

FINANCING WATER RESOURCES MANAGEMENT IN MEXICO

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1 Introduction

After some expert meetings and as a part of its 2009-2010 program of work, the Organisation for Economic Co-operation and Development (OECD) decided to carry out some work on the area of financing water resources management (WRM) and concluded that a “reference framework” should be provided to decision-makers to help them know more about the needs and options for funding water resources management, as well as best use the existing resources. In this sense, the OECD decided to carry out the report “Financing Water Resources Management” with three main objectives: i) to provide a reference framework for examining the issue of financing WRM, ii) to take stock of current experiences in financing WRM, and iii) to identify emerging challenges in financing WRM.

Moreover, to enrich the document it was decided that it was important to compare experiences of OECD and developing countries with good quality case studies that provide evidence for the analysis of current policies and practices around the world. That is why Mexico accepted the invitation to collaborate with this important task, so that the National Water Commission of Mexico (CONAGUA) and the Mexican Institute of Water Technology (IMTA) joined capacities and experience to prepare this paper on financing water resource management in Mexico.

For the preparation of this paper, some areas within CONAGUA and IMTA collaborated: *Subdirección General de Programación, Subdirección General de Administración del Agua, Subdirección General Técnica, Coordinación de Revisión y Liquidación Fiscal, Subdirección General de Agua Potable, Drenaje y Saneamiento, and Subcoordinación de Planeación, Economía y Finanzas del Agua.*

2 Executive Summary

Mexico has a unique set of water resource management challenges, and has developed a complex, decentralized method of managing and funding investments in water resources to meet those challenges. The country has uneven water availability, with an arid northern half that is seriously water constrained, and a southern half that is less constrained but still suffers from the problems that affect the entire country such as pollution and inefficient use of water.

Water resource management has long been a policy priority for Mexico, and the legal framework for managing water resources emanates from the country’s Constitution. The Constitution establishes that the national government is the owner of all water resources in Mexico, while local governments are responsible for delivering water and sanitation services. The National Water Law further develops this framework by tasking a federal agency—the National Water Commission (CONAGUA)—with responsibility for leading and coordinating water resource management. Any use of national water resources (both abstraction and discharge) requires a permit from CONAGUA. CONAGUA collects fees for water abstraction and discharge and redistributes the proceeds of those fees to be used to develop water resource management infrastructure.

Stakeholders play a major role in managing water resources. Mexico has devolved many water resources administration functions to local bodies centered on river basins, with 13 hydrological-administrative regions defined by the river basin boundaries. The hydrological-administrative regions are governed by 13 river basin organizations (*organismos de cuenca*) which are comprised of various government and water user

stakeholders who make decisions on allocating abstraction rights and investing in water resource management infrastructure. Stakeholders also participate in water resource management through a variety of other groups, such as the Irrigation Water User Groups which are responsible for managing large investments in irrigation infrastructure, including planning investments, operating the infrastructure, and collecting fees from users.

Mexico's strategy for managing water resources is defined in the Government's six-year National Development Plan, The National Water Program (PNH—Programa Nacional Hídrico) and the National Infrastructure Program (Programa Nacional de Infraestructura). The National Water Program lays out a defined set of goals for the sector over the period from 2007 to 2012, which include improving water productivity, increasing water quality, promoting sustainability in water management, and creating a culture of paying fees.

A key element for meeting its goals in the water sector is undertaking more investment in water resource management infrastructure. The lack of cost recovery through user fees is one major impediment to meeting investment needs in the sector. As a result of the lack of cost recovery, third-party financing is difficult to raise, and the sector relies almost entirely on government subsidies to meet its investment needs. The funds for these subsidies come from a variety of sources such as tax revenue and petroleum royalties, and are disbursed through a variety of programs, the largest of which are programs managed by CONAGUA.

Two of the largest of these CONAGUA programs are The Drinking Water and Sanitation Program for Urban Areas (APAZU—Programa de Agua Potable y Alcantarillado Sanitario en Zonas Urbanas) and the Program for the Reimbursement of Duties on Water Use and Wastewater Discharge (PRODDER—Programa de Devolución de Derechos). APAZU disburses subsidies targeted to improve the operating, commercial and financial efficiency of water supply and sewerage in urban areas. PRODDER reimburses water use duties to water and sanitation providers to fund qualifying investments.

In addition to providing grants, the government is also undertaking efforts to encourage a greater use of commercial finance and private sector participation. The core of this effort is the Water Utilities Modernization Program (PROMAGUA) with its financial tool, the National Infrastructure Fund (FONADIN). The Fund provides financing for planning, design, construction and transfer of projects in the water and sanitation projects that demonstrate positive social impact, reasonable profitability, and include private sector participation. So far it has provided about US\$1.5 billion for the sector, but most of its support to water supply infrastructure has taken the form of grants and subsidies, given that there has been little private-sector participation in the water sector.

Overall, private-sector participation and direct private financing of water investments has been rare. Mexico has a well-developed sub-national bond market, but this has not been a significant source of direct financing for the water sector. Water utilities have not been able to borrow on commercial terms, given the inability of most water utilities to recover costs. Instead, the bond issuance is often a source of general funding for local governments, which in turn use the proceeds to subsidize water investments. Similarly, the use of private sector participation (PSP) contracts in the water and sanitation sector has been limited. With more than 1,200 water and sanitation providers in the country, only about PSP 32 contracts have been signed; of these, about 70 percent have been

Build-Operate-Transfer (BOT) contracts. These contracts have been effective ways of raising funds for investments in facilities for treating water, treating wastewater, and desalination, but do not improve the level of efficiency of the water and sanitation providers and do increase the cost of service.

Mexico's water resource management framework has generally been successful at efficiently allocating water use rights among various users in a water-constrained environment, but some changes in the sector are still needed. For example, one challenge is to achieve a higher level of cost recovery through tariffs. Another challenge is for CONAGUA to improve water management by more closely linking grants and subsidies to performance, and by giving decentralized river basin organizations greater control over their budgets and planning processes. A final challenge is for CONAGUA to improve its current water rights management scheme by developing an economic value of water and linking abstraction charges to that value. These opportunities for improvement could increase the sustainability of the sector.

3 Background

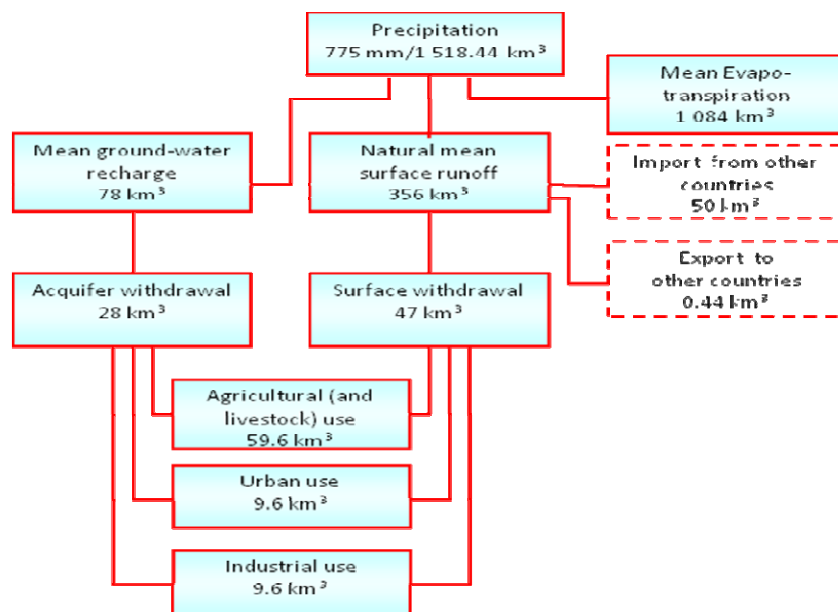
Mexico faces a number of human and environmental challenges in managing its water resources; it has developed a complex, decentralized policy framework involving a wide variety of stakeholders for meeting those challenges. In this section we provide an overview of the following key aspects for understanding these challenges:

- Water in Mexico—Uneven Water Availability
- Water legal framework and water management tools in Mexico
- Main water stakeholders in Mexico
- Policies for water resources management in Mexico
- Water challenges in Mexico—water stress and pollution

3.1 Water in Mexico—Uneven Water Availability

Water availability in Mexico varies significantly in different parts of the country and in different parts of the year. Mexico contains nearly 1,500 river basins, with most of the surface water concentrated in the southern half of the country. These basins vary greatly in size: 87 percent of the country's surface runoff is concentrated in 50 basins, and two-thirds is concentrated in just seven basins. Rainfall is also concentrated in the southern half of the country, and 68 percent falls between the months of June and September. Below we illustrate the mean annual data for the components of the hydrologic cycle in Mexico:

Figure 3.1: Mean Annual Data for the Components of the Hydrologic Cycle



The river basins are the basic unit for managing water resources in Mexico. In 1997, the country was divided into 13 hydrological-administrative regions with the objective of organizing the management and preservation of the nation's waters¹. These 13 regions contain 37 hydrological regions, which in turn consist of 1471 river basins, and 728 aquifers. The distribution of population, economic activity and mean natural availability of water is highly skewed across each of these 13 regions (see Table 3.1). More than 50 percent of the population lives in a region that can be considered to be in a condition of water stress (that is, areas with less than 1,700 cubic meters per person per year of mean natural availability of water).

Table 3.1: Uneven distribution across the 13 Regions

Region	Percent of Population	Percent of Gross Domestic Product	Percent of Overexploited Aquifers	Mean natural availability (in m ³ /person/year)
I - Baja California Península	3.4%	3.5%	8%	1,257
II – Northwest	2.4%	2.6%	21%	3,208
III – Northern Pacific	3.7%	3.1%	8%	6,471
IV – Balsas	9.9%	11.0%	4%	2,049
V – Southern Pacific	3.8%	1.8%	0%	7,955
VI - Río Bravo	10.1%	14.7%	15%	1,101

¹ These hydrological-administrative regions are composed of river basins, but have been created by taking into account municipal borders so as to facilitate the integration of socioeconomic information.

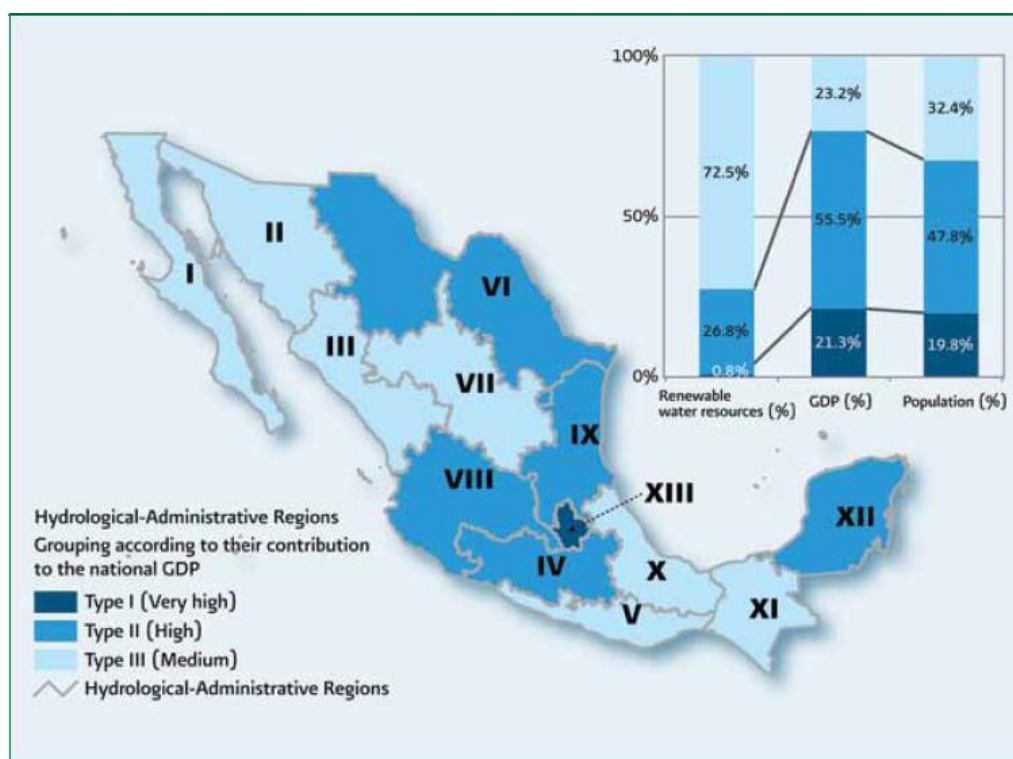
VII – Central Basins of the North	3.9%	2.7%	35%	1,898
VIII – Lerma-Santiago-Pacific	19.4%	14.5%	25%	1,642
IX – Northern Gulf	4.6%	6.8%	5%	5,155
X – Central Gulf	9.0%	4.8%	0%	9,969
X1 – Southern Border	6.1%	4.8%	0%	24,043
XII – Yucatan Peninsula	3.7%	8.5%	0%	7,442
XIII – Valley of Mexico	19.8%	21.3%	29%	165

Source: CONAGUA, *Estadísticas del Agua, edición 2010*

The map of Mexico in Figure 3.2 shows the location of these 13 regions. It demonstrates the unequal distribution of population, economic activity and availability of water.

The magnitude of this disparity is also relatively large: the Southeast of the country has a mean natural availability of water of about 4 times the national average. Table 3.1 highlights the problem further—the more than 20 percent of Mexico’s population that live in the Valley of Mexico have access to only 165 cubic meters per person per year.

Figure 3.2: Water availability in Mexico: disparity between the North and South



Source: CONAGUA, *Estadísticas del Agua, edición 2010*

Table 3.2 shows that water use in Mexico is heavily skewed toward agriculture. Of the water that is consumed in a given year, 77 percent is used for agricultural irrigation, while only 14 percent is used for public supply. Another 5 percent is used to generate electricity

in hydro plans, and 4 percent is consumed by self-supplying industry (see Table 2). Most water used—63 percent—comes from surface sources, the remainder—37 percent—is extracted from groundwater sources.

Table 3.2: Total offstream use (in km³) by source of withdrawal, 2008

Use	Origin		Total Volume (in km ³)	Percent
	Surface (in km ³)	Groundwater (in km ³)		
Agricultural	40.7	20.5	61.2	76.8%
Public supply	4.2	7.0	11.2	14%
Self-supplying industry (excluding thermoelectric)	1.6	1.6	3.3	4.1%
Thermoelectric	3.6	0.4	4.1	5.1%
Total	50.2	29.5	79.8	100%
Percent of Total	63%	37%		

Mexico's water resources needs have made water resource management a long-running strategic national priority. The next section discusses how the basic principles of decentralized water resource management are enshrined in national law.

3.2 Water legal framework and water management tools in Mexico

The National Constitution provides a broad framework for managing water resources in Mexico, with federal laws such as the National Water Law and Federal Duties Law providing the specific elements of that framework. This section discusses:

- The National Constitution—The Framework for Managing Water Resources
- Federal laws
- State laws and regulations

3.2.1 The National Constitution—The Framework for Managing Water Resources

The Constitution provides the outline of a decentralized water resource management framework, with the federal government as owner of national water resources, and sub-national entities having responsibility for providing water. It contains two articles for managing water resources in Mexico. The first, Article 27, states that the Federal Government is the original owner of water resources—rivers, lakes, and underground water—within the national boundaries. It further states that the Government has the right to transfer title of these water resources to other parties, constituting private

property.² The second, Article 115 (at paragraph III) assigns responsibility for providing water and sanitation services to municipal governments.

3.2.2 Federal laws

The following two federal laws regulate the relevant provisions in the Constitution and provide further guidance for managing water resources in Mexico:

- **The National Water Law (LAN, *Ley de Aguas Nacionales*³)**—this is the main law governing the water sector, establishing the principles and mechanisms for managing water resources in Mexico. The law establishes that all water use and discharge requires a concession from the federal government
- **The Federal Duties Law (LFD, *Ley Federal de Derechos*⁴)**—this is the federal law that establishes the collection of fees related to water resource management. For each municipality it establishes the availability zone, which determines the water abstraction fee payable in each municipality. It also establishes fees for water discharge and pollution, and prescribes which institutions within the Government receive those fees. In effect, this law applies the principle of the water user pays and the polluter pays.

In conjunction, the National Water Law and the Federal Duties Law establish the following four categories of tools for managing water resources:

- **Regulatory**—such as the allocation of titles for concession and allocation of water use rights; and three instruments: prohibitions, reserves and regulations within basins or aquifers so additional water will not be extracted; available water will be reserved to assure public services, restoration and preservation; and controls in water extraction, exploitation and use will be established if hydrologic or ecosystem sustainability are to be guaranteed
- **Order and control**— such as inspection and measurement; and sanctions
- **Economic**— such as the collection of fees for using water; the transfer of water rights; and the operation of water banks
- **Participative**— such as the management of water planning organizations; user associations; river basin councils; and technical committees for underground water (COTAS—*Comités Técnicos de Aguas Subterráneas*)

Finally, there are several Mexican Norms (Norma Oficial Mexicana—NOM), which are compulsory standards for technical and operational aspects of various sectors. Examples of Mexican Norms which affect the water sector include:

- **NOM-001-ECOL-1996**, which limits the maximum pollutants that can be discharged in national waters
- **NOM-002-ECOL-1996**, which establishes what can be discharged into urban drainage systems

² The text in Spanish reads: “La propiedad de las tierras y aguas comprendidas dentro de los límites del territorio nacional, corresponden originariamente a la Nación, la cual ha tenido y tiene el derecho de transmitir el dominio de ellas a los particulares, constituyendo la propiedad privada.”

³ This law was initially published in the *Diario Oficial de la Federación* on 1 December 1992. A modified version of this law was published on 29 April 2004.

⁴ This law was originally published in the *Diario Oficial de la Federación* on 31 December 1981. The latest reforms to this law were published on 27 November 2009.

- **NOM-003-ECOL-1997**, which establishes the limits of pollutants contained in treated wastewater for reuse in public services
- **NOM-127-SSA1-1994**, which establishes a baseline for environmental health and standards for water for human use and consumption.

These functions are carried out by a variety of actors including Federal Government entities such as CONAGUA

3.2.3 State laws and regulations

States also have a role in regulating the water sector, usually through economic regulation undertaken by state-level ministries and water commissions. These bodies can set state-level regulation in the sector, including tariffs for providing water and sanitation, design criteria for water infrastructure design and construction, and environmental and health standards for water infrastructure.

Having reviewed key aspects of the legal framework we now turn to the main stakeholders in the water sector in Mexico.

3.3 Main water stakeholders in Mexico

Mexico has a well-developed network of entities with responsibilities in the water sector. CONAGUA is the institution with responsibilities for coordinating the water sector, interfacing with decentralized river basin organizations and other bodies with various sector and regional responsibilities. The following government, quasi-government, and non-governmental bodies have key responsibilities for managing water resources in Mexico:

- The National Water Commission
- Other Institutions and Organizations with Responsibilities for Managing Water Resources

Below we describe each of these bodies.

3.3.1 The National Water Commission

The National Water Commission (CONAGUA—*Comisión Nacional del Agua*) is the federal government body with the greatest responsibility for water resource management in the country. CONAGUA is in charge of managing water resources in the country, and its main functions include the development of the national water policy; administering the rights for water use and wastewater discharge; planning, irrigation and developing drainage systems; managing emergency and natural disasters and managing investment in the water sector in Mexico.

CONAGUA is a decentralized agency under the mandate of the Ministry of Environment and Natural Resources (SEMARNAT *Secretaría del Medio Ambiente y Recursos Naturales*). It carries out its functions through 13 river basin organizations (*organismos de cuenca*), each of which is responsible for one of the hydrological-administrative regions. CONAGUA also has 20 local offices (*direcciones locales*) in the states in which no river basin organization has its headquarters.

CONAGUA funds the majority of its activities with direct budgetary transfers from the Federal Government and it also with the payments it receives for water use and wastewater discharge duties. It disburses those funds back to states and municipalities

through a variety of programs (see Section 6.3 for an overview of programs managed by CONAGUA for funding the water sector).

3.3.2 Other Institutions and Organizations with Responsibilities for Managing Water Resources

While CONAGUA is the agency with the greatest responsibility for water resource management, many other government entities have some role in the sector, in areas from environmental and health regulation to providing subsidized financing. Here we detail the other agencies that have some responsibility for managing water resources according to the following categories:

- Federal government institutions with primary responsibilities for managing water resources
- Federal government institutions with secondary responsibilities for managing water resources
- State, municipal, and other entities with responsibilities for managing water resources

Federal government institutions with primary responsibilities for managing water resources

The following Federal Government can be understood to have primary responsibilities for managing water resources in Mexico:

- **Ministry of Finance and Public Credit (Secretaría de Hacienda y Crédito Público)**—This Ministry defines the budget that is allocated to the water sector, coordinating with institutions in the water sector on the corresponding scheduling, and authorizing multi-year investment programs.
- **The Federal Congress (Congreso Federal)**—The Federal Congress sets policies and approves budgets for the water sector, assesses and approves amendments to the National Water Law and its regulations
- **Mexican Institute of Water Technology (IMTA—*Instituto Mexicano de Tecnología del Agua*)**—The Mexican Institute for Water Technology is a decentralized public organization that is responsible for producing, implementing and promoting knowledge, technology and innovation for the sustainable management of water resources in Mexico.
- **National Infrastructure Fund (FONADIN—Fondo Nacional de Infraestructura)**—The National Infrastructure Fund (FONADIN) is the coordination vehicle for funding and developing infrastructure in the communications, transport, water, environment and tourism sectors. The Fund provides financing for planning, design, construction and transfer of projects in the water and sanitation projects that demonstrate positive social impact, reasonable profitability, and include private sector participation. This program is described in more detail in Section 6.
- **Federal Attorney for Environmental Protection (PROFEPA—Procuraduría Federal de Protección al Ambiente)**—conducts environmental studies and monitors the quality of rivers, lakes and groundwater. The agency applies sanctions where violations of environmental regulations are discovered.

- **Ministry of Social Development (SEDESOL—Secretaría de Desarrollo Social)**—provides support to rural communities in developing water supply, sewerage and sanitation infrastructure
- **Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food (Secretaría de Agricultura, Ganadería, Desarrollo Rural, Pesca y Alimentación)**—Taking actions to achieve more efficient and productive water use in agriculture for meeting the country’s food needs and ensuring the sustainable use of soil and water resources
- **Federal Electricity Commission (CFE—Comisión Federal de Electricidad)**—Builds and operate dams which are used for generating electricity, supplying water to cities, irrigation and flood protection.
- **National Forestry Commission (CONAFOR—Comisión Nacional Forestal)**—funds and undertakes efforts to reduce soil erosion in upstream areas of river basins⁵

Federal government institutions with secondary responsibilities for managing water resources

The following Federal Government institutions can be understood to have secondary responsibilities for managing water resources in Mexico: Ministries of Foreign Affairs (Secretaría de Relaciones Exteriores); of the Interior (Secretaría de Gobernación); of Health (Secretaría de Salud); of Economy (Secretaría de Economía); of Public Education (Secretaría de Educación Pública); of Civil Service (Secretaría de la Función Pública); of Tourism (Secretaría de Turismo)

State, municipal, and other entities with responsibilities for managing water resources

In addition to the Federal Government agencies described above, state and municipal governments, as well as other entities, play an important role in managing water resources in Mexico.

- **State governments**—State governments have responsibilities for planning, regulating, developing infrastructure for water resources, and in some cases, directly providing water and sanitation. In most states, State Congresses are responsible for setting the tariffs charged by water and sanitation providers; in some cases the states have delegated this authority to state water commissions (*comisiones estatales de agua*). The state water commissions are organizations that coordinate between municipalities and the federal government to improve water management and water and sanitation service provision. State governments also can formulate their own development plans, similar to the National Development Plans, and carry out the objectives of those plans through state-level planning and development ministries.
- **Municipal governments and water and sanitation providers**—In Mexico, municipalities are responsible for providing water and sanitation services. In addition to providing the service directly (for example, through providers that are part of the municipal government or legally separate entities that are

⁵ Within its program for payment of environmental services (PRISMA—*Pago por Servicios Ambientales en las Américas*), CONAFOR has a component that is specifically for hydrological services.

wholly-owned by the municipality) or through delegation to others (for example, to private operators through concession contracts or to utilities owned and operated by the state government).

- **The National Association of Water and Sanitation Companies (ANEAS—Asociación Nacional de Empresas de Agua y Saneamiento de México)**—ANEAS is an association that encompasses the water and sanitation providers in Mexico. Its main objective is to support increases in efficiency of the water service provision, and the levels of professionalization and autonomy
- **Watershed Councils (Consejos de Cuencas) and their subsidiary bodies**—Participate in the integrated management of river basins and aquifers to promote social welfare, economic development and environmental preservation
- **Technical committees for subterranean waters (COTAS—comités técnicos de aguas subterráneas)**—provide training to the water users in exploited aquifers, helping them better understand the state of the aquifers and participate in developing proposed policies and programs related to the aquifers.

All of these agencies and organizations are aligned by a set of strategic priorities for Government policy and actions in the water sector. Those priorities are explained in the following sub-section.

3.4 Policies for water resources management in Mexico

Given the challenges and objectives described above, the Government's policy for managing water resources is based on the following principles:

- **Water resources are managed through river basins**—the country has been divided into 13 hydrological-administrative regions (groups of river basins that respect the municipal limits to facilitate the integration of socioeconomic information) for a better management and preservation of water
- **Water resources are managed with the organized participation of water users**—River basin organizations are managed by a variety of water user stakeholders. Irrigation users are also responsible for managing large irrigation schemes through Water User Associations (*asociaciones civiles de usuarios*)
- **Water use is managed through concessions allocated by the federal government**—exploitation and use is made through concessions (private users) and allocations (states and municipalities), as well as wastewater discharge permits, (which are recorded in the Public Registry of Water Rights).
- **Municipalities are responsible for providing water and sanitation services**—municipal governments are responsible for providing water and sanitation service either directly through municipal government departments, or through delegation to other entities such as municipally-owned companies, or, in a few cases, private providers. These providers typically receive subsidies for operating expenses and investments in infrastructure.
- **Water use should be managed to maintain the water balance in ecosystems**—the government seeks to manage water use to encourage sustainability in the

ecosystem, both through environmental regulations and by managing permits available from CONAGUA. Federal, state, and local officials all have a role in creating environmental standards for water use and discharge.

These policies are meant to manage the interests of various stakeholders in meeting the wide range of water-sector challenges. The environmental aspects of these challenges are discussed in the next sub-section, while the financial aspects are discussed in Sections 5 and 6.

3.5 Water challenges in Mexico—water stress and pollution

The main challenges related to the water environment are high levels of water stress and pollution. We describe these challenges in more detail below:

3.5.1 High levels of water stress

This low level of availability in the north, combined with high demand, leads to a significant level of water stress. On the whole, Mexico is experiencing 17 percent water stress, which is moderate; however, the central, northern and northwest area of the country is experiencing 47 percent water stress, which is as a strong degree of stress.⁶

Aquifer stress is a major component of overall water stress. Of the country's 653 aquifers, 101 are overexploited. These overexploited aquifers are concentrated in four of the 13 hydrological-administrative zones (with almost one-third of them being in the Lerma-Santiago-Pacific region). The overexploitation of aquifers creates high environmental, social and economic costs, including: a) Environmental harm to nearby plants and animals; b) Increased pumping costs; c) Saltwater and pollution intrusion; d) Reduction in aquifer size; e) Reduction in the performance of wells; f) Reduction of the base flow and depletion of seeps; and g) Sinking and cracking of soil.

The depletion of water resources can be attributed to a number of causes. In some cases, users abstract more water than what is stated in their water rights, and in others, the water allocated in their water rights is greater than the actual water availability. Climate variability, for example droughts or hurricanes, also plays a role in reduced water availability.

Another reason that aquifers are overexploited is that the subsidized electricity price charged for pumping of underground water for irrigation (tariff category 09) provides incentives for increasing the volumes of water pumped. This subsidy is a clear example of one of the public policies in the water sector that must be coordinated with those in other sectors, such as agriculture.

With the objective of administering and preserving the national waters to achieve their sustainable use among the Government and society, the National Water Commission (CONAGUA) has the obligation of carrying out visits for measuring and inspecting. The purpose of these visits is to verify that the users are complying with the obligations established in the National Waters Law, the regulations of that law and the other applicable legal measures. The importance of this issue is not trivial. In the design of the new instruments for regulating the relationship between economic activities and sustainable use of water resources, it is fundamental to note that a disorderly behavior of

⁶ CONAGUA, *Statistics on Water* 2008, page 61“An indicator of the water stress in any given country, catchment or region is the percentage of water used for offstream uses as compared to the total availability. It is considered that if the percentage is greater than 40%, there is strong water stress...”

the economic agents in the use of water and its public good aspects is a constraint for the sustainable development of the country.

Increasing the efficiency of irrigation infrastructure is also important; there are substantial losses in the irrigation networks. Since irrigation accounts for the vast majority of water use, better managing irrigation use could have a big impact on reducing the quantity of water needed and thus water stress. While water losses are high, Mexico has had some success in increasing the agricultural productivity of water used in recent years, a factor that is the result of a good water rights allocation system, described in detail in Section 5.3.

In addition to reducing water losses and increasing agricultural productivity, another important way to reduce water stress would be to reduce the water permits available for irrigation, but to do so would reduce the surface available for agriculture, which would make such a solution politically difficult. Nevertheless, such reductions may be necessary for regions such as the basins of Lerma-Chapala, the Valley of Mexico, the Colorado River, and the Bravo River, all of which suffer from major water stress.

Greater participation is required by the representatives of the users in the river basin organizations so that they communicate to the users the need to compromise on measurement, efficiency, and actions based on a basin-wide vision. Water users must change their perception that the aquifer is an ordinary and additional source of water rather than a reserve for periods of scarcity.

3.5.2 Need to reduce pollution

Mexico needs to increase the percent of wastewater collected and treated so that it can improve the quality of water provided to its citizens. Water quality problems affect both residential and agricultural users. Furthermore, Table 3.13 shows that regions with a large percentage of Mexico's population have water quality indicators reporting the water as being "polluted" or "heavily polluted".

Table 3.3: Comparing water quality indicators by region

Region	Percent of Population	Percent of sites reporting to be "Polluted" or "Heavily Polluted" according to:		
		Five-day Biochemical Oxygen Demand	Chemical Oxygen Demand	Total Suspended Solids
I - Baja California Pensinsula	3.4%	15%	75%	3%
II – Northwest	2.4%	10%	22%	14%
III – Northern Pacific	3.7%	3%	31%	0%
IV – Balsas	9.9%	14%	36%	17%
V – Southern Pacific	3.8%	0%	7%	13%
VI – Río Bravo	10.1%	4%	16%	2%
VII – Central Basins of the North	3.9%	0%	0%	5%
VIII – Lerma-Santiago-Pacific	19.4%	21%	61%	10%
IX – Northern Gulf	4.6%	2%	7%	6%

X – Central Gulf	9.0%	7%	19%	4%
X1 – Southern Border	6.1%	0%	6%	9%
XII – Yucatan Peninsula	3.7%	0%	0%	0%
XIII – Valley of Mexico	19.8%	68%	72%	40%
Average for the country		14%	31%	9%

Source: CONAGUA, *Estadísticas del Agua, edición 2010*

Water quality is evaluated with three indicators: five-day Biochemical Oxygen Demand (BOD5), Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS). BOD5 and COD help determine the quantity of organic matter mainly from municipal and non-municipal wastewater discharges.

Mexico has a National Monitoring Network, which in 2008 included a total of 1186 sites.

Around 42 percent of municipal wastewater is treated before being discharged (with the goal being 60 percent by 2012), and 16 percent of industrial wastewater, which means there is room for improvement in this area. The insufficient treatment of discharged water also has detrimental effects on agriculture. It is estimated that 240,000 hectares are irrigated with wastewater with no treatment, which affects the health of farmers and consumers.

These interrelated issues create a unique policy challenge for Mexico on how to allocate water amongst the various users and fund investments for providing water to those users. The next section examines how Mexico approaches those challenges through its national development plan.

4 Benefits of water resources management— Mexico’s National Water Resources Program Plan and its beneficiaries

Water resource management is a key aspect of Mexico’s strategy for human and economic development. The country’s National Water Resources Program (PNH—Programa *Nacional Hidrico*) lays out a set of goals for water resource management, defining what the impact of better water resource management would be for development. The beneficiaries of water resource management are primarily water users, who are represented through a various water user groups. This section discusses:

- **The contribution of water resources management to the national development goals**—The National Water Resources Program provides a set of clear goals for the water resource management sector.
- **Beneficiaries of water resources management**—Water users are the primary beneficiaries of water resource management policy in Mexico. A variety of organizations represent their interests in setting water resource management policy.

4.1 The contribution of water resources management to the national development goals

The National Water Program (PNH—*Programa Nacional Hídrico*) is the water sector's core policy instrument and outlines the main objectives and strategies for every six-year period. The current Program is for the period from 2007 to 2012.

The PNH is linked to the National Infrastructure Program (*Programa Nacional de Infraestructura*), which covers the Government's priorities for infrastructure development, and the Sectoral Program for the Environment and Natural Resources (*Programa Sectorial de Medio Ambiente y Recursos Naturales*). The PNH establishes eight guiding objectives for the period from 2007 to 2012:

1. Improving water productivity in the agricultural sector
2. Increasing access to and quality of drinking water, sewerage and sanitation services
3. Promoting integrated, sustainable water management in river basins and aquifers
4. Enhancing the technical, administrative and financial development of the water sector
5. Consolidating the participation of users and organized society in water management and to promote a culture for the proper use of this resource
6. Preventing risks related to meteorological and hydro-meteorological events and responding to their effects
7. Assessing the effects of climate change on the hydrological cycle
8. Creating a culture of paying for fees and complying with the administrative provisions of the National Water Law

For each of these objectives, strategies and goals have been established, and the challenges and organizations that must play a key role in attaining each of them have been identified. Integrated water management is an important aspect of Objective 3 and is interrelated with the other seven objectives, in particular Objectives 1, 2, 5 and 6. Achieving these objectives will require a combination of financial resources that could come from private companies, water users, and the federal, state, and municipal governments.

4.2 Beneficiaries of water resources management

Investing in water resources management has a number of important human development and economic benefits. This sub-section discusses aspects of both.

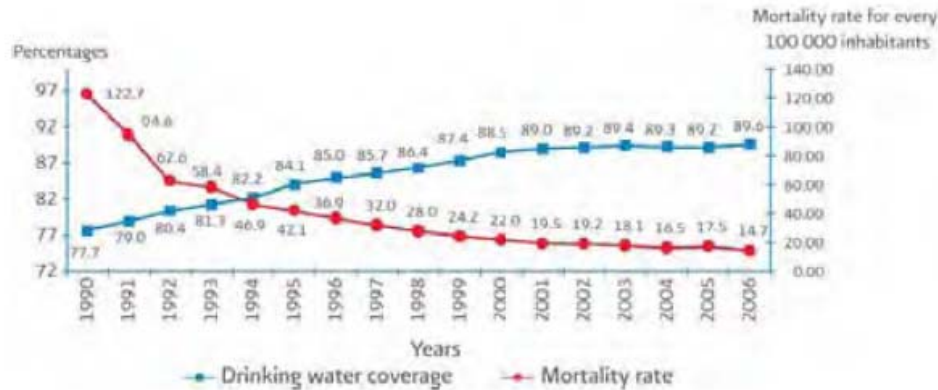
4.2.1 Human development benefits

Good water resource management has important human development impacts. Access to safe water and sanitation service has a strong correlation with health outcomes.

Most deaths from dysentery and diarrhea can be avoided with better access to water and sanitation. The World Health Organization (WHO) estimates that efforts to improve sanitation reduce diarrhea diseases by 32 percent, efforts to improve water supply decrease such diseases by 25 percent, and efforts to improve water quality decrease them by 31 percent.

Mexico's experience bears this out; Figure 4.1 shows that as improved drinking water coverage has increased, mortality from water-related diseases has drastically decreased.

Figure 4.1: Percentage of drinking water coverage and mortality rate through diarrheal diseases in children under 5 years old, annual series from 1990 to 2006



Source: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from the Ministry of Health. General Office for Performance Evaluation. <http://evaluacion.salud.gob.mx/indicadores/indicadores2.html>. June 2008.

Worldwide, investments in water supply and sanitation demonstrated major human development impacts. 320 million productive days gained each year in the 15- to 59-year age group, an extra 272 million school attendance days a year, and an added 1.5 billion healthy days for children under five years of age. These human development impacts come with major economic benefits.

4.2.2 Economic benefits

The economic benefits of water resource management can be divided between the economic benefits of improved health from water and sanitation investment, and the economic benefits derived from irrigated agriculture.

Worldwide, improvements in water and sanitation have saved 7 billions dollars per year in health care costs and 340 million in individual health expenditures. Productivity gains are estimated to be worth 9.9 billion, and avoided death worth \$3.6 billion. Similar figures are not available for Mexico specifically, but international data shows that the economic payoff of water and sanitation investments is far higher than the cost of the investments.

Mexico also derives significant economic benefits from irrigated agriculture. Agriculture accounts for 8.4 percent of GDP and employs 23 percent of Mexico's working population. About 30 percent of agricultural land in Mexico is irrigated. This land contributes 50 percent of agricultural production by value, and 70 percent of Mexico's agricultural exports.

The next section will discuss how Mexico invests in water resource management to make these benefits possible.

5 Investing in water resources management

The costs of water resource management are borne mainly by the federal government through subsidies, a fact necessitated by the low operating margins at water utilities. Mexico has taken some efforts to manage costs. The financial efforts to manage costs are discussed in Section 6, while in this section we cover the costs of water resource management and some of the non-financial efforts to manage those costs as follows:

- Water resources management expenditures
- Evaluation of the costs of water resources management—most water and sanitation providers do not cover costs
- Experience reducing costs and improving efficiency—A good water rights allocation system

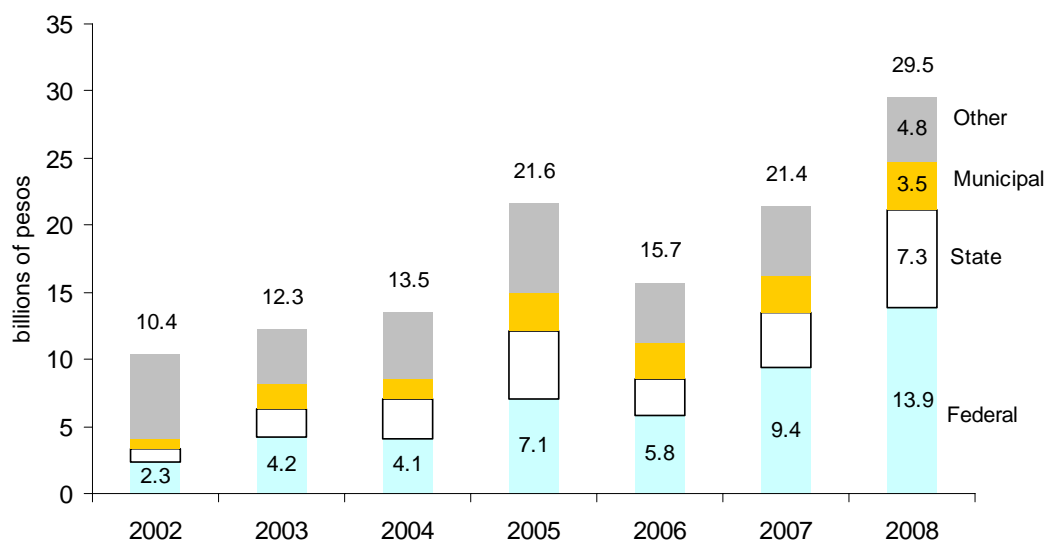
5.1 Water resources management expenditures

The costs of developing water resource management are typically paid by the Federal Government through about nine programs, of which the largest is the Drinking Water and Sanitation Program for Urban Areas (APAZU—*Programa de Agua Potable y Alcantarillado Sanitario en Zonas Urbanas*)⁷ for the water and sanitation sector, while the Program for Rehabilitation and Modernization of Irrigation Districts (*Programa de Rehabilitación y Modernización de Distritos de Riego*) is the largest in the water for agriculture sector. We provide a detailed overview of these programs in Section 6.

Funding available for the water sector is variable and subject to cyclical swings in the national economy. In real terms, overall investment in water infrastructure declined by about one-third from 1980 to 2002, but has since rebounded to the higher levels registered in the 1980s. Figure 5.1 shows investments undertaken in the water sector since 2002, including a breakdown by source of funding. Funding for water and sanitation has also risen substantially in recent years, as shown in Table 5.1.

⁷ In addition to the APAZU, the other eight programs are: the Program for the Modernization of Water Providers (PROMAGUA—*Programa para la Modernización de los Organismos Operadores de Agua*); the Program for the Sustainability of Potable Water and Sanitation Services in Rural Communities (PROSSAPYS—*Programa para la construcción y rehabilitación de sistemas de agua potable y saneamiento en Zonas rurales*); the Program for the Reimbursement of Water User Charges (PRODDER—*Programa de Devolución de Derechos*); the Federal Sanitation Program for Wastewater (PROSANEAR—*Programa Federal de Saneamiento de Aguas Residuales*); the Clean Water Program (PAL—*Programa de Agua Limpia*); (PATME—*Programa de Asistencia Técnica para la Mejora de Eficiencias del Sector Agua y Saneamiento*); and the Competitive Fund for Wastewater Treatment (*Fondo Concursable para Tratamiento de Aguas Residuales*)

Figure 5.1: Evolution of investments in water and sanitation by type of source



Source: CONAGUA, *Situación del Subsector Agua Potable, Alcantarillado y Saneamiento, Edición 2009*

Table 5.1: Investments in WSS by type of investment (millions of pesos at constant 2008 prices)

Year	Drinking water	Sewerage	Sanitation	Improving efficiency	Other	Total
2002	4,599	5,210	1,974	1,543	105	13,431
2003	6,388	6,082	1,491	1,153	217	15,331
2004	6,305	6,410	1,813	1,277	84	15,887
2005	9,505	9,330	3,700	1,804	133	24,473
2006	5,951	6,364	1,991	2,615	269	17,191
2007	9,824	7,801	1,824	2,575	596	22,620
2008	11,230	10,150	3,056	4,003	1,096	29,536

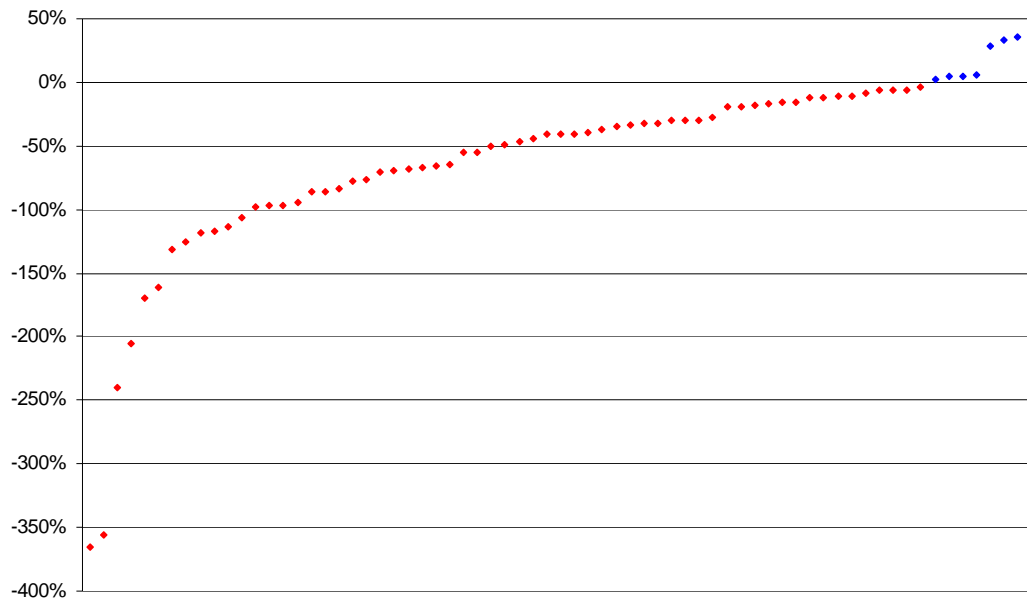
Source: CONAGUA 2010

5.2 Evaluation of the costs of water resources management—most water and sanitation providers do not cover costs

Most water and sanitation providers in Mexico do not cover operating expenditures with revenues from tariffs; the two main reasons for this are poor operating efficiency and tariffs that are not sufficient to cover reasonable costs of service. Figure 5.2 shows that in a sample of 69 of the largest providers in the country only 8 had operating margins that were positive (that is, that tariff revenues exceeded operating expenditures). This means that most providers are not able to generate any cash flows from operations that could

be used for investing in infrastructure for providing service (such as increasing the capacity of treated water) or reducing the level of wastewater that is not treated.

Figure 5.2: Operating margin for 69 municipalities with a population greater than 50,000 (2008)



Source: CONAGUA, Situación del Subsector Agua Potable, Alcantarillado y Saneamiento, Edición 2009

The operating margin equals: [total revenues (revenues from providing water, sewerage, and wastewater treatment)] minus [the total operating expenditures of the providers for salaries, maintenance, and operation] divided by [total revenues].

The Federal Government is working with the water and sanitation providers to help them increase their physical and commercial operating efficiency. Furthermore, it is undertaking efforts to convince the public that the tariffs charged for water and sanitation services must be sufficient to cover the full costs of operations and the replacement of infrastructure.

5.3 Experience reducing costs and improving efficiency—A good water rights allocation system

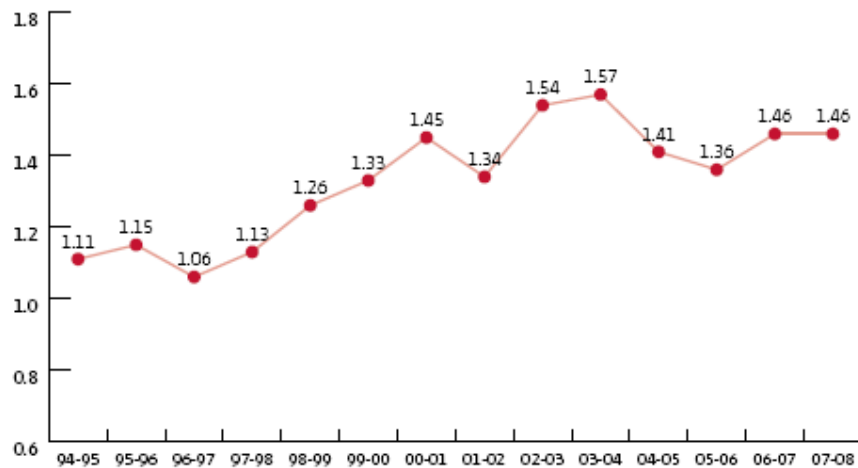
Mexico has made efforts to lower the costs through programs funded by the Federal Government and through the framework for managing water rights. In Section 6, we describe efforts to lower costs that involve the various funding programs of CONAGUA. Here we focus on the framework for managing water user rights.

Mexico's need to distribute limited water among a diverse group of users has led it to develop a good framework for allocating water resources. Good allocation of water rights has helped Mexico lower the amount of water used per unit of agricultural production. Figure 5.3 shows the increasing productivity of water use in irrigation. Mexico's framework for allocating water rights includes the following tools:

- Water Use and Wastewater Discharge Titles
- Duties Charged for Water Use and Wastewater Discharge Titles

- Water Banks
- Prohibition Zones
- Publishing of the Mean Annual Water Availability for Each Region
- Classifying bodies of water as national waters
- Mexican Standards

Figure 5.3: Productivity of water in the Irrigation Districts



Source: CONAGUA, *Statistics on Water*, 2010 edition

5.3.1 Water Use and Wastewater Discharge Titles

The National Water Law establishes that the right to use the nation's waters will be provided through a concession granted by the Federal Government, through CONAGUA, by means of its river basin organizations, or directly through CONAGUA when appropriate, according to the rules and conditions set forth in the Law. Similarly, for wastewater discharges, it is necessary to obtain a discharge permit issued by CONAGUA. As of the year when the National Water Law came into force (1992), all titles for water use (concessions and allocations) and discharge permits must be recorded in the Public Registry of Water Rights (REPDA—*Registro Público de Derechos de Agua*). As of December 2008, over 360 thousand concession or allocation deeds, accounting for almost 250 billion cubic meters of water, had been registered in the REPDA.

5.3.2 Duties Charged for Water Use and Wastewater Discharge Titles

All entities that use water or discharge wastewater must pay a duty. For the purposes of charging these duties, Mexico has been divided into nine availability zones. In general, the cost per cubic meter for a particular area increases as the availability of water falls. For example, the range for water used for supply of drinking water is from about 0.08 to 0.72 Mexican pesos per cubic meter (equivalent to about 0.01 to 0.06 US\$ per cubic meter).

According to Article 278C of the Federal Duties Law, the duties for wastewater discharges are related to the volume of wastewater discharged and the load of the

pollutants. The duties charged on wastewater discharged also depend on the body of water into which the discharges are made. For this purpose, the bodies of water are classified into three types: A, B, or C, according to the effects caused by the pollution, with the C-type receiver bodies being those in which the pollution has the strongest effect. The Federal Duties Law sets forth the list of the bodies of water that belong to each of these three categories.

The Law creates exceptions for payment for certain users and categories of use. For example, agricultural users only pay for the volume of water consumed above the volume allocated to them in their title. Another example are rural communities (those with populations below 2,500 inhabitants) that do not pay for water used as drinking water.

CONAGUA is responsible for billing and collection of the duties for water use and wastewater discharge. Table 5.2 shows proceeds collected by CONAGUA in 2008 related to these duties as well as other fees and services associated with managing water resources. Of approximately US\$859 million collected in 2008, US\$633 million (or about 74 percent) was from duties for water use. The payment of duties for wastewater discharges was significantly less, accounting for only US\$5 million (or less than 1 percent).

As described in Section 6, CONAGUA uses a portion of the proceeds collected from the duties for water use and wastewater discharge to fund two programs (PRODDER and PROSANEAR) that provide funding on a grant basis to municipalities and water utilities that are current on their duties for water use and wastewater discharge. With PRODDER the funding is given with the condition that the service provider adds the same amount of money to carry out an action plan to improve the water services (efficiency and/or infrastructure).

Table 5.2: Collections of Duties and Fees Related to Managing Water Resources

	Amount Collected in 2008 (in US\$ millions)	Percent of Total
Duties for water use	633	74%
Block water supply to urban and industrial centers	170	20%
Irrigation	16	2%
Duties for wastewater discharges	5	>1%
Other	35	4%
Total	859	100%

Source: CONAGUA, *Estadísticas del Agua en México, Edición 2010*

“Other” includes: fees for extraction of materials, fees for use of federal zones; transaction services; and Value Added Taxes and fines, among others.

5.3.3 Water Banks

With the objective of making the transfer of water use rights more efficient and transparent, the Government has created water banks as vehicles for managing regulated operations. These water banks are responsible for acting as facilitators, providing information about the applicable norms, advising and guiding users, verifying that the water use rights that are going to be transferred comply with the applicable regulations; with an aim to avoid speculation, hoarding and the existence of informal water markets. At end-2009, there were a total of six water banks operating in Mexico.

In Mexico, the problems of overexploitation and pollution of the bodies of water, as well as prohibitions on use of water, make it more difficult every day to issue new concession titles or allocations in most of the country's north-central region, therefore the reallocation of titles through water banks is one of the options for obtaining access to water resources.

Some of the challenges to ensuring effective operation of these water banks are sale of water rights among different uses, lack of metering, differential management between agricultural use and industrial or for public consumption that results in lack of interest in increasing the efficiency in agriculture and concern about the efficiency in industrial or public consumption.

5.3.4 Prohibition Zones

With the aim of diminishing the overexploitation of the country's aquifers and watersheds, the Federal Government has issued prohibitions to restrict water withdrawals in various areas. As of December 2009, 145 prohibition zones for groundwater sources were in place. For surface waters, the prohibition zones were established between 1929 and 1975. In 2006, after having carried out the corresponding technical studies, the Government suspended the prohibitions on numerous river basins.

5.3.5 Publishing of the Mean Annual Water Availability for Each Region

The National Water Law Law establishes that when awarding titles for water use through concessions or allocations, CONAGUA must take into account the mean annual water availability of the river basin or aquifer from which the water will be used. CONAGUA must publish this availability for each river basin or aquifer according to NOM-011-CNA-2000, which is titled, "Conservation of water resources—which establishes the specifications and methodology for determining the mean annual availability of the nation's waters". As of April 2010, the availability of the entire 728 basins in the country and 282 hydrogeological units or aquifers, from which 75 percent of the country's groundwater is withdrawn, had been published in the Official Government Gazette (DOF—*Diario Oficial de la Federación*).

5.3.6 Classifying bodies of water as national waters

The National Water Law states that when awarding discharge permits for wastewater the Declarations for Classification (*Declaratorias de Clasificación*) of the bodies of water owned by the nation must be taken into account. CONAGUA is responsible for developing and publishing in the DOF the Declarations for Classification. According to Article 87 of the National Water Law, the Declarations for Classification provide the borders of the

bodies of water, as well as their capacity for assimilation and dilution of any contaminants⁸.

In the following section we examine successes and failures in using financial resources.

5.3.7 Mexican Standards

Recently, CONAGUA has issued a set of compulsory (NOM) and non-compulsory (NMX) norms to support management of water resources in Mexico, among which are:

- Drinking Water, Drainage and Sewerage, Services – Tariff – Methodology to evaluate the tariff.
- Drinking Water, Drainage and Sewerage – Efficiency - Methodology to Evaluate the Service Quality. Part 1.- Guidelines for the assessment and for the improvement of the service to users
- Drinking Water, Drainage and Sewerage – Efficiency - Methodology to evaluate the service provider efficiency. Part 1 - Guidelines for the management of wastewater utilities and for the assessment of wastewater services.
- Drinking Water, Drainage and Sewerage – Efficiency - Methodology to evaluate the service provider efficiency. Part 2.- Guidelines for the management of drinking water utilities and for the assessment of drinking water services.
- Requisites for the artificial recharge of aquifers with treated wastewater
- Artificial infiltration of water to aquifers – Characteristics and specifications of works and water.

6 Paying for and financing water resources management

Mexico has a complex, decentralized institutional framework for managing and investing in water resources. The Federal Government provides most funds for managing water resources, but many decisions regarding allocation of funds and infrastructure planning take place at the sub-national level, including states, municipalities, and river basin committees.

Mexico has taken some steps to introduce commercial financing, but overall use of private sector participation (PSP) has been concentrated in wastewater treatment plants, and subnational financing is not generally accessed directly by water and sanitation providers.

In this section we detail the following aspects of financing the water sector:

- Framework for financing water resources management—sources of revenue
- Experiences with instruments for raising revenues

⁸ More specifically, the Declarations for Classification should include the following information on the particular body of water: the parameters of the quality with which the effluent must comply and the maximum limits of the discharge of such parameters in the classified areas.

- Experiences in managing public financial resources—mechanisms for public expenditure
- Experiences with the use of commercial finance and specific private sector financial schemes and resources
- Experience in reforming policies and institutions to reduce costs, raise and manage funds, and mobilize commercial finance

6.1 Framework for financing water resources management—sources of revenue

Most investments in infrastructure for managing water resources are made through subsidies provided by the Federal Government (primarily through CONAGUA) to states and municipalities and water and sanitation providers. The following sources of funds available for managing water resources:

- **General government revenues**—The Federal Government may use any of the following sources for distribution to the water sector: (a) Proceeds from taxes; (b) Oil revenues; and (c) Proceeds from loans provided by international creditors
- **Fees for water use and discharge**—water use and wastewater discharge duties paid to CONAGUA
- **Proceeds from debt**—including federal, state, and municipal bonds issued in Mexico and abroad, and concessional and commercial loans from financial institutions.

These funds flow into the federal budget and are later allocated to different sectors.

Tariffs are charged to water users, but these tariffs are generally not sufficient to cover the costs of providing the service. For water and sanitation services, end users pay tariffs to water and sanitation providers. For irrigation, users pay tariffs either to Water User Associations, which manage the largest irrigation infrastructure, or to various smaller operators of the other irrigation infrastructure.

CONAGUA's income from abstracting fees is rebated to utilities and municipalities through several programs described in sub-section 6.3.

A specific amount (\$300 million pesos) of water use fees collected from non-municipal entities has been allocated to the Mexican Forestry Fund (*Fondo Forestal Mexicano*). This amount is used for environmental programs that preserve the environment and water.

6.2 Experiences with instruments for raising revenues

Mexico has a well-developed sub-national bond market, but this has not been a significant source of direct financing for the water sector. Water utilities have not been able to borrow on commercial terms, given the inability of most water utilities to recover costs. Instead, the bond issuance is often a source of general funding for local governments, which in turn use the proceeds to subsidize water investments.

Mexico has one of the best-developed sub-national bond markets in the developing world. A total of 31 Mexican states (out of 31) and 70 municipalities have credit ratings – the second highest number of sub-national credit ratings outside the United States and Canada. A World Bank structural adjustment loan in 1992 helped kick-start reforms leading to this high level of sub-national bond activity. More recent legislative reforms have helped further expand the market. For instance, a 2001 law helps local government

expand their capacity to manage debt. The law mandates that states and municipalities establish a trust for repaying general obligation bonds, which is funded by the federal “tax participation” payments collected by the national government and redistributed to states and municipalities. These funds, earmarked for debt repayment, are isolated from local governments’ general accounts, leading to lower borrowing costs than would be achieved without the trust.⁹

Sub-national bonds typically come in two varieties: general obligation bonds and revenue bonds. General obligation bonds are secured by overall government revenue and tax receipts—the type of bonds discussed in the previous paragraph. Revenue bonds, by contrast, are usually secured only by the revenue from a particular asset. Revenue bonds are typically associated with infrastructure investments that generate sufficient revenue to cover operating and financing costs. Airports, industrial parks, toll roads and water treatment plants can all be financed in whole or in part by revenue bonds. In the United States, municipal water companies are also typically financed by revenue bonds.

In Mexico, water utilities are not typically financed by revenue bonds, however there are some exceptions. In Tlalnepantla, a city in the State of Mexico, some investments in the water sector are being financed solely through the private sector. A 2003 transaction was the first in the Mexico water sector that did not use federal transfers as collateral, and instead relied mostly on fees to cover the financing cost. The city funded a new water treatment plan and related water leakage reduction investments solely through local-currency, private sector financing, with guarantees provided by the International Finance Corporation and Dexia, a major international Bank. The independent trust, which issued the bonds, is supported mostly by tariff revenue, with a municipal guarantee and the other private-sector guarantees, but no federal government guarantee or call on federal government transfers.¹⁰

While this type of bond financing is so far rare, Mexico is pursuing a number of other, innovative sub-national financing strategies that could have implications for financing the water sector. Two recent initiatives point to the potential for sub-national finance to help meet water-sector investment needs: a pooled bond initiatives in the State of Quintana Roo, and a PPP Capital Mobilization Vehicle in the State of Campeche.

In Quintana Roo in 2009, the State recently completed a US\$370 million pooled bond initiative—the first of its kind in Mexico—which combines the issues of general obligation bonds by the state several of its municipalities to fund infrastructure in the state, including water infrastructure. The pooling allows the participating municipalities to achieve higher liquidity and lower borrowing rates than they could by issuing bonds on their own

In Campeche, the state is attempting a more ambitious program to attract commercial finance to infrastructure, including water infrastructure, through the establishment of a state-wide PPP Capital Mobilization Vehicle. The Capital Mobilization Vehicle will be a special purpose company that develops infrastructure, including water infrastructure, and borrows in capital markets on the basis of committed lease payments from the state government to the special purpose company. This structure will allow the state to access private-sector financing without further increasing its debt, though it remains to be seen

⁹ http://www.un.org/esa/desa/papers/2009/wp76_2009.pdf

¹⁰ <http://www.ifc.org/ifcext/spiwebsite1.nsf/1ca07340e47a35cd85256efb00700cce/331BC3F84B671522852576C10080CB85>

whether the PPP Capital Mobilization Vehicle will result in lower financing costs for infrastructure than issuing a typical General Obligation Bond would.

Overall, the bond market and commercial finance has the potential to provide substantial sums of money for water infrastructure development and reduce the level of public subsidy, although that potential has yet to be realized in Mexico. [In general], the Federal Government provides well over 50 percent of funding for investments in the water sector, with state government subsidies accounting for around 10 percent. Private debt and equity covers a small percent of investments. In order for commercial finance to be a viable source of funding for the water sector, cost recovery and efficiency would have to improve. One way to improve the incentives for cost recovery and efficiency would be through greater private-sector participation. But as we explain in sub-section 6.4, the potential for private-sector participation in the water sector also has yet to be realized.

6.3 Experiences in managing public financial resources—mechanisms for public expenditure

In addition to allocating water use permits, CONAGUA's main function is to disburse funds for water resource management, specifically for developing infrastructure. CONAGUA's average annual budget for 2007 to 2009 was \$22.1 billion pesos (about US\$1.75 billion dollars). During the same period, CONAGUA collected about \$9.97 billion pesos (about US\$787 million dollars), or approximately 45 percent of its overall budget.

The main programs through which CONAGUA disburses funds to water and sanitation providers are:

- **The Drinking Water and Sanitation Program for Urban Areas (APAZU—*Programa de Agua Potable y Alcantarillado Sanitario en Zonas Urbanas*)**—this program helps states and municipalities develop projects to increase the quality and availability of water supply, sewerage, and sanitation in urban areas. It disburses subsidies targeted to improve the operating, commercial and financial efficiency of service delivery. The program can contribute up to \$100 million pesos to a given project, covering up to 45 percent of the funding required to fund project to improve efficiency and expand access in these areas.
- **Program for the Reimbursement of Duties on Water Use and Wastewater Discharge (PRODDER—*Programa de Devolución de Derechos*)**—this program reimburses water use and wastewater discharge duties to water and sanitation providers to fund qualifying investments. All funds received from PRODDER and matched by the water and sanitation providers must be invested in the system. Such investments must be consistent with a work plan that has been accepted by CONAGUA
- **Federal Sanitation Program for Wastewater (PROSANEAR—*Programa Federal de Saneamiento de Aguas Residuales*)**—the objective of this program is to provide funds to build wastewater treatment systems, reduce pollution, and prevent the incidence of water-born illnesses, and contribute to environmental sustainability¹¹. Through PROSANEAR, CONAGUA provides

¹¹ On 24 December 2007, a Decree that modifies the Federal Duties Law was published in the DOF. Article 279 of this Decree establishes that entities that pay wastewater discharge duties for discharging into bodies of water that are the property of the nation can request CONAGUA's authorization to carry out a "Program of Actions" (PAS—

funding to entities for an amount up to the payments made for wastewater discharge.

- **Wastewater treatment Fund – Program (Programa Fondo concursable para tratamiento de aguas residuales)** –the objective of this program is to provide financial support to the water and sanitation service providers to design, build, and rehabilitate wastewater treatment plants to increase the volume treated or improve its treatment processes and at the same time support the service providers that already have WWTPs for its operation and maintenance to comply with the wastewater quality established in the law. It is focused on populations below 500,000 inhabitants or populations with high and very high marginality.
- **Water Utilities Modernization Program (Programa para la Modernización de Organismos Operadores)** – functions as an additional source of financial resources, on the condition of a structural change to consolidate water utilities, improve efficiencies, gain access to technology, and foster sustainability with the private sector participation (PSP). This program is focused to localities above 50,000 inhabitants, and can support water supply, sanitation, macroprojects and investments to improve water management (efficiencies).

These programs are administered based on rules of operation that are published by the Ministry of the Environment; the current version of the rules is dated 200812.

Additionally, the **Natural Disasters Fund** (FONDEN—*Fondo de Desastres Naturales*) provides funding for responses to extreme natural events. However, its funding is for responding to disasters rather than for mitigating risks presented by natural disasters. For preventing natural disasters, CONAGUA uses its own budget.

6.4 Experiences with the use of commercial finance and specific private sector financial schemes and resources

In Mexico, the use of private sector participation (PSP) contracts in the water and sanitation sector has been limited. With more than 1,200 water and sanitation providers in the country, only about PSP 32 contracts have been signed; of these, about 70 percent have been Build-Operate-Transfer (BOT) contracts. These contracts have been effective ways of raising funds for investments in facilities for treating water, treating wastewater, and desalination. However, BOT contracts increase the capacity to supply potable water and treat wastewater, but do not improve the level of efficiency of the water and sanitation providers and do increase the cost of service.

Three concessions for water and sanitation services that could be considered successful—all three increased coverage through capital investments and improved the operating efficiency of the utilities—are in place in Aguascalientes, Cancun/Isla Mujeres, and Saltillo. The concessionaires in Aguascalientes and Cancun/Isla Mujeres, both of which are 100 percent privately owned, began operations in 1993 and 1994. The concessionaire in Saltillo, which began operations in 2001, is joint-venture between a

Programa de Acciones) with the objective of collecting and treating wastewater. Having received approval from CONAGUA for this program, the entities can receive funds from CONAGUA for an amount equivalent to the duty paid for wastewater discharges.

¹² These rules are the *Reglas de Operación para los Programas de Infraestructura Hidroagrícola, y de Agua Potable, Alcantarillado y Saneamiento a cargo de la Comisión Nacional del Agua, aplicables a partir del 2008*

private company and the State government. These three utilities are among the most efficient water and sanitation providers in the country. Furthermore, their tariffs cover a greater portion of their cost of service than the tariffs for most other water and sanitation providers.

Recognizing the importance of increasing the operating efficiency of water and sanitation providers, and the potential for PSP contracts to contribute to this objective, CONAGUA and other Federal Government entities are pursuing efforts to increase this type of private management and operation of water and sanitation providers, through the Water Utilities Modernization Program (PROMAGUA), which intends to improve efficiencies, make structural changes and include private sector participation (PSP) in the water utilities. For example, CONAGUA and BANOBRAS are working with a number of municipalities to develop and implement contracts for Integrated Management Improvement (MIG—Mejora Integral de Gestión). The objective of this new type of contract is for the private operator to directly management the utility—therefore leading to increases in operating efficiency—and also to provide funding for capital investments.

The Municipality of San Luis Potosi and its water and sanitation provider (INTERAPAS—*Organismo Operador Intermunicipal de Agua Potable, Alcantarillado, Saneamiento y Servicios Conexos*) are developing a MIG scheme with the objective of establishing a service contract that includes the works, actions and operations required to increase the efficiency of the utility. The private company's compensation would consist of a fixed fee, with an element for recuperating investment funded by the private company (debt plus equity), conditioning the return of and on equity to achieving specific levels of efficiency. The objective of the contract is to increase the operating efficiency of the water and sanitation provider by 28 percent in four years (four years for the execution of works and specific actions, and four years to consolidate the gains achieved through those works and actions).

The estimated amount of investment required is \$650 million pesos (not including value-added tax). The Federal Government will provide subsidies to cover 40 percent of total investments required. The private company is responsible for contracting and repaying the debt (35 percent of total investment requirements). Debt service will be covered through payments from the contractor. The equity contribution (25 percent of total investment requirements) will be recovered through payments from the contractor as the private operator meets objectives for efficiency improvements.

6.5 Experience in reforming policies and institutions to reduce costs, raise and manage funds, and mobilize commercial finance

The establishment of the National Infrastructure Fund (FONADIN—*Fondo Nacional de Infraestructura*) is the Government's main reform effort to reduce costs by mobilizing private funds for developing infrastructure. The Government created FONADIN in 2008 as a vehicle for funding investments in water and other infrastructure. Private companies must invest equity for a project to be eligible for receiving funding from FONADIN.

FONADIN can provide financial assistance either as subsidies or reimbursable support. The reimbursable support can include funding of studies, guarantees (such as loan guarantees, performance guarantees, and political risk guarantees), subordinated and/or convertible loans, and even equity contributions.

The non-reimbursable support can be provided through contributions or subsidies. Contribution can be used to cover the costs of studies or consultancies or the costs of developing infrastructure projects with a high degree of social return. These projects must incorporate private sector participation and have their own source of revenues. Subsidies are awarded to achieve financial equilibrium in projects that are expected to have a high social return, but with low financial returns.

Government entities as well as private companies are eligible to receive support from FONADIN. To be eligible private companies must be the beneficiaries of concessions, licenses or contracts that permit public-private partnerships. To date, FONADIN has approved over US\$1.5 billion in funding for projects in water and sanitation. The largest of these is the Atotonilco wastewater treatment plant for a sum of about US\$700 million.

7 General conclusions

Mexico has a well-developed, decentralized framework for managing water resources, but a number of steps still need to be taken to ensure an effective, efficient, and equitable funding for the sector. Future reforms will be most successful if they are made according to the following [seven] principles:

1. Ensure that proceeds of any duties for using water use and discharge are applied directly to the water sector, and linked to performance incentives
2. Move toward cost recovery tariffs for water used in agriculture, and in tariffs charged by water and sanitation providers
3. Remove the subsidy for electricity used in irrigation pumping, which encourages overuse of groundwater.
4. Improve coordination of public policy in the water sector with that in other sectors, especially agriculture
5. Further decentralize water management, including giving River Basin Organizations full planning and budgetary control
6. Ensure that federal subsidies for water resource management are targeted to poor regions, with wealthier regions financing their own water resource management needs.
7. Ensure the development and sustainability of the population in accordance with technical studies regarding the availability of water so that growth is orderly

A final key step for the efficient and sustainable allocation of water resources is to improve the current method for estimating the value of water according to its different uses. Toward this objective, CONAGUA has already developed a general framework within which to undertake studies to estimate the financial and economic values of water¹³.

¹³ *Reglas Generales para la Realización de Estudios sobre la Valoración Económica y Financiera del Agua*, Issued on 12 April 2010, CONAGUA

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