

*Water for the Americas: Challenges and Opportunities*

**Supply and Sanitation: How Are the Unserved to Be Served?**

**Serving the Rural Unserved**

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Water management involves the protection of resources in order to secure safe water for consumption and continued use by the world population. It is especially urgent to secure access to quality drinking water for human consumption and improved sanitation services to reduce waterborne diseases and promote economic and social development. Therefore, our priority is directed to those who are not served with water supplies or basic sanitation services. Global Millennium Development Goals, established by the United Nations, have been set to provide rural unserved people with sustainable access to safe drinking water and basic sanitation services by 2015. In most developing countries, rural populations are migrating to urban areas: from 2007 onwards, the world urban population will be greater than the rural population. Even taking this into consideration, the Joint Monitoring Programme for Water Supply and Sanitation (JMP) predicts that in 2015 the number of unserved rural dwellers (1.7 billion) will continue to be more than twice the number of unserved urban residents (7 million). At the current rate of growth, only 49% of the rural population will have sanitation services by 2015. Therefore, the number of unserved people in rural populations need special attention in order to reach higher coverage with a healthful water supply and sanitation services. This is a special challenge in order to secure good water management in the Americas and contribute to improving safe water for consumption and sanitation in the developing countries of this hemisphere.

**1. Unserved in Rural Areas in the Americas**

According to the report “Progress on Drinking Water and Sanitation, Special Focus on Sanitation” from the WHO/UNICEF Joint Monitoring Programme for Water Supply and Sanitation-JMP (2008), the Latin American and Caribbean regions are advancing in their efforts to increase **coverage of improved drinking water sources**. From 1990 to 2006, the region has increased coverage in 8 percentage points, reaching 92%. As a

comparison, it is notable that the global coverage in 2006 for developing countries is 84% and the world percentage is 87%. The numbers tell another story when the urban-rural disparity is taken into account, in which Latin America and the Caribbean have one of the highest differences between urban and rural coverage. The water supply coverage for urban areas is 97% and rural is only 73%. As a reference, the world coverage is 96% for urban areas and 78% in rural areas. As observed in Figure 1, large areas of Central America and South America have been found to have rural drinking water coverage of between 50 and 75% by population. Rural access to improved drinking water sources remains low in the majority of countries of Latin America. (Annex 1)

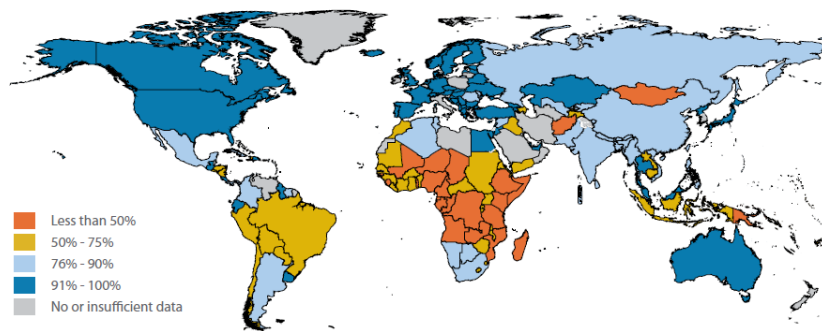


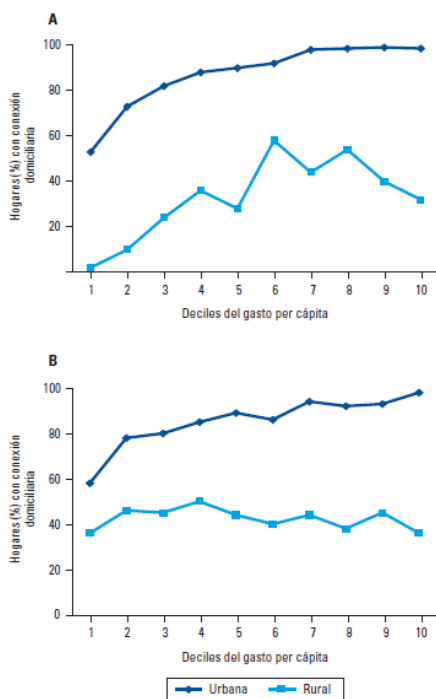
Figure 1. Trends in **rural** drinking water coverage by population, 1990-2006  
 (Source. Progress on Drinking Water and Sanitation, Special Focus on Sanitation from Joint Monitoring Programme for Water Supply and Sanitation –JMP(2008)

It has been found by the Joint Monitoring Programme that of the 53 million people in the Americas who do not have drinking water coverage, the majority (more than 68%) live in rural zones (JMP 2008). In most countries, access to water is unequal between rural and urban areas but also according to income groups. An example of two Latin American countries, Brazil and Peru, shows lower accessibility to drinking water in rural zones and in lower-income groups (Figure 2). In Latin America, the income share spent by the poorest quintile is more or less twice the income share spent by the richest quintile (Komives et al. 2005). If expenditures for non-piped services (water vendors and tanker trucks) are included, the income share for the poorest quintile increases even more. Global estimates indicate that the richest quintile of the income distribution is

twice as likely (four times more likely) to use improved water services (sanitation services) than the poorest quintile.

Some countries have made considerable progress. In 2006, three Central American countries have rural drinking water coverage of more than 80%: Guatemala, Costa Rica and Panama. In South America, four have more than 80%: Ecuador, Guyana, Uruguay, Argentina. Among the Caribbean, five countries have more than 80 percent: Barbados, Jamaica, Dominican Republic, San Kitts & Nevis and Trinidad & Tobago. (Figure 3)

**FIGURA 10. Cobertura de agua en las zonas rurales y urbanas del Brasil (A) y del Perú (B), y su relación con los deciles de gasto.**



Fuente: Organización Panamericana de la Salud. Desigualdades en el acceso, uso y gasto del agua potable en América Latina y el Caribe. Serie de informes técnicos no. 2 y no. 11. Washington, D.C.: OPS; 2001.

Figure 2. Drinking water coverage in rural and urban zones in Brasil (A) and Peru (B) in relation to spending. (Source. Organización Panamericana de la Salud. OPS (2007) Desigualdades en el acceso, uso y gasto del agua potable en América Latina y el Caribe. Serie de informes técnicos no. 2 y no 11)

Another indicator of improving drinking water conditions is the progress that has been made in the use of “piped drinking water on premises.” It has been observed that this is the best system to secure the improvement of health in a population. Globally, the use of piped drinking water has increased by 6% since 1990 and now has reached 54%. But,

again, this represents progress for urban populations in which 90% of urban dwellers have piped water in Latin America and the Caribbean, but the rural areas have only 48% coverage.

	% Rural Population	Rural Improved Drinking Water in the Region	Countries above 80%	Rural Improved Sanitation in the Region	Countries above 80%	Countries with a high open defecation in the population
Mexico	24%	85%	Mexico	48%		
Central America	28%-53%	63% - 94%	Guatemala, Costa Rica, Panama	34%-95%	El Salvador (80%), Costa Rica	Honduras (28%), Nicaragua (27%)
South America	6%-72%	52% - 100%	Ecuador, Guyana, Uruguay, Argentina (80%)	22%-95%	Guyana (80%), Uruguay, Argentina	Colombia(20%), Surinam (21%), Peru (35%), Brazil (40%), Bolivia (54%)
Caribbean	9%-87%	51% - 100%	Barbados, Jamaica, Dominican Republic, San Kitts & Nevis, Trinidad & Tobago	12% - 100%	Bahamas, Barbados, Cuba, Grenada, Jamaica, San Kitts & Nevis, Trinidad & Tobago	Haiti (51%)

Figure 3. Coverage of Improved Drinking Water and Sanitation per Region (Mexico, Central America, South America and the Caribbean) for 2006 (Data Source from JMP, 2008)

Although basic sanitation has the lowest utility coverage ratios in the Americas, the proportion of the population without access to drinking water is six times higher in the

rural zone as the urban zones, and the ratio for basic sanitation is three-and-a-half times higher in rural areas.

The number of *unserved* populations with **basic sanitation services** is overwhelming on a global scale. The number of people who still do not have access to improved sanitation is extremely high, and this impacts health, which in turn affects earnings and keeps people living in poverty.

In 2006, the world's population was almost equally divided between urban and rural dwellers. Nevertheless, more than 7 out of 10 people without improved sanitation were rural inhabitants. Better sanitation is the most important improvement that can guarantee better health in a population. It "offers us the opportunity to save the lives of 1.5 million children a year who would otherwise succumb to diarrheal diseases and to protect the health of many more" (JMP 2008). Better sanitation has also been recognized as a basic requirement for human dignity and promotes economic development and supports financial progress in education and health. The actual status is that only "62 percent of the world's population has access to improved sanitation" (JMP 2008), which means sanitation measures that guarantee separation of human excreta from human contact.

The urban sanitation coverage in Latin America and the Caribbean has reached 86%, which is above the world coverage of 79% percent. But rural coverage has been incredibly neglected, demonstrating only 52%, which shows one of the highest disparities between urban and rural coverage in the world. (Figure 4)

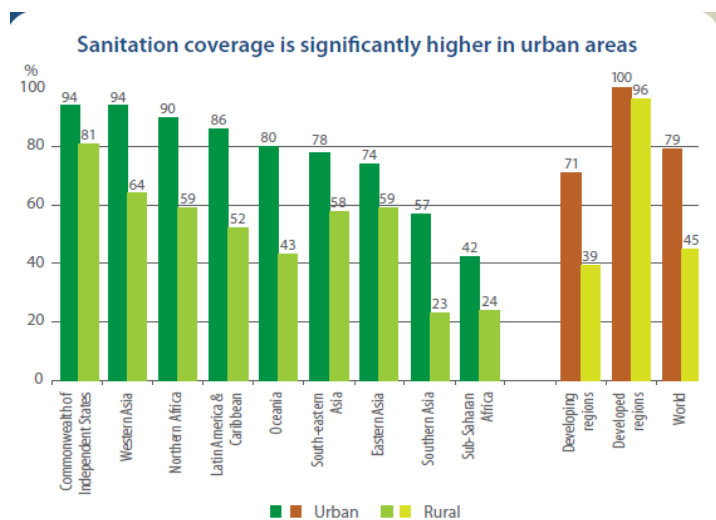


Figure 4. Urban and Rural Sanitation Coverage, 2006.

Progress on Drinking Water and Sanitation, Special Focus on Sanitation from Joint Monitoring Programme for Water Supply and Sanitation-JMP (2008).

In 2006, only two countries of Central America (El Salvador and Costa Rica) had 80% or more in coverage of improved sanitation in rural areas. In South America, only three countries (Guyana, Uruguay and Argentina) had more than 80% coverage in rural areas. In the Caribbean, rural areas of Bahamas, Barbados, Cuba, Grenada, Jamaica, San Kitts & Nevis, and Trinidad & Tobago had more than 80% coverage. (Figure 5)

High open defecation of the population causes contamination of water resources and, therefore, greatly impacts human health. In Central America, both Honduras and Nicaragua have problems with the continuing practice of open defecation in rural areas, registering respectively 28% and 27% of the population. In South America, five countries still show a population practicing open defecation above 20% in rural regions: Colombia (20%), Surinam (21%), Peru (35%), Brazil (40%) and Bolivia (54%). Only Haiti from the Caribbean has a high defecation rate of 51%, which is one of the highest in the Americas. (Figure 3)

Progress has been made in sanitation for rural areas in the Americas from 1990 to 2006. Mexico has improved from 8% to 48%. In Central America, Honduras, Guatemala and El Salvador have made more than 20% progress in securing sanitation in rural zones of their countries. Peru has advanced in coverage by 21%, Ecuador by 22%, Chile by 26%,

and Argentina by 38%. The countries of the Caribbean mostly had high coverage rates in rural areas but it is to be noted that the Dominican Republic has improved by 17%, and Haiti has reduced coverage in the 16 years by -8%. (Figure 5)

Country per Region	Sanitation coverage in 1990 in %	Sanitation coverage in 2006 in %	Progress in % coverage
<b>Mexico</b>			
Mexico	8	48	40
<b>Centroamerica</b>			
Guatemala	58	79	21
Belize	-	-	
Honduras	29	55	26
El Salvador	59	80	21
Nicaragua	23	34	11
Costa Rica	92	95	3
Panama	-	63	
<b>Suramerica</b>			
Colombia	39	58	19
Venezuela	47	-	
Ecuador	50	72	22
Guyana	-	80	
Suriname	-	60	
Peru	15	36	21
Bolivia	15	22	7
Brazil	37	37	0
Paraguay	34	42	8
Uruguay	99	99	0
Chile	48	74	26
Argentina	45	83	38
<b>Caribe</b>			
Antigua y Barbuda	-	-	
Bahamas	100	100	0
Barbados	100	100	0

Cuba	95	95	0
Dominica	-	-	
Grenada	97	97	0
Haiti	20	12	-8
Jamaica	83	84	1
Dominican Republic	57	74	17
San Kitts y Nevis	96	96	0
San Vicente	96	96	0
Santa Lucia	-	-	
	93	92	-1

Figure 5. Increase in coverage of sanitation in rural areas from 1990 to 2006 in Mexico, Central America, South America, and the Caribbean. (Data Source from JMP, 2008)

The lack of coverage of sanitary infrastructure, the discharge of domestic wastewater without treatment into surface water, and deficient functioning sanitation systems (septic tanks and latrines) contaminate groundwater, which can create major health problems in populations. The risks of wastewaters have been associated with transmission of enteric illnesses, such as cholera and typhoid fever. Those most vulnerable to health hazards, above all children, are most likely to be affected by one of the several water-related diseases (diarrhea, intestinal helminthes, schistosomiasis, trypanosomiasis, etc.). In an evaluation of drinking water and sanitation in the Americas, it was estimated in 2000 that the average production of wastewater reached 600 m<sup>3</sup>/seg, of which only 14% received treatment and, in reality, only 6% received adequate treatment (OPS 2007). Recent estimates show that improved water (sanitation) services reduce diarrhea morbidity on the average of 25% (JMP 2005). The lack of sanitation coverage has direct impacts on health. Figure 6 shows the reciprocal relationship between mortality in children under 5 years of age and coverage of sanitation in the countries of the region.



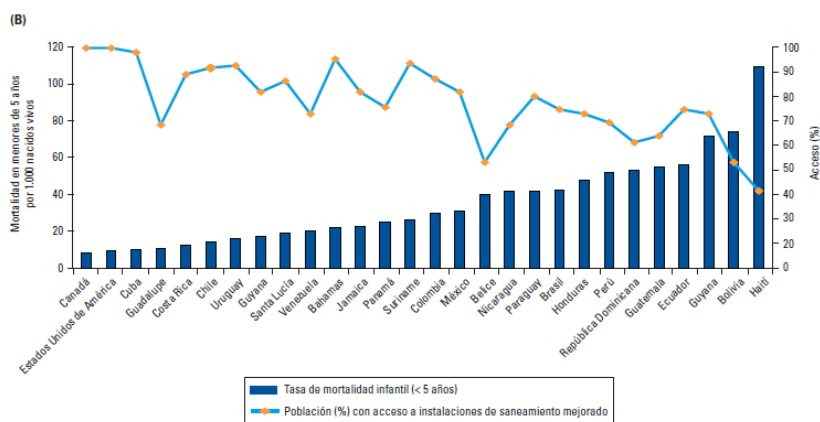


Figure 6. Comparison of rate of infantile mortality and population with access to sanitation infrastructure in the countries of the Americas (adapted from Otterstetter H., 2004)

Results of the evaluation of costs and benefits of water and sanitation improvements in Latin America and the Caribbean countries have shown that meeting the 10<sup>th</sup> millennium goal of 50% reduction of the deficit of access to water and sanitation would have an annual benefit of \$9,635 million US\$, versus a cost of \$788 million US\$. The benefits include savings on health costs but the major benefit is saving time, which could be invested in other sectors such as education agriculture, industry, tourism, etc. (Hutton G. & Heller L. 2004)

The quality and sustainability of water and sanitation services is a problem in rural areas. The majority of countries report discontinuity in services that risks public health and results in inefficient use of infrastructure. Deficiencies in the operation and maintenance of installations can mean affecting the quality of water, failures in disinfection, and loss of water in the distribution system. Keeping track of water usage and billing is usually very poorly developed in rural areas and there are enormous deficiencies and absence of disinfection of water, especially in rural areas (OPS 2007).

One factor that is of utmost importance to secure good-quality water is the development of monitoring capacity for existing distribution systems and sources of drinking water. Monitoring systems do exist but sometimes do not include rural areas. Good laboratory analytical services are essential, including basic chemical and physical analysis,

determination of metal and organic compounds (hydrocarbons and pesticides), and analysis for bacteriological quality of water in the distribution system, as well as in surface and groundwater, which serve as present and future sources for potable water. Only laboratories with well-established quality control systems can provide valid and precise data for evaluation of good water quality.

Based on data reported by the provincial and district health authorities of Columbia (SSPD 2006), in 2005 64% of the districts for which information was available reported that the delivered water did not meet the legal standards defined in Decree No. 475 (Ministerio de Salud de Colombia 1998).

It is important to note that in meetings of ministers of environment and health of Latin-American and Caribbean countries in Ottawa in 2002 and in Mar del Plata in 2005, declarations emphasized a great need to promote integrated management of water resources. The deficient management of watersheds to protect water resources, combined with the discharge of wastewater without treatment and limitations in infrastructure to secure efficient treatment, are factors that cause deterioration of the quality of water distributed to consumers.

The protection of water resources (both surface and groundwater) is one of the first and largest problems in securing good-quality water for human consumption. In order to secure sustainable water sources, it is essential to impede the contamination of these bodies of water. In rural areas, the contamination is dominated by pesticides used in agriculture, nitrates from sources of domestic and community wastes, and bacterial sources from poor-quality sanitation and open defecation, which is more frequently practiced in rural areas. Eutrophication of surface waters is due to changing of soil use, deforestation, and an increase in agricultural and pasture lands in the watersheds, which bring erosion and contamination with agrochemicals. This results in higher treatment costs and deterioration of drinking water quality due to high concentrations of organic substances which on contact with chlorine can be a risk to health. In a regional study by the Council of European Professional Informatics Societies (CEPIS), more than 75% of the lakes and dams evaluated in the Latin American and Caribbean countries (Argentina, Brazil, Colombia, Cuba, Ecuador, El Salvador, Guatemala, Honduras,

México, Nicaragua, Paraguay, Peru, Puerto Rico, Dominican Republic, and Venezuela) were classified as eutrophic or in the process of eutrophication. (OPS 2007)

Due to climate change, the demand for water will increase in just 20 years by 40%, and by more than 50% in the most rapidly developing countries. Supply expansion and improvements in efficiency will not be able to close the gap. Rural areas will be affected stronger in areas of low coverage, where irrigated agriculture dominates, and in semi-arid and arid zones. These factors will slow down economic development, and result in more hungry villages and degraded environments. (Water Resources Group 2009).

On July 28, 2010, the United Nations adopted a resolution proposed by Bolivia with the support of several Latin American and Caribbean countries which declared the “right to safe and clean drinking water and sanitation as a human right that is essential for the full enjoyment of life and all human rights” (General Assembly of the United Nations 2010). The declaration called upon states and international organizations to “provide financial resources, capacity building and technology transfer, through international assistance and co-operation, in particular to developing countries, in order to scale up efforts to provide safe, clean, accessible and affordable drinking water and sanitation for all”. The World Health Organization and the United Nations’ High Commissioner for Human Rights published a document in 2003 International Year of Freshwater “The Right to Water,” in which the responsibility of governments were recommended to defend the right to water with the following practices: 1) legislative implementation; 2) adopting a national water strategy and plan of action to realize this right; 3) ensuring that water is affordable for everyone; and 4) facilitating improved and sustainable access to water, **particularly in rural** and deprived urban areas. These are new initiatives to emphasize a human rights-based approach to water that should guarantee a social and cultural value to the resource instead of dominantly economic. This should also mean that the unserved or “least served” are given priority in policies and management for the access of water.

## **2. Causes for the lack of service in rural areas**

Why are water and sanitation services so far behind in coverage and quality in rural areas? Why are the numbers of unserved in rural areas the highest in the Americas?

Rural areas tend to have less economic activity, high poverty rates and usually lower population density. The lack of water and sanitation services in rural areas increases the risk of disease, which in turn means less productivity and economic possibilities of the household. Productivity is also extremely reduced, due to time spent in obtaining safe water from wells far away or from extremely expensive sources such as vendors. It can be said that lacking access to adequate water and sanitation services reduces personal opportunities to economic, social and political dimensions of well-being.

It is obvious that the **average income** of the country, the **availability of freshwater resources** in both ground and surface waters conditioned by quantity and quality of water and also the spatial distribution and social-cultural aspects of the population affect the demand and supply and therefore the organizational forms of services in rural areas. Private service providers are usually not interested in serving rural areas due to the high atomization of the service needs and especially the low perspective of tariffs.

But, the causes for the lack of services in rural areas are multiple and have their essential source in the organization of society and decision-making which neglects or has a lack of understanding and capacity in taking on challenges for improving equity of these services in rural areas.

The lack of **good-quality governance** and effective **institutional frameworks** that shape policy-making and public decision-making for rural areas are one of the principle reasons for the low coverage of water and sanitation services. Due to the low political representation in the government and the absence of special policies for securing safe water for all populations with emphasis on the unserved, the inhabitants of rural areas suffer from deficient performance of water services. Policies have not been developed to promote investments to benefit those who lack access, which almost always concentrated in poor rural areas.

One of the results of good governance is the restructuring of **economic policies** to promote the increase in coverage of water and sanitation services in rural areas. In *The Political Economy of Water and Sanitation* (Krause 2009), it has been emphasized that “both improvements in allocative efficiency and improvements in equity are considered valid arguments for justifying welfare-enhancing in water and sanitation policies.” In

other words, adopting economic policies that make good usage of resources and that promote their best use for benefiting the unserved; that is evading urban bias in economic policies and putting priorities on rural areas. Most governments in the Americas give very little priority to rural water and sanitation, and prefer to invest in large-scale projects for urban populations that are able to pay for higher levels of service at full cost-recovery water rates. Evidence has been found that low-quality governance of sub-national governments compromises a more widespread access to services (Krause 2009). It is to be emphasized that a changing of priorities is needed both at central and local community government levels.

Sometimes rural communities are forced to pay for investment in basic services by taking loans. In most urban areas' water supply systems, infrastructure, electricity, sewerage, drainage, education, and health are all subsidized from the state. Some subsidy systems have reached only households that are connected to an established service provider, and it has been observed that "half of the households that are subsidized have an income that lies above the national poverty line." (Krause 2009)

In analyzing the reasons for low coverage within a country, it is necessary to examine the governance factors that influence collective decision making and implementation of economic policies within the state. It is essential to evaluate the **institutional framework** and which components are responsible for rural areas and know how they are being politically represented. Who are the institutional actors that play a role in providing water and sanitation services?

Global estimations for developing countries indicate that 75% to 85% of the financing for the water and sanitation sector originated from public sources in the 1990s (65% to 70% from public domestic sources and 10% to 15% from international donors); at present, just about 3% of the population is served by providers that are fully or partially private owned (Krause 2009). This means that it is vital to have **cooperation of governments, civil society and private sector** for investment and management of water and sanitation services in rural areas.

It is sometimes found that public funds destined for the water and sanitation sector are not used sufficiently to expand services to the unserved in rural areas. Some of the

factors that are responsible for this lack of investment for expansion are: 1) the lack of capacity for and absence of territorial planning of districts in rural areas, 2) the lack of civic participation in the planning process, 3) lack of coordination between investments plans of service providers and public or district investment plans, and 4) lack of supervision and transparency in the awarding of construction contracts.

There is evidence that private service providers can contribute to improvements in the internal efficiency of water and sanitation services but have not been able to affect on a long-term basis as promoting coverage expansion or improvements in better social distribution of services (Krause 2009). These factors depend on the quality of governance.

Most analysis of water and sanitation services note that an effective institutional framework to accomplish a functional economy should include structures for three components: 1) policy making, 2) regulation, and 3) service delivery. The design of the structure of these components varies. It has been recommended that citizens or users be incorporated into these structures to guarantee effectiveness for those being benefited by the service or in the user's interest.

As in other services that involve large investments in infrastructure, one requirement is considerable investments in long-lived assets. For this reason, reliability of water and sanitation policies is essential even in decentralized systems.

In rural areas, these institutional framework components are somewhat different but of utmost importance since the services are usually decentralized and imply highly atomized production units which entail good cooperation on a local and regional level.

Here user participation is essential in all three – policy, regulation and service delivery – in order to guarantee good-quality service adapted to the characteristics of the specific rural areas in question. There are also good examples in Latin America of user cooperatives who are both owners and carry out the management of the service provider.

One of the causes that influence the coverage of services to rural areas and is observed in the practice throughout the Americas is **clientalism**, in which politicians deliver benefits according to political and economic support from different groups of the population. As poor rural areas usually have less potential to support candidates due to

lack of economic means and reduced voter quantities, this phenomena has been observed to affect service coverage. This also affects the accumulation of capacity due to frequent technical and management staff rotation. This, combined with tendencies of corruption, affects policy making which turn back from equity policies and turn toward “private-regardedness rather than public-regardedness.” (Krause 2009)

As has been emphasized before, controlling the **quality of water** being provided to the consumer is one of the main factors in assuring good water services with safe water, which should be monitored in the process of regulation according to legal norms. Due to lack of knowledge and information, the importance of the quality of water in rural areas has been neglected. It should be noted that in rural communities, even where the availability of water resources is secured, people suffer from water-related diseases due to the use of poor-quality water drawn from unprotected shallow wells or other sources used. For this reason, the term **access to safe drinking water** or the availability of good-quality water systems is the real challenge. In many countries of Latin America rural water resources are affected by natural arsenic contamination (Argentina, Nicaragua, Honduras, and others).

Lack of **capacity** of local authorities and communities required to manage water supply and sanitation service delivery is very prominent in rural areas. This means not only technical capacity but also the need for competence in mobilizing financial sources for investment in water and sanitation projects in rural areas and in the organization of the institutional framework of management and delivery of services. Regional and local authorities need to improve their capacity in organizing systems in outlying areas, logistical organization and getting finance and materials required for the delivery of water and sanitation services. There is a lack of knowledge of small-scale technological solutions adequate for use in rural areas.

Wastewater services and **sanitation needs special attention** in rural areas as the coverage percentages are the lowest, as observed by the JMP mentioned above. The willingness to pay for sanitation is typically lower than for water, and the awareness among users of the benefits from sanitation services is lower. The demand for sanitation is also lower in rural areas because it depends on the level of hygiene education. This is partly due to a misconception of sanitation and lack of consciousness in the population

about their necessity in rural areas. “In many villages, the same source is used for all water purposes: drinking water, and washing cattle, clothes and people. During the rainy season, the number of sanitation-related diseases increases because run-off water washes feces into the ponds” (Keirns 2007). The common concept of sanitation systems involves only the toilet, but the system involves “more than just the user interface but includes the excreta collection unit: a method of transport from the site; the treatment process and, finally, the end use or disposal” (Van Vliet et al. 2010). Sanitation systems must also include not only physical infrastructure but also the users and management frameworks for the operation and maintenance of the whole treatment process. The entire system needs human interaction as individual user and communal group users. The development and design of systems especially for rural areas must take into consideration culture and the organization of the civil society in the specific area. The Sustainable Sanitation Alliance defined in 2007 a sustainable sanitation as systems that “primarily protect and promote human health by providing a clean environment and breaking the cycle of disease, and that sustainable sanitation systems must not only be economically viable, socially acceptable, and technically and institutionally appropriate, but should also protect the environment and the natural resource base” (SuSanA 2007).

There is a great need for **education in hygiene** in rural areas. It should be noted that in many cases, the installation of the different systems of latrines have not solved the problem of sanitation, rather, in many cases, have even caused fecal contamination of drinking water sources.

It is also very important to emphasize that investing in sanitation infrastructure involves a **long project cycle** and, if the MDG sanitation target is to be achieved, innovative approaches need to be developed to reduce the time span from policy-making to services delivery.

The increased introduction of wastewater treatment and sanitation is of special importance as they increasingly have an impact on surface and groundwater sources due to deficiency or absence of systems in rural areas. Of course, this in turn, can affect the quality of drinking water sources. It is also a principal of good water management to secure good-quality “upstream” water resources and adequate wastewater services and



sanitation as a precondition for solving other water issues, such as those of clean water supply in municipal and rural systems, downstream.

There are many **conflicts of use for land and water** in rural areas, especially between agriculture and domestic use which impact drinking water accessibility and influence wastewater sanitation. This is, of course, driven by economic growth in this sector as an essential industry for food production. “Agriculture accounts for approximately 3,100 billion m<sup>3</sup> or 71 percent of global water withdrawals today, and without efficiency gains will increase to 4,500 billion m<sup>3</sup> by 2030 (a slight decline to 65% of global water withdrawals)” (Water Resources Group 2009).

**Climate change** also affects water availability, especially in rural areas with dry climate conditions. Climate change impacts due to dry events such as El Niño which leads to scarcity of water resources in specific rural areas usually located in semi-arid and arid regions. Extreme climate events such as hurricanes and tropical storms cause flooding which leads to contamination of water resources by landslides and also in individual domestic wells that commonly lack protection in rural areas.

### **3. Remedies available for lack of service for low income rural populations.**

Remedies for the lack of access to water and sanitation services in rural areas must involve the use of innovative technology, but innovation is also needed in creating good governance which means institutional and financial mechanisms. Resolving problems of equity and good quality of services is key to all recommendations for remedies. Due to the conditions of population dispersion in rural areas which call for systems of large atomization of service units, the most appropriate solutions will be low-cost decentralized systems that are completely different from modern sanitation systems.

Sanitation in rural areas deserves special remedies. Some rural settlements probably will never have centralized sewage systems. Dry toilets, urine-diversion toilets, vacuum toilets, on-site composting, or anaerobic digestion are all potential means to keep places clean and hygienic, while making the need for sewage systems redundant. It is necessary to guarantee that these remedies are widely adapted to the specific area which assures their acceptance and widespread use. It is essential to develop rural sanitation with a mix of scales, strategies, technologies, payment systems, and decision-making

structures that better fit the physical and human systems for which they are designed (Van Bliet et al. 2010).

Martijn and Hubers (2001) have suggested several components for the technical design of treatment systems with effluent use. These would include type of post-treatment, effluent supply, irrigation method and technology, and crops and farming practices. Irrigated agriculture could therefore receive and use different qualities of water. Farmers could be inserted into the end point of the sanitation system which economize nutrient uses; although it has been pointed out that it is hard to accomplish both hygiene and food safety along with the reuse of excreta. Special monitoring capacities and mechanisms for handling excreta are needed. The protection of water quality must be guaranteed which means controlling runoff to local water resources.

One of the preconditions for these improvements is that governmental institutions or NGO's have to provide technical assistance and capacity strengthening on different levels from general hygiene education of the population up to the technical and institutional management of the water and sanitation systems. Also, local government authorities need capacities in order to coordinate activities and negotiations as well as developing monitoring and regulation for decentralized systems.

Most economic studies have shown that there exists a bias towards big systems while completely neglecting on-site options and semi-collective solutions adapted to local spaces (Van Vliet et al. 2010). Therefore, it is necessary to develop alternative ways for financing the development and functioning of the decentralized systems. It has been suggested funding at the local level. Micro-credit schemes have proved to increase the debt of poor households. Another proposal is for government authorities to develop a general system of subsidies on sanitation facilities. Sources of indirect financing could be from drinking water tariffs or funds (e.g., from abstraction of raw water or discharge of wastewater). Local businesses could be involved in the process. A system of subsidies for infrastructure expansion or new connections could lower the burden of investment costs for new users and promote wider use of sanitation (Krause 2009), and subsidies could be included for low-income households if the current tariff level is higher than the affordable limit for households living below the poverty line.

Better governance that prioritizes rural areas must involve forming special policies, measures of regulation and promote equity in service delivery for the water and sanitation sector. Institutions that promote democratic participation should look for systematic effects on policy making. Accountability of public officials to the population as a whole needs to be guaranteed through a system of checks and balances. It is important to reinforce user participation at all levels “in order to make regulators and service providers responsive to the interests and needs of users” (Krause 2009). In rural areas it is especially important to emphasize the importance of the quality of local governance, because user participation and the availability of transparent information can prevent clientilism from affecting equity in the provision of services.

Some countries (for example, South Africa) have provided a special legislative framework for the responsibility for water supply and sanitation devolved from the nation level to the local governments in order to secure better access in both urban and rural areas.

Good planning of water and sanitation projects is vital, which means attacking the issue both at the local and national level. Institutional, financial, social, technical and environmental sustainability must be taken into consideration in all planning processes to guarantee that a long-term economic improvement can be reached. Participation and coordination among the different stakeholders is part of the planning strategy. The development of facilities that meet the needs and cultural preferences of the beneficiaries is key to the planning strategy in order to guarantee that they take ownership, are willing and have the capacity to maintain the system over a long period of time. Provisions must be taken into consideration to guarantee that the system remains functional and a system of tariffs that could lead to self-funding. It has been observed in many community projects that it is favorable to use local materials and labor in the construction process and promote capacity-building in the maintenance for local people.

Communities should evolve their own systems of monitoring or be linked to a system for the periodic control of quality of water.

It is now essential to introduce water harvesting in watersheds and groundwater recharge promotion to improve availability of water resources for the communities, especially in semi-arid and arid areas affected by climate change. A fundamental part of improving availability is the promotion of measures to increase the efficiency of water application and the net water gains through crop yield enhancement (Water Resources Group 2009). Stakeholders in water-deficient watersheds will have to eventually make decisions for water resource security, which could involve water-saving techniques for farmers.

There are many examples of community-based water and sanitation projects in Latin America. The Comities of Drinking Water and Sanitation (in Spanish – Comitees para Agua Potable y Saneamiento, CAPs) is a good example of how availability of water resources has been improved in rural areas where private and state companies have not reached. The comities have been formed in the majority of the watersheds of Nicaragua – from semi-arid to regions with high precipitation. Presently 1, 200,000 Nicaraguans have water administrated by the CAPS. Their functions are to solicit with municipal authorities construction works for drinking water and sanitation; orientate, direct and organize the construction; assure the care and maintenance of the works; and support initiatives for health campaigns, reforestation and conservation of environment. They are also distributing special filters to remove arsenic from contaminated wells in rural areas. They are planning a monitoring system for all water sources in coordination with the Nicaraguan Research Center for Water Resources of the National Autonomic University of Nicaragua. In 2010, a Special Law for the Comities of Potable Water and Sanitation (CAPS) was approved by the National Assembly of Nicaragua (Ley No. 722, Nicaragua 2010). The objective of this law is to institutionalize, regulate, support and facilitate legal and administrative processes necessary for the community projects of existing CAPS, and to normalize the establishment of new CAPS.



Activities of Comities of Potable Water and Sanitation in Rural Areas of Nicaragua

#### **4. Recommendations to reach a sharp reduction of unserved in rural areas in the next decades.**

The challenge to sharply reduce the number of unserved in rural areas in both water supply and sanitation in the Americas is a big task, considering the existing gap of coverage. However, it is possible at a reasonable cost if all countries together with all stakeholders develop concerted efforts to bring a turnaround in the approach in adopting a total resource view in which water is seen as a key, cross-sectoral input for development and growth. It needs to fund water sector reforms and initiate high-intensity activities in poor rural areas. This turnaround implies changes in the governance of water focused on the unserved in rural areas. Society must be prepared to adapt policies that guarantee the expansion of water and sanitation services to rural areas that lack access. This means introducing programs to subsidize those households and communities in which the expenses are unaffordable, along with stimulating and introducing support and ownership of water supply and sanitation in different forms of community user participation and management. The countries should set up good water governance with a well-functioning system of checks and balances that includes an accountable regulatory system to prevent tendencies toward clientalism. They should also secure a good and transparent management of water services to improve the application of water policies that guarantee an equitable distribution of water and sanitation access. User participation and democratic accountability can make a difference in securing the just representation of rural areas.

A concentrated divulgation campaign and implementation of educational mobilization programs in rural areas is needed to increase social awareness of water issues and to

raise consciousness of the importance of hygiene and water sanitation. Water projects in rural areas have been found to waste too much time from policy-making to delivery and, therefore, it is necessary to introduce special intensive programs designed to reduce this time span. It is important that governments, in cooperation with the civil society and private sector partners, promote the innovation of water and sanitation technologies and service levels that are technically, socially, environmentally, and financially appropriate for rural areas. The development of rural sanitation must be undertaken with a mix of scales, strategies, technologies, payment systems, and decision-making structures that better fit the physical and human systems in the specific rural areas. The introduction of technical sanitation infrastructure involving different management compartments that rely on human interaction in both individual and communal contexts should be closely related to specific cultural and economic aspects of the rural community. Watershed management to secure long-lasting availability of good-quality water resources for the communities is essential. Measures for water harvesting in watersheds and groundwater recharge promotion can improve availability in semi-arid and arid rural areas. The difference in the impacts from climate change should be taken into consideration for the management of different watersheds. Efficiency in the use of water for agriculture needs special attention in rural areas.

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Haiti	2006	61	51	4	58	11	47	42	12	6	31	51	19	13	34	34
Jamaica	2006	47	88	47	93	70	23	7	84	12	3	1	83	14	3	0
Dominican Republic	2006	32	91	62	95	82	12	5	74	15	3	8	79	15	2	4
San Kitts & Nevis	2006	68	99	-	99	-	-	1	96	-	4	-	96	-	4	-
San Vicente	2006	54	-	-	-	-	-	-	96	-	4	-	-	-	-	-
Santa Lucia	2006	72	-	-	-	-	-	2	-	-	-	-	-	-	-	-
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