National Development Plan 2013-2018

Federal Government of Mexico

National Water Plan

Special Plan

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(Original title in Spanish: Progama Nacional Hídrico, 2014-2018)

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Printed and made in Mexico.

Foreword

This National Water Plan was drawn up in 2013 and is based on various core components:

- The National Development Plan (PND 2013-2018), published in May 2013.
- The water sector planning system.
- The collaboration and contribution of the different sectors comprising the Federal Government.
- The expert review by water specialists from various professional disciplines.
- A regional public consultation process with the participation of water users, academics, civil society organizations, media, legislators, and specialists, generating numerous initiatives.
- An in-depth review by the secretariats of state involved in the issues, especially the Secretariat of Finance and Public Credit (SHCP) and the Secretariat of Environment and Natural Resources (Semarnat).

The Plan adheres closely to the schedules, structure, content, and other guidelines and characteristics defined by the Secretariat of Finance and Public Credit—the government department legally responsible for the heading and orienting the efforts leading to the plans and programs of the Federal Government.

This Plan is called the National Water Plan 2014-2018 (PNH 2014-2018) on account of its date of publication. However, its structure, baseline, indicators, and targets, as well as the proposals contained in or deriving from the objectives, strategies, and lines of action, all correspond to the 2013-2018 period.

Within this context, the result of this collective effort is hereby presented as: **The National Water Plan**.

Mexico City, April 2014

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Enrique Peña Nieto
President of the United Mexican States

Message

Mexico's federal government is fully committed to building a more prosperous and inclusive country.

Alongside local governments, we are working to ensure that Mexico's entire population has full access to basic services, water in particular; a vital resource for families to be able to flourish.

We understand the enormity of the challenge lying ahead. Over the course of its history, Mexico has faced a complex water situation with serious droughts, water shortages, and floods.

We must therefore redouble our efforts so that every Mexican has access to drinking water, drainage, and sanitation services, and is able to tackle the adverse impacts of climate change.

With these aims in mind, we have begun a major infrastructure program with the participation of the private sector as well as of state and municipal governments.

However, this work must be complemented with specific medium- and long-term actions: the rational use of aquifers and improvements to the environmental conditions of watersheds, in order to promote Mexico's water sustainability.

Thanks to the hard work and contributions of academics, experts, civil society organizations and those working at the National Water Commission (Conagua), the National Water Plan establishes strategies and lines of action to achieve greater efficiency and sustainability in the use of this vital liquid.

This invaluable planning instrument, which will define water policy for the decades to come, will help to improve the entire country's social and financial situation.

With more water, Mexico will continue moving ahead.

Puente de Dios, San Luis Potosí.

Message

Sufficiently available and high-quality water resources are essential for Mexico's development and for maintaining the well-being and health of our population and the environment as a whole. This administration has therefore made it a priority to reassess how water is managed in Mexico, and to modernize the sector's institutions and infrastructure in order to ensure the country's water security and sustainability.

We are working hard to achieve this goal. In just over a year, this administration has laid the foundations for a wide-ranging system for the protection and sustainable management of our water resources. President Peña Nieto has driven forward this process, after presiding over the National Water Contingency Prevention Program (Pronach)—one of his inaugural presidential programs—and during the World Water Day celebrations he announced the National Water Policy (Política Nacional en Materia de Agua) and the publication of the general agreement to provisionally suspend the unrestricted extraction of groundwater in various regions across the country.

Alongside these public policy instruments we should also refer to the establishment of the Intersecretarial Committee on Droughts and Floods, responsible for coordinating the federal government's prevention and mitigation measures to respond to extreme hydrometeorological hazards and their effects. We should also refer to the equally important reforestation programs that have been pushed forward since the start of the current administration, considering that woodlands are veritable water factories.

The National Water Plan 2014-2018 (PNH 2014-2018) also forms an integral part of this system, strengthening the institutional capacity to sustainably manage and protect water. This Plan has six objectives and each one includes various strategies and lines of action that precisely define the way forward for our work.

Each objective has been assigned one or more indicators —such as the Global Indicator of Access to Basic Water Services and the Indicator of Water Productivity in Irrigation Districts— in order to ensure its follow-up and close monitoring of progress. These indicators are designed to be reviewed and updated every two years if necessary.

In this way, the National Water Plan 2014-2018 serves various purposes: it proposes the reform and modernization of the sector; focuses the work of the three tiers of government and every sector of society on achieving water security and sustainability; and finally, it prepares the ground for a new culture that enables the government and citizens to take full and shared responsibility for the care and management of Mexico's water resources.

Juan José Guerra Abud
Secretary of Environment and Natural Resources

Francisco I. Madero (Tres Virgenes) Dam, Chihuahua.

Message

Water is the vital force behind Mexico's development. Our lives today and those of future generations of Mexicans depend on its proper care and efficient use.

Mexico has a wide range of hydrological conditions; each region in the country has its own water benefits and challenges, and each Mexican has different needs and relationships to water.

The variety of climates and watersheds is fundamental to our natural riches and heritage, but this same situation also makes us vulnerable to the effects of hydrometeorological hazards, such as droughts and floods.

Therefore, we have an enormous responsibility to plan our actions properly in order to manage our national water resources constantly, sustainably and responsibly, considering climate change, demographic growth, industrial and agricultural needs, and public-urban water supply.

This document not only reflects the strategies and lines of action for public policies but also Mexico's collective awareness about water and aspirations for the path we must follow to ensure joined-up management and proper control over water resources.

For the first time ever, this Plan contains a national water policy that includes the participation of various government agencies and tiers to work together on its implementation. It is designed to be reviewed every two years, so that strategies can be redefined according to the results and progress achieved.

The years ahead will be critical in moving toward a new stage in prevention, efficient usage, and improved services. This will require far-reaching changes in the sector and legal reforms to help us build up our capacities and create the tools with which to tackle the challenges lying ahead of us, so that water may continue to be the driving force to move Mexico forward.

David Korenfeld Federman
Director-General of the National Water Commission

Apatlaco Waterfall, Puebla.

Introduction

In today's world, water must be appreciated as a vital element that helps Mexicans to live in peace, to avoid conflicts and give security to all; it must contribute to social justice, so that all Mexicans have access to sufficient, readily available, high-quality water, and the opportunity to exercise their human right that is enshrined in Article 4 of the Mexican Constitution; it must be a force to reduce poverty in Mexico and promote people's wellbeing.

Water must also help effect a change in our culture and education to make Mexico a society of shared knowledge with a commitment to build the Mexico we all want; it must also continue to be the driving force behind sustainable development, which is essential for economic growth in terms of an increasingly productive use and management of the resource; and finally, it must be the element that inspires a sense of global responsibility, so that we can become an international beacon of excellence in the management, administration and integrated handling of water.

A Comprehensive Reform of the Mexican Water Sector

The National Water Plan 2014-2018 (PNH 2014-2018) is based on its underpinning strategic and critical elements that shape it and explain its very reason for being, in response to current water needs and those anticipated both by the current Federal Public Administration (APF) and for the challenges that are likely to arise in the following three or four decades, aligned with or as a product of the processes of national growth and development, as well as due to the effects of Mexico's increasing interaction with other nations around the world as part of globalization processes.

In this sense, a key element for the structure and underpinnings of the PNH 2014-2018 is precisely the need to embark on a rigorous, all-encompassing reform of the Mexican water sector, as an initiative of the current Federal Public Administration. This must be accompanied by a strong and sustained modernization of various pillars of Mexico's water development.

- *Water is an asset for sustainable development.*

The scope and vision of this comprehensive reform, alongside modernization processes, are so far-reaching that they warrant special treatment. Therefore, this shall be the approach to tackling both elements in relation to the current planning exercise. However, it should be pointed out that these two critical elements—the comprehensive reform and modernization of the Mexican water sector—are central to this Plan.

Multisectoral Approach

The federal government of Mexico has created an overarching strategy in which water security and the human right to water and basic sanitation services are all essential. This involves providing objective and well-planned support to the population by improving every aspect of water management, including the provision of water services in human settlements and in rural areas. With this approach, work will be undertaken by sectors and by watersheds, collaborating productively and extensively with the different states and their municipalities, with the support of an institutional mainstreaming approach that must evolve and endure.

- *The federal government considers that the Mexican water sector requires a comprehensive reform.*

The National Development Plan 2013-2018 (PND 2013-2018) and this global strategy are the foundations for the PNH 2014-2018. For its implementation, it is clearly necessary to undertake a complete transformation of the Mexican water sector, beginning with its definitive integration, in order to provide it with existence, meaning and future scope. This transformation requires implementing crucial reforms as well as elements of modernization that are essential in order to succeed in the overall objective for the sector: **attaining water security and sustainability in Mexico**. Within this strategic vision, reforms shall be oriented with a view to take full advantage of the components of the PNH 2014-2018 as a central instrument for developing water resources in Mexico.

The Mexican State has been gradually articulating and improving its vision for water over the past decades; it has given priority to implementing a water development agenda that enjoys increasingly closer ties with the environment, biodiversity, land management, energy, climate, agriculture, land use, and economic development. Furthermore, it has embarked on a series of important reforms (legal, institutional, financial, water planning and human resources management) in relation to the water sector, and also made the improvements and additions to water infrastructure that are required for Mexico's development.

Mexico is prepared to make the necessary efforts to improve water resource management,

Lázaro Cárdenas Dam, Tlaxcala.

especially in those localities with more precarious water, economic, sanitary and human conditions, as well as in geographical areas facing greater risks of adverse effects on water as a result of climate change or climate variability.

It is therefore important to collect and synthesize the Mexican government's vision and society's conceptualizations about water as a scarce, strategic and also essential resource to support the growth of the economy and society, to drive forward local, regional, and national sustainable development, and as a critical component of national security.

In order to overcome the great and complex water-related challenges, it is crucial to combine efforts, skills, and resources and to change the traditional way of relating to it. In other words, water should no longer be viewed as an infinite resource, but rather as one that is scarce, expensive and that needs responsible management.

The PNH 2014-2018 draws together the work and experiences of government and society to achieve a comprehensive water resources management, to devise a formula for water development that is compatible across the political spectrum, and with social perceptions and demands, gender and financial inequalities, environmental challenges, and the need to gradually shape a new Mexico that is fairer, more productive, more aware, and in harmony with its environment.

Therefore, in accordance with the Planning Law, this Plan has been given a special plan status. It has a multisectoral approach, given the need for more than one sector-coordinating agency for this purpose and, above all, for its implementation. Water is a part of every sector in Mexico. The PNH 2014-2018 sets out to address problems of gender inequality interpreted in relation to the national reality, and it also responds to the demands of marginalized social groups.

In this context, the PNH 2014-2018 is a long-term planning instrument that charts the way forward and defines the elements needed to achieve water security and sustainability in Mexico. It establishes objectives, strategies and lines of action, the progress and results of which must be assessed every two years in order to update it as seen fit.

- *The challenges of water go beyond the water sector and affect most spheres of the Federal Public Administration.*

It also indicates the reforms and modernization needed in areas such as institutional organization, planning, legislation, regulation, financing and other similarly important issues. Therefore, the investment portfolio of the sector—which includes federal and state government authorities, as well as other actors in the sector—must be aligned with this instrument and the budgetary programs for water.

Looking Ahead to 2018

On the basis of the planning instrument contained in the PNH 2014-2018, the groundwork will be complete and progress made on implementing the complete structural change as required for the Mexican water sector. The Mexican water sector will have been properly established, with cross-cutting mechanisms in place to ensure the joined-up work of the departments, agencies, organizations and institutions which together comprise the sector as a whole. The political and administrative elements needed for a productive relationship between the three tiers of government on the issue of water will be instituted through suitable mechanisms such as agreements, operating rules, special programs applicable to defined areas of land, as well as specific actions and projects for these purposes.

- *The PNH 2014-2018 is multisectoral, making it one of the most important water planning reforms.*

The Mexican water sector will also be making successful progress towards finding opportunities and synergies with Mexican society in several areas in order to improve the management and protection of the country's water resources. In this sense, mechanisms will be in place to facilitate and strengthen relations with legislators, academics, the private sector, civil society organizations, media, including elements of education, communication and dissemination. This will combine to help the sector achieve excellence in its water management and sustainable development using water resources.

In this way, strong progress will have been made and concrete results achieved in the classic areas of water development: water services for human settlements and in rural areas, with strides taken to ensure water security for the benefit of inhabitants and productive regions.

Governance and governability will also have improved and become strengthened, and water resources will be controlled through more effective institutions with the closer involvement and commitment of political and social actors. A robust and modern system for planning, programming, budgeting, implementing, following up, and assessing will be in place, driving the sector forward to increase levels of development and to contribute to the Mexican population's quality of life.

Focusing on a critical aspect for the development of the Mexican water sector, improvements and innovations will have been made to systems for measuring the water cycle, and to mechanisms for preventing and responding more effectively to extreme hydrometeorological hazards.

A solid and well-developed basis will have been established, applying the sector's indicators of results so that government authorities and society can swiftly find out reliable information on the progress, challenges, and opportunities in relation to water resources in Mexico.

Additionally, mechanisms for ensuring information, knowledge management, technological development and implementation mechanisms will have been consolidated for the objective and well-guided use of talented young people gradually entering productive careers in the Mexican water sector.

Mexico will have markedly increased its presence on the world stage, with a strong and well-respected voice in terms of water development. The country will thus learn from and capitalize on the progress made on water issues around the world, and, at the same time, will share with other countries the advantages and benefits of Mexico's own water development model through the mechanisms established for international cooperation in order to help improve conditions in other corners of the planet.

- *The PNH 2014-2018 was drawn up with a long-term vision.*
- *The objectives, strategies, and lines of action must be taken beyond the end of the current administration period.*

Long-Term Vision

It should be stressed that the the core objective, as well as the structure, contents and proposals of the PNH 2014-2018 were conceived with a long-term vision in mind. The importance of the lines of action, strategies, and objectives, as well as the depth and breadth of the reforms and modernization mechanisms proposed in the Plan, surpass the results expected during the 2014-2018 period. As part of this long-term approach, this plan's offer should go beyond this period. It is strongly suggested that the reforms and structural changes continue after this date, since they are urgently required for water resources to play a strategic role and offer sufficient elements to contribute to Mexico's growth and development.

Continuity and Experience in the Water Resources Planning Process

This planning exercise that has led up to the PNH 2014-2018 is based on a structured series of well-researched considerations on water, born of the challenges which the country has had to face in recent decades. Mexico has a long and distinguished history in terms of water planning, an experience that the country has been able to draw from over the past 38 years, ever since the period of the first National Water Plan of 1975.

In turn, this process is derived from a concept of well-understood and justified continuity over the years, in terms of Mexico's vision on water, especially given the needs to provide water for human consumption and agricultural production, and in order to surmount the challenges posed by extreme hydrometeorological events. And more recently, to adapt the Mexican water agenda to the need for more and higher-quality information, analyses, strategies, and public policies to support decision-making, as well as to achieve effective sanitation for the management of effluents and a strategic and practical response to climate variability in Mexico.

The strategies and lines of action with a budgetary impact shall be subject to the availability of resources approved by the lower chamber of Congress as part of the federal expenditure budget for the corresponding fiscal year.

Cerro Prieto Dam, Nuevo León.

Regulatory Framework

The PNH 2014-2018 draws on various pieces of legislation, foremost on the Political Constitution of the United Mexican States, whose Article 25 refers to the responsibility of the state for the national development in order to ensure that it is inclusive and sustainable, strengthens the country's sovereignty and its democratic regime and, by encouraging economic growth and employment and a fairer distribution of income and wealth, enables all individuals, groups and social classes to enjoy their lives in freedom and in dignity.

Article 26 of the Constitution establishes that the State shall organize a system of democratic planning for national development, in order to give the country a solid, dynamic, permanent and fair economic growth for the country's political, social, and cultural independence and democratization. National development planning must be a democratic process and the objectives contained within the national development plans and programs shall be defined by the purposes of the National Plan as contained in the Constitution. Also, society's aspirations and demands shall be taken into account through the participation of various social sectors, to be incorporated within the federal government's management instruments.

Furthermore, paragraphs five and six of Article 27 of the Constitution define that the water resources contained within the limits of the national territory correspond originally to the nation, and that this control is inalienable and not subject to adverse possession, and the resource can only be exploited, used or utilized through allocations granted by the federal executive branch in accordance with lawful rules and regulations.

Article 134 of the Constitution stipulates that resources belonging to the Federation, states, municipalities, the Federal District and to the politico-administrative bodies within their respective boundaries, shall be managed efficiently, effectively, economically, transparently and honorably.

The Planning Law (Ley de Planeación) establishes basic standards and principles that guide national development planning, as well as the basis for a National Democratic Planning System (SNPD). Article 4 stipulates that the federal executive branch is responsible for carrying out national development planning with the democratic participation of social groups.

Article 22 of this law indicates that the National Development Plan (PND) shall indicate the special programs that are to be drawn up and shall be consistent with the main development plan.

In addition, the same piece of legislation establishes in Article 26 that special programs shall refer to the priorities of the country's comprehensive development, enshrined in the National Development Plan or the activities related to two or more sector-coordinating agencies.

The PND 2013-2018, approved by the Decree published on May 20, 2013, in the Official Gazette of the Federation (DOF), defines

- *The PNH 2014-2018 is legally based on the Mexican Constitution and the Planning Law.*
- *It is aligned with the PND 2013-2018.*

Batanes Bridge, Guanajuato.

the sectoral, special and regional programs to be drawn up by the current Federal Public Administration to achieve the five national goals in order for Mexico to achieve its maximum potential. The PNH 2014-208 falls into this special category.

Article 16 of the Federal Budget and Fiscal Accountability Law defines the parameters for drafting and the approving the Law on Federal Revenues and the Expenditure Budget, which must be based on quantifiable parameters and objectives of economic policy, and taking into account the corresponding performance indicators. They must also be consistent with the PND 2013-2018 and its subprograms.

The National Water Law (LAN), as indicated in Article 1, is a regulatory law of Article 27 of the Mexican Constitution on the issue of national water resources and exists to regulate the exploitation, use, or utilization of these water

resources, their distribution and control, as well as to preserve their quantity and quality for sustainable comprehensive development.

Article 7, Section 1, refers to the integrated management of national water resources for public use as a priority national security matter. Article 15 establishes that water planning must be obligatory for the integrated management of water resources and the conservation of natural resources, vital ecosystems and the environment, making the process the most important instrument of water management.

Article 9, Section II, establishes that the National Water Commission (Conagua) is responsible for putting together and formulating the National Water Plan in accordance with the terms of the LAN and the Planning Law, as well as for updating and ensuring its compliance, and proposing criteria and guidelines to ensure consistency and congruency in the actions taken by the federal government in regard to national water resources and its inherent public goods.

Oasis. Irrigation Canal. San Ignacio, Baja California Sur.

CHAPTER I. Diagnosis

I.1 Introduction

Water is a finite resource that is essential for public health, ecosystems, biodiversity, food production, industry, energy, and economic development. Therefore, it is considered a strategic element of national security and for Mexico's social and political stability.

Although some regions in Mexico have enough water to meet demand without any conflict arising, in two-thirds of the country—where the fastest growing and most populated areas are located—there is severe pressure for already scarce water resources, since the liquid has been committed for other uses. It is therefore of utmost importance to put together an increasingly efficient and flexible water resources management model that is appropriate for its context, without restricting the country's social and economic development.

Since the early twentieth century, national water policy has responded to society's demands with a controlled water supply focused on socioeconomic development by building a range of water infrastructure projects, including dams, aqueducts, wells, and drinking water supply and agricultural irrigation systems. These initiatives made water available to many Mexicans, increased the area of irrigated agricultural land (the seventh largest in the world) and helped boost industrial production (the most important in Latin America in terms of sectoral output per capita).

Mexico has an allocation and assignment system in place for surface- and groundwater. This is subject to the National Water Law (LAN), with the National Water Commission (Conagua) having nationwide responsibility for water resources. However, efforts to manage Mexico's water resources have been failing because the necessary mechanisms and instruments to effectively implement public water policies have not been consolidated.

Given the limited availability of water, demand has needed to be managed through economic and financial instruments, mainly by applying fiscal and market-based measures and with charges applied for water services.

Therefore, the water sector requires a reform process that complements the purely technical-hydrological focus to make the integrated water resources management process more effective by incorporating social and environmental initiatives within the framework of sustainable development. There is a need for modern, efficient, strong, reliable, and capable institutions that can benefit from Mexico's experience with water. In order to achieve this aim, the planning process will be reformed to trigger institutional, legal, technical, scientific, economic, financial, budgetary, and information technology changes across the three tiers of government and in user and civil society organizations.

Mexico's watershed-based water management implies the participation of those sharing the resource within each corresponding area of land. Since some watersheds are shared between Mexico and neighboring countries, water man-

- *Water availability per capita has reduced:*
  - *18,035 m^3/inhab/year in 1950.*
  - *3,982m^3/inhab/year in 2013.*
- *35 million Mexicans have poor water availability in terms of both quantity and quality.*

agement also requires various international treaties to be established and then followed up.

Mexico has a total area of 1,959,248 square kilometers. Part of the country is located on the same latitude as the Sahara Desert; therefore, the central-northern region is semi-arid and arid (Figure I.1).

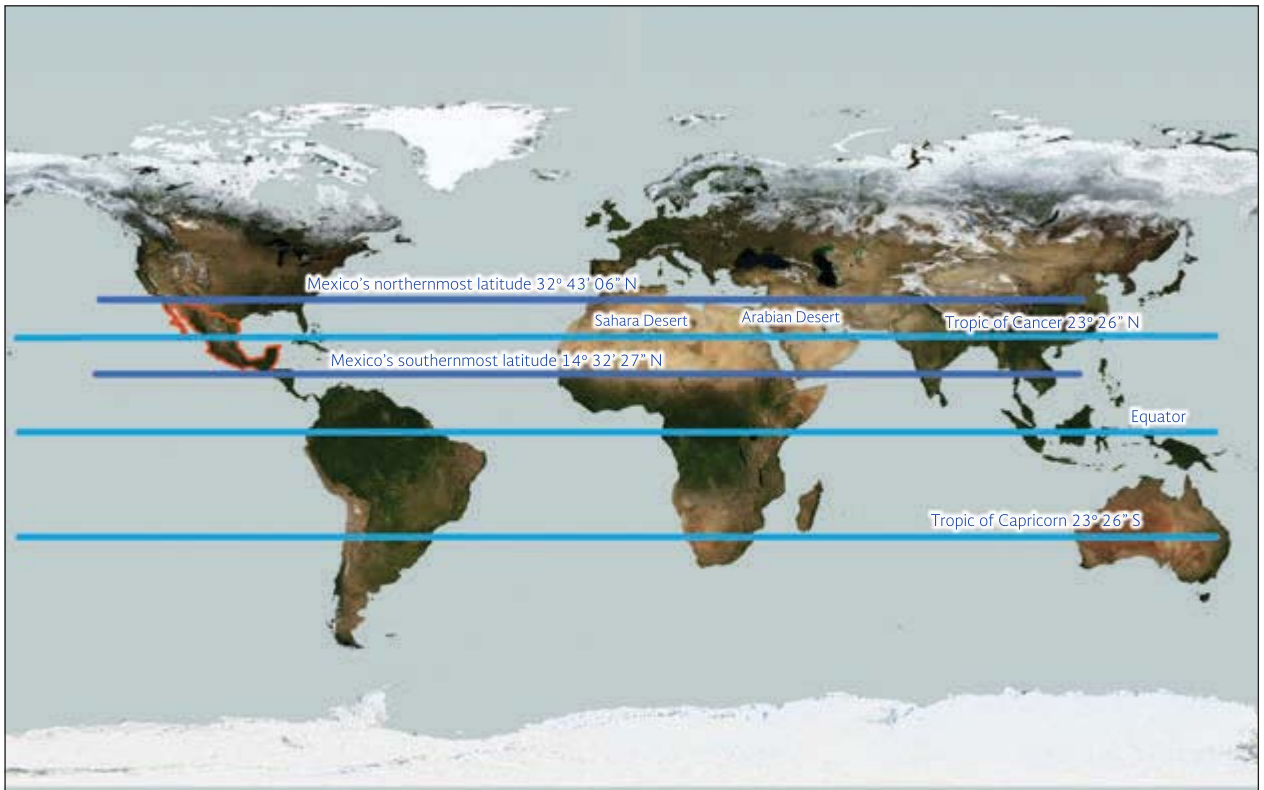
Rainfall is scarce in the north and north-east of the country and in the Baja California peninsula, and abundant in the south-east and in the watersheds of the Gulf of Mexico and Pacific regions, to the south of the Tropic of Cancer (Figure I.2).

The mean annual precipitation is 760 mm, equivalent to 1,489 square kilometers per year: 331 cubic kilometers flow through the country's rivers, with 1,065 cubic meters of evapotranspiration and 93 cubic kilometers recharging the aquifers. In most areas of Mexico, precipitation occurs mainly between June and September, except in the Baja California peninsula, where it happens predominantly during the winter (Figure I.3).

Mexico had 25.8 million inhabitants in 1950, compared to 118.4 in 2013 (population figures measured in mid-2013, projection by the National Population Council, Conapo). The annual rate of population growth is tending to gradually reduce. Since 1970, the population has changed from being predominantly rural to predominantly urban (Figure I.4). Conapo estimates that by 2050 Mexico will have a population of 150.8 million, which will increase the pressure on water resources.

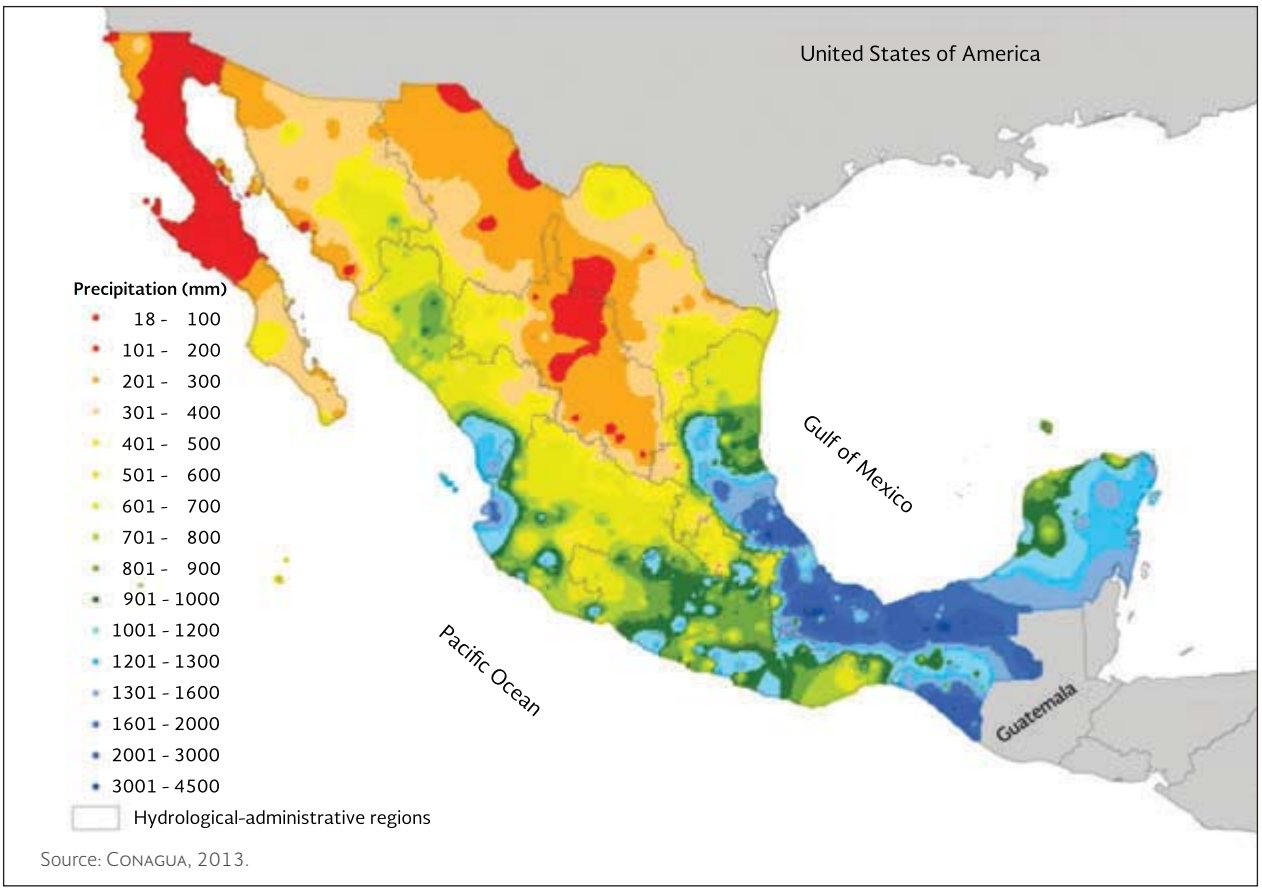
The mean per capita natural water availability in Mexico in 1950 was 18,035 m^3/inhab/year and in 2013 it dropped to 3,982 m^3/inhab/year; a low figure according to the United Nations Development Program (Figure I.5).

Figure I.1 Geographical location of Mexico, relative to the world's largest deserts.



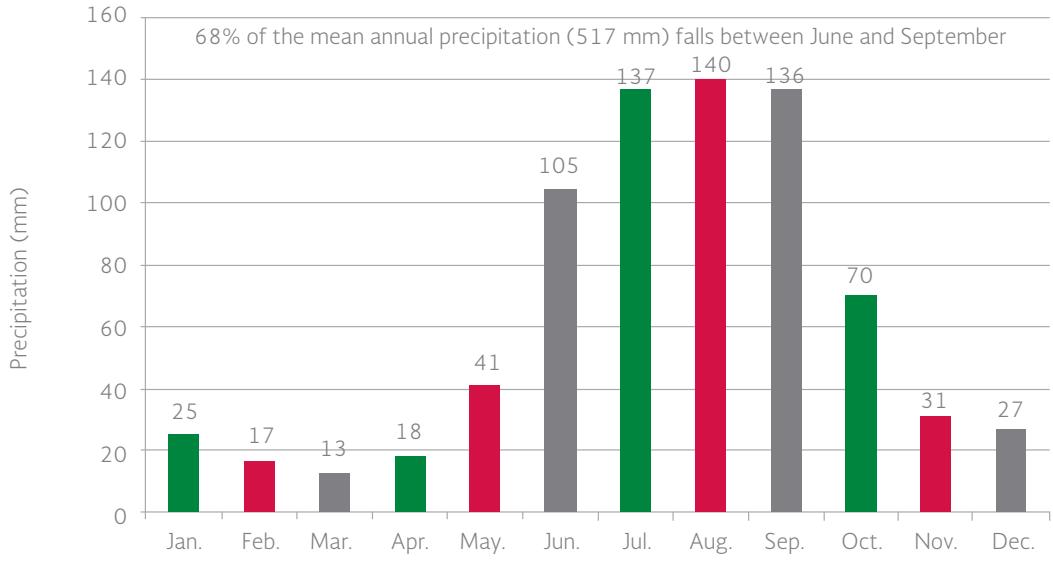
Source: Conagua, 2013, based on *NASA, Earth Observatory Blue Marble.*

Figure I.2 Spatial distribution of mean annual precipitation.



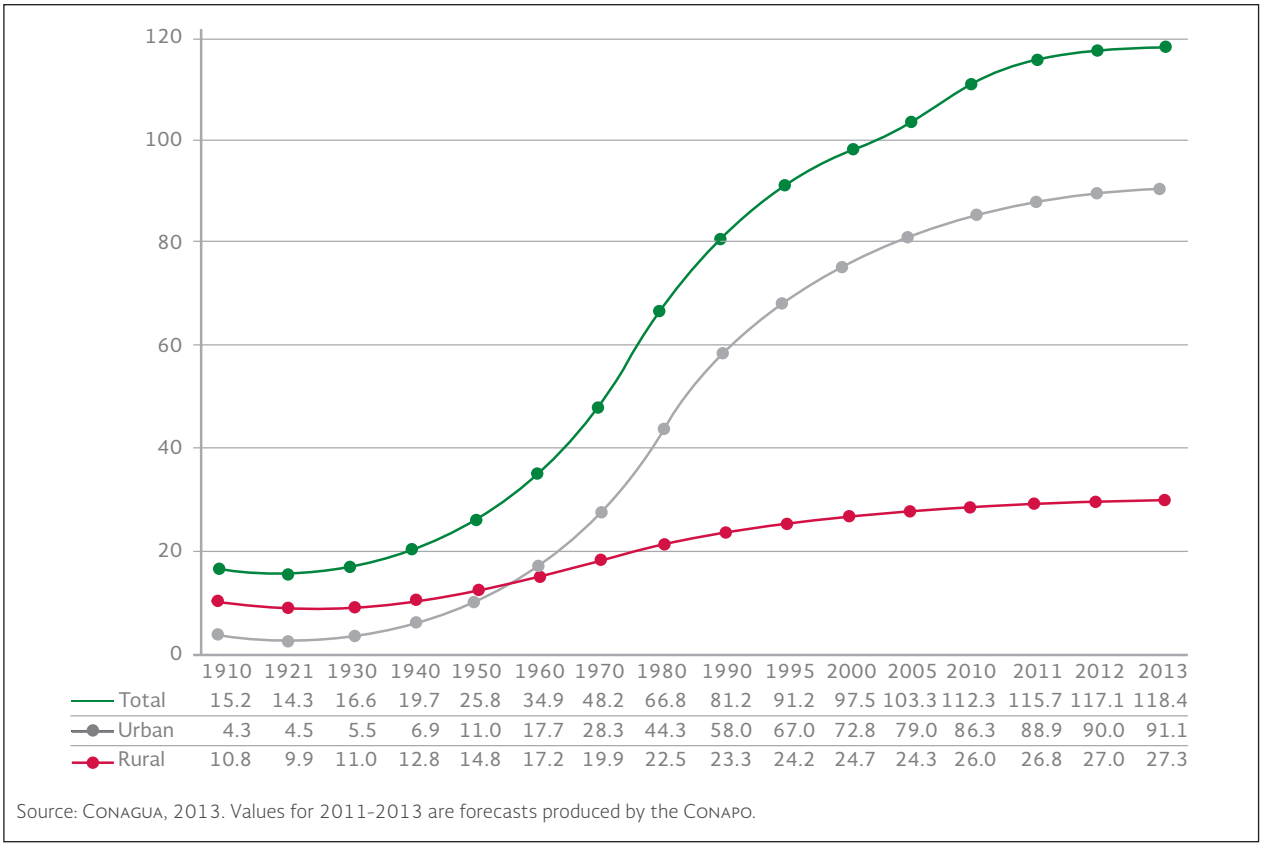
Source: CONAGUA, 2013.

Figure I.3 Monthly distribution of mean annual precipitation.



Source: CONAGUA, 2013.

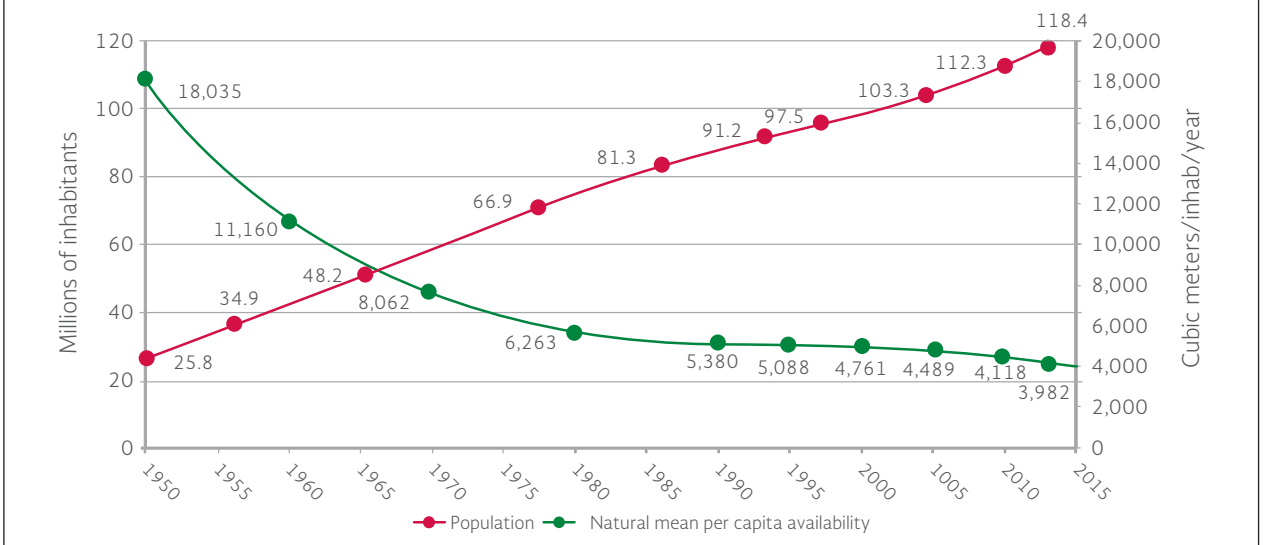
Figure I.4 Variation of the rural and urban population.



	1910	1921	1930	1940	1950	1960	1970	1980	1990	1995	2000	2005	2010	2011	2012	2013
Total	15.2	14.3	16.6	19.7	25.8	34.9	48.2	66.8	81.2	91.2	97.5	103.3	112.3	115.7	117.1	118.4
Urban	4.3	4.5	5.5	6.9	11.0	17.7	28.3	44.3	58.0	67.0	72.8	79.0	86.3	88.9	90.0	91.1
Rural	10.8	9.9	11.0	12.8	14.8	17.2	19.9	22.5	23.3	24.2	24.7	24.3	26.0	26.8	27.0	27.3

Source: CONAGUA, 2013. Values for 2011-2013 are forecasts produced by the CONAPO.

Figure I.5 Evolution of the population and natural mean per capita availability.



Source: CONAGUA, 2013.

Figure I.6 shows the mean per capita natural water availability in different countries around the world.

I.2 Water as the Cohesive Element of Mexicans

Institutionality

In recent years, Mexico has faced an unprecedented problem in terms of water security that has entailed a high social and human cost that threatens the peaceful coexistence of its citizens.

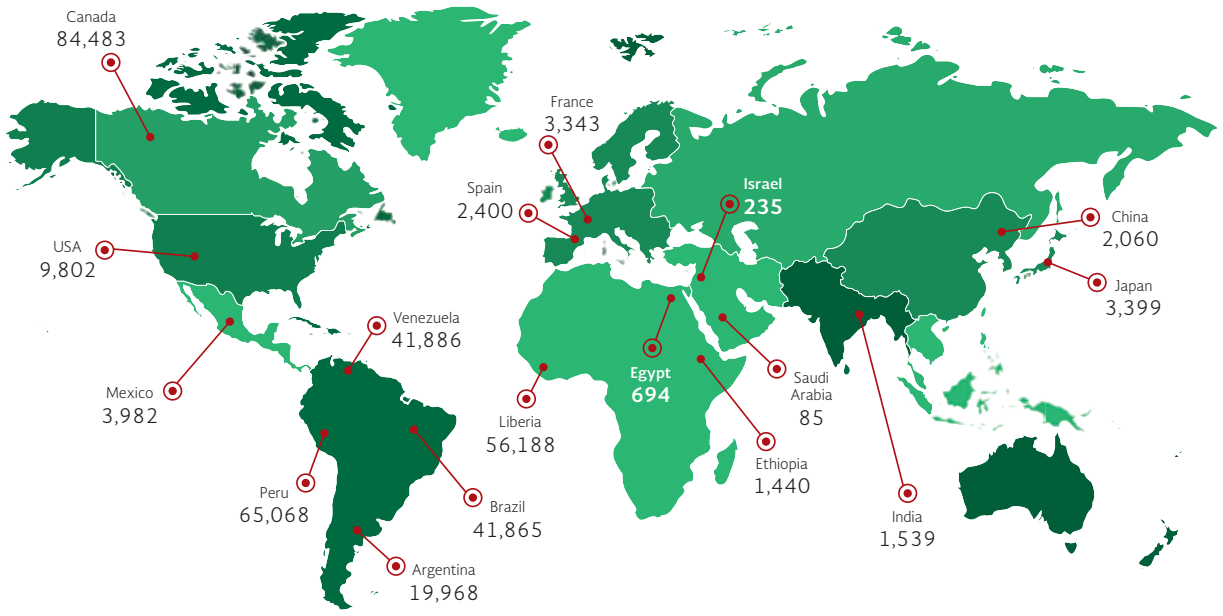
A Mexico in peace requires a consolidation of institutional power. Evidence shows that countries with successful development have solid and inclusive institutions. In contrast, non-inclusive institutions reduce the strength of the state and also limits and weakens the legitimacy of the programs required for its development.

Water Usage:
(of total extracted volume)

- *77% for irrigation.*
- *14% for public-urban usage.*
- *9% for self-supplied industries and thermoelectric plants.*

Since last century, Mexico has institutionalized water management, yet this process has not been consolidated due to badly coordinated public policies, affecting the actual management

Figure I.6 Natural mean per capita availability of water in some countries (m³/inhab/year).



Source: FAO. 2013. *Aquastat* Database. United Nations Food and Agriculture Organization.

as well as the handling and administration of water. Water problems are largely caused by the combination of different economic, social, financial, and environmental hazards, the solution for which, under the current legal and institutional framework, lies beyond the reach of the authority that manages national water resources.

The lack of proper coordination has compromised the credibility of water-related institutions in people's eyes and caused a negative environmental impact that has led to the deterioration or pollution of Mexico's water resources.

The limited and unsatisfactory institutional arrangements that have held back the water sector connect the three branches and the three tiers of government, as well as organized civil society, preventing the observance of established government programs.

Governance and Governability

Mexico's social, economic and political stability has been compromised by various conflicts that have arisen around the use of some watersheds across the country due to increasing demand and competition among different users for water resources.

In the past three decades, numerous civil society initiatives have demanded that the government take action on natural resources and the environment. In order to involve organized civil society in integrated water management, the LAN recognizes the role of river basin councils as coordinators, and the water committees of irrigation districts as collegiate organization bodies, to ensure proper management of water resources and infrastructure.

The experience of creating, operating, and restructuring the river basin councils has shown that progress has been slower than expected in including users and societies in the management of water; efforts must continue to break away from the paradigms of governmental paternalism, establish synergies between institutions for the integrated management of water resources, and seek solutions to benefit collective wellbeing.

Furthermore, in terms of governability of the water sector, the problem is related mainly to water management, which has become a limiting factor for the sustainable utilization of water resources and is beginning to place restrictions on Mexico's social, economic and environmental development.

The identified problem can be summed up in three aspects: overexploitation, over-allocation, and pollution of water resources. Allocation and assignment deeds are lacking for some types of utilization, and there is an insufficient and low level of measurement of extracted water and monitoring of utilizations and discharges. In areas of unrestricted extraction there is no control over water utilization; constructions in waterways and zones under federal jurisdiction are also proliferating, posing a threat to society at large.

Also, some allocation deeds have expired: users either lack interest or are simply unaware of the need to apply for the corresponding extension.

Regardless of whether or not the LAN allows the transfer of allocation deeds, this process must be regulated in order to discourage the informal market, speculation, and stockpiling the resource.

Water has not been properly managed because the LAN has not been rigorously applied, mainly due to the water authority's diminished capacity to carry out inspection visits and because it has not taken action to ensure water is utilized according to its availability.

Water Security

In Mexico, 69 percent of natural of runoff available in the country (including contributions received from other countries) is concentrated

in the watersheds of the Balsas, Santiago, Verde, Ometepec, Fuerte, Grijalva-Usumacinta, Papaloapan, Coatzacoalcos, Pánuco, Tecolutla, Bravo, and Tonalá rivers. However, the area drained by these twelve waterways only corresponds to 38 percent of Mexico's continental area, meaning that over 60 percent of the territory has only 31 percent natural runoff.

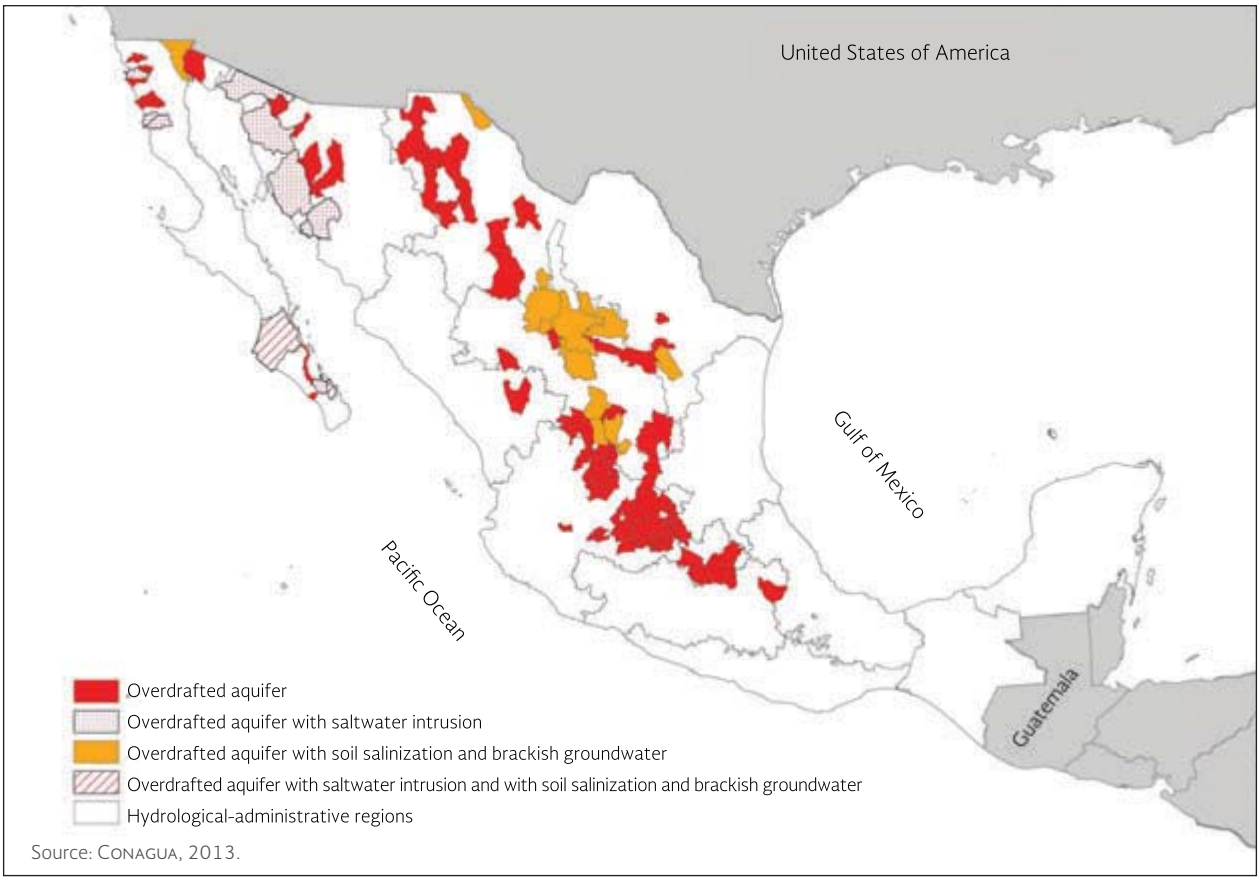
Additionally, and as a result of the troubles related to inadequate and unsustainable water resources management, of the 731 watersheds defined in the country, 104 have availability problems. Mexican standard NMX-AA-159-SCFI-2012 was recently approved in order to establish the procedure for determining the ecological flow in watersheds, in order to help reestablish the hydrologic balance.

In the same sense, as a unique frame of reference for groundwater management, 653 aquifers have been defined as supplying most of the water needs of industrial developments, and almost 65 percent of the volume of water required by cities where some sixty million inhabitants are concentrated.

These same aquifers are also the main supply source for the rural population and provide water for the irrigation of around two million hectares, 35 percent of Mexico's total irrigation area.

The overexploitation of aquifers in Mexico is more alarming each year: 32 in 1975 and 106 in 2013 (Figure I.7).

Figure I.7 Location of over-exploited aquifers.



Source: CONAGUA, 2013.

Allocated volume for off-stream water uses

- *62% from surface sources.*
- *38% from aquifers.*

To compound the problem of excessive water utilization, many areas also suffer from the deforestation of woodlands—primary zones for aquifer recharge. Other problems include the fact that green areas in cities are increasingly being paved over, preventing proper infiltration. As long as the need to strengthen and modernize the national system for measuring the water cycle for sustainable water use continues to be ignored, water security will remain unattainable.

Mexico has an arid climate in 52 percent of its area, and a semi-arid climate in 31 percent of its territory.

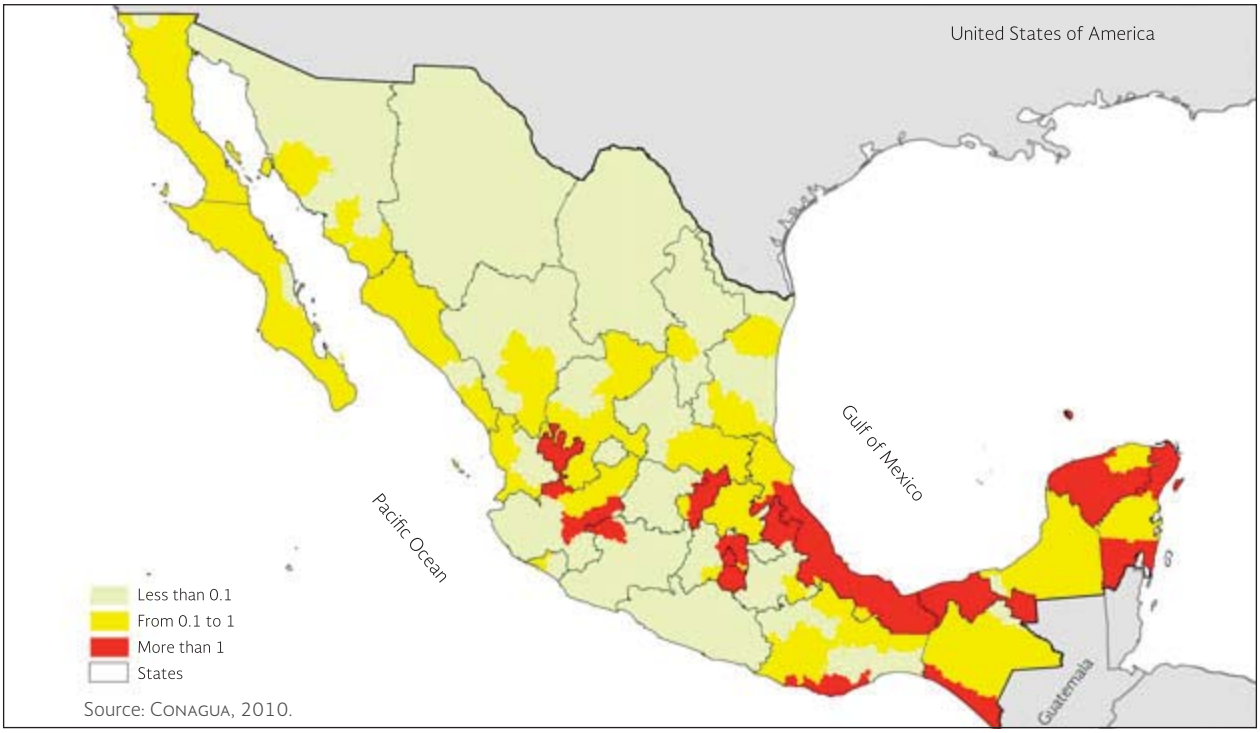
Given the country's geographical location, it is regularly exposed to severe hydrometeorological hazards, such as hurricanes and intense rainfall. Although this increases the availability of surface water and the natural recharge of aquifers, it also causes damages to the population, infrastructure, services and productive systems.

Between 1980 and 2010, intense rainfall affected over eight million people and caused more than $214 billion pesos in economic damage.

Figure I.8 shows the flood impact index. The greatest historic flood impact and risk is found in 17 states, home to 62 percent of the population.

The most affected states are the State of Mexico, Veracruz, Tabasco and Chiapas, as well as

Figure I.8 Flood impact index.



Source: Conagua, 2010.

the Federal District, all of which have high-density settlements in areas that are at risk and affected by frequent floods.

Mexico is highly vulnerable to drought, mainly in the northern states of Chihuahua, Coahuila, Nuevo León, Durango, and Zacatecas, where the impact of this phenomenon can have consequences that range from being minor to catastrophic. The severe lack of water in the north, and its excess in the south, means that both hazards can occur simultaneously with disastrous results.

As mentioned above, in terms of adapting to climate change or climate variability, Mexico has a wide variety of climates and rainfall patterns which affect its population's productive processes and activities.

According to several studies, between 2013 and 2030, temperature and precipitation variations in Mexico are set to increase. These modifications will affect the water sector in various ways, including variations in the availability of both surface- and groundwater for its different uses. These variations will also affect water environments, such as rivers, lakes, artificial reservoirs, coastal lagoons and wetlands.

Regionalized climate scenarios concerning precipitation and temperature indicate that by the end of this century, in the north-eastern states the winter season will tend to be around 30 percent shorter, while the south-eastern states will see a similar decrease in summertime length. In regard to surface temperature, all forecasts suggest increases of up to 5°C compared to the last century in some specific areas of the country.

Various vulnerability studies have been produced on agricultural issues, water quality, surface runoff, groundwater, impact on society, and extreme events. The results indicate that runoff will tend to reduce by up to 7 percent by 2030 in some hydrological regions under climate change conditions (Figure I.9). Furthermore, the latest regional climate projections (RCP), which analyzed spatial patterns between 1961 and 2000, show that annual increases in precipitation have been recorded in the tropical region.

I.3 Water as an Element of Social Justice

Poverty and Water Shortage

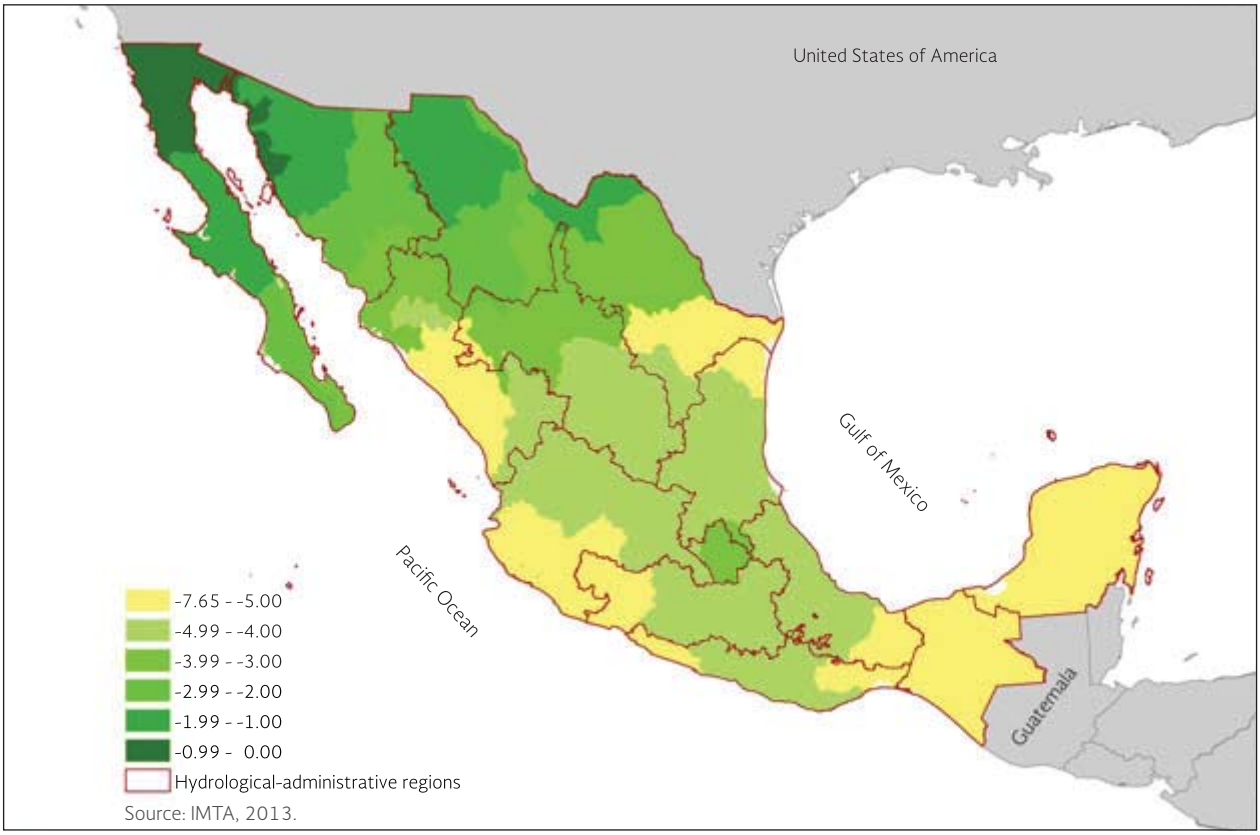
According the 2012 Poverty in Mexico Report (Informe de Pobreza en México), published by the National Council for the Evaluation of Social Development Policy (CONEVAL), 53.3 million Mexicans were living in poverty, a measurement based on an estimated population of 117.3 million people. Those considered as lacking access to basic housing services are those who do not receive water, sewerage and electricity services.

Lack of sewerage and water affected just over ten million people nationwide in 2012. The states with the most serious lack of sewerage services were Oaxaca, San Luis Potosí, Guerrero and Chiapas. The lack of water services in Guerrero affected just over a third of the state's population; in Veracruz, one in every four people; and in Tabasco, Chiapas, and Oaxaca, one out of every five inhabitants were affected.

The lack of water services is a factor of poverty. In Mexico, poverty exists where there is a lack of drinking water and sanitation services. According to the Ethos Poverty Index for Mexico,[1] the income variable contributes most to a household's poverty (22 percent), followed by the sanitation service and access to drinking water, (21 and 20 percent, respectively). Therefore, 41 percent of the poverty factor relates to the amount and quality of water available for the poor.

[1] Poverty typically results from people's inability to meet their household and other needs in order to enjoy wellbeing according to the social consensus and political, economic and social reality of any given society.

Figure I.9 Anomaly of mean annual runoff for the year 2030 (%).



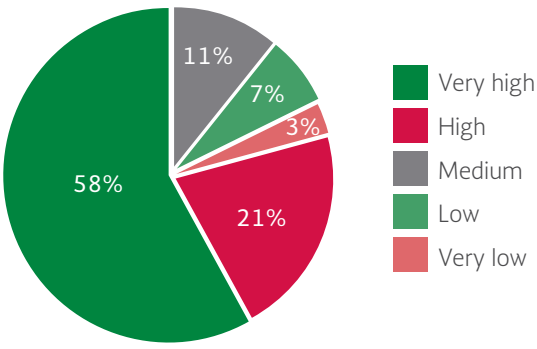
Of the 107,458 localities comprising the universe in question, CONAPO estimates that 22,443 are highly marginalized, indicating that over two million people live with very limited social opportunities (Figure I.10).

In localities with very high and high levels of marginalization, the chief problem continues to be the percentage of households without connection to water mains (32 and 21 percent, respectively) (Figure I.11).

Right to Water

According to the amendment to Article 4 of the Mexican Constitution, published on February 8, 2012, any person has the right of access, provision and drainage of water for personal and domestic consumption in a sufficient, healthy, acceptable, and affordable manner. It also establishes the participation of the three tiers of government and society itself in order to guarantee this right.

Figure I.10 Level of marginalization in 2010.



Source: CONAPO. Based on INEGI, Population and Housing Census 2010.

- *Between 1980 and 2010, intense rainfall affected more than eight million people.*

Women, especially those from minority ethnic groups and those living in rural areas and city outskirts, are the ones who suffer most from the lack of drinking water and sanitation services, since they are generally required to prepare meals, wash clothes, clean their homes, and to ensure their family's health. This situation also affects millions of girls when forced to stay home to clean, prepare meals, look after their younger siblings, and collect water every day.

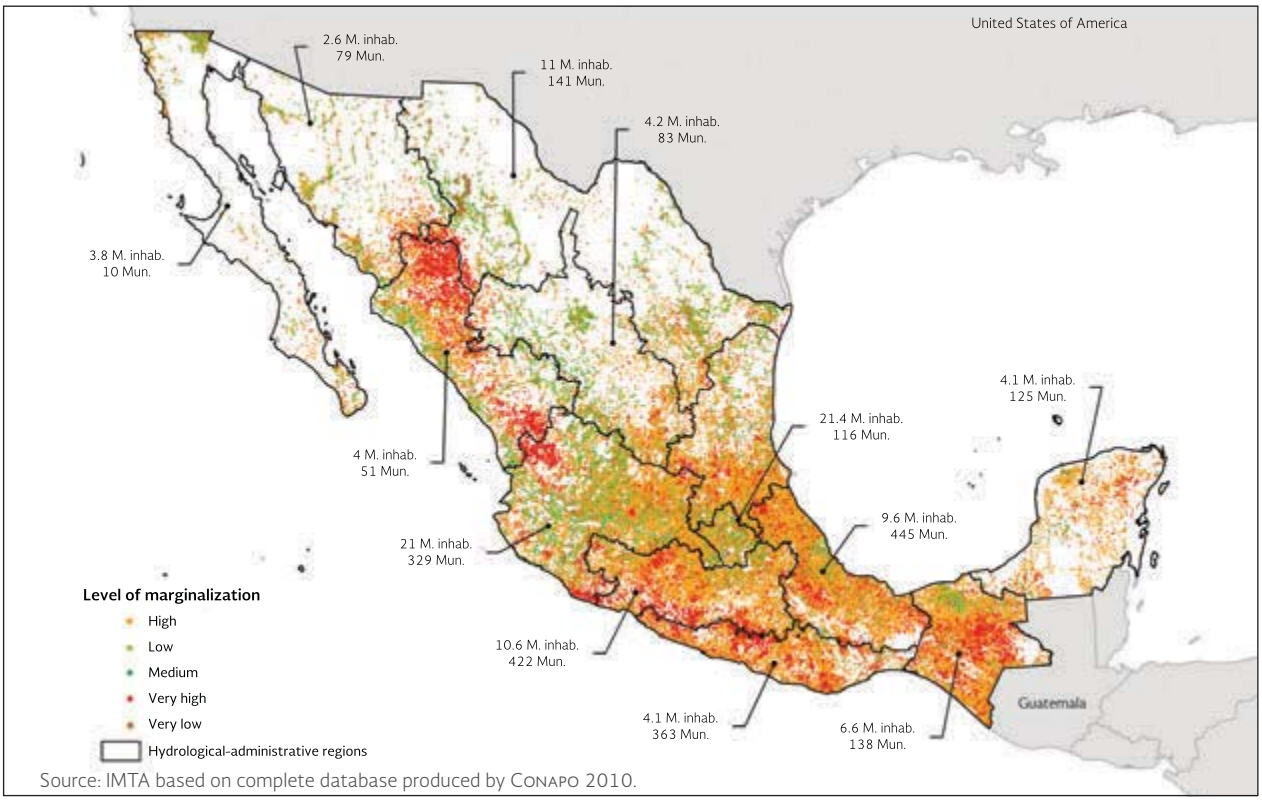
Water and Health

The supply of drinking water and sanitation services plays a major role in the health of the population. Access to these services reduces mortality and morbidity rates, especially among children, while the lack of them is largely responsible for causing waterborne diseases, such as viral hepatitis, typhoid fever, cholera, trachoma, dysentery, and other causes of diarrhea. Harmful effects have been recorded following consumption of water containing pathogenic elements such as arsenic, nitrates and fluoride.

Water pollution is one of the most serious environmental problems. Worsening water quality harms ecosystems, human health, and the availability of water sources.

Pollution is mainly due to the discharge of large amounts of untreated wastewater into re-

Figure I.11 Level of marginalization by locality in 2010.



Source: IMTA based on complete database produced by CONAPO 2010.

ceiving water bodies by municipalities and the industry, to the use of fertilizers and pesticides in agriculture, to the improper collection and disposal of solid waste by municipalities and the industry, and to the accelerated erosion process caused by improper practices in agricultural and forestry activities.

The National Network for Measuring Water Quality, which is used to assess the quality of national water resources, had, as of 2012, more than five thousand sites for measuring physico-chemical and biological parameters. Although this network has grown, it is still insufficient and obsolete, and does not measure various parameters that have a direct impact on health.

It is estimated that eighty percent of aquifers have good quality water, but 40 of them have been identified as having impaired quality as a result of human activities or natural causes; 17 have salt-water intrusion and 32 are affected by soil salinization and brackish groundwater.

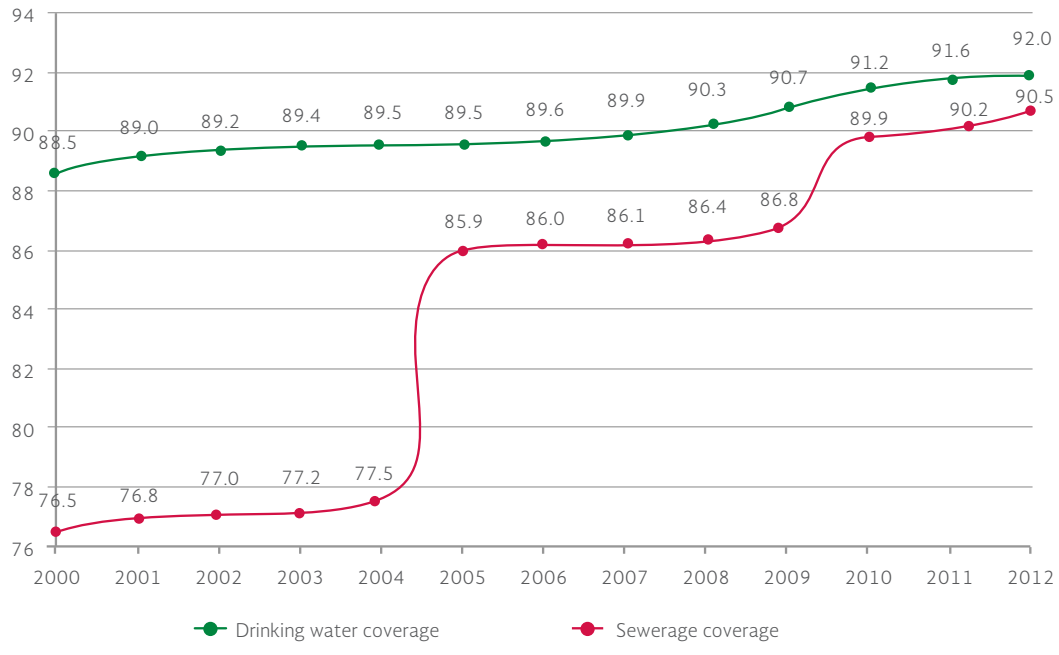
It is important to mention that the corresponding standards currently in force do not consider some pollutants, and they have strict thresholds that make them hard to adjust to the Mexican reality. Also, some official parameters are not measured.

Drinking Water, Sewerage, and Sanitation Services

As of December 31, 2012, drinking water and sewerage services reached 92 and 90.5 percent coverage, respectively (Figure I.12). Despite the progress made, almost nine million people lack drinking water services (five million in rural areas) and 11 million do not have sewerage services (7.8 million in rural areas). Almost 98 percent of water supplied to populated areas (322.97 m^3/s) is disinfected by chlorination.

The challenges in providing services increase and the financial implications are considerable, since

Figure I.12 Evolution of coverage of drinking water and sewerage services (%).



Source: Conagua, 2012.

it is necessary to implement the aforementioned amendment made in 2012 to Article 4 of the Mexican Constitution.

For its due implementation, this amendment requires a strong commitment from the three tiers of government; it must be applied gradually and with a legal framework that clearly establishes the responsibilities of each sector, as well as the financial, technical, and social criteria for facing the challenge, since the main problem, as in many other countries, is the fact that the rural population is widely dispersed (Figure I.13).

The figures in the table show the magnitude of the challenge in providing rural localities with drinking water and sanitation services through formal systems. Constructing this infrastructure is not the only problem: the supply of energy and the operation of systems that pipe water to these small communities require alternative, original technologies and the adaptation of new eco-technologies. Organized social participation is required in every action taken to bring water closer to people, in order to contribute towards the sustainability of services.

Given this outlook, two clearly differentiated challenges can be identified: in urban localities, coverage reaches up to 95.5 percent in the case of drinking water, and 96.5 percent in sewerage services. Hence the greater importance of supplying water from sustainable sources and improving the quality of the service provided, and the need to strengthen water utilities in Mexico so that they can become financially self-sufficient. Meanwhile, rural areas (80.3 percent drinking water coverage, 70.1 percent sewerage coverage), require considerable efforts to significantly increase the proportion of the population with secure access to water and basic sanitation.

Significant amounts of water—between 30 and 50 percent—continue to be lost from drinking water distribution networks, mainly due to the age of pipes, lack of pressure control and the poor quality of materials used. Homes still use high water-consumption fixtures and leaks go unnoticed or remain unfixed. Water utilities have high manager turnover rates, in addition to low levels of commercial efficiency.

- *Droughts affect mainly northern states, such as Chihuahua, Coahuila, Nuevo León, and Zacatecas.*

Figure I.13 Distribution of the Mexico's rural population.

Population Range	No. of localities	Total population
1 – 249	159,820	5,743,745
249 – 499	13,587	4,829,906
500 – 999	9,265	6,507,589
1,000 – 2,499	5,921	8,976,888
Totals	**188,593**	**26,049,128**

Source: INEGI, Population and Housing Census, 2010.

Since December 2012, municipal infrastructure has been bolstered with 2,342 wastewater treatment plants, with an installed capacity of 140.1 m^3/s. However, only an average of 99.8 m^3/s is treated, equivalent to 47.5 percent of the 210 m^3/s of wastewater collected in formal sewerage systems.

The main problems in several areas of Mexico include the lack of financial resources for the construction, overhaul and maintenance of wastewater treatment infrastructure; the high costs of electricity and of the chemical reagents used for their operation; the lack of training of operations personnel; and a poor payment culture among users when it comes to paying for sanitation services.

The Atotonilco Wastewater Treatment Plant—one of the largest in the world—is currently under construction and will treat 57 percent of the wastewater from the metropolitan area of Mexico City. And upon its completion and entry into operation, the Agua Prieta wastewater treatment plant for the metropolitan area of the city of Guadalajara will be able to increase the treated flow by more than 30 cubic meters per second.

Much work remains to be done in regards to wastewater treatment, apart from solving existing problems, which include plants that are under-used due to the lack of connections with sewerage systems, inefficient management, and the shortage of municipal funds to cover operating costs.

In 2012, the industrial sector generated an average flow of 210 m^3/s. A total of 2,569 plants exist with an installed capacity of 89 m^3/s, 2,530 of which are in operation and treat 60.5 m^3/s of industrial effluents. Additionally, 63 m^3/s were treated by using wetlands, raising the treated flow to 58.8 percent.

I.4 Developing a Water Culture with an Informed and Participative Society

Information, education, and culture are key elements to change attitudes and to transmit values, beliefs and behaviors for sustainable water management, and to protect the environment.

In general, the economic, social, and environmental value of water is largely ignored in Mexico, leading to its inefficient use, wastage, overexploitation and degrading quality.

This situation is also reflected in people's reluctance to pay for using national water resources, for domestic water supply, and for the sanitation of the water they use.

The formal school curriculum, at its different levels, is still failing to communicate the overall issues related to water. Textbooks do not explain in detail the regional differences in terms of water availability and use, among other shortcomings.

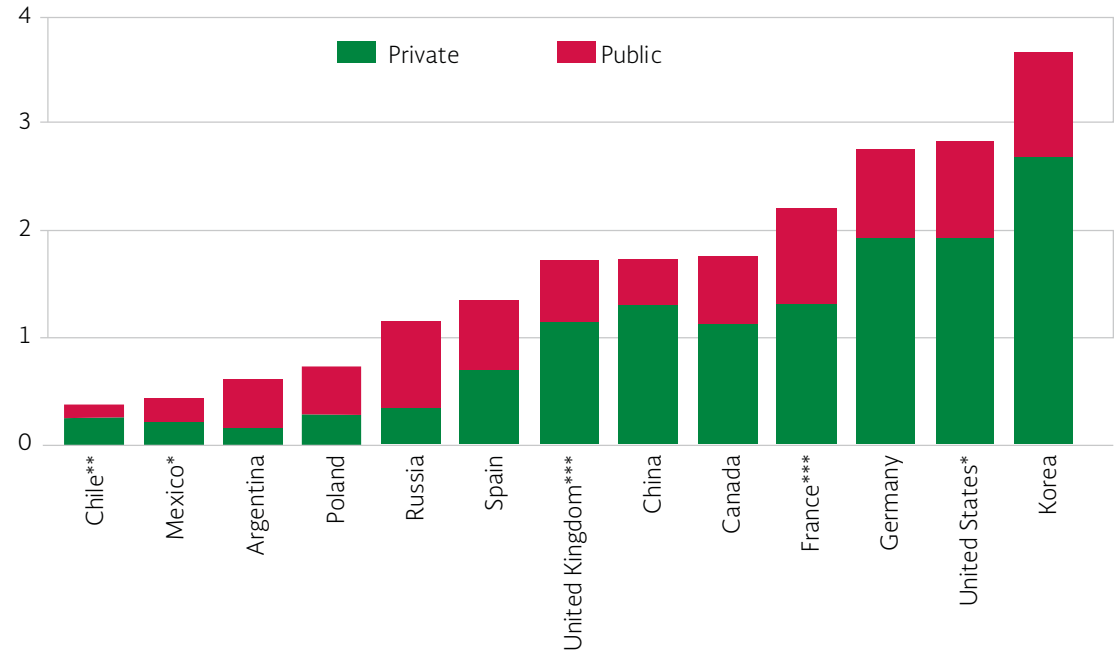
The contribution of research, technological development, and human resources training still falls short of its maximum potential. Neither does it meet the sector's needs.

International experience shows that to stimulate substantial interest in the development of research and technology requires a corresponding investment that is higher than or equal to 1 percent of the Gross Domestic Product (GDP). In Mexico, this investment reached only 0.5 percent of the GDP in 2012, representing the lowest level among all member countries of the Organization for Economic Co-operation and Development (OECD), and even lower than the Latin American average (Figure I.14).

The number of Mexican researchers per thousand economically active inhabitants represents around one tenth the proportion observed in more developed countries, and the number of Ph.D. graduates per million inhabitants (29.9) is not enough to provide the required human capital in the near future.

A dependence on foreign technology can be seen, translating into an import of processes,

Figure I.14 Investment in Research and Development (% GDP).



Source: OECD, CONACYT for Mexico, 2010. *Figures for 2009 **Figures for 2008 ***Preliminary figures.

equipment, IT applications, and technological services, to the detriment of Mexico's science and technology sector.

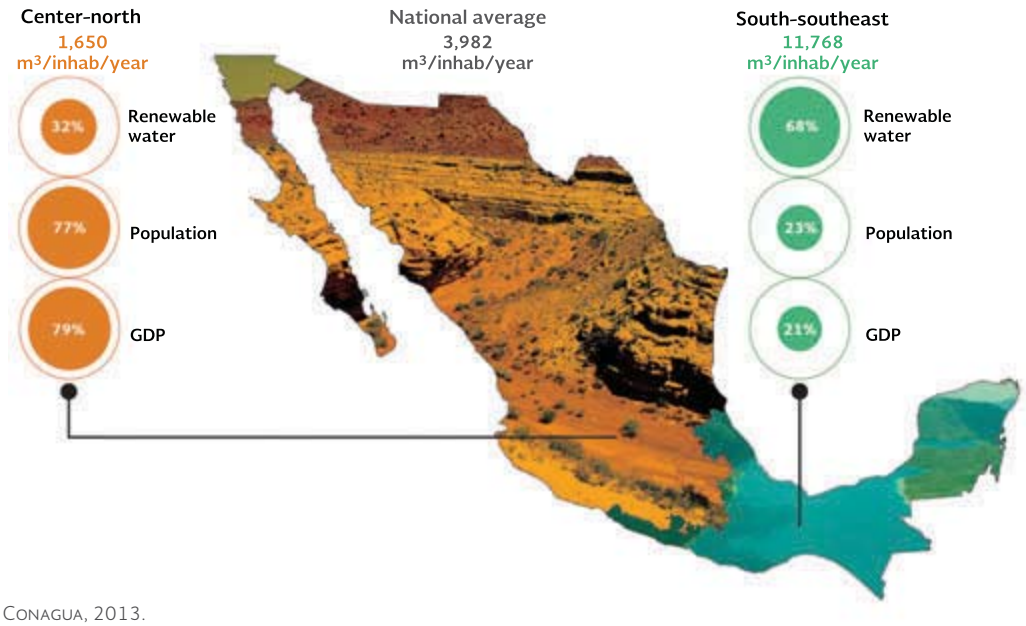
Legal, institutional, and administrative weaknesses, added to financing, hiring, and structure-expansion restrictions, have combined to create a set of problems affecting the sector. Important examples include, inter alia, training that is either insufficient or that does not meet the sector's real needs; a lack of policies for renewing technical teams, managing knowledge, taking advantage of experience, and creating of work teams; lack of national and international interaction; and failure to recruit young talents.

Currently, the training and certification of skills among professional and technical personnel working in the sector takes less account of real needs to improve the performance of their assigned roles within their respective institutions. Also, the profile of people working in the sector does not relate to their actual duties.

Furthermore, the technical teams and directors in the water sector, including those from CONAGUA and the Mexican Institute of Water Technology (IMTA), have been gradually thinning out, with fewer and fewer experienced professional staff with master's or doctoral degrees. The systematic recruitment of talented young graduates from universities and technological institutes is reduced, due to the low salaries and unfavorable conditions for careers within the water sector. No longer is there a professional training system to encourage young people in the sector as in times past.

Today, there are few experts in the fields of engineering; socioeconomics; finance; infrastructure operation; water governance; technical water management in river engineering; hydrogeology; decision-making; calculation

Figure I.15 Contrast between development and water availability.



Source: Conagua, 2013.

of balances and availabilities; application of laws and regulations; design and construction of dams, water and wastewater treatment plants, aqueducts, sewers, and irrigation systems; work supervision; and study and project design, etc., attesting to the delicate situation of the water sector.

I.5 Water as a Promoter of Sustainable Development

Economic Development and Water

The highest levels of population and economic growth have been registered in areas with the least available water. Therefore, in the central and northern regions of Mexico, where 77 percent of the population is concentrated and where 79 percent of the country's GDP is generated, there is just 32 percent of the country's available water; this situation contrasts with the south and south-eastern region, where 23 percent of the population live and contribute 21 percent of Mexico's GDP, and which has 68 percent of the available water (Figure I.15).

One serious limiting factor for the development of the water sector has undoubtedly been the insufficient investment and funding to expand, maintain, and operate Mexico's water infrastructure, as well as to implement measures to manage water.

Traditionally, most funding has relied on fiscal revenue; this is clearly an unsustainable situation. The funding scheme must be revised to substantially increase the flow of financial resources from a variety of sources (Figure I.16).

- *9 million Mexicans lack drinking water services.*
- *11 million Mexicans lack drainage services.*

(approximate figures).

Figure I.16 Investment in water infrastructure.

Year	Federal	State and Municipal	Other Sources and Users	Total
2007	19,144.1	8,688.4	4,357.8	32,190.3
2008	25,870.0	14,042.4	3,759.8	43,672.2
2009	23,712.3	12,676.3	3,511.0	39,899.7
2010	32,318.0	8,935.6	4,065.3	45,318.8
2011	31,727.2	7,772.2	5,011.3	44,510.7
2012	28,266.3	2,138.5	9,315.4	39,720.2
Total	161,038.0	54,253.4	30,020.6	**245,312.0**

Source: Conagua, 2012. Millions of constant pesos of August 2013.

Although investments in water infrastructure have increased in recent years, there is still a deficit that will require an increase of at least 80 percent in terms of annual investments.

It should be noted that the design and implementation of funding programs must clearly and efficiently contribute to fulfilling the objectives set out in the PNH 2014-2018, and also to add institutional strength to the sector through water governance measures, including those referring to technical and administrative capacity and the use of technology.

The challenge for the years ahead lies in ensuring sufficient investments and funding, as well as the continuity and availability of the assignment and application of the required financial resources. This will lead to high levels of financial, social, and environmental profitability.

The Mexican federal government has economic instruments with which to regulate the use and utilization of water, such as charging for rights and usage. These instruments seek to send economic signals to encourage the efficient and sustainable use of water (managing demand) as well as contributing to finance its administration (water paying for water). Some states and municipalities have similar instruments in place.

In this context, the historical evolution of the federal revenues from water duties in real and nominal terms between 1989 and 2012 is shown in Figure I.17.

Between 1993 and 1998, revenues fell by an accumulated total of 38.8 percent in real terms; this trend began to change from 1999, and there was a real accumulated growth of 30 percent from 2006 to 2012. At the end of 2012, revenues of $14.171 billion pesos were received from water duties, in addition to the amounts recovered through tax credits.

Although the LAN contemplates the existence of a water financial system, it has not been designed or implemented either nationally or regionally.

Water Sustainability

Most watersheds in Mexico are unsustainable, with demand steadily increasing as the population and its needs continue to grow.

Until 2012, the total demand for national water resources in Mexico was in the region of 78.4 billion cubic meters, a need that was met with a sustainable volume of 66.9 billion

Figure I.17 Historical evolution of Conagua's revenue.

Source: Conagua, 2012. Millions of pesos of December 2012.

cubic meters of surface- and groundwater, and with an unsustainable volume of 11.5 billion cubic meters, 6.5 billion cubic meters of which come from overdrafted aquifers. The highest percentage of the demand continues to be in the agricultural sector.

It is estimated that in around twenty years demand will increase to 91.2 billion cubic meters due to the increase in productive activities and population growth, with supply reaching 68.3 billion cubic meters, taking into account infrastructure works registered in the project portfolio; therefore, an estimated 23 billion cubic meter gap will exist between supply and demand (Figure I.18). This gap includes the volume of water that will be used to cover demand growth in the agricultural, public-urban and industrial sectors, as well as the unsustainable volume that will no longer be extracted due to the decreased overdrafting of aquifers. The main challenges are found in the watersheds of the Valley of Mexico and of the Lerma, Bravo, Fuerte, Mocorito, Presidio-San Pedro, Tula, and Balsas rivers.

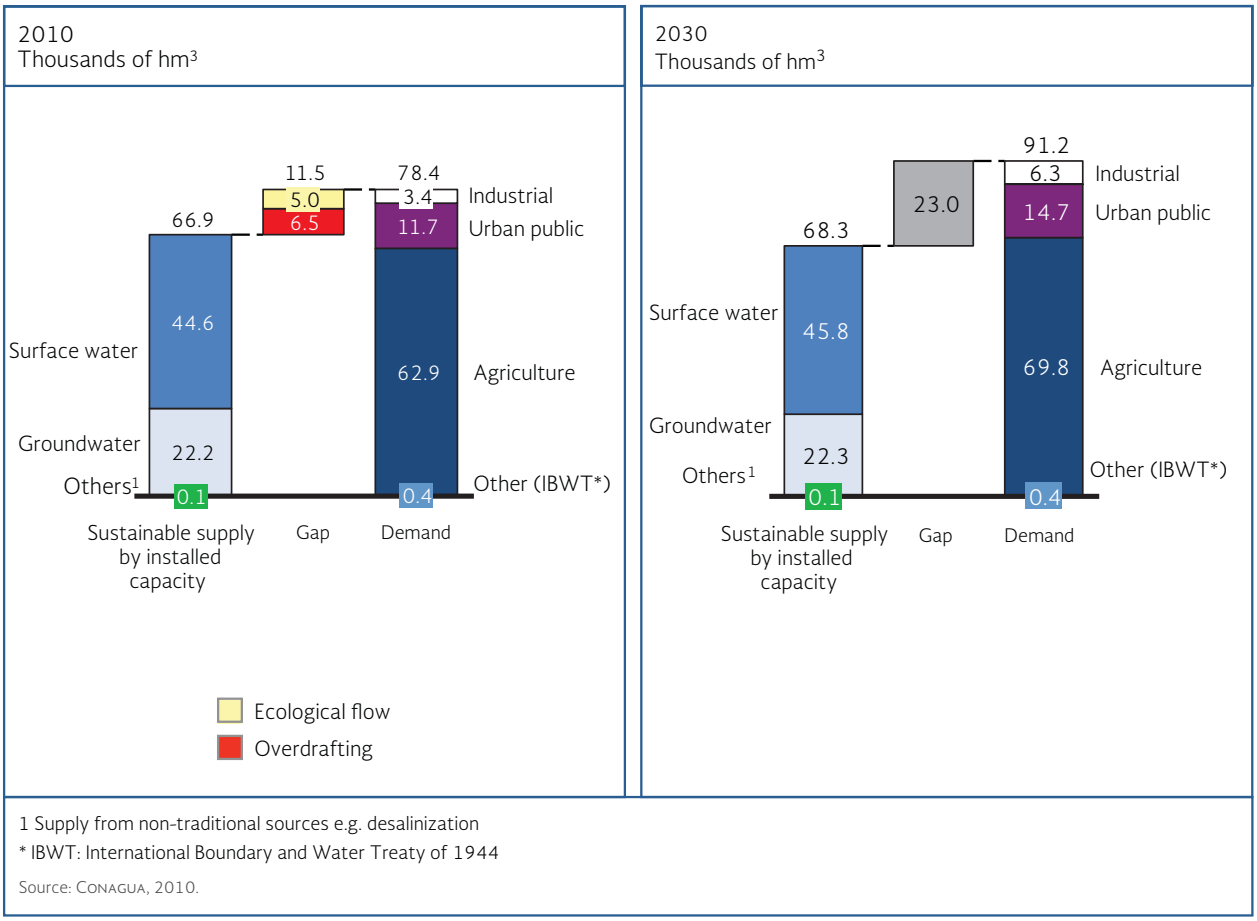
Water Uses and Water Services

Currently the allocated volume for off-stream water uses is 82.734 billion cubic meters; 50,951 of which come from surface water sources and 31,783 from aquifers; and the allocated volume for use in hydroelectric plants has increased to 166.014 billion cubic meters.

Irrigation consumes 63.35 billion cubic meters of water per year (77 percent of total withdrawals); public-urban usage, 14 percent; and self-supplied and thermoelectric industries, 9 percent. Hydroelectric power generation uses just over twice the extracted volume of off-stream water uses combined.

The intensive use of water in various socio-economic activities has led to the overexploitation of surface- and groundwater and to the deterioration of ecosystems in some regions due to reduced runoff. This situation has also caused an over-allocation of water volumes available in watersheds and aquifers.

Figure I.18 Supply-Demand Gap for Water.



1 Supply from non-traditional sources e.g. desalinization
* IBWT: International Boundary and Water Treaty of 1944

Source: CONAGUA, 2010.

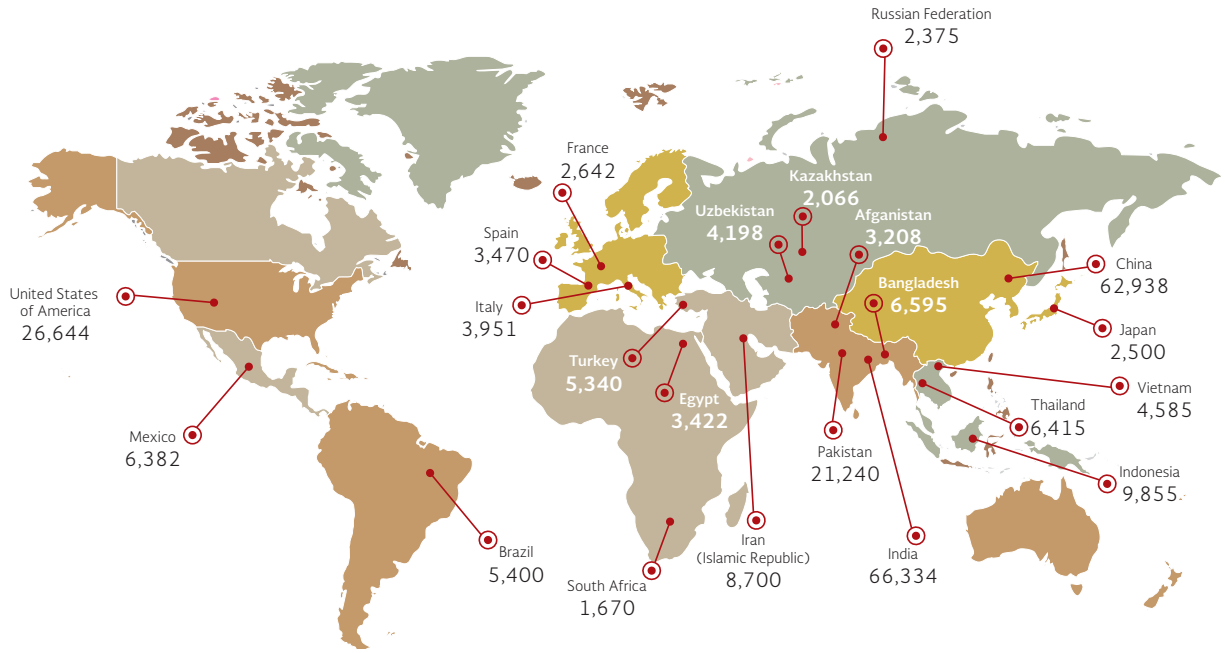
Mexico has 6.4 million hectares of land with irrigation infrastructure, the seventh largest area in the world (Figure I.19). Of this area, 3.4 million hectares correspond to 85 irrigation districts, which during the 2011-2012 agricultural year drafted a supply of 25.63 billion cubic meters from their supply sources, a lower volume than the allocated amount of 32.904 billion cubic meters per year and a further three million hectares are in 39,492 irrigation units, with an allocated volume of 29.192 billion cubic meters.

During the 2011-2012 agricultural year, efficiency in water conveyance and distribution was 86 and 76 percent respectively, since many of the channels have a soil bed. Also, current water practices use more water than necessary, due to the predominant use of furrow or flood irrigation.

In recent years, water productivity has increased from 1.41 kilograms per cubic meter in 2006 to 1.86 kilograms per cubic meter in 2012. Despite the enhanced yield from water, Mexico currently imports 45 percent of the grains it consumes.

- *47.5% of collected wastewater is treated in some way.*

Figure I.19 Global irrigation infrastructure (thousands of hectares).



Source: Conagua, 2013. With information from the AQUASTAT database. United Nations Food and Agriculture Organization. The data corresponds to different years between 2002 and 2012, depending on the country.

In the tropical and subtropical planes with abundant precipitation, 2,860,000 hectares of land in 23 technified rainfed districts are under federal control, with road networks and infrastructure to evacuate surplus water.

Annually, thermoelectric power generation uses 4.077 billion cubic meters of water and hydroelectric plants are allocated 166.014 billion cubic meters.

In 2011, according to the Secretariat of Energy's (SE) Electricity Sector Outlook (2012-2016), 13.8 percent of electricity was generated in the country's large hydroelectric plants. Significant but as-yet-unexplored potential exists for generating electricity in small-scale hydroelectric plants, with production capacity not exceeding 30 megawatts.

Although self-supplied industry only consumes four percent of total drafted water (3.325 billion cubic meters per year), it pollutes the equivalent amount of 300 million inhabitants in terms of biochemical oxygen demand (BOD_5). Industrial water pollution is greater along Mexico's northern border, where a large number of maquiladoras and general industries have been set up, causing serious environmental damage.

Finally, regarding tourism, although Mexico remains a leading tourist destination, it has fallen in the World Tourism Organization's rankings from seventh place in 2000 to thirteenth in 2012, in terms of the number of international tourist arrivals, and from twelfth to twenty-fourth in terms of foreign currency earnings. This sector has traditionally required increasing water and sanitation services.

Figure I.20 details Mexico's most important types of water infrastructure to provide the water needed for the various uses.

Figure I.20 Water infrastructure.

Storage	
Dams and water retention berms	**5,163.0**
Capacity at NPE (Mm^3)	**138,080.0**
Hydroagricultural	
Irrigation districts	**85.0**
Total surface area (Millions of hectares)	**3.4**
Irrigation units	**39,492.0**
Total surface area (Millions of hectares)	**3.0**
Technified Rainfed Districts	**23.0**
Total surface area (Millions of hectares)	**2.8**
Drinking Water Coverage (%)	
National	**92.0**
Urban mean	**95.5**
Rural mean	**80.3**
Sanitation Coverage (%)	
National	**90.5**
Urban mean	**96.5**
Rural mean	**70.1**
Conveyance	
Aqueducts (length in km)	**> 3,000.0**
Capacity (m^3/s)	**112.0**

Cutzamala System	
Average volume supplied to Valley of Mexico (Mm^3/year)	**485.0**
(Drinking) Water Treatment	
Water treatment plants in operation	**699.0**
Installed capacity (m^3/s)	**135.0**
Treated flow (m^3/s)	**96.0**
Treatment	
Municipal wastewater treatment (%)	**47.5**
Municipal treatment plants in operation	**2,342.0**
Installed capacity (m^3/s)	**140.1**
Treated flow (m^3/s)	**99.8**
Industrial treatment plants in operation	**2,530.0**
Installed capacity (m^3/s)	**74.9**
Treated flow (m^3/s)	**60.5**
Flood Protection	
Regional Emergency Response Centers in Operation	**20.0**

Source: CONAGUA, 2012.

However, the constructed infrastructure is still insufficient, given the problems of obsolescence, high operating costs, as well as a growing opposition to the construction of new projects due to political and social problems.

The reuse of treated municipal wastewater has increased in recent years in Mexico, generally in agriculture, industry and municipal services, mainly for the irrigation of green urban areas. Of the total volume of treated water—3.146 billion cubic meters—only 33 percent is reused, 7.8 percent of which is exchanged for first-use water, recovering flows for priority areas such as for public-urban usage. Also, approximately 60 cubic meters per second of untreated wastewater is used for agricultural irrigation.

Investment Projects and Studies

The lack of studies and projects is an unresolved water management problem, and one that seriously affects the investment process. It is hard to comply with the government budgets within the fiscal year; the cost of constructions increases as a result of substandard projects or projects carried out too hastily, situations which, among other things, thwart any chance of a properly organized planning process.

Furthermore, not enough investments have been allocated for studies and projects, resulting in a weak project portfolio.

Atotonilco Wastewater Treatment Plant (the largest of its type in the world), Hidalgo.

I.6 Mexico as a Global Player on Water Issues

For decades Mexico has participated in various international forums dealing with water and its management, as well as in various meetings and technical missions, and it is highly regarded for its work. However, due to the low level of importance given domestically to Mexico's progress on water issues, it has kept a low profile and chosen to avoid taking responsibility, sharing experiences or cooperating with other countries.

It is worthwhile and even strategically necessary to formulate a clear and solid public policy with which Mexico can position itself on the global stage, with increasing firmness and consistency, based on its wealth of experience and knowledge on handling water resources, and making the most of the growing opportunities available to the country to increase its international standing and influence, with its unique contribution to water resources management models.

Up until recently, Mexico's positive presence and influence in terms of water issues has largely been wasted. Suffice it to mention Mexico's importance and its water development for other Latin American countries that look to Mexico to find out more about its progress, results and management models in their search for solutions to their own situations. Mexico is able and has the historical need to open up and share experiences, knowledge, lessons learned, best practices, and processes that may be emulated in other countries.

Mexico must have the confidence to make its voice heard at international events on water issues. It must work hard through a solid public policy and well-supported strategies to become a reference point for water issues in the

- *Mexico's national water demand is 78.4 billion m^3.*
- *11.5 billion m^3 of water are supplied under unsustainable conditions.*

developing world, due to its multifaceted and wide range of proposals, built projects, and major achievements, as well as practices that proved unsuccessful and were subsequently abandoned.

Mexico is one of the world's fifteen largest economies, a member of the OECD and of the G-20. It is also a reference point for other countries for water development, albeit still with a small voice compared to other countries that boast about their latest achievements with water—which Mexico has often already implemented; indeed, other countries' achievements are sometimes the result of Mexico's own expertise and successful handling of water issues.

In conclusion, these results aim to support a public policy of promoting Mexico's presence on the world stage on water issues, and thus contribute in this regard to the overall national guidelines set out in the PND 2013-2018: to raise Mexico's profile internationally and to participate in new international roles in which Mexico sets an important example for the world.

Río Nazas, flowing through Coahuila.

Chapter II. Alignment with National Goals

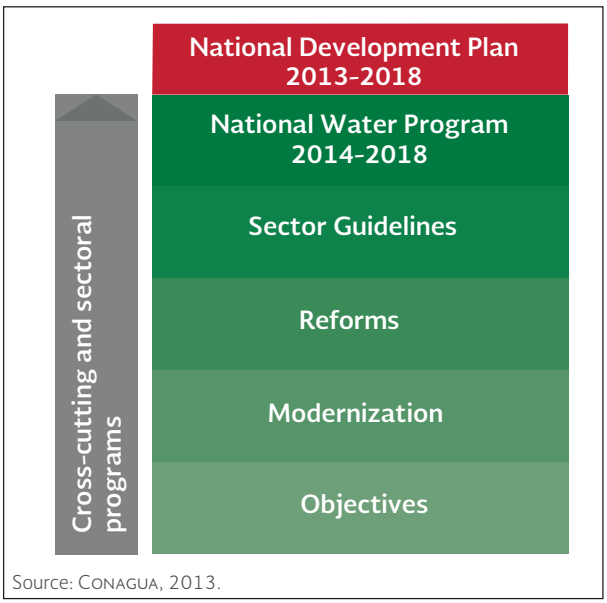
The National Development Plan (PND 2013-2018) is the roadmap drawn up by society and the federal government of Mexico to walk together toward a new stage for the country. It contains the national goals, the overarching objectives of public policies, and specific actions **to bring Mexico to its maximum potential**.

In line with the PND 2013-2018, five guidelines have been established for Mexico's water sector:

1. Water as the cohesive element of Mexicans.
2. Water as an element of social justice.
3. Developing a water culture with an informed and participative society.
4. Water as a promoter of sustainable development.
5. Mexico as a global player on water issues.

In this sense, the National Water Plan (PNH 2014-2018) derives from—and is aligned with—various sectoral programs and the five national goals of the PND 2013-2018, as shown in figures II.1, II.2 and II.3.

Figure II.1 General Alignment Scheme.



Source: Conagua, 2013.

- *The PNH 2014-2018 is aligned with the five national goals of the PND 2013-2018 and with various sectoral programs of the Federal Government Administration.*

The implementation of this Plan requires the participation of the following departments, agencies and organizations have participated in the implementation of this Plan:

- Secretariat of the Interior (Segob)
- Secretariat of Foreign Affairs (SRE)
- Secretariat of National Defense (Sedena)
- Secretariat of the Navy (Semar)
- Secretariat of Finance and Public Credit (SHCP)
- Secretariat of Social Development (Sedesol)
- Secretariat of the Environment and Natural Resources (Semarnat)
- Secretariat of Energy (Sener)
- Secretariat of Economy (SE)
- Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (Sagarpa)
- Secretariat of Communications and Transportation (SCT)
- Secretariat of Public Education (SEP)
- Secretariat of Health (SSA)
- Secretariat of Labor and Social Welfare (STPS)
- Secretariat of Agrarian, Territorial, and Urban Development (Sedatu)
- Secretariat of Tourism (Sectur)
- Petróleos Mexicanos (Pemex)
- Federal Electricity Commission (CFE)
- National Council on Science and Technology (Conacyt)
- National Institute of Statistics and Geography (INEGI)
- Congress
- State governments
- Municipal governments
- Water user organizations
- Civil society organizations

Alignment with Sectoral Programs

As stated above, the PNH 2014-2018 has a multi-sectoral and cross-cutting approach as a result of the need for more than one sector-coordinating agency for its implementation.

Figure II.3 shows the link between the PNH 2014-2018 and water-related sectoral programs derived from the PND 2013-2018. Therefore, the coordinated and harmonious work of water sector institutions and agencies will be essential to achieve the Plan's objectives.

The objectives set forth by the PNH 2014-2018 have a direct bearing on:

a) Promoting and strengthening water governance and governability, as proposed in Segob's sectoral program;
b) Ensuring water security in the face of extreme hydrometeorological hazards that threaten human life, in support of Segob's and Sedena's sectoral programs;
c) Ensuring the effective exercise of the entire population's social rights to water, in accordance with Sedesol's and Sedatu's sectoral programs;
d) Developing the human potential of the water sector in line with SEP's sectoral program;
e) Promoting and guiding an inclusive and enabling green growth that may preserve Mexico's natural heritage while effectively creating wealth, competitiveness and employment, in line with Semarnat's sectoral program;
f) Expand and strengthen Mexico's global presence in water issues, as proposed in the SRE sectoral program.

The objectives of the PNH 2014-2018 contribute also in a special way to the sectoral programs of Sagarpa, Semar, the SSA, the SCT, Sener and Sectur.

Aqueduct 2, Querétaro.

Figure II.2

Multisectoral Alignment Scheme

National Development Plan 2013-2018: To bring Mexico to its maximum potential

- A Mexico at Peace
- An Inclusive Mexico
- A Mexico with Quality Education
- A Prosperous Mexico
- A Mexico with Global Responsibility

National Water Plan 2014-2018: To attain water security and sustainability in Mexico

• Guidelines

- Water as the cohesive element of Mexicans
- Water as an element of social justice
- Developing a water culture with an informed and participative society
- Water as a promoter of sustainable development
- Mexico as a global player on water issues

• Reforms

- Legal framework for water
- Institutional framework of the public water sector
- Water financial system
- Water planning
- Water human resources management system

• Modernization

- Public policies on water and its management
- Water metering system
- Water information system
- Water project and process management system
- Integrated water resources management
- Mexico's international leadership
- Water technology and scientific research system
- National strategy for the adaptation of the water sector in the face of climate change or climate variability

• Objectives

1. To strengthen integrated and sustainable water management
2. To increase water security against droughts and floods
3. To improve water supply and access to drinking water, sewerage, and sanitation services
4. To increase the sector's technological, scientific, and technical capacities
5. To ensure sustainable water availability for agricultural irrigation, energy, industry, tourism, and other economic and financial activities
6. To consolidate Mexico's international involvement in water issues


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Figure II.3 Alignment of PNH 2014-2018 with sectoral programs and the PND 2013-2018.

National Goal Objective	Strategies of National Goal Objective	Sectoral Objectives	PNH 2014-2018 Objective
1.1. To promote and strengthen democratic governability.	1.1.1. To contribute to the development of democracy. 1.1.2. To strengthen relations with Congress and the judicial branch, and to build political agreements for the reforms needed by Mexico. 1.1.3. To push forward joined- up federalism though effective coordination and greater co-responsibility of the three tiers of government. 1.1.4. To prevent and manage social conflicts through constructive dialogue.	1. To promote and strengthen democratic governability. (SEGOB sectoral program).	1. To strengthen integrated and sustainable water management.
1.6 To protect the population, its property and its environment in the event of a natural or man-made disaster.	1.6.1. Strategic disaster prevention policy. 1.6.2. Handling emergencies and effective disaster response.	5. To coordinate the National Civil Protection System in order to protect the population, its property and its environment in the event of disasters. (SEGOB sectoral program). 5. To provide effective support to the civilian population in the event of disasters. (SEDENA sectoral program).	2. To increase water security against droughts and floods.

Source: CONAGUA, 2013.

Figure II.3 (contd.) Alignment of PNH 2014-2018 with sectoral programs and the PND 2013-2018.

National Goal Objective	Strategies of National Goal Objective	Sectoral Objectives	PNH 2014-2018 Objective
2.5. To provide a suitable environment in which people can lead a dignified life.	2.5.2. To reduce responsibly the housing shortfall by improving and expanding existing housing stock and encouraging the purchase of new housing. 2.5.3. To increase and enhance inter-institutional coordination that guarantees co-responsibility and coordination between the three tiers of government, for sustainable land management, as well as for the promotion of regional, urban, metropolitan, and housing development.	5. To encourage the development of farming centers through territorial cohesion, productivity, land, rural housing, and governability. (SEDATU sectoral program). 2. To create a dignified environment that encourages development by improving basic services, housing quality and spaces, and social infrastructure. (SEDENA sectoral program).	3. To improve water supply and access to drinking water, sewerage, and sanitation services.

Source: CONAGUA, 2013.

Figure II.3 (contd.) Alignment of PNH 2014-2018 with sectoral programs and the PND 2013-2018.

National Goal Objective	Strategies of National Goal Objective	Sectoral Objectives	PNH 2014-2018 Objective
3.5. To turn scientific and technological development and innovation into pillars for sustainable economic and social progress.	3.5.1. To contribute to increasing the annual growth of domestic investment in scientific research and technological development, in order to reach 1 per cent of GDP. 3.5.2. To contribute to the trainning and enhancement of highly-skilled human capital. 3.5.3. To promote the development of scientific and technological vocations and capabilities and local innovations, in order to strengthen sustainable and inclusive regional development. 3.5.4. To contribute with the transfer and usage of knowledge, linking higher-education institutions and research centers with with the social, private, and public sectors. 3.5.5. To contribute to enhancing Mexico's scientific and technological infrastructure	6. To promote scientific and technological education as an essential element for transforming Mexico into a knowledge society. (SEP's sectoral program).	4. To increase the sector's technical, scientific, and technological capacities.

Source: CONAGUA, 2013.

Figure II.3 (contd.) Alignment of PNH 2014-2018 with sectoral programs and the PND 2013-2018.

National Goal Objective	Strategies of National Goal Objective	Sectoral Objectives	PNH 2014-2018 Objective
4.4. To promote and guide and inclusive and enabling green growth, and that may preserve Mexico's natural heritage while effectively creating wealth, competitiveness, and employment.	4.4.1. To implement an integral policy of development that links environmental sustainability with costs and benefits for society. 4.4.2. To implement sustainable water management so that every Mexican has access to water.	3. To strengthen integrated and sustainable water management, ensuring its accessibility for the population and for ecosystems. (SEMARNAT sectoral program).	5. To ensure sustainable water availability for agricultural irrigation, energy, industry, tourism, and other economic and financial activities.

Source: CONAGUA, 2013.

Figure II.3 (contd.) Alignment of PNH 2014-2018 with sectoral programs and the PND 2013-2018.

National Goal Objective	Strategies of National Goal Objective	Sectoral Objectives	PNH 2014-2018 Objective
5.1. To increase and strengthen Mexico's global presence.	5.1.6. To consolidate Mexico's role as a responsible, active, and committed player in the multilateral setting, prioritizing the promotion of strategic issues for the benefit of the world and in line with domestic interests.	2. To contribute actively to multilateral forums on issues that are relevant for Mexico and the world. (SRE's sectoral program).	6. To consolidate Mexico's international involvement in water issues.

Source: CONAGUA, 2013.

Grijalva-Usumacinta-San Pedro river branches, Tabasco.

Chapter III. Objectives, Strategies, and Lines of Action

Water Security and Sustainability in Mexico

According to the UN definition, water security is the "the capacity of a population to safeguard sustainable access to adequate quantities of acceptable quality water for sustaining livelihoods, human well-being, and socio-economic development, for ensuring protection against waterborne pollution and water-related disasters, and for preserving ecosystems in a climate of peace and political stability."

The concept of water security is an issue that cross-cuts every aspect of life in Mexico.

Mexico needs to ensure a water supply for present and future generations, so that the resource becomes a strength that promotes the country's economic, social, and sustainable development.

For the Mexican state, water is a priority issue and a matter of national security to be addressed comprehensively, so that the country can shift from a reactive to a proactive approach, count on a sufficient supply, and strengthen its ability to respond to the challenges associated with climate change. It has therefore drawn up four public policy areas:

1. Adequate, accessible, affordable and efficient water services.
2. Water for food security to boost the sufficient production of foods for the population and to support measures taken by the National Crusade against Hunger.
3. Responsible and sustainable water management to guide its rational use and consumption.
4. Reduce vulnerability to the effects of climate change and environmental contingencies.

These four areas—forming the basis of the national water policy—require the joined-up efforts of the three tiers of government and society in general.

a) Water sector reforms and modernization

Mexico is undergoing a process of far-reaching reforms that will make substantial changes to the water sector and help to improve the management of water resources in response to the challenges in a country with a constantly expanding economy.

In this context, the water sector needs modern, efficient, strong, reliable, and capable institutions that make the most of Mexico's experience with water. This requires institutional, legal, political, technical, scientific, social, economic, financial, budgetary, and information technology changes across the three tiers of government and in user organizations and society in general.

a.1) Sector reforms

The proposed changes require the implementation and consolidation of five key reforms in the areas of national water priority, security and sovereignty, in the understanding that this essential liquid lies at the heart of Mexico's economy and society:

- *The PNH 2014-2018 will be subject to a biennial review and assessment process.*
- *The strategies can be adjusted and reoriented.*

Water sector reforms:

- *Legal framework.*
- *Institutional framework.*
- *Human resources management system.*
- *Financial system.*
- *Water planning.*

1. **Reform of the water legal framework** to strengthen the water sector, with all institutions involved contributing their knowledge and experience with sufficient authority for water to become a genuine engine for national development, always under the coordination of the national water authority.

   This proposal involves modifying the legal framework, thus enabling public institutions to carry out their official duties more effectively and allowing citizens to have a greater legal certainty concerning their rights and obligations.

   This reform proposes the establishment of a general water law that should lay the foundations for access to and fair and sustainable use of water resources, as well as for the involvement of the three tiers of government and citizens for this purpose. It also foresees various provisions related to aspects of the regulation of water services for all uses, as well as the relevant regulations and norms, the review and adaptation of the fiscal framework in connection to water duties and the utilization of national water resources and their inherent public goods that will enable investments in water infrastructure projects to be recouped.

2. **Institutional reform of the public water sector**. All institutions comprising the water sector within the Mexican government will be re-engineered in order to increase effectiveness, efficiency, productivity, and coordination, as well as to improve water governance and governability. Similarly, institutions of the other tiers of government will also be reformed.

Conveyance channel, La Cangrajera Dam, Veracruz.

3. **Reform of the human resources management system of the water sector**. This reform involves setting up a system to identify and select talented individuals studying water-related courses in higher education institutions. This talented cadre of new recruits will be trained in situ on water projects. Those who perform outstandingly will be given access to specialization courses and periods spent at leading institutions in Mexico and abroad.

   This initiative will bring in specialized human resources to handle priority issues.

   The reform will also include an option for existing personnel to receive training and become certified with quality standards that may lead to the creation of high-performance

teams with specific technical training, a broad perspective, and responsibility.

4. **Reform of the water financial system** to ensure the sector's sustainability and transparent use of resources and subsidies.

   To strengthen the financial system in order to identify new financing mechanisms and fund sources, innovative uses and repayment methods, as well as accountability systems.

5. **Water planning reform**. To create a multisectoral and long-term planning system that is institutionalized, iterative, comprehensive, participative, plural, inclusive, and incorporates gender equality.

   An essential part of this reform includes the biennial review of the National Water Plan 2014-2018 (PNH 2014-2018) in order to make adjustments and, where applicable, redirect government strategies to adapt to an ever-changing reality.

a.2) Sector modernization

Furthermore, to complement the proposed reforms and to achieve the vision for the sector, modernization is required in the following areas:

1. Public policies on water resources and water management.

   Mexico is facing a complex water situation that requires responsible and objective measures to be taken in order to achieve water security. To make this feasible, public water policies will be drawn up to enable a sustainable management of water resources.

2. Water measurement system.

   Water management will improve with the modernization and expansion of water measurement systems that include the gathering, transmission, reception and storage of data. This not only refers to the physical equipment but also to the training and

certification of the personnel who will operate the measuring systems and the processes and procedures for its operation, and a system for verifying prior to their transfer to information systems. This improvement in measuring is important in order to make forecasts and to issue alerts in order to reassure the population of their safety.

3. Water information system.

   The National Water Information System will be modernized, inspired by the best water planning and development systems of the world. This will facilitate easy, user-friendly, modern, and effective access to information.

4. Management system for water projects and processes.

   The national system for preparing projects will be re-established and improved. This process will include identification, methodologies and norms in order to systematically carry out the various stages of investment projects: overarching vision and pre-feasibility and feasibility studies.

   Technical, social, economic, financial, and public policy criteria will be considered for project development (including measures for environmental issues and climate change adaptation).

5. Integrated water resources management.

   The relationship between governments and citizens will be improved with a greater role played by society in resolving conflicts, and with the renewal of collegiate agencies with a mixed membership, such as river basin councils and their auxiliary bodies, user organizations, academia and centers of research and technological development, etc.

   Water management will be transformed to provide certainty to users regarding their officially registered assignments and allocations so that they are in accordance with climate variability and water resources availability.

Agua Azul Waterfalls, Chiapas.

6. Mexico's global leadership on water issues.

   Mexico has a status as a global leader on water issues, and this role will be strengthened and deepened by collaborating with the World Water Council and in other relevant forums in order to offer its accumulated knowledge and experience on water issues to developing countries, both in Latin America as well as in Africa and Asia.

   Similarly, technical cooperation and international financial assistance on water issues will increase, strengthening the participation of the Mexican water sector in international political discussions, as well as the relationship with neighboring countries for improved transboundary water management.

   Actions will be taken to strengthen and consolidate the abilities of the sector's human capital through the selective access and best possible use of international opportunities for training, exchanging experiences and available technical assistance on water issues. Also, Mexico's knowledge on water will be incorporated to help solve problems in other countries.

   Mexico's leading technical experts on water issues will be urged to participate in directing groups working on international water management policies, and to support international and regional water forums in Mexico or in other countries of the region.

   These initiatives will be organized in close cooperation with the Mexican Agency for International Development Cooperation (AMEXCID).

7. Water Scientific and technological research system.

   Public and private water-related scientific and technological research institutions will be reoriented and strengthened to respond more effectively to the sector's needs and thus reduce technological dependence.

Modernizing the water sector:

- *Water policy.*
- *Measuring system.*
- *Information system.*
- *Process and project management system.*
- *Integrated management.*
- *Mexico's international leadership.*
- *Scientific and technological research system.*
- *National adaptation and mitigation strategy for responding to climate change or climate variability.*

   The budget for technological research and development in the sector will be increased in order to reduce the backlog in these areas.

8. National strategy of the water sector for climate change adaptation and mitigation.

   An overarching water sector strategy will be drawn up, in accordance with the National Climate Change Strategy and Law, including a historical analysis and a project and initiative catalogue of climate change adaptation; a preliminary catalogue of projects and methods for financing the strategy; initiatives

for modernizing climate change or climate variability adaptation and mitigation manuals; and a platform for launching the strategy and devising an implementation method.

b) Objectives, strategies, and lines of action

Each new Federal Public Administration is legally required to draw up a six-year National Water Plan for the nation's water sector. This document (PNH 2014-2018) addresses current issues and defines a long-term vision with six objectives, in order to resolve the identified problems and to achieve water security and sustainability.

This will be the source document for regional water programs, specific plans for priority issues, and annual work plans for the institutions working in the water sector.

In accordance with the Planning Law, the PNH 2014-2018 has been given the status of a special plan; this refers to priorities for the country's development as a whole, and is therefore an inherently cross-cutting plan. Co-responsibility between the three tiers of government and society in general is essential in order to achieve its objectives.

This requires the coordinated and joined-up work of water sector institutions and agencies, including user and civil society organizations. Therefore, there must be a collective effort by users, civil society organizations, and society as a whole in order to ensure that the Plan is properly and fully implemented. The effort will be translated into improved living conditions, growth, and sustainable development.

The Plan's strategies create actions that must be linked to results, in line with stipulations on the efficiency of public expenditure; these results will determine the budgetary allocation for the institutions within the sector.

The following objectives, strategies, and lines of action will be rolled out in the 2014-2018 period.

PNH 2014-2018: Objectives

1. To strengthen integrated and sustainable water management.
2. To increase water security against droughts and floods.
3. To improve water supply and access to drinking water, sewerage, and sanitation services.
4. To increase the sector's technical, scientific, and technological capacities.
5. To ensure sustainable water availability for agricultural irrigation, energy, industry, tourism, and other economic and financial activities.
6. To consolidate Mexico's international involvement in water issues.

Lacustrine zone, Xochimilco, Mexico City.

Objective 1. To strengthen integrated and sustainable water management

To improve water security and sustainability, a fundamental part of the PNH 2014-2018 includes the management of water use in watersheds and aquifers, the modernization and extension of water cycle measurements, and the furtherance of constant improvements on water governance and governability in order to increase theris effectiveness through the participation of society and inter- and intra-institutional coordination to reduce the risk of conflicts.

Strategy 1.1 To manage and regulate water use in watersheds and aquifers

1.1.1 To update how surface- and groundwater availability is expressed.

1.1.2 To adapt the Federal Duties Law based on water availability areas.

1.1.3 To adjust allocations and assignments to actual water supply and availability and to national priorities.

1.1.4 To update prohibition, reserve, and regulated zone decrees.

1.1.5 To regulate areas of unrestricted groundwater withdrawal.

1.1.6 To regulate watersheds and aquifers.

1.1.7 To define the limits of national growth in terms of water availability.

1.1.8 To optimize dam operation policies.

Strategy 1.2 To manage water exploitation and utilization in watersheds and aquifers

1.2.1 To reuse all treated wastewater.

1.2.2 To take measures to increase aquifers recharge.

1.2.3 To establish national surface water reserves for ecological protection.

1.2.4 To strengthen the process for formulating, monitoring, and evaluating water programs.

1.2.5 To establish a project management system for the water sector with a short-, medium-, and long-term vision.

Strategy 1.3 To modernize and extend water cycle measurements

1.3.1 To consolidate the modernization of the National Meteorological Service (SMN).

1.3.2 To strengthen and modernize the measurement of the water cycle at the national, regional, and local levesl.

Strategy 1.4 To improve water quality in watersheds and aquifers

1.4.1 To improve the measurement and assessment of water quality and to determine the main sources of pollution.

1.4.2 To increase the issuing of classification statements, water quality studies, and specific reports on effects.

1.4.3 To determine the impact of agrochemicals on water quality.

1.4.4 To coordinate with all sectors involved to promote the proper use of agrochemicals as a means of controlling non-point source pollution.

1.4.5 To generate and apply water regulations on the disposal of solid waste.

1.4.6 To includee a greater number of pollution parameters in particular discharge conditions.

1.4.7 To modify the regulatory code on wastewater discharges to contribute to a framework of sustainable water quality.

Strategy 1.5 To enhance water governance

1.5.1 To improve the organization and operation of river basin councils and auxiliary bodies to adapt them to the sector's needs.

Potrerillos Dam, Aguascalientes.

1.5.2 To promote the participation of non-governmental and academic organizations in water administration and conservation.

1.5.3 To address the demand for information of the organized population.

Strategy 1.6 To enhance water governability

1.6.1 To draw up new legal instruments or amend existing ones in order to improve the current legal framework.

1.6.2 To propose and implement amendments to the Federal Duties Law (Ley Federal de Derechos).

1.6.3 To strengthen and elevate the hierarchical level of water sector institutions in the Federal and other tiers of government.

1.6.4 To strengthen the supervision, inspection, and sanction application of withdrawals and discharges.

1.6.5 To reinforce metering systems and ensure compliance with allocated volumes.

1.6.6 To condition increases in allocations and assignments on the efficiency level of users (municipalities, industries, agriculture).

1.6.7 To promote the increase of resources for funding water-related government operations and controls.

1.6.8 To promote the payment for environmental services for the conservation of water resources.

1.6.9 To increase the efficiency of the water sector revenue system.

Cross-Cutting Lines of Action

Program to Democratize Productivity

Specific Lines of Action

1.4.3 To establish prices and fees that reflect the financial cost of water and promote its conservation and efficient use.

General Lines of Action

3.1.2 To increase public sector revenues.

Program for a Modern Government Closer to its Citizens

General Lines of Action

1.1.9 To strengthen the mechanisms for transparency and citizen participation in public procurement.

- *The PNH 2014-2018 is a special program, implying co-responsibility between the three tiers of government, water users, and society in general.*

Villa Hidalgo, Durango.

Objective 2. To increase water security against droughts and floods

Action must be taken to reduce the vulnerability of human settlements to prevent the loss of human lives and material damage to infrastructure due to extreme hydrometeorological hazards.

During this administration, measures will be reinforced to prevent people from encroaching on waterways and federal zones, and to make progress, in coordination with the three tiers of government, to relocate settlements in areas that are highly prone to flooding. Where this is not possible, road protection infrastructure and control measures shall be implemented.

For this purpose, protection programs for the population will be strengthened, and early warning systems perfected, with a link-up to the National Civil Protection System and other related government agencies. This will continue with the modernization of the National Meteorological Service in order to provide better and more opportune meteorological information and to strengthen or establish regional hydrometeorological centers.

It will also be necessary to tackle the droughts that affect the proper and timely distribution of water to the population, to the industry, and for food production. A specially designed program will be implemented so that people are better prepared to cope with droughts, with the timely and effective assistance of the water authority.

The operating policies of the main supply sources will be updated according to criteria of optimization, with the aim of maximizing water productivity and implementing restrictions in order to mitigate the impact of floods and droughts.

Coordinated action is required between the three tiers of government to achieve this objective.

Strategy 2.1 To protect and increase the resilience of the population and productive areas in zones prone to floods and/or droughts

2.1.1 To implement the National Water Contingency Prevention Program (Pronach).

2.1.2 To implement the National Program against Droughts (Pronacose).

2.1.3 To strengthen or, where applicable, to create specialized, trained, and equipped emergency response groups.

2.1.4 To update dam operation policies, giving priority to the protection of population centers.

2.1.5 To prevent human settlements in areas prone to flooding and to relocate existing ones in safe zones.

2.1.6 To strengthen early warning systems and prevention and mitigation actions in case of emergencies due to hydrometeorological hazards.

2.1.7 To promote the construction of sustainable rainwater drainage infrastructure.

2.1.8 To undertake environmental water restoration measures in high-priority watersheds.

2.1.9 To establish systems of co-responsibility with local authorities in order to keep river banks and water bodies clean and orderly.

Strategy 2.2 To reduce vulnerability to the effects of climate change or climate variability

2.2.1 To increase the participation and co-responsibility of states and municipalities in terms of taking measures to adapt to climate change or climate variability.

2.2.2 To create or strengthen funds for adaptation to climate change and to maintain and rehabilitate water infrastructure.

2.2.3 To increase information exchange with national and international institutions.

Cross-Cutting Lines of Action

Programa to Democratize Productivity

Specific Lines of Action

1.3.5 To steer the process of ecological management and to support regional and local management processes.

4.1.7 To promote a policy in marine and coastal areas in order to encourage competitiveness and to counteract the effects of climate change.

General Lines of Action

1.1.3 To carry out a comprehensive analysis of government programs and public policies so that government strategies and programs stimulate activity in the formal economy.

Programa for a Modern Government Closer to its Citizens

General Lines of Action

1.1.2 To establish consultation mechanisms with the private sector, organizations and CSOs for governmental decision-making.

Lines of Coordination

1.1.1 To strengthen the APF's citizen participation mechanisms to steer them toward producing specific benefits for society.

1.1.4 To promote transparency and accountability among the CSOs that develop projects using public resources.

Drinking water treatment system, Cutzamala, State of Mexico.

Objective 3. To improve water supply and access to drinking water, sewerage, and sanitation services

The state faces a major challenge for municipalities to provide the population drinking water, drainage, sewerage, and wastewater treatment and disposal services, and to comply with the human right to water regarding access to sufficient, healthy, acceptable and afordable water.

A proportion of the rural population is scattered across small localities. Therefore, alternative systems will be developed to bring water closer to them, such as the use of public hydrants and rainwater harvesting. Basic sanitation services will also be promoted.

During the current Public Administration, drinking water coverage will be increased to 94 percent, sewerage and basic sanitation coverage to 93 percent, and disinfection to 99 percent. This will represent an additional 8 million and 8.5 million people receiving drinking water and sewerage services, respectively.

The technical, administrative, and financial efficiencies and capacities of water utilities will be enhanced and new or replacement supply sources will be made available.

Actions will also be taken to increase and improve municipal and industrial wastewater treatment.

Achieving this objective requires the joint and coordinated participation of several institutions at the different tiers of government and in society at large, each one of which must assume its respective responsibility and act according to its mandates and sphere of competence.

Strategy 3.1 To increase the coverage of drinking water and sewerage services

3.1.1 To increase drinking water and sanitation coverage in urban and rural zones, giving priority to the most vulnerable population.

3.1.2 To supply high-quality water for human consumption and use to prevent water-borne diseases.

3.1.3 To take measures to ensure that drinking water, sewerage, and sanitation service fees are defined according to technical, financial and social criteria.

3.1.4 To create infrastructure to utilize new supply sources.

3.1.5 To expand and improve the use of alternative water sources, such as water desalinization and rainwater harvesting.

Strategy 3.2 To improve efficiency in municipal water services

3.2.1 To improve the physical efficiency of water supply.

3.2.2 To improve water metering systems for public urban, and industrial usage.

3.2.3 To promote and apply low water consumption technologies in public supply systems, industries and services.

3.2.4 To improve the technical, commercial, and financial performance of water and sanitation utilities.

3.2.5 To support and create metropolitan and inter-municipal organizations for the provision of drinking water, sewerage, and sanitation services.

Strategy 3.3 To treat municipal and industrial wastewater with an integrated watershed and aquifer approach

3.3.1 To improve the operation of wastewater treatment infrastructure.

3.3.2 To construct new wastewater treatment and drainage infrastructure and to promote alternative sanitation systems in rural communities.

3.3.3 To promote the use and management of alternative energy sources for self-consumption in wastewater treatment processes.

Strategy 3.4 To promote the development of projects that may contribute to mitigate poverty, including the National Crusade against Hunger

3.4.1 To implement productive projects using appropriate irrigation technologies in deprived communities, in order to raise income, provide employment, and produce food.

3.4.2 To encourage the participation of indigenous communities in managing water resources for their sustainable development.

3.4.3 To disseminate appropriate water supply technology, including rainwater and fog harvesting, cisterns, and pumping, filtering, and disinfection equipment.

3.4.4 To disseminate the use of appropriate technology for sanitation and the construction of ecological toilets and laundry sinks, biodigesters, biofilters, wetlands, etc.

Strategy 3.5 To promote coordination instruments that may foster legal certainty in order to guarantee the human right to water access

3.5.1 To promote coordination instruments for allowing the regulation of drinking water, sewerage, and sanitation services.

Cross-Cutting Lines of Action

National Program for Equal Opportunities and Non-Discrimination against Women 2013-2018 (Proigualdad 2013-2018)

Specific Lines of Action

3.4.9 To promote women's access to water resources.

5.5.8 To promote sanitation and water supply for human consumption and domestic use in rural areas where women provide these commodities.

General Lines of Action

1.2.5 To develop protocols and codes of conduct so that service providers attend to women without discrimination or misogyny.

1.4.6 To increase women's involvement in defining, implementing, and evaluating programs and projects that are beneficial to them.

Water Quality Laboratory, Mexican Institute of Water Technology (IMTA).

Objective 4. To increase the sector's technical, scientific, and technological capacities

In order to achieve effective social participation, it is necessary to develop the interest, understanding, and critical capacity of the population, enabling people to take informed and responsible decisions and actions on water-related issues. Therefore, it is essential to foster an understanding of the water cycle; the excess or lack of water availability; the processes for purifying, distributing, collecting, and treating water; as well as the cultural, social, legal, and economic aspects of water.

Strategy 4.1 To promote water education and knowledge to contribute to developing a water culture.

4.1.1 To improve people's understanding of the water cycle and of the occurrence and availability of water.

4.1.2 To reinforce water culture in the school curriculum.

4.1.3 To set up a teachers' training program on water issues.

4.1.4 To train communication professionals in water issues in order to contribute to a more informed and participative society.

4.1.5 To promote cooperation with businesses and institutions in order to help contribute to water education and culture.

Strategy 4.2 To promote the continuous education and certification of water stakeholders

4.2.1 To promote ongoing education and certification of competencies in the sector.

4.2.2 To review and propose the reorganization of a professional career service in institutions within the water sector.

4.2.3 To support the training of the sector's human resources.

4.2.4 To implement process improvement programs in water-sector entities.

Strategy 4.3 To promote scientific research and technological development to achieve the sector's objectives

4.3.1 To strengthen technological research and development and to create links to research centers in order to address priorities in the water sector.

4.3.2 To establish strategies for disseminating water-related science and technology.

4.3.3 To identify technological advances in the international arena and to implement those applicable to Mexico.

4.3.4 To promote the development of leaders for the water sector.

Strategy 4.4 To generate and provide information about water

4.4.1 To strengthen automated and information providing networks that provide water-related data.

4.4.2 To consolidate water data at national and regional levels under a unified scheme.

4.4.3 To systematize and expand the dissemination of information on water to diverse sectors of the population.

4.4.4 To strengthen information networks and centers for sharing and disseminating water-related knowledge.

4.4.5 To strengthen and innovate national and regional water-related information systems.

4.4.6 To establish communication channels among all research entities associated with the water sector at national and international levels.

4.4.7 To develop, adopt, and apply information and communication technologies for facilitating social participation in the water sector.

4.4.8 To integrate mass media to water resources management.

Cross-Cutting Lines of Action

Program to Democratize Productivity

Specific Lines of Action

2.5.1 To join up the work of the public, private and civil society sectors to increase investment in Science, Technology, and Innovation (STI) to 1 percent of the Gross Domestic Product (GDP).

2.5.8 Increase STI investment for the water, agricultural and fisheries sector.

Program for a Modern Government Closer to its Citizens

General Lines of Action

4.2.2 To manage the human resources process, including the SPC, on the basis of competencies and merit.

Irrigation, Tomatlán, Jalisco.

OBJECTIVE 5. TO ENSURE SUSTAINABLE WATER AVAILABILITY FOR AGRICULTURAL IRRIGATION, ENERGY, INDUSTRY, TOURISM, AND OTHER ECONOMIC AND FINANCIAL ACTIVITIES

In order to ensure water for these uses, various strategies will be employed, such as irrigation technification, improved efficiencies, expansion, rehabilitation and conservation of infrastructure and the orientation of economic activities toward zones where water is available.

Strategy 5.1 To improve water productivity in agriculture

5.1.1 To intensify irrigation technification in irrigation districts and units.

5.1.2 To technify gravity irrigation in irrigation districts and units.

5.1.3 To upgrade systems for conducting and distributing water in irrigation districts and units .

5.1.4 To rehabilitate, improve, and expand infrastructure for deriving and storing surface water for agriculture.

5.1.5 To rehabilitate, improve, and expand the infrastructure for using groundwater in agriculture.

5.1.6 To conserve and maintain technified rainfed hydro-agricultural infrastructure.

5.1.7 To measure water supply and consumption in agriculture.

5.1.8 To develop and approve irrigation plans in line with authorized water volumes.

5.1.9 To resize irrigation districts according to the actual water supply.

5.1.10 To install on-farm drainage in irrigation districts.

Strategy 5.2 To use water sustainably to promote development in areas with water availability

5.2.1 To expand irrigated and technified rainfed land areas in zones with water availability.

5.2.2 To expand infrastructure for using surface- and groundwater in areas with the potential for activities with high water productivity.

5.2.3 To promote the development of hydro-electric potential in areas with water availability.

5.2.4 To organize and provide training for irrigation users.

Cross-Cutting Lines of Action

Program to Democratize Productivity

Specific Lines of Action

1.2.3 To generate financial instruments according to the needs and capacities of agricultural production units.

1.4.4 To upgrade and expand hydro-agricultural infrastructure for rational and efficient water use.

2.4.3 To promote the adoption of new technologies and techniques in the agricultural and fisheries sector, including Information and Communication Technologies (ICT) by means of outreach activities and training.

2.5.8 To increase the investment in Science, Technology and Innovation (STI) for the water, agricultural, and fisheries sector.

3.5.8 To upgrade and expand hydro-agricultural infrastructure.

In 2013, Mexico hosted the International Year of Water Cooperation in Mexico City.

Objective 6. To consolidate Mexico's international involvement in water issues

Mexico aims to become an important actor within the international context. By means of strategically coordinated and guided actions it will be able to consolidate its leadership on water issues, through the implementation of a strategy of international cooperation, backed up by core elements of Mexico's foreign policy as offerer and by the framework of knowledge society as receiver.

Mexico has institutionalized the management of water since last century. As a result, it can offer its vision, water management model, and solutions platform to provide orientation for best practices and to exchange technologies that may help many less-developed countries find solutions to water-related problems.

Mexico will strengthen its participation in international forums; in the exchange of experiences, skills, human resources, and best practices, as well as in the management of new sources of technical assistance and international financing for the sector.

Strategy 6.1 To strengthen international cooperation for development, the knowledge society agenda, and international financial assistance in the sector

6.1.1 To consolidate international technical cooperation on water issues with countries interested in Mexico's experience.

6.1.2 To increase and diversify cooperation with developed countries and international organizations in order to consolidate the knowledge society concept.

6.1.3 To strengthen international financial assistance for the water sector.

Strategy 6.2 To consolidate the participation of Mexico's water sector in international political discussions

6.2.1 To strengthen Mexico's international leadership in discussions on water.

6.2.2 To reinforce relations with leading multilateral and international water-related organizations.

Strategy 6.3 To strengthen relationships with neighboring countries for a better trans boundary water management

6.3.1 To promote scientific, technical, and financial coordination with water-related agencies, academic organizations, and institutions in neighboring countries.

Cross-Cutting Lines of Action

Program for a Modern Government Closer its Citizens

General Lines of Action

2.5.6 Provide better training to public officials supported by international financial organizations, to improve the quality of socio-economic assessments.

Sian Ka'an, Quintana Roo.

III.1 Cross-cutting strategies

It is important to highlight that the PNH 2014-2018 includes the strategies established in the cross-cutting programs.

- **Special Program to Democratize Productivity**
- **Program for a Modern Government Closer its Citizens**
- **National Program for Equal Opportunities and Non-Discrimination against Women 2013-2018 (Proigualdad 2013-2018)**

Specific and general lines of action were identified for the sector, and these will be developed in coordination with other sectors.

Program to Democratize Productivity

Specific Lines of Action

1.2.3 To generate financial instruments according to the needs and capacities of agricultural production units.

1.4.3 To establish prices and fees that reflect the financial cost of water and promote its conservation and efficient use.

1.4.4 To upgrade and expand hydro-agricultural infrastructure for a rational and efficient water use.

2.4.3 To promote the adoption of new technologies and techniques in the agricultural and fisheries sector, including Information and Communication Technologies (ICT), by means of outreach and training activities.

2.5.8 To increase investment on Science, Technology, and Innovation (STI) for the water, agriculture and livestock, and fisheries sectors.

3.5.8 To upgrade and expand hydro-agricultural infrastructure.

General Lines of Action

3.1.2 To strengthen public sector revenues.

Program for a Modern Government Closer its Citizens

General Lines of Action

1.1.9 To strengthen the mechanisms for transparency and citizen participation in public-sector procurement.

- *The PNH 2014-2018 takes into consideration civil society and expert initiatives resulting from a purpose-designed public consultation.*

National Program for Equal Opportunities and Non-Discrimination against Women 2013-2018 (Proigualdad 2013-2018)

Specific Lines of Action

3.4.9 Increase women's access to water resources.

5.5.8 Promote water sanitation and supply for human consumption and domestic use in rural areas where women go for supplies.

General Lines of Action

1.2.5 To develop protocols and codes of conduct so that service providers attend to women without discrimination or misogyny.

1.4.6 To increase women's involvement in defining, implementing, and evaluating programs and projects that are beneficial to them.

Lagunas de Montebello, Chiapas.

Cross-Cutting Approach (An Inclusive Mexico)

Strategy II. A Modern Government Closer to its Citizens

Lines of Action

1. To incorporate social participation from the design and implementation to the assessment and feedback of social programs.

Cross-Cutting Approach (A Mexico with Quality Education)

Strategy I. To Democratize Productivity

Lines of Action

1. To increase public investment and promote private investment in innovation and development activities in research centers and private businesses, particularly in creating and expanding high technology companies.

Cross-Cutting Approach (A Prosperous Mexico)

Strategy II. A Modern Government Closer to its Citizens

Lines of Action

1. To modernize the Federal Public Administration by using information and communication technologies.

2. To simplify tax regulations to improve voluntary compliance with fiscal obligations and help increase the number of registered taxpayers.

3. To combat and punish environmental crimes by strengthening prevention, investigation, surveillance, inspection, and sanction systems.

Valle de los Cirios, Baja California.

CHAPTER IV. INDICATORS

Eight indicators—two of which are indexes—are proposed to follow up and assess the impact of the PNH (2014-2018). The National Water Commission (CONAGUA) will refine the indicators, identifying and incorporating those that measure the impact on water management following actions taken by other sectors, the states, municipalities, and users, and by the Commission itself.

Objective 1. To strengthen integrated and sustainable water management

Indicator Datasheet

Indicator	**1. Global Index of Water Sustainability (GIWS)**
Objective	Objective 1. To strengthen integrated and sustainable water management.
General description	This index measures how to manage water resources to achieve sustainability in Mexico's watersheds and aquifers, and to guarantee water security. It takes into account the amount of water available and that which is consumed by different types of users, water quality, and water resources management.
Observations	This index considers four components, and a total of 18 variables: **Water stress level:** • Stress level on surface water due to agricultural use (%). • Stress level on surface water due to public-urban supply (%). • Stress level on surface water due to uses in self-supplied industry and thermoelectric plants (%). • Stress level on groundwater due to agricultural use (%). • Stress level on groundwater due to public-urban supply (%). • Stress level on groundwater due to uses in self-supplied industry and thermoelectric plants (%). **Water cycle measurement:** • Number of hydrometric stations in operation. • Number of climatological stations in operation. • Number of sites for surface water quality measurement. • Percentage of gauging stations with complete information of surface water quality indicators. **Water quality:** • Percentage of monitoring sites with good and excellent water quality in terms of BOD_5. • Percentage of monitoring sites with good and excellent water quality in terms of COD. • Percentage of monitoring sites with good and excellent water quality in terms of TSS.

Observations

Water management:

- Number of gauging stations for automatic monitoring of extracted volumes.
- Verification of utilization of national water resources and inherent public goods.
- Revenue by river basin organization (millions of pesos).
- Percentage of aquifers without over-exploitation.
- Number of watersheds without deficit.

The values of the variables are normalized in terms of the range of calculated values, considering minimum and maximum values. All variables have the same weighting. The proposed calculation method is:

$$Z_{ij} = \frac{X_{ij} - X_{min}}{X_{max} - X_{min}}$$

Where:

- Z_{ij} = Normalized variable.
- X_{ij} = Associated variable.
- X_{min} = Minimum value of the X_{ij} variable data.
- X_{max} = Maximum value of the X_{ij} variable data.
- i = 1 a n.
- j = Value of the variable i for the unit of analysis.
- n = Number of variables involved in the index.

The normalized variables vary between 0 and 1, indicating the minimum and maximum variables, respectively, in the data series of analyzed variables.

Index is obtained as follows:

$$GIWS = \frac{\sum_1^n (Z_{ij} P_i)}{\sum_1^n P_i}$$

Where:

- Z_{ij} = Normalized variable.
- P_i = Weighting of variable.
- GIWS = Global Index of Water Sustainability.

The GIWS value varied between 0 to 1, with the following intervals:

- GIWS>= 0.65 High level of water sustainability
- 0.43<GIWS<0.65 Medium level of water sustainability
- GIWS<= 0.43 Low level of water sustainability.

Frequency

Twice a year.

Source

National Water Commission (CONAGUA):

- Water Statistics in Mexico.
- National Water Information System.
- Statistical compilation of water management.

Further references

Link to sectoral indicators:

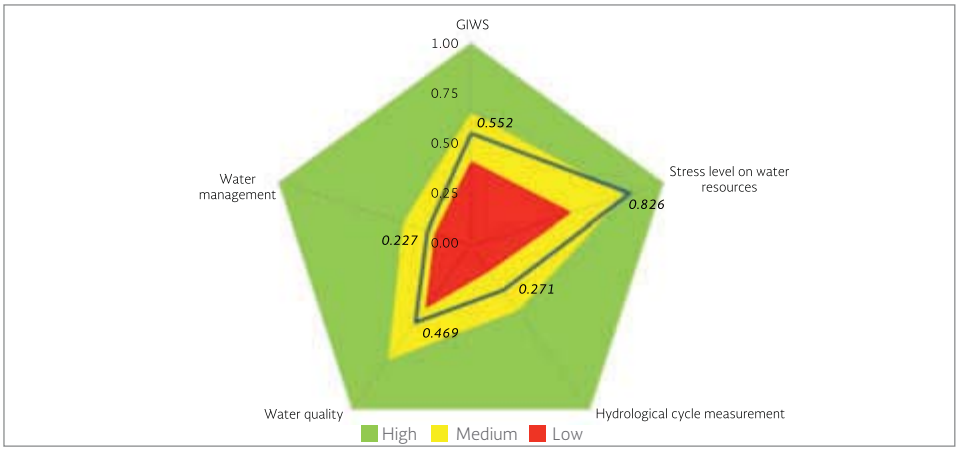
Indicator: "Reduction of vulnerability using infrastructure and actions for the sustainable management, conservation, and restoration of natural capital," from Objective 2. Increase resilience to the effects of climate change and reduce emissions of greenhouse gases and compounds of the SEMARNAT Sectoral Program (2013-2018).

Department responsible for information: Deputy Director General's Office for Planning of the National Water Commission (Subdirección General de Planeación de la Comisión Nacional del Agua).

Coordinating agencies for further information: Deputy Director General's Office for Water Management, Deputy Director General's Office for Technical Affairs, Coordination of Fiscal Revenue, and National Meteorological Service (Subdirección General de Administración del Agua, Subdirección General Técnica, Coordinación General de Recaudación y Liquidación Fiscal, Servicio Meteorológico Nacional).

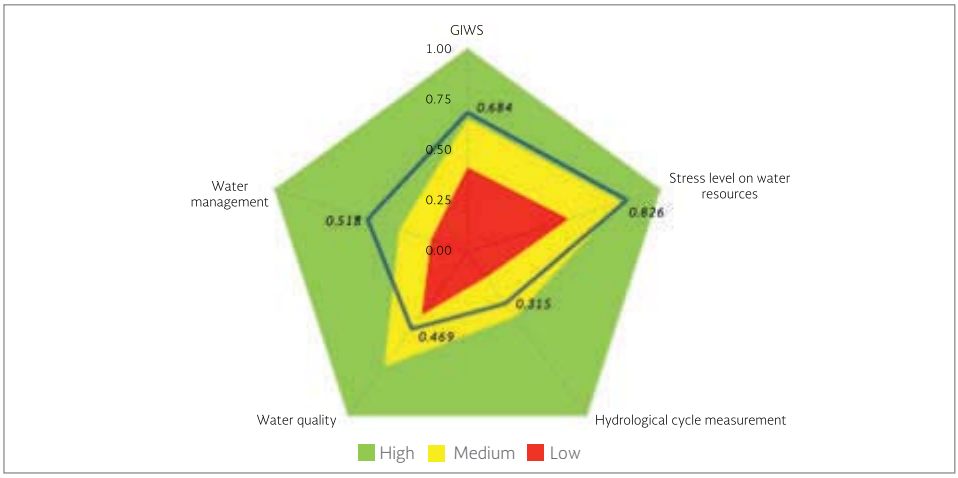
2012 Baseline

GIWS = 0.552



2018 Target

GIWS =0.684



Objective 2. To increase water security against droughts and floods

Indicator Datasheet

Indicator	**2. Formulated decrees for reserves of water for environmental use**
Objective	Objective 2. To increase water security against droughts and floods.
General description	The indicator shows the level of progress toward reaching the target in terms of the number of decrees set up for the ecological conservation or environmental use of water resources. By taking these measures, Mexico will underline its commitment to the international environmental and sustainable development agenda, by ensuring environmental services on which the country's wellbeing and sustainability depend.
Observations	Number of decrees published in the Official Gazette of the Federation (DOF).
Frequency	Twice a year.
Source	Deputy Director General's Office for Technical Affairs of the National Water Commission (Subdirección General Técnica de la Comisión Nacional del Agua).
Further references	Link to sectoral indicators: Indicator: "Formulated decrees for reserves of water for environmental use," from Objective 3. Strengthen the integral and sustainable management of water, ensuring availability for the population and ecosystems of the SEMARNAT's Sectoral Program (2013-2018). Department responsible for information: Deputy Director General's Office for Technical Affairs of the National Water Commission (Subdirección General Técnica de la Comisión Nacional del Agua).
2012 Baseline	0
2018 Target	189 watersheds with published decree.

Indicator Datasheet

Indicator	**3. Population and productive area protected against floods**
Objective	Objective 2. To increase water security against droughts and floods.
General description	The indicator will measure the number of people and hectares protected by the actions of the various agencies and affected parties.
Observations	
Frequency	Every year.
Source	Deputy Director General's Office for Hydro-Agricultural Infrastructure of the National Water Commission (Subdirección General de Infraestructura Hidroagrícola de la Comisión Nacional del Agua).
Further references	Link to sectoral indicators: Indicator: "Reduction of vulnerability using infrastructure and actions for the sustainable management, conservation, and restoration of natural capital," from Objective 2. Increase resilience to the effects of climate change and reduce emissions of greenhouse gases and compounds of SEMARNAT's Sectoral Program (2013-2018). Department responsible for information: Deputy Director General's Office for Hydro-Agricultural Infrastructure of the National Water Commission (Subdirección General de Infraestructura Hidroagrícola de la Comisión Nacional del Agua).
2012 Baseline	0 inhabitants 297,917 hectares
2018 Target	6,620,000 inhabitants 300,000 hectares

Indicator Datasheet

Indicator	**4. Drought management programs drawn up and approved by the river basin councils**
Objective	Objective 2. To increase water security against droughts and floods.
General description	The indicator will measure the number of drought management programs drawn up and approved by the river basin councils.
Observations	
Frequency	Every year.
Source	Deputy Director General's Office for Technical Affairs of the National Water Commission (Subdirección General Técnica de la Comisión Nacional del Agua).
Further references	Link to sectoral indicators: Indicator: "Reduction of vulnerability using infrastructure and actions for the sustainable management, conservation, and restoration of natural capital," from Objective 2. Increase resilience to the effects of climate change and reduce emissions of greenhouse gases and compounds of SEMARNAT's Sectoral Program (2013-2018). Department responsible for information: Deputy Director General's Office for Technical Affairs of the National Water Commission (Subdirección General Técnica de la Comisión Nacional del Agua).
2012 Baseline	0
2018 Target	26

Objective 3. To improve water supply and access to drinking water, sewerage and sanitation services

Indicator Datasheet

Indicator	**5. Global index of access to basic water services (GIAWS)**
Objective	Objective 3. To improve water supply and access to drinking water, sewerage, and sanitation services.
General description	This index makes it possible to assess three aspects of the impact of water policy: coverage, quality, and efficiency of drinking water and sanitation services.

Observations

This index considers the following components, which include a total of nine variables:

Access to Drinking Water Services:
- Drinking water coverage (%).
- Drinking water coverage in urban areas (%).
- Drinking water coverage in rural areas (%).
- Disinfected water (%).

Access to Sanitation Services:
- Sanitation coverage (%).
- Sanitation coverage in urban areas (%).
- Sanitation coverage in rural areas (%).
- Efficiency of resulting wastewater collection (%).
- Coverage of municipal wastewater treatment (%).

The values of the variables are normalized in terms of the range of calculated values, considering minimum and maximum values. All variables have the same weighting. The proposed calculation method is:

$$Z_{ij} = \frac{X_{ij} - X_{min}}{X_{max} - X_{min}}$$

Where:
- Z_{ij} = Normalized variable.
- X_{ij} = Associated variable.
- X_{min} = Minimum value of the X_{ij} variable data.
- X_{max} = Maximum value of the X_{ij} variable data.
- i = 1 a n.
- j = Value of the variable i for the unit of analysis.
- n = Number of variables involved in the index.

The normalized variables vary between 0 and 1, indicating the minimum and maximum variables, respectively, in the data series of the analyzed variables.

The index is obtained as follows:

$$GIAWS = \frac{\sum_1^n (Z_{ij}\ P_i)}{\sum_1^n P_i}$$

Observations

Where:

- Z_{ij} = Normalized variable.
- P_i = Weighting of variable.
- GIAWS = Global Index of Acess to Basic Water Services.

The GIAWS value varied between 0 to 1, with the following intervals:

- GIAWS >= 0.82 Good services
- 0.57 < GIAWS < 0.82 Regular services
- GIAWS <= 0.57 Poor services

Frequency

Every year.

Source

National Water Commission (CONAGUA).
Water Statistics in Mexico.
Drinking Water, Sewerage and Sanitation Subsector Situation.

Further references

Link to sectoral indicators:

Indicator: "Drinking water coverage" from Objective 3. To strengthen the integrated and sustainable management of water, ensuring availability for the population and ecosystems of SEMARNAT's Sectoral Program (2013-2018).

Indicator: "Municipal wastewater treatment coverage" from Objective 5. To cease and revert the loss of natural capital and the pollution of water, air and soils of SEMARNAT's Sectoral Program (2013-2018).

Indicator: Percentage of samples of chlorinated water conforming to the standard of the Official Mexican Standard (NOM)", from Objective 3. To reduce the risks affecting the health of the population undertaking any activity, of the SSA's sectoral program (2013-2018).

Indicator: "Percentage of the population suffering from a lack of access to basic housing services in Mexico", of Objective 2. Creating a dignified environment that supports development through improved basic services, high-quality living spaces and public infrastructure, of SEDESOL's Sectoral Program (2013-2018).

Indicator: "To access to basic housing services in rural localities within agrarian centers" of Objective 5. To strengthen the development of agrarian centers through measures to improve territorial cohesion, productivity, soil, rural housing and governability, of SEDATU's Sectoral Program (2013-2018).

Department responsible for compiling information: Deputy Director General's Office for Drinking Water, Sewerage and Sanitation of the National Water Commission (Subdirección General de Agua Potable, Drenaje y Saneamiento de la Comisión Nacional del Agua).

Coordinating agencies to ensure targets are reached and for further information:

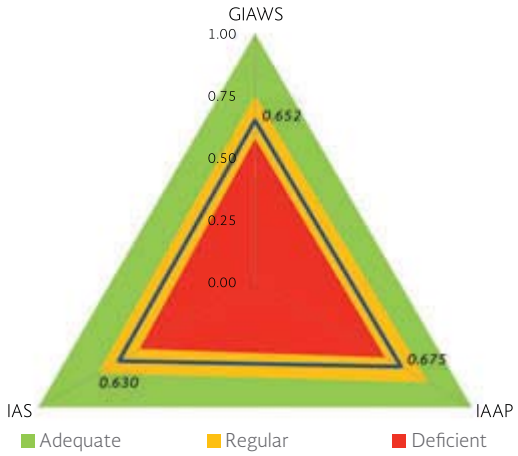
- SHCP: government department responsible for assigning the budget for the actions.
- State governments: to plan actions and ensure implementation, together with municipalities.
- State organizations, in some states they compiled information from service providers.

Further references

- The municipalities which, according to Article 115 of the Constitution, are responsible for providing drinking water, drainage, and wastewater treatment services, as well as operating and maintaining infrastructure.
- Service providers, which are directly responsible for providing services and for generating information directly.
- Users, who contribute by paying for services, thus enabling operation and maintenance of services.
- Other federal departments: SEDESOL, BANOBRAS, CDI, CONAVI, contribute with the construction of infrastructure, through their budgetary programs.

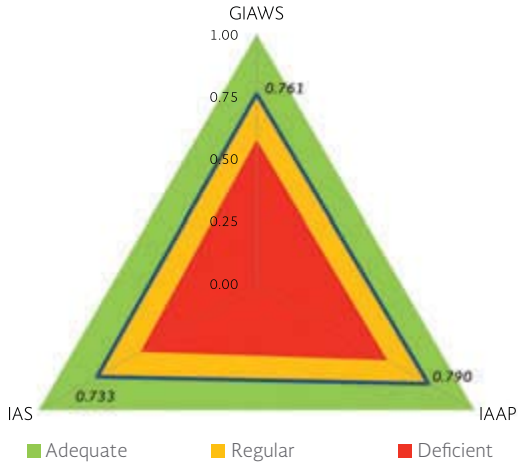
2012 Baseline

GIAWS = 0.652



2018 Target

GIAWS = 0.761



Objective 4. To increase the sector's technical, scientific, and technological capacities

Indicator Datasheet

Indicator	**6. Influence of the water sector's technological development on decision making**
Objective	Objective 4. To increase the sector's technical, scientific, and technological capacities.
General description	Objective 6 of the sectoral program and Objective 4 of the PNH (2014-2018) include the development and promotion of research to strengthen environmental governance. In particular, this indicator reflects the result of the development and promotion of research in the environmental sector by estimating the influence of its research into environmental, water, and climate change policies in the three tiers of government. It consists of the following component: percentage of national, regional and local influence of research and technological projects carried out by the Mexican Institute of Water Technology (IMTA) in terms of water policy, including its design, modification, and implementation. Projects are considered that have been transferred to other states, to support in the implementation of public policies through regulatory, economic, and technological instruments.
Observations	General calculation formula: Percentage of total influence = (Percentage of influence of IMTA projects). Estimated influence of IMTA projects on national, regional and local water policy, calculated as follows: (number of projects linked to instruments of water policy and the integrated management of water resources/total projects carried out)*100. We propose a universe of various instruments to be consulted: a) implementation of technological development in projects derived from the National Water Plan 2014-2018; b) Official Mexican Standards (NOMs) or, in their absence, planned or draft NOMs; c) bills drafted by Chamber of Deputies' commissions of Agriculture and Irrigation; Climate Change; Rural Development; Human Development and Land Management; Energy; Environment and Natural Resources; Fisheries; Water Resources; Health; Transport; and Tourism; d) Operating rules of the environmental and water sector; e) Protected Natural Area decrees; f) Ecological land management; g) Environmental and water management instruments; h) Water management plans in watersheds; and state and regional water programs; and i) State laws.
Frequency	Three times a year.
Source	The source of information can be found in IMTA's annual report, published at www.imta.gob.mx.

Further references	Link to sectoral indicators: Indicator: "Scientific Research and Experimental Development Expense (GIDE), implemented by the Higher Education Institutes (IES) in terms of Gross Domestic Product (GDP)" of Objective 6. To promote scientific and technological education as an essential means of transforming Mexico into a knowledge society Department responsible for the information: Mexican Institute of Water Technology (IMTA).
2012 Baseline	13.3%
2018 Target	20%

Objective 5. To ensure sustainable water availability for agricultural irrigation, energy, industry, tourism, and other financial and economic activities

Indicator Datasheet

Indicator	**7. Water productivity in irrigation districts (kg/m³)**
Objective	Objective 5. To ensure sustainable water availability for agricultural irrigation, energy, industry, tourism, and other economic and economic activities.
General description	Measures water productivity in irrigation districts, Progress will be expressed in kilograms per cubic meter of water used. The increased productivity in irrigation districts improves efficiency in the use of water in agriculture.
Observations	Millions of tons of product per agricultural year / millions of cubic meters of water used during the agricultural year in the irrigation districts.
Frequency	Every year.
Source	National Water Commission's Hydroagricultural Infrastructure Office (Subdirección General de Infraestructura Hidroagrícola de la Comisión Nacional del Agua).
Further references	Link to sectoral indicators: Indicator: "Productivity of water in irrigation districts" of Objective 3. To strengthen the integrated and sustainable management of water, ensuring availability for the population and ecosystems of SEMARNAT's Sectoral Program (2013-2018) . Indicator: "Index of water use efficiency (water savings per technified irrigation hectare versus non-technified irrigation)" of Objective 4. "Promoting the sustainable use of the country's natural resources, of SAGARPA's Sectoral Program (2013-2018). Department responsible for the information: Deputy Director General's Office for Hydro-Agricultural Infrastructure of the National Water Commission (Subdirección General de Infraestructura Hidroagrícola de la Comisión Nacional del Agua).
2012 Baseline	1.62 kg/m^3
2018 Target	1.87 kg/m^3

Objective 6. To consolidate Mexico's international involvement in water issues

Indicator Datasheet

Indicator	**8. International cooperation projects undertaken**
Objective	Objective 6. To consolidate Mexico's international involvement in water issues.
General description	This indicator measures the percentage of international water projects undertaken with the different countries with which Mexico has international cooperation agreements. The indicator will make it possible for Mexico to expand and consolidate its role as a responsible and committed actor internationally, thus contributing to expanding and strengthening Mexico's presence around the world as a country with global responsibility.
Observations	100% of projects undertaken.
Frequency	Every year.
Source	Deputy Director General's Office for Planning of the National Water Commission (Subdirección General de Planeación de la Comisión Nacional del Agua).
Further references	Link to sectoral indicators: Indicator: "Mexican initiatives approved in multilateral forums" of Objective 2, To contribute actively in multilateral forums in relation to issues of interest for Mexico and the world, of the SRE's Sectoral Program (2013-2018). Indicator: "Increase resources for the supply of cooperation from various funding sources" of Objective 3. Promoting international cooperation for development, to benefit Mexico and other countries, of the SRE's Sectoral Program (2013-2018). Department responsible for the information: Deputy Director General's Office for Planning of the National Water Commission (Subdirección General de Planeación de la Comisión Nacional del Agua).
2012 Baseline	0
2018 Target	100% of projects

El Soldado Estuary, Sonora.

TRANSPARENCY

In order to meet transparency and accountability requirements, the National Water Plan 2014-2018 (PNH 2014-2018) shall be available at the transparency portal of the National Water Commission's website: www.conagua.com.mx

The follow-up of indicators will be available for consultation on the same website.

Chicoasén Dam, Chiapas.

Glossary of Terms

Agricultural use. The use of national water resources for irrigating agricultural land and its preparation for the first sale, provided that the products have not yet been subject to industrial transformation.

Allocated water. Volume of water deeded by the federal executive branch, through Conagua.

Allocation. Deed granted by the federal executive branch for the exploitation, use, or utilization of national water resources and of inherent public goods, to individuals and public or private corporate entities.

Aquifer. Hydrologically connected geologic formation or group of formations through which groundwater flows or is stored and can be extracted for its exploitation, use, or utilization with lateral and vertical boundaries conventionally demarcated for the purposes of evaluating, managing and administering national groundwater.

Artificial recharge. The set of hydro-geological techniques applied to introduce water into an aquifer, using purpose-built infrastructure.

Assignment. Deed granted by the federal executive branch for national water resources to be used by Mexico's municipalities, states and the Federal District, for the provision of public, urban or domestic water services.

Demarcation of waterway and federal zone. Topographic, bathymetric, photogrammetric, hydrologic and hydraulic reports and studies needed to determine the borders of the waterway and the federal zone.

Discharge. The action of discharging, infiltrating, depositing or injecting wastewater into a receiving body.

Drinking water. Water for human use and consumption, without objectionable pollutants (in accordance with NOM-127-SSA1-1994), either in the form of chemicals or infectious agents, and which does not pose health risks.

Drinking water and sanitation system. Infrastructure projects and actions that make it possible to provide public drinking water, sewerage, and sanitation services; the latter understood as the piping, treatment, transport and discharge of wastewater.

Drinking water coverage. Percentage of the population living in private homes with mains water supply inside their home or on their land. Determined by censuses and counts carried out by the National Institute for Statistics and Geography (INEGI).

Drought. Prolonged absence or major shortage of precipitation.

Ecological flow. Minimum necessary flow to guarantee the maintenance of ecosystems in sections of regulated rivers or streams.

Ecological management. Planning instrument designed to regulate or control land use and productive activities.

Environmental services. Benefits for society generated or derived from hydrological river basins and their components, such as climate regulation, continued water cycles, erosion control, flood control, recharging aquifers, quality and quantity of runoffs maintained, carbon capture, purifying water bodies, as well as the conservation and protection of biodiversity.

Environmental sustainability. Change process in which the exploitation of resources, investment, the direction of technological development and institutional evolution are in complete

harmony and promote current and future possibilities of meeting human aspirations and needs.

Exploitation. Use of water to extract chemical or organic elements dissolved in it, after which it is returned to its original source without significant consumption.

First-use water. Water from natural sources and artificial reservoirs that has never been previously used.

Flow. Amount of runoff passing through a specific location at a specific time. This concept is used to define the volume of water flowing down a river.

Groundwater. Water contained in geological formations.

Hydrological-administrative region. Land defined by hydrological criteria, in which the river basin is considered the most suitable basic unit for water management and the municipality as the country's smallest administrative unit. Mexico has been divided into 13 hydrological-administrative regions.

Hydrological region. Area of land created through its morphological, orographic and hydrological features, in which the hydrological basin is considered the basic water management unit.

Infrastructure. Man-made constructions to meet a need or provide a service.

Inherent public goods. As specified in Article 113 of the LAN.

Integrated water resources management. A process that promotes the coordinated management and development of water, soil, concomitant resources and the environment, in order to maximize the balanced social and financial well-being without compromising the sustainability of essential ecosystems. This management is closely linked with sustainable development.

Investment portfolio. Investment programs and projects in accordance with the terms of Article 34, Section III of the Federal Budget and Fiscal Accountability Law (Ley Federal de Presupuesto y Responsabilidad Hacendaria) and Article 46 of its Regulations (Registration guidelines in the program and investment project portfolio, published in the Official Gazette of the Federation [DOF] on March 18, 2008).

Irrigation district. Established by presidential decree, formed by one or several previously defined surface water bodies, within the perimeters of which is the irrigation district, which has water infrastructure, surface- and groundwater, as well as their reservoirs, its federal area, protection, and other goods and attached work, and possibly consisting of one or more irrigation districts.

Land management. The process of balanced and sustainable distribution of the population and of economic activities within Mexico.

Mean annual recharge. The annual mean volume of water entering an aquifer.

Mean natural availability. Total volume of renewable surface- and groundwater occuring naturally in a region.

Mitigation. Measures taken ahead of a disaster and during the emergency itself to mitigate the impact on the population, goods and the environment.

National water resources. Water that belongs to the nation, in accordance with the Mexican Constitution (Article 27, paragraph 5).

Natural recharge. Generated by direct infiltration of rainfall, surface runoffs in waterways or water stored in water bodies.

Off-stream (water) use. The volume of water of a specific quality that is consumed in the course of a specific activity, and which is deter-

mined as the difference between the volume of a specific quality that is extracted, less the volume of a quality also determined that is discharged, and as indicated in the respective deed.

Operating rules. A set of provisions that detail how to operate a federal program that provides subsidies to the population, in order to achieve the expected levels of effectiveness, efficiency, fairness and transparency.

Particular discharge conditions. The series of physical, chemical and biological parameters and of its maximum permitted levels in discharges of wastewater, as determined by CONAGUA or by the River Basin Council corresponding to each user, for a specific use or group of users of a specific water body in order to preserve and control the quality of water according to the LAN and its regulations.

Permits. Granted by the federal executive branch, through CONAGUA or the corresponding River Basin Council, for the exploitation, use, or utilization of national water resources, as well as the construction of water infrastructure and various other functions related to national water resources and goods referred to in Article 113 of the LAN.

Precipitation. Atmospheric water in liquid or solid form that is deposited on the earth's surface; this includes dew, drizzle, rain, hail, sleet and snow.

Price. Evaluation of a good or service in monetary units or other instrument of exchange. The price can be freely fixed either by the market through the law of supply and demand, or by the government, in which case it is called controlled price.

Project catalogue. Structural and non-structural types or kinds of projects.

Project portfolio. Group of projects that belong to one or various types of projects.

Public-urban usage. The use of national water resources for population centers and human settlements though municipal systems.

Rates or fees. Unit price established by the competent authorities for the provision of public drinking water, drainage and sanitation services.

Receiving (water) body. The current or natural deposit of water, dams, waterways, coastal zones or national goods receiving wastewater discharges, as well as land into which these waters become infiltrated or injected, when they can pollute the soil, subsoil or aquifers.

Regional level. The sphere of action of the different government agencies in charge of regulating one of the country's regions.

Resilience. A system's capacity to handle disruptions without significantly altering its characteristics and returning to its original state once the disruption is over. The term is usually applied in ecological contexts to refer to an ecosystem's capacity to return to the same state as before a given disruption.

Reuse. The exploitation, use, or utilization of wastewater with or without prior treatment.

Revenues. For the water sector, the amount charged to taxpayers for the exploitation, use, or utilization of national water resources, as well as for the discharge or wastewater and for the use of goods inherently related to water.

River Basin Council. Advisory panel consisting of varied members that consults, supports and coordinates, liaising between the "the Commission", including the corresponding River Basin Council, and the federal agencies and departments and representatives of the water users and civil society organization in the respective river basin or hydrological region.

River basin organization. A specialized and autonomous technical, administrative and legal unit, directly attached to CONAGUA's director's

office, acting in accordance with the LAN and its regulatory laws. Conagua defines its specific resources and budget.

Rural locality. Locality with a population of under 2,500, and not the seat of the municipal government authorities.

Sanitation. Collection and transport of wastewater and its treatment, as well as the resulting by-products, in order to minimize the environmental impact of its discharge.

Sanitation coverage. Percentage of the population living in private homes with sewerage connections to a public sanitation network or to a septic tank. Determined by censuses and counts carried out by the INEGI.

Sectoral level. The sphere of action of different government agencies in charge of regulating one of the economic sectors.

Stone materials. Materials such as sand, gravel, stone and/or any other type of material used in construction which is extracted from a reservoir, waterway or any other property indicated in Article 113 of the LAN.

Substandard flow treatment. Refers to the flow currently being treated but below the level required by the Federal Duties Law (Ley Federal de Derechos) and the NOM-001-SEMARNAT-1996 standard, according to the type of receiving water body.

Surface runoff. Water from precipitation that reaches a surface water flow.

Sustainable development. In terms of water resources, this is the measurable process using water-related, economic, social and environmental criteria and indicators, which tend to improve people's quality of life and productivity, based on the measures necessary to preserve hydrological balance, the use and protection of water resources, to ensure that the water needs of future generations can be met.

Sustainable volume. Amount of surface or groundwater that is artificially extracted without affecting natural supply sources.

Technified rainfed district. A geographical area normally used for agriculture but lacking irrigation infrastructure, where, by using various techniques and infrastructure, damage caused to production as a result of heavy and sustained rainfall is minimized. Or when there is a lack of water, rain and soil moisture in agricultural land is used more efficiently. The technified rainfed district consists of rainfed units.

Unsustainable volume. Amount of surface or groundwater that is artificially extracted affecting natural supply sources.

Urban locality. Locality with a population of 2,500 or more, or is the seat of the municipal government authorities regardless of the number of inhabitants recorded at the last census.

Use. The use of water in an activity that implies its total or partial consumption.

Users. People or organizations that receive or use the products provided by the institution.

Utilization. Water usage for activities that do not imply its actual consumption.

Vulnerability. Internal risk factor of a subject, object or system, exposed to the threat, that relates to its intrinsic propensity to suffer damage.

Wastewater. Water of varying composition discharged after public use—urban, domestic, industrial, commercial, service, agriculture, fisheries, treatment plants and other types of use—or a combination of such discharges.

Water productivity in irrigation districts. The amount of agricultural output from all harvests in the Rainfed Districts that were irrigated, divided by the amount water used in said districts. Expressed as kilograms (of product) per cubic meter (of water).

Watershed. The land unit, differentiated from other units, normally defined by a watershed—the polygonal line formed by the highest points in said unit—where water is found in various forms, and it is stored or flows to an exit point that can either be the sea or another interior water body, through a hydrographic network of waterways that converge into one main one, or the land where the waters form a unit that is independent or differentiated from other ones, even if they do not discharge into the sea. In this space, defined by a variety of topographical features, there is a combination of water, land, flora other related natural resources, and the environment.

Water stress level. A percentage indicator of the stress on the water resource, producing a quotient between the total volume of allocated water and the volume of renewable water.

Water supply gap. Difference between the sustainable offer per installed capacity and total demand, expressed in terms of volume (cubic meters).

Wetlands. Transition zones between water and land systems that constitute areas of temporary or permanent flooding, under tidal or other influences, such as swamps, bogs, and marshland, the limits of which are defined by the type of permanent or seasonal absorbent vegetation; the areas where the soil predominantly consists of water; and lacustrine areas or soils that are permanently moist due to natural discharge from aquifers.

DISCLAIMER: This glossary is compiled from various sources in order to illustrate the concepts used in this document and therefore its definitions are not legally binding.

El Chique Dam, Zacatecas.

Acronyms and Abbreviations

APF	Federal Public Administration
AQUASTAT	FAO's Information System on Water and Agriculture
BECC	Border Environment Cooperation Commission
Cenapred	National Center for Disaster Prevention
CFE	Federal Electricity Commission
Codia	Conference of Ibero-American Water Directors
Conacyt	National Council on Science and Technology
Conagua	National Water Commission
Conapo	National Population Council
Cotas	Technical Committee on Groundwater
CRAE	Regional Emergency Response Center
CSO	Civil Society Organizations
CTOOH	Technical Committee for Water Infrastructure Operation
DOF	Official Gazette of the Federation
GDP	Gross Domestic Product
IBWC	International Boundary & Water Commission
ICT	Information and Communications Technology
IMTA	Mexican Institute of Water Technology
INEGI	National Institute of Statistics and Geography
INSIVUMEH	Guatemalan National Institute for Seismology, Volcanology, Meteorology and Hydrology
LAN	National Water Law
LFPRH	Federal Budget and Fiscal Accountability Law
NADB	North American Development Bank
NPE	Normal Pool Elevation
OECD	Organisation for Economic Co-Operation and Development
Pemex	Petróleos Mexicanos (Mexican Oil)
PND 2013-2018	National Development Plan 2013-2018
PNH 2014-2018	National Water Plan 2014-2018
Proigualdad 2013-2018	National Program for Equal Opportunities and Non-Discrimination against Women 2013-2018
Pronach	National Water Contingency Prevention Program
Pronacose	National Program against Drought
Renameca	National Water Quality Measurement Network
RPA	Potential Water Reserves
Sagarpa	Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food

SCT	Secretariat of Communications and Transportation
SE	Secretariat of Economy
Sectur	Secretariat of Tourism
Sedatu	Secretariat of Agrarian, Territorial, and Urban Development
Sedena	Secretariat of National Defense
Sedesol	Secretariat of Social Development
Segob	Secretariat of the Interior
Semar	Secretariat of the Navy
Semarnat	Secretariat of Environment and Natural Resources
Sener	Secretariat of Energy
SEP	Secretariat of Public Education
SHCP	Secretariat of Finance and Public Credit
SNPD	National Democratic Planning System
SPC	Professional career service
SRE	Secretariat of Foreign Affairs
SSA	Secretariat of Health
STI	Science, Technology and Innovation
USBR	U.S. Bureau of Reclamation
USEPA	U.S. Environmental Protection Agency
WMO	World Meteorological Organization

ANNEXES

- Description of the Lines of Action
- Methodology for Integrating Indicators

Description of the Lines of Action

1.1.1 To update how surface- and groundwater availability is expressed

A program for periodically updating surface- and groundwater availability will be promoted, in accordance with the National Water Law (LAN).

Efforts will be made to promote the establishment of closed or reserved zones, in line with availability studies conducted in areas with unrestricted extraction, to prevent the overdrafting of aquifers. In closed zones where overdrafting occurs, the respective regulations will be implemented, and users will be urged to actively participate, with the goal of self-regulation.

In addition, efforts will be made to promote the updating of Official Mexican Standard NOM-011-CONAGUA-2000 on Water Conservation, which establishes the specifications and method for determining the annual mean availability of national water resources, to then consider seasonal availability.

1.1.2 To adapt the Federal Duties Law based on water availability areas

Modifications will be proposed to the regulatory framework in order to reclassify water availability zones using a new methodology that will differentiate between surface- and groundwater. This will be based on the technical perspective in NOM 011-CONAGUA-2000 on Water Conservation, which establishes the specifications and method for determining the annual mean availability of national water resources. It will facilitate an efficient allocation of water based on fees that reflect the actual availability of water; it will discourage the overexploitation of watersheds and aquifers; and it will reflect water's economic value.

1.1.3 To adjust allocations and assignments to actual water supply and availability, and to national priorities

Granted allocations and assignments will be gradually reviewed and adjusted in relation to updated water availability studies, with the aim of reducing the over-allocation of water and contributing to recuperating a balance in overexploited watersheds and aquifers.

This action involves maintaining national water resources availability studies updated; precisely defining the actual requirements of water users; increasing the measurement of the use and exploitation of national water resources, primarily by large users; controlling surface- and groundwater extraction; and in agreement with irrigation users' organizations, making modifications in water titles in modernized, rehabilitated and technified zones through federal government investments.

At the same time, it is necessary to adjust land surface measurements for irrigation districts and units that are over-sized or over-allocated, and in agreement with irrigation users, modify the divestment of these land surface areas, particularly those that have been abandoned, those least productive, and those with changed or changing land use.

An important element is the process of adjusting allocations through the expiry of volumes.

Efforts will be made to reinforce federal programs for inspecting and monitoring the extraction of national waters, with the aim of canceling irregular extractions and fining those who fail to declare their total water use. In addition allocations will be reviewed in order to verify their validity. Also, in the case of watersheds in which large volumes have been allocated for generating hydroelectric energy or have been

reserved for irrigation works that have not been conducted or have already fulfilled their purpose, it is absolutely necessary to modify prohibitions of the use of surface- and groundwater in order to meet the population's needs.

Also, allocations for public use will be recuperated in the cases stipulated in legislation, and efforts will be made to promote the exchange of first-use water originally allocated for agricultural irrigation and treated wastewater originally allocated to municipalities, particularly in cities located near irrigation districts or units.

1.1.4 To update prohibition, reserve, and regulated zone decrees

In accordance with the current situation in Mexico, the growing demand for water and the indiscriminate use of water in some regions, the country's prohibition, reserved and regulated zones, involving both surface water and groundwater, will be updated. This process may be unnecessary in some areas, but urgent in others.

1.1.5 To regulate areas of unrestricted groundwater withdrawal

As part of structural reforms and transformations in the water sector, the Federal Executive Branch published General Agreements through which the unrestricted extraction of national groundwater is provisionally suspended in some of the country's regions, in order to establish control over extractions and reduce the overexploitation of some specific aquifers.

These agreements represent the first of a series of comprehensive mechanisms for regulating unrestricted extraction zones, in order to guarantee the administration of water supply and demand, as well as the protection of this resource, and a balance between the availability and use of water from aquifers. To this end, the corresponding technical studies will be conducted in order to determine the legal instrument that will allow for the administration and sustainable use of national groundwater.

1.1.6 To regulate watersheds and aquifers

Regulations on watersheds and aquifers will be reinforced as a fundamental tool for achieving balance. Special importance will be placed on regions subjected to water stress due to climatic or dry conditions, and regions where the demand for water is high for demographic or economic reasons. This objective will be accomplished through efficient, transparent mechanisms.

1.1.7 To define the limits of national growth in terms of water availability

For the purpose of harmonizing water policies with national development policies, the necessary prospective studies will be carried out in order to visualize tendencies in urban, agricultural, and industrial growth. These studies will serve as a basis for defining the actions, projects, and programs that will contribute to limiting growth in zones with scarce availability or limited supply of water, and promoting growth in zones where water is available. Efforts will be made to identify water sources and establish basic sanitation in the design and implementation of organized urban planning, in coordination with the responsible government entities.

To this end, zones of availability will be reviewed on the basis of watershed and aquifer criteria to ensure that the costs of water access are directly related to water availability. In coordination with the entities responsible for urban, agricultural, and economic development, criteria on location and development will be established.

1.1.8 To optimize dam operation policies

Stored water resources will be used to their maximum potential through the development and enforcement of policies for optimal dam operations. This will make it possible to determine sustainable water extraction in accordance with fairness and availability criteria. With this purpose in mind, design floods as well as area-capacity-elevation curves will be updated, as will policies and criteria for operations and extractions.

The types of policies will be defined on the basis of the type of use given to water from the dam, whether for generating electricity, for irrigation or for drinking water. Agreements and policies on dam operations will be discussed in the Technical Committee for Water Infrastructure Operation (CTOOH).

The corresponding studies and the updating of those studies will be promoted in order to modify the guideline curves of dams, with the objectives of establishing controlled downstream extractions that will not negatively affect the population, and avoiding fluctuating water levels at the sites where water is piped into drinking water systems.

1.2.1 To reuse all treated wastewater

A strong impetus will be given to reusing treated wastewater in the agricultural sector. This will facilitate redirecting first-use water that has been allocated for irrigation to other purposes. In order to reuse treated water, it is necessary to build the necessary infrastructure for taking treated water from treatment plants to the sites where it can be used, and to sites with the appropriate infrastructure and equipment for further treatment of water following its initial treatment, depending on the requirements of the water's final use. This is particularly important in cities where large amounts of water are needed and cities located close to irrigation districts and units.

The construction and expansion of pipelines for treated wastewater—known as purple pipelines—will be promoted for use with treated water from municipal water treatment plants. The goal is to reuse this treated water in industrial parks, or inject it into aquifers after the corresponding stipulations have been met.

Also, the reuse of treated wastewater will be encouraged in industrial processes, to replace first-use water. A particularly important case can be found in the systems for vapor collection and condensation in petrochemical plants. This process consumes immense volumes of water, and treated wastewater can be used.

1.2.2 To take measures to increase aquifers recharge

A reservoir system will be designed and absorption wells will be constructed for artificially injecting rainwater into aquifers, in areas where rainwater quality is suitable. In addition, the recharging of aquifers will be complemented by channeling rainwater into infiltration lakes in natural land areas, far removed from urban pollution, in order for the water to filter naturally into the aquifers as well as through reservoirs dedicated specifically to recharging aquifers. In any case, basic studies on high-priority aquifers will be conducted, in order to learn more about recharging sites.

1.2.3 To establish national surface water reserves for ecological protection

The establishment of water reserves will guarantee water for the environment in the terms stipulated in the LAN and backed by the Mexican standard on ecological flow (NMX-AA-159-SCFI-2012).

Water reserves are a way to guarantee conservation, not only for aquatic systems, but also for land systems and biodiversity in general, contributing to adaptation to climate change.

Establishing sustainable limits on water supply will facilitate management focused on reducing use and management of the demand for water, in watersheds with water availability.

1.2.4 To strengthen the process of formulating, monitoring and evaluating water programs

The PNH 2014-2018 will conduct a review and evaluation process every two years. Also, programs will be formulated by hydrological-administrative region and for high-priority watersheds, with objectives that are congruent with national goals. Periodic evaluations will guarantee that the Plan's actions are oriented toward results corresponding to the specific challenges and problems in each hydrological-administrative

region. These programs will be the instruments used to manage watersheds and aquifers, and will thus be developed through consensus among users, local governments, river basin organizations and other social actors.

1.2.5 To establish a project management system for the water sector, with a short-, medium-, and long-term vision

The necessary studies and projects will be developed to contribute to achieving the water sector's objectives, from a perspective of integral water management by watershed and by aquifer. Consequently, the sector's portfolio of projects will be prioritized and expanded, and will include a Planning Mechanism for the process of systematic investment in the short, medium and long term.

1.3.1 To consolidate the modernization of the National Meteorological Service (SMN)

This process includes the improvement of infrastructure for observation networks, the automation of climatological stations and meteorological observatories, and the rehabilitation and expansion of the radar network, as well as stations receiving satellite images, remote-sensing stations and the radio-sounding network.

In addition, a program will be implemented for building capacities and enhancing skills of technical personnel at the National Meteorological Service, with the aim of strengthening institutional capacity and communication with users.

Plans and programs will be formulated for the integrated operation and maintenance of all the networks, with the aim of assuring the reliability of information and optimal operation of stations.

As part of the modernization process, regional hydrometeorological centers will be established and/or strengthened to include a center for tropical monitoring in the Mesoamerican Pacific, and a center for winter monitoring in the country's north central region.

Cooperative efforts that have been established in these aspects with national and international organizations, such as the World Meteorological Organization, will be intensified.

1.3.2 To strengthen and modernize the measurement of the water cycle at the national, regional, and local levels

A National Hydrological System will be established to ensure the conditions for making decisions in real time, related to the evolution of water availability at the different sources of water supply. This will involve the modernization and expansion of the network of climatological, hydrometric and piezometric stations and an increase in skilled technical personnel at the Regional Hydrometeorological Centers. The aim will be to strengthen technical capacities and enhance the work of measuring the components of the water cycle: precipitation, evapotranspiration, natural surface runoff and aquifer recharging. This will make it possible to verify the natural mean availability of water. It will also be necessary to improve procedures for sending, storing, publishing and interpreting information.

This information will be very useful in formulating programs and actions for preventing and confronting hydrometeorological hazards such as drought and flooding, through the assessment and management of risks and the crises resulting from these events.

In addition, there will be an increase in participation and collaboration by states, municipalities and higher education institutions in the task of measuring hydroclimatological variables.

1.4.1 To improve the measurement and assessment of water quality and to determine the main sources of pollution

The National Water Quality Measurement Network (Renameca) will be expanded and modernized to include an integrated, automated monitoring network, with participation by all the sector's institutions. In addition, water quality laboratories will be improved, with the goal

of obtaining certification from the Mexican Accreditation Entity (Entidad Mexicana de Acreditación), thereby obtaining legal backing for the analysis conducted. Participation by the private sector will also be facilitated.

In addition, the number of monitoring sites will be increased, together with the water quality parameters to be periodically measured. Monitoring will include measurement of water flow. Automated stations for measuring water quality and quantity will be established at strategic sites, located along rivers and reservoirs, for the purpose of providing information in real time.

Water quality studies will also continue to be carried out in water bodies with high levels of pollution caused by point sources. Also, special studies will be conducted with the aim of evaluating non-point sources of pollution, as well as pollution from the use of agrochemicals in agricultural productive activities. The purpose will be to establish guidelines for improved control over these sources of pollution.

And, with the aim of conducting a more comprehensive and precise evaluation of information on water quality, new indicators will be established, and ecological criteria for water quality will be updated. This will make it possible to conduct a better diagnostic assessment of the potential use of water and of health-environment risks, and will help to establish goals for water quality in polluted water bodies.

1.4.2 To increase the issuing of classification statements, water quality studies, and specific reports on effects

The number of declarations on classification of national water bodies and the number of water quality studies will be increased, to determine the self-purification capacity of water bodies and the maximum allowable limits on pollutants, and to establish the appropriate quality-related goals for each water body, as well as the use to which it will be dedicated. It is vital that this information be used to generate integrated simulation models for water quantity and quality, with the aim of observing the process in which pollutants become diluted, all along natural waterways, considering both point and non-point sources.

In addition, specific studies will be conducted to determine the level of impact at sites with water bodies as a result of the direct discharge of wastewater by major polluters.

Permits for discharging wastewater will be based on classification declarations, water quality studies and specific studies, and will specify the corresponding conditions that must be met before discharging into any receiving water body under federal jurisdiction.

This action will contribute to maintaining clean water bodies and to guaranteeing the quality of water for its subsequent uses.

1.4.3 To determine the impact of agrochemicals on water quality

While point-source pollution can be controlled through the installation of wastewater treatment plants, it is vital to prevent non-point source pollution—involving large volumes of water that make it impractical and highly costly to implement treatment a posteriori. With this aim, a national program will be implemented to measure, evaluate and control non-point source pollution. It will include environmentally friendly agricultural practices designed to protect water quality and conserve soil, and it will increase the robustness of monitoring and sanctions for polluting. In addition, a standard for evaluating, controlling, observing, and registering non-point pollution sources will be developed and enforced, based on the operation of the National Water Quality Measurement Network (Renameca).

1.4.4 To coordinate with all sectors involved to promote the proper use of agrochemicals as a means of controlling non-point source pollution

In order to control non-point source pollution, it is necessary to implement instruments that will

help to contain the excessive use of agrochemicals in agriculture. The rational, appropriate use of fertilizers and pesticides will be encouraged in order to reduce the effects of non-point source pollution on water bodies.

Also, a program will be designed to incorporate the corresponding best national and international practices in its policy definitions, including the use of biodegradable and organic fertilizers.

1.4.5 To generate and apply water regulations on the disposal of solid wastes

Water criteria will be developed for the appropriate disposal of solid wastes, and efforts will be made in conjunction with the corresponding entities to monitor compliance with standards for sanitary landfills that could affect surface water or groundwater. This is necessary due to the high potential for pollution from the leachates generated in disposal processes. Efforts will be made to promote legal reforms to enable water authorities to be involved in approving the location of sanitary landfill sites.

1.4.6 To include a greater number of pollution parameters in particular discharge conditions

The maximum allowable limits for pollutants currently included in the Particular Discharge Conditions of the permits granted for this purpose will be reviewed, and the limits will be specifically adjusted to the type of pollutants in each particular effluent. This review will also consider whether other pollutants should be added (adjusting the measurement indicators for water quality in order to incorporate microbiological criteria).

1.4.7 To modify the regulatory code on wastewater discharges to contribute to a framework of sustainable water quality

With the aim of guaranteeing high-quality water in national water bodies, the following standards will be reviewed and modified: NOM 001-SEMAR-NAT-1996, which establishes the maximum allowable limits for pollutants in wastewater discharges into national water bodies and properties; and NOM 002-SEMAR-NAT-1996, which defines the maximum allowable limits in wastewater discharges into urban and municipal sanitation systems. In addition, the inspection and verification of compliance with these standards will be reinforced, applying the enforcement, security and/or corrective measures stipulated in legislative terms.

Furthermore, efforts will be made to analyze the possibility of developing progressive standards in terms of quality of wastewater discharged into rivers and other receiving bodies, into coastal waters, and when used for other purposes, primarily public-urban and domestic uses.

1.5.1 To improve the organization and operation of river basin councils and auxiliary bodies to adapt them to the sector's needs

River basin councils, as well as river basin commissions and committees, and groundwater technical committees, represent a solid formula for confronting the primary challenges in terms of water governance and governability in these geographic demarcations. This formula operates under a combined-focus principle in which the government and society join efforts to bring together objectives and forms of action in an organized manner, with the aim of obtaining beneficial results in response to current needs, and to take advantage of the potential found in various parts of the country. This combined formula is based on agreements between water authorities, without affecting their role in terms of the law, and social actors involved in water management, primarily user organizations.

During the current administration, the integral reform of these organizations involved in water management will be promoted. The primary aim is to take advantage of the wealth of experience that has been gained in this area over a period of more than 20 years in different parts of the

country. Lessons have been learned from these experiences, and an objective assessment has been made of the success stories, including elements and mechanisms that have functioned adequately, as well as efforts that have not provided the expected outcomes.

The next step will be to enhance the model and the programmatic, operational and financial processes of river basin organizations and similar entities for sub-basins, micro-basins and aquifers. Along these lines, the pre-existing objectives, mechanisms, and primary management instruments will be reviewed in order to make the necessary modifications and improvements in light of obtained results.

This strategic effort clearly represents one of the triggers for change in Mexico's water sector. The efforts of the federal government, together with those of social organizations, on the basis of this reform, will make it possible to make progress at a better pace and with better results. The goal is the integrated management of water resources, which will in turn contribute to economic growth, social justice and sustainable development.

On the basis of the above, the regulatory framework will be strengthened in order to improve the organization, operation and financing of river basin organizations and its auxiliary bodies, with the aim of contributing to water planning, management and protection.

To this end, the model will be adjusted in terms of the interaction between organizations and water authorities, in order to facilitate problem-solving and take advantage of opportunities for development. In addition, new modalities will be introduced and will translate into proposals for programs and actions. Mechanisms that facilitate and enhance the execution of these programs and actions will be incorporated, in relation to joint actions between authorities and users. Also, mechanisms will be introduced for monitoring, evaluation and accountability in relation to obtained results. And, general assemblies of users in the river basin organizations will be strengthened.

Furthermore, the necessary elements to enable users to have greater representation and legitimacy will be implemented. Another step will be to facilitate the active participation of users in the development of instruments for the distribution and rational use of surface water and groundwater, while adhering to laws and regulations, and in the establishment of prohibition or reserve zones. Capacity building for members of river basin organizations will be strengthened, and schemes for assessing plans and programs and for establishing accountability will be formulated. Thus, solid progress will be made in establishing realistic conditions for co-responsibility between authorities and user organizations, within the terms possible in accordance with the law.

In addition to the elements specified above, and in the interest of contributing to improving conditions for the conservation of groundwater bodies, agreements will be developed and implemented in the particular case of the Technical Committees on Groundwater (Cotas), to facilitate users' participation in measuring and monitoring the water flow extracted, and in planning, managing and regulating the extraction of water from aquifers. In addition, coordination and collaboration agreements will be established to allow these Committees to work with water authorities in diverse processes that do not involve acts of authority but that contribute to making institutional processes more agile and efficient, to improving services to users, and at the same time, to socially and financially consolidating the organizations. Lastly, support will be provided to construction works, to projects for technological and operational improvements, and to other types of actions that contribute to achieving balance in piezometric levels and water infiltration in groundwater bodies.

1.5.2 To promote the participation of non-governmental and academic organizations in water administration and conservation

Channels for participation by civil society organizations and the academic sector will be

strengthened in the planning, implementation and monitoring of actions for management and conservation of the country's water resources.

Co-responsibility involves effective collaboration by diverse social actors in formulating and designing water policies, especially in monitoring and providing feedback, and thus the existing mechanisms and channels for this purpose will be reviewed.

1.5.3 To address the demand for information of the organized population

Establishing co-responsibility with society is fundamental in caring for and conserving water resources. Diverse social actors demand opportunities for participation that will truly have an impact on public decisions.

For this reason, relevant information regarding water resources will be available through communication media, with the aim that society participates in achieving objectives in this sector.

1.6.1 To draw up new legal instruments or amend existing ones in order to improve the current legal framework

One of the central elements in the protection and conservation of water resources is a strong, clear and complete legal framework that constitutes a framework for taking actions that applies to all social actors. This legal framework will be formulated to ensure clarity among the three tiers of government as to their responsibilities in managing water resources, with the aim of strengthening water governability and federalism.

When applicable, existing legislation should be comprehensively reformed so that it responds to the genuine social and environmental needs in water use, and incorporates current international principles, with the aim of improved management, handling and administration of water resources in our country.

Nine Mexican states have recently reviewed their legislation on water, to update their existing framework.

However, legislation in other states dates back to the 1970s, and efforts will thus be made to encourage local Congresses to update legislation, to maintain congruence with the new legal framework.

1.6.2 To propose and implement amendments to the Federal Duties Law (Ley Federal de Derechos)

Modification of the current regulatory framework on water will lead to a review of the manner, assumptions and procedures through which service charges are generated for the use of water.

In addition to the reclassification of zones with water availability, the regulation of inter-basin transfer is anticipated to contribute to achieving balance between water exports and imports. It will make it possible to recuperate social and environmental opportunity costs, it will contribute to peace and social equity, and it will create an incentive for the inter-basin transfer of water when it is truly necessary. This in turn will allow for the optimal allocation of this resource, reduce hoarding, and identify water's economic value for users.

Reforms will be made to the requirements for obtaining an exemption for the use of brackish waters, to ensure ongoing measurement that will allow authorities to verify the quality of water extracted and determine whether or not there is a payment obligation.

1.6.3 To strengthen and elevate the hierarchical level of water sector institutions in the Federal Government and other tiers of government

The water sector should have its own arena of action, as a cross-cutting issue and a point of focus for many sectors, which could not function without it. From a systemic perspective, water

has its own arena. The exercise of authority in water issues will be strengthened at the different levels of action, with decision-making and financial capacity for addressing the institutional, social and environmental problems currently encountered. Therefore, the organizational structure of the water sector at federal, state and municipal levels will be reviewed.

1.6.4 To strengthen the supervision, inspection, and sanction application of withdrawals and discharges

Mechanisms for monitoring, inspecting and applying sanctions for discharges into national receiving bodies will be made more rigorous. To this end, the legal system for water will be reformed and updated, to ensure that the three tiers of government and private and social sectors participate, addressing collective, general interests in the monitoring and inspection of discharges into national receiving bodies.

In the Federal Duties Law, the calculation of charges for the use of national receiving bodies for discharging wastewater will be simplified. This will reduce costs for those paying service charges, to comply with their fiscal obligations, and will allow authorities to install volumetric meters for adequate control over discharges.

Mechanisms for monitoring, inspecting and applying sanctions for the illegal exploitation of stone materials in national water bodies will be made more rigorous.

1.6.5 To reinforce metering systems and ensure compliance with allocated volumes

The measurement and verification of allocated volumes will be reinforced by increasing inspection and measurement visits, by installing meters in surface- and groundwater sources, and by taking the necessary administrative actions to ensure that users take care of measurement devices and maintain them in operation, or to the contrary, the corresponding sanctions will be enforced.

In addition, systems with remote measurement and indirect measurement of volumes extracted by users will be incorporated, to orient control and monitoring actions.

Agreements with local entities will be promoted with the aim of supporting water authorities in their tasks of measuring and monitoring extractions, primarily in the agricultural and public-urban sectors. In particular, measurement and monitoring in irrigation districts will be carried out with assistance from organized users.

1.6.6 To condition increases in allocations and assignments on the efficiency level of users (municipalities, industries, agriculture)

In order to meet the increased demand for water, priority will be given to carrying out actions that improve efficiency in the use and handling of water through existing infrastructure, equipment and systems, until international standards are reached, prior to constructing new infrastructure that would involve an increase in the volumes of allocations and assignments. Society's participation is vital in carrying out these actions.

1.6.7 To promote the increase of resources for funding water-related government operations and controls

An increase in resources will be promoted for reinforcing water governance and government systems. This implies a larger budget for measuring the quantity and quality of surface- and groundwater; for water administration and supervision, and related technical services; and for the development of programs and studies, among other needs.

1.6.8 To promote payment for environmental services, for the conservation of water resources

Payment schemes for environmental services will be promoted, to ensure that all water users contribute the financial resources necessary for carrying out actions to conserve water and soil,

as well as forests at higher elevations in watersheds that facilitate the recharging of aquifers and a decrease in soil erosion.

In addition, actions will be taken to conserve wetlands with the aims of protecting biodiversity, controlling flooding, and avoiding soil erosion.

1.6.9. To increase the efficiency of the water sector revenue system

With the aim of achieving efficient collection of service charges and fees related to national water resources and inherent public goods, fiscal instruments will be improved in order to consolidate a culture of paying fees in the water sector. This will encourage efficient use of water and at the same time promote economic growth, to create a link between environmental sustainability and costs-benefits for society.

In this way, the payment of service charges will increase, and voluntary compliance with fiscal obligations will improve. In addition, actions will be taken to strategically strengthen the fiscal presence of water authorities.

2.1.1 To implement the National Water Contingency Prevention Program (Pronach)

In the framework of the National Water Contingency Prevention Program, the necessary technical studies and construction works will be carried out, together with the maintenance and rehabilitation of infrastructure, to mitigate the effects from flooding on population centers and areas with productive activities. Waterways will be desilted as necessary, and the construction of new protective construction works will be determined and promoted, including flood control dry dam and other such infrastructure designed for flood control, as well as pilot channels and regulatory floodways and protection levees.

Work will be carried out in the rehabilitation, modernization and safety verification of dams, particularly those of overflow spillways.

The methodologies used to obtain climatological forecasts will be strengthened, and a capacity-building program will be established in this area.

2.1.2 To implement the National Program Against Drought (Pronacose)

In the framework of the National Program against Drought, programs will be designed for preventing and confronting droughts and for issuing warnings. The programs will consider the elements of effective warning and prevention with a focus on timely actions in response to possible climatological contingencies with the potential to affect the population and agricultural productivity. Activities will include the measurement and analysis of climatological variables, and the assessment and management of risks and crises. The goal is for the competent authorities and users of national water resources for agricultural, domestic, industrial, livestock, and public-urban use to react appropriately with the objective of mitigating the adverse effects of drought.

2.1.3 To strengthen, or where applicable, create specialized, trained, and equipped emergency response groups

Response capacity will be strengthened through specialized groups that are trained, certified and equipped, in order to attend to the population in the case of a hydroclimatological emergency. This action will be reinforced through the technification of the National Meteorological Service (SMN), to ensure the best technical elements for making decisions.

2.1.4 To update dam operation policies, giving priority to the protection of population centers

In watersheds with water storage dams for flood control, efforts will be made to promote the development or updating of policies for their operations during wet periods and hurricane seasons, with priority placed on protecting people and their property. In addition, obligatory

enforcement will be promoted, in order to prevent the effects of flooding.

To this end, mathematical simulation models will be developed to support the optimal policies for infrastructure operations. In order to achieve this line of action, it is vitally important that water authorities work together with universities and research centers.

It is also important to strengthen the Technical Committee for Water Infrastructure (CTOOH), and therefore its functioning and composition will be analyzed and enhanced. This will ensure that the identification, conservation and/or strengthening of the buffering functions in watersheds will be incorporated into the definition of policies on operations. This is not only to mitigate risks but also to provide sources of emergency water during natural disasters.

In irrigation districts the optimal policies for extracting water from dams will be defined, approved and enforced.

2.1.5 To prevent human settlements in areas prone to flooding and to relocate existing ones in safe zones

The demarcation of federal zones and waterways will continue, and flood-prone zones will be identified along the primary rivers and water bodies located alongside human settlements prone to flooding.

Efforts will be made to promote the signing of agreements with municipalities and states for the safeguarding, conservation and maintenance of federal zones and waterways in urban areas, and the participation of water authorities in the development and approval of housing development plans in coordination with the corresponding entities.

The corresponding authorities will make sustained efforts to prevent new human settlements from being established in flood-prone zones, and they will promote the relocation of those already existing in high-risk zones to other safer areas. Authorities will carry out the removal and demolition of construction works that endanger people's properties, ecosystems and natural water flow. They will impose sanctions on individuals and entities that establish themselves in high-risk zones, and in addition, sanctions will be determined for public employees who allow human settlements in these zones. Authorities will also prepare a public catalogue on the occupation of federal zones, and will promote the acquisition of flood insurance.

2.1.6 To strengthen early warning systems and prevention and mitigation actions in the case of emergencies caused by hydrometeorological hazards

A rehabilitation scheme will be implemented for pre-existing warning systems, and new systems will be implemented in high-risk zones. Consideration will be given to modernizing telecommunications, through systems for assuring the uninterrupted availability of information. In addition, new Regional Hydrometeorological Centers will be set up.

A digital modeling system will be implemented for flood risks in rivers and dams. In this way, before flooding occurs, and based on the volume of water stored in dams, the volume of rainfall and the capacity of rivers, authorities will be able to predict possible flooding risks. Steps can be taken to prevent flooding, and most importantly, the population can be evacuated to avoid the loss of human lives.

In addition, new Regional Emergency Response Centers (CRAE) will be built at strategic sites across the country, and those already existing will be strengthened and equipped with mobile units for producing drinking water, pumping equipment, electricity generators and water tanker trucks.

In order to respond to hydrometeorological emergencies, a closer relationship will be developed with the National Civil Protection System, primarily in the following areas: defining and enforcing necessary actions during

a hydrometeorological contingency; restoring and normalizing the provision of water and sanitation services; removing water from flooded populations; monitoring water infrastructure; avoiding potential epidemiological outbreaks; and providing emergency drinking water to shelters, hospitals, health centers and the general population.

Efforts will continue in the formulation and implementation of emergency plans for rivers with the potential for damages from flooding, and for cities vulnerable to the effects associated with extraordinary amounts of rainfall.

2.1.7 To promote the construction of sustainable rainwater drainage infrastructure

Capacities will be strengthened in developing, building and operating sustainable rainfall drainage systems in urban and rural zones. The concentration of rainwater has become greater than the capacity for removal in the existing drainage systems, due to the increase in hydrometeorological hazards of greater intensity and/or duration, and the high degree of impermeability in urban localities as a result of housing construction, diverse infrastructure and the paving of streets, among other factors.

The construction of rainwater drainage systems will also allow for improving the efficiency of wastewater treatment plants and making better use of rainwater, particularly in areas with scarce water resources.

In addition, based on the available information and participation by federal, state, and municipal governments and operating agencies, authorities will develop general government diagnostic assessments for identifying the most serious problems. These assessments will help to support the development and promotion of the establishment and development of rainfall drainage projects, which will contain the most relevant objectives, policies, strategies, lines of action, construction works and actions, and the necessary economic resources and potential financing sources. The purpose of these efforts is to diminish flooding risks in urban areas, and they will involve local regulation of sustainable rainwater drainage.

2.1.8 To undertake environmental water restoration measures in high-priority watersheds

Actions will be taken to restore the mid-level and high sections of watersheds, in hydrological and environmental terms. Soil and water conservation practices will be implemented to diminish runoff, erosion, risks of landslides and flooding, and their impacts on the lower sections of the watersheds.

Watersheds experiencing a process of degradation will be diagnostically assessed, and hydrological and environmental restoration work will be carried out, to sustain their productivity and diminish the washout of sediments. The goal is to constitute a water and soil conservation service.

Attending to watersheds in a comprehensive manner involves the efficient handling of surface water runoff and serious flooding generated during the rainy season. These actions contribute to gradually decreasing the washout of sediments to lower parts of the watersheds and the impact from accumulated sludge in reservoirs and other water infrastructure, and the problems caused by flooding in communities located in the lower areas.

2.1.9 To establish systems of co-responsibility with local authorities in order to keep riverbanks and water bodies clean and orderly

Systems for inspection, monitoring and control of federal zones will be strengthened along river waterways and water body reservoirs, to prevent human settlements, discharges of wastewater, and dumping of trash in these areas. Agreements will be established with state and municipal governments for safeguarding federal zones and waterways in urban areas, and for modifying ownership of some federal zones

on the perimeter of their populations, shifting the responsibility for monitoring these areas to state and municipal governments.

Actions will be taken to clean up, and when applicable, shut down garbage dump sites in federal zones along rivers and reservoirs of water bodies, as well as in areas where trash impacts water quality or restricts water flow. In addition, awareness-raising campaigns will be conducted and social participation will be encouraged in the tasks of maintaining clean and orderly riverbanks, streambeds, ravines, water bodies and protective zones around water infrastructure works.

2.2.1 To increase the participation and co-responsibility of states and municipalities in terms of taking measures to adapt to climate change or climate variability

In the framework of the Climate Change National Strategy and Law, and state laws when applicable, authorities will encourage coordination among the federal, state, and municipal governments in carrying out joint adaptation actions, with the aim of becoming better prepared for the adverse effects of hydrometeorological hazards.

Specifically, maps will be developed to indicate risks for impacts from climate change that may affect water quality in high-priority water bodies, based on information generated by the National Water Quality Measurement Network (Renameca). Authorities will also develop climate change scenarios in terms of precipitation and temperatures, analysis of vulnerability, adaptation plans for high-priority watersheds, and climate change impact studies in terms of the availability of water resources, as well as other tools.

2.2.2 To create or strengthen funds for adaptation to climate change and to maintain and rehabilitate water infrastructure

Since it is impossible to precisely predict the degree of climate change in the future or the magnitude of its effects in Mexico, authorities will establish funds for adopting and implementing adaptation measures designed for a better response from the water sector to the effects of climate change and for taking the necessary actions in a timely and effective manner. Examples are the development of infrastructure for water provision, drought management and flood protection.

In addition, a fund will be created for specifically attending to the needs for maintenance and rehabilitation of water infrastructure with high levels of vulnerability to the effects of climate change or climate variability.

2.2.3 To increase information exchange with national and international institutions

Evaluating the effects of climate change or climate variability on water resource management is a challenge currently facing all countries. Along these lines, actions will be implemented to increase information exchange and results, in relation to water and climate, with national and international entities, to allow for establishing strategies with shared benefits in facing the potential effects from this phenomenon in the best conditions possible.

3.1.1 To increase drinking water and sanitation coverage in urban and rural zones, giving priority to the most vulnerable population

Efforts will be prioritized for the construction of infrastructure in municipalities with greater deficiencies in available services and in poor communities.

Drinking water and sanitation systems will be expanded in urban and peri-urban zones, and alternative technologies will be used in rural zones, where it is impractical to offer services through conventional systems based on networks for conducting, distribution and removal through pipelines.

Even though coverage for these services already exceeds 90 percent, much greater efforts and the resolution of more difficult problems will be necessary for each percentage-point increase in coverage. Therefore, the strategy is not only to build infrastructure, but also to carry out the following actions: i) Plan urban development in accordance with water availability and better management of the water supply, under the premise of a sustainable supply; ii) Work toward transforming drinking water and sanitation services into a high-priority issue within municipal and state responsibilities; iii) Achieve co-responsibility among the three tiers of government and society; iv) Diversify the sources of financing required in the sector; and v) Consolidate social participation in the development of new infrastructure and its operation and maintenance in rural settings.

The programs created to carry out these actions will include technological alternatives and innovations that permit access to water on the basis of sustainability criteria, and without regard for gender, ethnic group or religion. The implementation of strategies must be accompanied by community participation, in aspects ranging from the designing of infrastructure to its operation and maintenance. Also, women's involvement must be encouraged during all the stages of the projects' cycles.

3.1.2 To supply high-quality water for human consumption and use to prevent waterborne diseases

Actions to monitor and control quality in water supply sources for the population will be strengthened, as will programs to support and promote the production of drinking water and disinfect water supplied. This will include the respective monitoring and control mechanisms, with the appropriate coordination between government and society, to ensure that the water provided to the population for its use and consumption meets quality requirements established by current standards in this area. The goals are to ensure acceptable water quality, and to prevent waterborne diseases.

Special attention will be paid to complying with regulations on disinfecting water supplies, to guaranteeing its bacteriological quality, and to promoting alternative devices for water treatment and disinfection. These efforts will support users, especially in rural, remote localities, in high-risk areas in terms of sanitation, and where supply sources have excessive concentrations of heavy metals.

3.1.3 To take measures to ensure that drinking water, sewerage, and sanitation service fees are defined according to technical, financial and social criteria

With the objective of achieving financial self-sufficiency in the provision of drinking water, sewerage and sanitation services, it is important that realistic rates are charged. To this end, it will be absolutely necessary to reach consensus on rates with the sectors and actors involved.

To this end, local Congresses will be encouraged to approve service charges calculated on the basis of technical, financial and social criteria.

3.1.4 To create infrastructure to utilize new supply sources

With the goal of providing water to the population, infrastructure will be constructed to utilize new water sources, while taking special care in the way in which this resource is exploited and in its quality, on the basis of sustainability criteria.

Efforts will continue to promote sustainable supply projects, in order to replace currently overexploited sources. An example is to utilize surface water through projects such as El Zapotillo, El Realito and Monterrey VI.

3.1.5 To expand and improve the use of alternative water sources, such as desalinization and rainwater harvesting

Given the prevailing conditions characterizing the environment and exploitation in some

areas of the country, the provision of water from conventional and traditional sources is becoming increasingly complicated and costly. Consequently, authorities will promote projects for supplying water through the use of alternative sources, such as the desalinization of ocean water in coastal areas or the use of brackish water from aquifers, with subsequent treatment for the production of drinking water.

Rainwater harvesting will be promoted as an alternative for individuals, using the roofs of their homes, through simple systems for capturing and storing this water for basically domestic use. Where feasible, rainwater harvesting through collective systems will be promoted in both rural and urban settings, primarily for domestic use, for watering yards and for use in bathrooms.

Also, information on appropriate technology will be disseminated with the goal of expanding and improving the use of alternative water sources.

3.2.1 To improve the physical efficiency of water supply

With regard to drinking water, actions will be taken to improve the efficiency and effectiveness of distribution networks, including adequate control of water pressure and flow, and the replacement of old networks to reduce water loss from leaks. Authorities will also promote the implementation of programs designed to reduce leaks in the hook-ups to homes, as well as to businesses and industries, since this water loss increases the demand.

3.2.2 To improve water metering systems for public, urban, and industrial usage

With an updating of the lists of users and those in operating agencies paying service charges, authorities will promote the installation of meters at hook-ups to homes, and will assist those providing services to measure the use of water between their control points.

3.2.3 To promote and apply low-water-use technologies in public water supply systems, industries and services

Standards will be established for promoting the replacement of high-water-use domestic fixtures and appliances for those that use less water.

These actions will be focused basically on introducing or replacing toilets, showerheads, faucets and washers with models that use less water and less electricity, together with some other devices designed to decrease water consumption.

In the case of industries, authorities will promote actions to incentivize low water-use processes, such as systems for vapor collection or condensation in petrochemical industries, the solidification of wastes in mineral extraction, and dry cooling in power generation equipment, to give some examples.

3.2.4 To improve the technical, commercial, and financial performance of water and sanitation utilities

The technical and administrative capacities of companies and agencies providing water and sanitation services will be strengthened, in terms of planning, operation and maintenance of infrastructure, including support for the installation of meters in the hook-ups to homes.

Efforts will be made to promote actions that contribute to improving pumping systems, through efficient energy use.

In addition, efforts will be made to promote the creation of operating agencies that are decentralized from municipal governments, with their own legal status and assets, as well as the systematic training and certification of competences of administrative and technical personnel.

3.2.5 To support or create metropolitan and inter-municipal organizations for the provision of drinking water, sewerage, and sanitation services

Support will be provided to create metropolitan and inter-municipal entities that can be integrated into local operating entities. These entities will have responsibility for planning, programming, studying, projecting, budgeting, constructing, rehabilitating, expanding, operating, administering, conserving and improving drinking water and sanitation systems, as well as wastewater treatment and re-use, with the aim of providing services in an integral, efficient manner. They will also contribute to better administration and conservation of supply sources, in joint efforts with municipalities and states.

3.3.1 To improve the operation of existing wastewater treatment infrastructure

In order to achieve this objective, efforts will be made to promote, together with states and municipalities, the adequate functioning of existing treatment plants. This will involve the efficient, ongoing operation of these plants, and ensuring that industries treat their wastewater.

It will also be necessary for the operation and maintenance costs of sanitation systems to be included in the fees charged, and that existing treatment plants be adapted to achieve the level of quality required for receiving bodies, in accordance with applicable standards or the particular discharge conditions established. Special attention will be given to cases in which treatment infrastructure is not complete, or some technical or financial situation is present.

3.3.2 To construct new wastewater treatment and drainage infrastructure and to promote alternative sanitation systems in rural communities

Wastewater treatment plants and drainage will be constructed with an integral watershed and aquifer perspective. A strong impetus will be given to the reuse of treated wastewater, particularly for agricultural irrigation, parks and yards, and industrial processes.

Inhabitants of the rural areas of our country experience a higher rate of marginalization and poverty due to their geographic isolation, and this translates into severe lags in services provided, as in the case of basic sanitation.

Actions and investments in alternative sanitation will be carried out by the three tiers of government, in accordance with the geographic, cultural and social characteristics in each region, primarily through the use of low-cost technologies that are easy to use.

3.3.3 To promote the use and management of alternative energy sources for self-consumption in wastewater treatment processes

Efforts will be made to promote electricity generation for self-consumption based on the biogas generated in municipal wastewater treatment plants with a capacity above 2 m^3/s. This will contribute to reducing greenhouse effect gas emissions and to improving the operation of the treatment plants.

Although biogas technology has been able to be utilized since the end of the last century, this practice is just beginning in our country, with some specific cases such as the treatment plants in Guadalajara (El Ahogado and Agua Prieta) and in Atotonilco de Tula, which will be treating a significant portion of the wastewater generated in the Mexico City metropolitan area.

Efforts will also be made to promote the use and handling of alternative energy sources in wastewater treatment processes, with the aim of reducing greenhouse effect gases.

3.4.1 To implement productive projects using appropriate irrigation technologies in deprived communities, in order to raise income, provide employment, and produce food

Actions will be taken in coordination with the corresponding government offices in order to

support the inhabitants of the most deprived zones in developing and implementing projects by appropriating irrigation technologies not only for self-consumption but also for creating jobs and making it more likely inhabitants will be able to remain in their communities of origin.

3.4.2 To encourage the participation of indigenous communities in managing water resources for their sustainable development

Reinforce communication and training in indigenous communities and coordination with the corresponding government offices in order to achieve sustainable water management.

3.4.3 To disseminate appropriate water supply technology, including rainwater and fog harvesting, cisterns, and pumping, filtering, and disinfection equipment

Easy-to-understand didactic material will be prepared to explain the different appropriate technologies available for providing water to communities and families, including the utilization of rainwater and fog harvesting, and elements of storage and pumping devices, filtration and disinfection. The goal is for each community to eventually be able to build the most appropriate system for its own specific characteristics. This material should be accompanied by information on programs for providing assistance in the construction of these systems or potential sources of support from the federal government.

In addition, mechanisms for coordination with other sectors should be established so that information can be prepared on the benefits for the population's health from using this type of technology.

3.4.4 To disseminate the use of appropriate technology for sanitation and the construction of ecological toilets and laundry sinks, biodigesters, biofilters, wetlands, etc.

Easy-to-understand didactic material will be prepared to explain the different appropriate technologies available for basic sanitation in communities and families, including the construction of ecological toilets and washing facilities, biodigesters, biofilters and wetlands. The goal is for each community to eventually be able to build, operate and maintain the most appropriate system for its own specific characteristics. This material should be accompanied by information regarding programs for providing assistance in the construction of these systems or potential sources of support from the federal government.

In addition, mechanisms for coordination with other sectors should be established so that information can be prepared on the benefits for the population's health from using this type of technology.

3.5.1 To promote coordination instruments for allowing the regulation of drinking water, sewerage, and sanitation services

With regard to the Constitutional attributions granted to municipalities in Article 115, it is urgently necessary to create a legal framework that offers unified conditions in water access and user protection in the provision of drinking water, sewerage and sanitation services. It is also vital to prevent discrimination due to geographic location, water control issues or excessive costs, as typically experienced by the most vulnerable population. The highest aim of the right to access to quality water for human consumption in equal conditions requires regulations that guarantee minimal, basic conditions throughout national territory.

Regulations for guaranteeing access to water as a human right will be promoted, through the issuance of a law that establishes foundations for the fair and sustainable use of water resources, through participation by different tiers of government, without contravening the attributions granted to municipalities in Article 115 of the Constitution.

The proposal for this legal framework is not only aimed at ensuring a regulatory framework that

offers the population the guarantee of respecting the human right of access to drinking water. It is also necessary that the obligations of users be defined more clearly.

4.1.1 To improve people's understanding of the water cycle and of the occurrence and availability of water

Water is a cross-cutting issue that encompasses many areas of knowledge, and it is therefore vitally important that the population understands the water cycle and the occurrence and availability of water, as well as the necessary processes for treating water and making it suitable for drinking, its importance for life, and its environmental, social and economic aspects, in order to ensure that society is aware, informed and participative.

Specific programs on water culture will be promoted in the country's states, with the aim of disseminating basic knowledge on topics such as preventive sanitary measures, the efficient and rational use of water, and climate change or climate variability, with consideration given to the vital nature of water, its scarcity, and its economic, social and environmental value.

This will contribute to increasing acknowledgement of water's value and to enhancing the culture of efficient water use in agriculture, in public services provided in households, in the treatment of wastewater, in environmental services when applicable, in the payment for services and in the use of national water resources.

4.1.2 To reinforce water culture in the school curriculum

Access to education on water and the environment should be facilitated to make it affordable and so that it will lead to informed, responsible participation by society in water issues, which will then lead to positive water governance.

To this end, strategies, information mechanisms, courses and didactic materials will be designed for the different educational and public modalities. Also, programs, projects and actions in communication and education will be promoted.

Water issues will be included at all levels of basic, middle and higher education. Along these lines, efforts will be made to work with the education sector to incorporate and improve educational contents on water in study programs and textbooks, in line with national objectives. Agreements will be made at the state level to include water-related materials and contents in educational strategies. In addition, materials adapted to the reality in the country's different states and regions will be designed and disseminated.

Efforts will also be made to promote the inclusion of environment and water education in state legislation, with the aim of helping to promote ongoing programs in water and environment education and to achieve improved results in this area.

4.1.3 To set up a teachers' training program on water issues

Because of the importance of education on the topic of water at all educational levels, a professional training program for teachers will be established for all levels, with the purpose of facilitating and stimulating the work of teachers in this vital area.

4.1.4 To train communication professionals in water issues in order to contribute to a more informed and participative society

The role of communication media is very important in enabling society to have access to timely, reliable information. Professionals in these media who address water and environment issues need specialized knowledge and language in order to carry out their work in the best manner possible.

4.1.5 To promote cooperation with businesses and institutions in order to help contribute to water education and culture

Water education and culture require the concerted participation by society and government.

Agreements on collaboration and joint projects will be established with private enterprise, civil society organizations, educational institutions, and at the three tiers of government, in order to create synergies and carry out diverse education programs on water.

The country's companies and industries will be encouraged to assume social and environmental responsibility, in the water consumption patterns they promote in society through their own behavior, and in their production and commercialization styles. To this end, efforts will be made to encourage companies to include information in their industrial products on their water footprint and the corresponding environmental impact.

4.2.1 To promote the continuous education and certification of water stakeholders

To achieve more effective results from human resources, the needs for training and certification will be identified in the water sector's entities. This effort will focus on technical, administrative and legal areas, as well as on organizational development and interdisciplinary work teams, for example, in which the staff, working in the different water sector entities, update and develop new competencies.

In addition, the results of training will be evaluated on an ongoing basis.

4.2.2 To review and propose the reorganization of a professional career service in institutions within the water sector

Specialized human resources are needed to address the sector's priorities, and to this end, a professional career service system that promotes the professionalism of all personnel working in the sector's entities and that prepares new professionals will be promoted.

4.2.3 To support the training of the sector's human resources

In order to enhance the professionalization of personnel in the sector's institutions, new graduate programs will be created or those already existing will be strengthened, making use of available academic entities, as well as financing by Conacyt's Sectoral Fund for water authorities, and other instruments in effect or newly formed, which promote broad visions and the enrichment of the sector's personnel.

In addition, the experience of experts currently filling positions in the sector will be capitalized upon in order to support the development of new professionals.

4.2.4 To implement process improvement programs in water-sector entities

Within two years, water management processes will be improved in order to reduce paperwork and increase the agility of processes of formulating, issuing and enforcing operation rules, agreements between different government tiers, and the allocation of federal resources, for example.

Each of the sector's institutions should ensure that processes are implemented to simplify the administration, modernization and ongoing improvement of processes, placing priority on the use of information and communication technologies.

4.3.1 To strengthen technological research and development and to create links to research centers in order to address priorities in the water sector

More human and financial resources, infrastructure and specialized equipment are needed to increase the capacity of research centers to respond to the increasingly complex and challenging technological research and development required for addressing the sector's priorities. One example is the use of satellite mapping techniques for estimating the runoff flow in urban zones, for optimizing the users' list for all water uses, and for identifying zones at risk for pollution or hydrometeorological hazards.

In addition, mechanisms for creating links and receiving feedback from the scientific and

technological community will be strengthened, for resolving national and regional problems such as the development of methods for removing pollutants such as arsenic, fluorine, etc.; the development of water saving systems in cooling towers used in industrial processes, and the development and testing of low-cost plants for generating drinking water for rural communities.

4.3.2 To establish strategies for disseminating water-related science and technology

New schemes will be promoted for disseminating information regarding scientific and technological projects at research centers that address topics related to water. The aim is to bring the generated knowledge to professionals in the sector and to put new developments and applications into practice. The use of social networks will be promoted as an information channel to the scientific community and society in general. Priority will be given to disseminating results from research on systems for telemetric diffusion by way of cellular diffusion of hydrometric and climatological information and the hydrological performance of dams; the dissemination of measurements of water in primary and secondary networks in Irrigation Districts; and measurements in large pipelines.

4.3.3 To identify technological advances in the international arena and implement those applicable to Mexico

Advances made by other countries in efficient water use will be identified, to then be adapted to the prevailing conditions in our country. Particularly worth mentioning are new technologies for efficient water use in irrigation agriculture, and advances in desalinization; new developments in treating wastewater; techniques for administering water; improving flood forecasts through the adjustment, calibration and application of rainfall-runoff models; the modeling of hydraulic behavior and water quality in surface water bodies; and real-time monitoring systems for climate, water and soil to use in optimizing water use in irrigation.

4.3.4 To promote the development of leaders for the water sector

The preparation of professionals with skills in high-level leadership and decision-making in the area of water resources will be promoted. These professionals are needed to confront the major challenges ahead and to propose the innovative solutions required in various contexts in the water sector. The goal is to have list of professionals who match this profile.

A water sector program will be established to design and implement, in a concrete and realistic way, profound changes in the current model for attracting, developing and managing expert personnel in an integral, sustainable manner. The new model will be particularly oriented toward attracting talented young people with a vision beyond the current administration, and promoting their professional development.

In this way, skilled professionals with abilities in developing substantial programs will be incorporated into the water sector. This will contribute to raising the sector's capacity to implement and the quality of such implementation, it will provide better integration and quality in technical and administration professionals, and it will systematize the necessary replacement of retiring personnel.

4.4.1 To strengthen automated and information providing networks that provide water-related data

Information on water that is used in processes of evaluation, planning and decision-making is comprised primarily of data from documents, measuring and monitoring networks, and networks of informants from numerous entities participating in water management.

It is therefore particularly important to study and conduct an inventory of the availability and nature of the analytical and cartographic data in the sector, to be able to effectively gather and systematize this data for its subsequent use. To this end the National Registry of Statistical and

Geographic Information on Water (Registro Nacional de Información Estadística y Geográfica del Agua) has been developed.

In the case of document-based information, which represents the historic evidence of the activities of institutions participating in the sector, it can be found in the many archives throughout national territory. To ensure its accessibility and conservation, processes for indexing and safeguarding this information will be promoted, in line with national standards and including its digitalization for online consultation.

In addition, there are currently numerous networks for measurement and monitoring in the country, operated by different institutions that generate water-related data that is essential in preventing risks to the population, to water infrastructure and to service coverage. Due to the importance of data on water quantity and quality, efforts will be made to define national standards and protocols for the transmission of this data.

Much of the data used in evaluation, planning and decision-making processes in the water sector comes from many sources and entities within the three tiers of government. This means that compiling this data is increasingly arduous and complex. In order to move more smoothly to its consolidation, mechanisms for collecting data will be unified, and the sector's information providers will be required to deliver and update key pieces of information.

4.4.2 To consolidate water data at national and regional levels under a unified scheme

An Information Government model will be established in order to contribute to extending the usefulness of data generated at regional and national levels for the benefit of diverse sectors of the population, assuring its consistency and frequent updating.

There are sets of useful data for understanding and analyzing the economic, social and environmental contexts of water. Generated by other national and international entities, as well as research centers, they can be accessed to the degree that common elements are maintained. For this reason efforts will be made to bring uniformity to the catalogues currently used to operate computerized systems in the sector.

Due to the diversity of schemes used to manage data on water, an important challenge has been proposed in terms of the accessibility of this data and the ease with which it can be exchanged. With the aim of facilitating the maintenance and updating of consolidated data, and also reducing the costs involved, there are plans to unify the analytical and geographic computerized platforms used to structure and store data regarding risks, quantity, quality, uses and conservation of water.

Lastly, this strategy for consolidating data will be supported by the expansion and strengthening of data storage at national and regional levels, using modern, efficient systems through which data will be structured and consolidated to facilitate the intelligent generation of useful, reliable information for evaluation, planning and decision-making processes in the national water sector.

4.4.3 To systematize and expand the dissemination of information on water to diverse sectors of the population

Currently, there is a wide range of topics, sources and formats available for consulting information on water, in both digital and printed media.

Even so, it is clear that the possibilities for publishing and accessing information have multiplied, given advances in information and communication technologies, and this makes it necessary to review and adjust the current schemes for dissemination of information, in order to assure the organization, appropriate use and understanding of information. Thus, guidelines for digital and printed dissemination of statistical and geographic information on water will be defined and consolidated.

Efforts will be made to involve mass media and to encourage them to participate in the dissemination of information on water management, as a strategic activity.

4.4.4 To strengthen information networks and centers for sharing and disseminating water-related knowledge

Sharing, spreading and disseminating information on complex water issues is vital to enhancing society's awareness regarding the relevance of sustainable water management. It is therefore essential to strengthen networks of experts, specialists, researchers and different water users' groups. It is also important to stimulate the creation and operation of information centers and units with physical and digital collections, at national and regional levels, so that information and knowledge on water resources can be understood and appropriated by Mexican society.

4.4.5 To strengthen and innovate national and regional water-related information systems

It is strategically important for sustainable water management to develop robust, regional and national information systems, associated with information on water. The state is not the only responsible entity in the generation of water information and knowledge. There are other social and economic actors with the capacity to produce this information and knowledge, and it is necessary to incorporate them as strategic actors in water information and/or knowledge production. Consequently, a high priority is to establish a systematic collection of information, together with congruent, uniform databases, and statistical information on this resource.

In this context, the national information system will be strengthened and regional information systems will be created, to ensure timely, reliable and accessible information for facilitating processes of water planning, evaluation and consultation, thereby contributing to integrated water management.

To develop and strengthen information systems and databases, the most advanced information and communication technologies will be used to provide better services to water users.

4.4.6 To establish communication channels among all research entities associated with the water sector at national and international levels

The only way to achieve water goals is to carry out concrete actions that promote the efficient generation, dissemination, appropriation, use and utilization of knowledge. To the degree that effective channels of communication are established among all the entities linked to the water sector, society will be able to gain better and more access to information and the possibility of actively participating in the search for solutions to water problems.

A basic aspect of this process is to promote intergovernmental and intersectoral coordination with national and international research centers. Therefore, a database will be created with the institutions and entities involved in the scientific and technological development associated with the water and environment sector.

4.4.7 To develop, adopt, and apply information and communication technologies for facilitating social participation in the water sector

The knowledge society represents a new paradigm, and therefore the strategic use of media involved in dissemination and communication can help us to learn new forms of managing knowledge regarding water and the environment.

Thus, information and communication technologies will be used to disseminate knowledge regarding water problems and their possible solutions, by sending messages directed at specific audiences. New information technologies and the generalized use of various mobile devices have the potential to stimulate the active participation of society as a whole.

4.4.8 To integrate mass media to water resources management

Efforts will be made to help mass media integrate and participate in the dissemination of information regarding water management, as a strategic activity. Participation by electronic media will facilitate the designing of ongoing campaigns of dissemination, including mechanisms for measuring the real impact on the population, with regard to changes in water-related attitudes and habits.

Working with these media will facilitate the generation of synergies in dissemination of information and knowledge regarding water, through unified communication platforms (social and mobile networks and traditional media such as newspapers, radio, television and film).

5.1.1 To intensify irrigation technification in irrigation districts and units

The technification of irrigation in plots, and in irrigation districts and units, will be intensified by replacing gravity-fed irrigation systems with high or low pressure systems (including sprinkler, center pivot and drip irrigation systems).

By replacing traditional irrigation methods, significant volumes of water will be recuperated. Combined with strict enforcement of legislation, it will be possible to prevent continued extractions and to extract smaller volumes, thereby contributing to re-establishing balance in watersheds and aquifers. It is important to incorporate elements of technical training and assistance and irrigation investments, since these components make it feasible to achieve measurable water savings.

In common agreement with agricultural users, efforts will be made to prioritize efficient irrigation methods and gradually limit wheel move and flooding irrigation systems, particularly in areas of the country with limited water availability.

5.1.2 To technify gravity irrigation in irrigation districts and units

Gravity irrigation will be technified through design, real-time forecasts, measurement, delivery, charging users for water by volume, and when applicable, the grading of land, in order to decrease the irrigation sheet and increase production.

The water saved will remain in the supply sources, to stabilize the water supply and assist in re-establishing balance in watersheds and aquifers.

In common agreement with agricultural users, efforts will be made to prioritize efficient irrigation methods and gradually limit wheel move and flooding irrigation systems, particularly in areas of the country with limited water availability

5.1.3 To upgrade systems for conducting and distributing water in irrigation districts and units

The work of laying casing pipes and pipelines in the system for conducting and distributing water will continue, in order to reduce water loss from infiltration, leading to the extraction of supply sources.

When those granted water allocations for other uses invest in this upgrading process, the water saved will be transferred to public, urban and industrial use.

5.1.4 To rehabilitate, improve, and expand infrastructure for storing and diverting surface water for agriculture

Water infrastructure that has not received proper maintenance will be monitored and rehabilitated, and will thus once again provide the services for which it was constructed. When this infrastructure is being used again, volumes of water will be saved and will thus create a usable supply. Such efforts will be combined with structural actions to increase the water supply by collecting surface water at ideal sites for building new reservoirs, and expanding existing ones by

raising their elevation, while at the same time considering measures to assure the sustainability of the ecological contexts in the selected sites.

Water storage infrastructure will be monitored and assessed in order to verify the true state of its operation. In the case of construction works and installations such as dams and pumping stations that are in need of rehabilitation or conservation work, the necessary actions will be taken to maintain them in suitable conditions for water and structural service and security.

5.1.5 To rehabilitate, improve, and expand the infrastructure for utilizing groundwater in agriculture

Wells located at sites with water availability will be rehabilitated, improved and constructed.

5.1.6 To conserve and maintain technified rainfed hydro-agricultural infrastructure

In coordination with users, actions will be taken to conserve technified rainfed hydro-agricultural infrastructure in the conditions necessary for its operation and service.

In addition actions will be taken in the areas of water management and soil conservation in technified rainfed districts. And, in areas where a process of degradation is underway, hydrological and environmental restoration work will be carried out in order to sustain productivity and diminish the washout of sediment.

5.1.7 To measure water supply and consumption in agriculture

Measurements in dams, canals and wells in irrigation districts will continue to be improved, with special emphasis on the control points for delivering volumes of water to those granted allocations of national water resources.

Water authorities will implement programs for installing meters, with the commitment on the part of irrigation users to provide them with the necessary maintenance and conservation, and to collaboration in measuring water use.

5.1.8 To develop and approve irrigation plans in line with authorized water volumes

The Water Committees (Comités Hidráulicos) in irrigation districts will develop irrigation plans in line with water volumes authorized by the Technical Committee for Water Infrastructure Operations (CTOOH), and water authorities will approve them.

Coordination will be improved with Mexico's Secretariat of Agriculture, Livestock, Rural Development, Fisheries and Food (Sagarpa) in the issuing of single crop planting permits. During agricultural years in which restrictions have been established, efforts will be made to promote the planting of crops that require less water but for which there is a market demand, as well as water recuperation and the utilization of surface- and groundwater in volumes equal to or less than the amount allocated.

5.1.9 To resize irrigation districts according to the actual water supply

In irrigation districts in which the allocated water volumes are greater than the actual water supply, and the land area with irrigation rights is larger than that which can be irrigated with the actual water supply, authorities will implement an integrated modernization and technification program for modifying the irrigation districts and decreasing the water volumes allocated.

5.1.10 To install on-farm drainage in irrigation districts

The installation of parcel drainage will be promoted in irrigation districts in order to control salinity and excess moisture in the soil.

5.2.1 To expand irrigated and technified rainfed land areas in zones with water availability

Irrigation districts will be established and expanded in zones with water availability, by raising

the elevation of storage dams and building new ones, and building irrigation infrastructure.

Irrigation units will be established in zones with water availability by building the necessary construction works for the utilization of surface- and groundwater.

In humid zones, technified rainfed districts will be established and expanded, and supplementary irrigation will also be promoted.

5.2.2 To expand infrastructure for utilizing surface- and groundwater in areas with the potential for activities with high water productivity

The necessary water infrastructure for utilizing water in zones where it is possible to do so will be developed in order to support activities with high water productivity.

5.2.3 To promote the development of hydroelectric potential in areas with water availability

Efforts will be made to take advantage of the potential for developing hydroelectric energy in watersheds with water availability. In addition, authorities will promote the generation of hydroelectric energy in the dams and canals in irrigation districts with appropriate technology for small scale production (micro-generation). Support will be provided for joint programming of hydroelectric development, as well as the definition of operating policies that will facilitate the multiple use of water in watersheds. Authorities will promote electricity-generating projects that are environmentally friendly and that respect the socio-cultural environment in the regions involved.

5.2.4 To organize and provide training for irrigation users

It is necessary to continue to organize and provide training to users in irrigation districts and units, in order to assist them in making progress in the administration and modernization of their production units, with a focus on efficient water use and greater water productivity.

6.1.1 To consolidate international technical cooperation on water issues with countries interested in Mexico's experience

Support for international cooperation will be strengthened through agreements with less developed countries, as well as reciprocal exchange with countries at a similar level of development as Mexico. This will be accomplished through collaborative projects, technical commissions, joint seminars, capacity building, technological transfer, and other modalities of cooperation. Three-way cooperation will be a tactical instrument for supporting and strengthening these types of action.

Various mechanisms will be strengthened with the aim of expanding, improving and disseminating knowledge and information regarding water.

6.1.2 To increase and diversify cooperation with developed countries and international organizations in order to consolidate the knowledge society concept

Mexico will make use of developed countries' knowledge and experience in water management.

Actions and mechanisms for creating links with scientific networks and/or groups, with governments, research institutes and universities in other countries will be enhanced in order to take advantage of their scientific and technological advancements and highly skilled professionals, with the aim of consolidating technological innovation processes in the area of water.

Mexico will make use of the management knowledge possessed by developed countries

that have transboundary watersheds and aquifers, with the aim of improving water management.

Mexico will increase and diversify technical cooperation with international, bilateral and multilateral organizations.

6.1.3 To strengthen international financial assistance for the water sector

Mexico will identify, process, and evaluate offers of assistance from international public and private financial entities, with the objective of facilitating networking and strengthening processes between the sector's capital and institutions. The goal is to strengthen water programs and projects, and to increase and diversify financing sources, in order to carry out priority actions.

6.2.1 To strengthen Mexico's international leadership in discussions on water

Mexico will actively promote and participate in regional forums and discussions in Latin America and the Caribbean, as well as in international discussions related to water issues. It will seek to expand the presence and leadership of Mexican experts in international entities, with a view to constructing an agenda of mutual interest; to participate in processes of deliberation in the global community that are directed at codifying international water policies; to reach agreements on global issues; and to define the global water agenda.

6.2.2 To reinforce relations with leading multilateral and international water-related organizations

Relations with leading international institutions, organizations and networks in the area of water will be strengthened, in order to promote the effectiveness of the sector's memberships for stimulating cooperation, improving channels of information, and conducting technical training and pilot projects, with the objective of measuring impacts and advances in resolving the problems in Mexico's water sector.

6.3.1 To promote scientific, technical, and financial coordination with water-related agencies, academic organizations, and institutions in neighboring countries

With the aim of improving water management in transboundary watersheds, Mexico will promote scientific, technical, and financial coordination with government offices, agencies, research institutes, and those responsible for water management in countries with shared watersheds and aquifers through entities such as the International Boundary and Water Commission (IBWC), the US Environmental Protection Agency (USEPA), the US Bureau of Reclamation (USBR), the Border Environment Cooperation Commission (BECC), the North American Development Bank (NADB), the Belize Meteorological Service, the Guatemalan National Institute of Seismology, Volcanology, Meteorology and Hydrology (INSIVUMEH), among others.

In addition, mechanisms for expanding, improving and disseminating knowledge and information regarding water will be strengthened with countries with shared watersheds and aquifers in order to improve water management based on agreements such as those established with the World Meteorological Organization (WMO) and the Conference of Ibero-American Water Directors (Codia). Efforts will be made to establish networks of experts, institutions, and groups associated with this topic and to strengthen those already existing.

Furthermore, protocols for exchanging information on warning systems will be implemented in coordination with Mexico's National Civil Protection System and the equivalent entities in neighboring countries.

METHODOLOGY FOR INTEGRATING INDICATORS

Objective 1. To strengthen integrated and sustainable water management

Indicator 1. Global Index of Water Sustainability (GIWS)

This index measures how water resources are managed to achieve the sustainability of the country's watersheds and aquifers and to guarantee water security. It considers the amount of water available and the amount of water used by different types of users, as well as water quality and the administration of water resources.

Through a normalization methodology in which all variables have the same weight, values were established for the 2012 baseline and the 2018 target for each of the variables intervening in the index component:

Water Stress Level

Topic	Variable (unit of measurement)	Calculation method	Numerator value (reported 2012)	Denominator value	2012 baseline value	Value of normalized baseline	2018 target	Value of normalized 2018 target
Water Stress Level	Stress level on surface water due to agricultural use (%).	Volume of surface water allocated for agricultural use, in relation to total mean natural surface runoff.	41,172 hm^3/year	378,873 hm^3/year	10.87%	0.944	10.87%	0.944
	Stress level on surface water due to public-urban supply (%).	Volume of surface water allocated for public-urban usage, in relation to total mean natural surface runoff.	4,704 hm^3/year	378,873 hm^3/year	1.24%	0.961	1.24%	0.961
	Stress level on surface water due to uses in self-supplied industry and thermoelectric plants (%).	Volume of surface water allocated for use in thermo-electrical and self-supplied industries, in relation to total mean natural surface runoff.	5,074 hm^3/year	378,873 hm^3/year	1.34%	0.930	1.34%	0.930
	Stress level on groundwater due to agricultural use (%).	Volume of groundwater allocated for agricultural use, in relation to total mean recharging of aquifers.	22,177 hm^3/year	92,030 hm^3/year	24.10%	0.741	24.10%	0.741
	Stress level on groundwater due to public-urban supply (%).	Volume of groundwater allocated for public-urban usage, in relation to total mean recharging of aquifers.	7,277 hm^3/year	92,030 hm^3/year	7.91%	0.900	7.91%	0.900
	Stress level on groundwater due to uses in self-supplied industry and thermoelectric plants (%).	Volume of groundwater allocated for use in thermo-electrical and self-supplied industries, in relation to total mean recharging of aquifers.	2,328 hm^3/year	92,030 hm^3/year	2.53%	0.831	2.53%	0.831

Water Cycle Measurement

Topic	Variable (unit of measurement)	Calculation method	Numerator value (reported 2012)	Denominator value	2012 baseline value	Value of normalized baseline	2018 target	Value of normalized 2018 target
Water Cycle Measurement	Number of hydrometric stations in operation.	Data			717	0.168	1,318	0.311
	Number of climatological stations in operation.	Data			2,983	0.216	3,031	0.224
	Number of sites for surface water quality measurement.	Data			3,646	0.318	3,646	0.318
	Percentage of gauging stations with complete information of surface water quality indicators.	Number of gauging stations with complete information on indicators for surface water quality, in relation to the total number of sites for measuring water quality.	2,539	3,646	69.6 %	0.568	69.6%	0.568

Water Quality

Topic	Variable (unit of measurement)	Calculation method	Numerator value (reported 2012)	Denominator value	2012 baseline value	Value of normalized baseline	2018 target	Value of normalized 2018 target
Water Quality	Percentage of monitoring sites with good and excellent water quality in terms of BOD_5.	Monitoring sites with good and excellent water quality, in terms of BOD_5, in relation to total monitoring sites.	1,729	2,588	66.8%	0.487	66.8%	0.487
	Percentage of monitoring sites with good and excellent water quality in terms of COD.	Monitoring sites with good and excellent water quality, in terms of COD, in relation to total monitoring sites.	1,231	2,601	47.3%	0.391	47.3%	0.391
	Percentage of monitoring sites with good and excellent water quality in terms of TSS.	Monitoring sites with good and excellent water quality, in terms of TSS, in relation to total monitoring sites.	3,141	3,617	86.8%	0.725	86.8%	0.725

Water Management

Topic	Variable (unit of measurement)	Calculation method	Numerator value (reported 2012)	Denominator value	2012 baseline value	Value of normalized baseline	2018 target	Value of normalized 2018 target
Water Management	Number of gauging stations for automatic monitoring of extracted volumes.	Data			0	0	16,169	0.434
	Verification of utilization of national water resources and inherent public goods.	Data			59,400	0.046	380,000	0.380
	Revenue by river basin organization (millions of pesos).	Data			14,170.9	0.139	16,841.4	0.169
	Percentage of aquifers without overexploitation.	Aquifers without overexploitation, in relation to total aquifers.	547	653	83.7%	0.541	83.7%	0.541
	Number of watersheds without deficit.	Data			627	0.414	627	0.414

Objective 2. To increase water security against droughts and floods

Indicator 2. Decrees formulated for reserves of water for environmental use

There is no baseline for this Indicator since it has been recently created. In terms of the 2018 target of having decrees published for a total of 189 watersheds by 2018, this target was defined through the study entitled "Identification of Potential Water Reserves for the Environment in Mexico."

This study identified the country's zones with water availability and which, due to their biological wealth, ecological significance, and lower water stress, have favorable conditions for establishing water reserves that will guarantee water flows for ecological protection in the terms stipulated in the National Water Law (LAN).

Efforts to identify potential water reserves focused on three decision scenarios: linear valuation, decision tree, and weighted valuation. Through the comparison of results and the adjustment of criteria for these three scenarios, 189 management units were identified with favorable characteristics for being decreed as Potential Water Reserves (PWRs) at three levels of feasibility: 19 watersheds with "Very High" feasibility, 54 with "High" feasibility, and 116 with "Medium" feasibility.

These 189 management units are located in 31 (84%) of the country's 37 Hydrological Regions, and in most cases there is an obvious relation with natural protected areas. The Frontera Sur, Península de Baja California and Golfo Norte River Basin Organizations presented the most proposals for reserves, with 56, 25, and 23, respectively. It is worth mentioning that the areas proposed for reserves were consistently located in coastal zones or low lying watersheds, and also inland watersheds, and those with Very High feasibility were concentrated in coastal zones. In terms of the pressure caused by population growth, a decrease of approximately 30 percent by 2030 can be observed in all of the proposed areas.

The 189 PWRs present an available volume of 256 cubic kilometers. A reserve could represent the conservation of 75 percent of the annual mean runoff, or in other words, 192 cubic kilometers. This might seem like a high figure, but the use of the available volume for extraction (64 cubic kilometers) would signify more than double our current use from surface water sources (50 cubic kilometers per year). If this is added the fact that the country is experiencing inefficiencies in water use (50 percent) and that the main challenge in achieving balanced watersheds is to maintain the current water supply and work for a more efficient demand, there is no reason to think of reserves as a restriction to sustainable development, but rather as a foundation for its achievement.

The creation of a system of reserves would establish improved conditions of resilience in watersheds, regions and in the country, and this would represent an important measure in the world's adaptation to climate change. More information on water reserves, the ecological flow, and the Mexican standard on which it is based, can be found in www.reservasdeagua.com.

Indicator 3. Population and productive land protected against floods

The objective of establishing this indicator is to diminish the risks and vulnerability to which the population and its economic activities and ecosystems are subjected, in terms of the occurrence of extreme hydrometeorological hazards and possible effects from climate change, and to thus contribute to the country's sustainable development.

The values established in both components in the 2012 baseline and the 2018 target will be fine-tuned when the National Center for Disaster Prevention (CENAPRED) publishes information regarding the population and land vulnerable to flooding.

Indicator 4. Programs for managing droughts, prepared and approved by river basin organizations

The National Program against Drought has two components:

1. Development of measuring programs for preventing and confronting drought in watersheds and groups of watersheds.

2. Execution of actions for mitigating droughts.

In relation to the first component:

a) Monitoring. Develop ment of indicators for drought (through precipitation and runoff indexes); to be published on CONAGUA's website.

b) Programs of measures for preventing and confronting drought in watersheds and groups of watersheds. For each of the 26 river basin councils, a program of measures for preventing and confronting drought (in watersheds and groups of watersheds) will be developed, together with programs for the largest users of national water resources (urban, agricultural, industrial, etc.). CONAGUA will provide support through its 13 River Basin Organizations. Groups of researchers, universities, and institutions with renowned prestige in the study of droughts will participate in formulating the programs.

No programs were developed in the definition of the 2012 baseline, and therefore 26 programs, one for each river basin organization established in the country, will be prepared during the six-year term.

Objective 3. To improve water supply and access to drinking water, sewerage and sanitation services

Indicator 5. Global Indicator of Access to Basic Water Services (GIAWS)

This index shows the evolution of the Mexican population's access to drinking water and sanitation services as a result of actions taken by the federal government, the states and municipalities. Access to basic water services strengthens the development of capacities in households for contributing to improving their quality of life. All Mexicans can exercise their social rights through access to these services.

This index makes it possible to evaluate the impact from water policies in three dimensions, specifically the coverage, quality and efficiency of drinking water and sanitation services.

Through a normalization methodology, in which all variables have the same weight, the values for the 2012 baseline were established, together with those for the 2018 targets, for each of the variables intervening in the index components:

Access to Drinking Water Services

Topic	Variable (unit of measurement)	Calculation method	Numerator value (reported 2012)	Denominator value	2012 baseline value	Value of normalized baseline	2018 target	Value of normalized 2018 target
Access to Drinking Water Services	Drinking water coverage (%).	Total population with drinking water, in relation to population in private homes.	104.9 million inhabitants	114.0 million inhabitants	92.0%	0.733	94.0%	0.812
	Drinking water coverage in urban areas (%).	Population with drinking water in urban zones, in relation to urban population in private homes.	84.0 million inhabitants	87.9 million inhabitants	95.5%	0.773	96.5%	0.828
	Drinking water coverage in rural areas (%).	Population with drinking water in rural zones, in relation to rural population in private homes.	20.9 million inhabitants	26.1 million inhabitants	80.3%	0.520	85.0%	0.676
	Disinfected water (%).	Disinfected water, in relation to water provided.	322,971 lps	329,841 lps	97.9%	0.672	99.0%	0.843

Access to Sanitation Services

Topic	Variable (unit of measurement)	Calculation method	Numerator value (reported 2012)	Denominator value	2012 baseline value	Value of normalized baseline	2018 target	Value of normalized 2018 target
Access to Sanitation Services	Sanitation coverage (%).	Total population with sanitation, in relation to population in private homes.	103.1 million inhabitants	114.0 million inhabitants	90.5%	0.633	93.0%	0.744
	Sanitation coverage in urban areas (%).	Population with sanitation in urban zones, in relation to urban population in private homes.	84.8 million inhabitants	87.9 million inhabitants	96.5%	0.804	96.6%	0.826
	Sanitation coverage in rural areas (%).	Population with sanitation in rural zones, in relation to rural population in private homes.	18.3 million inhabitants	26.1 million inhabitants	70.1%	0.536	80.0%	0.728
	Efficiency of resulting wastewater collection (%).	Wastewater collected, in relation to wastewater generated.	210,169 lps	229,735 lps	91.5%	0.715	92.5%	0.749
	Coverage of municipal wastewater treatment (%).	Wastewater treated, in relation wastewater collected.	99,750 lps	210,169 lps	47.5%	0.460	63.0%	0.620

Objective 4. To increase the sector's technical, scientific and technological capacities

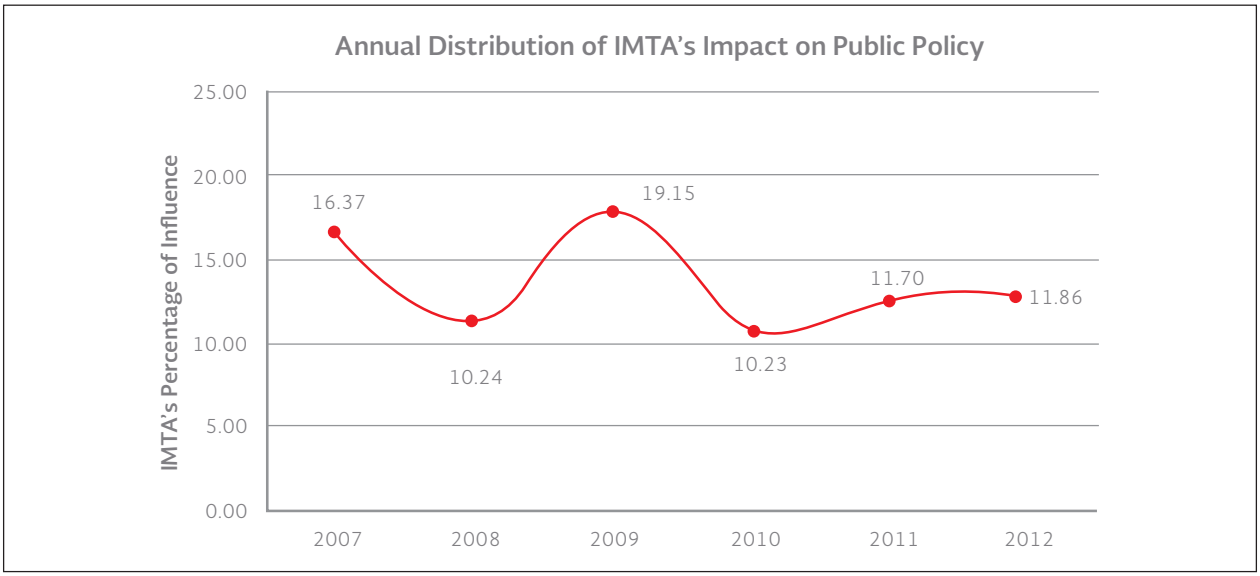
Indicator 6. Influence from the water sector's technological development on decision-making

The following graph presents an estimate of the influence from IMTA research studies during the 2007-2012 period.

The baseline for 2012 that is being proposed is 13.3, which corresponds to the annual average for that period (2007-2012). The standard deviation for these figures is 3.34.

Based on IMTA's collaboration with CONAGUA in formulating the PNH 2014-2018, increasing influence can be expected, through economic, regulatory, and technological instruments that support the implementation of water policies.

Within this context, the target proposed for 2018 is to increase IMTA's influence by 20%.



Objective 5. To ensure sustainable water availability for agricultural irrigation, energy, industry, tourism, and other economic and financial activities

Indicator 7. Water productivity in irrigation districts (kg/m³)

Through this indicator, improvement in water productivity in irrigation districts will be measured. Progress will be expressed in kilograms per cubic meter of water applied. With these actions, efficiency in water management will be improved.

The baseline for this indicator is 1.62 kg/m³ as established for 2012. The 2018 target is 1.87 kg/m³. These two figures were defined through the statistical analysis presented below:

Year	Production (metric tons)	Gross volume [1] (thousands of m³)	Productivity (kg/m³)	Estimated productivity [2] (kg/m³)
1990	31,962,513	29,023,336	1.10	1.04
1991	30,692,858	29,064,387	1.06	1.07
1992	29,235,544	26,553,892	1.10	1.10
1993	33,206,299	31,621,245	1.05	1.12
1994	34,379,146	34,541,416	1.00	1.15
1995	33,284,715	28,738,004	1.16	1.18
1996	33,842,527	28,411,462	1.19	1.20
1997	35,878,319	32,668,076	1.10	1.23
1998	34,832,640	29,684,689	1.17	1.25
1999	32,513,920	24,794,682	1.31	1.28
2000	37,601,290	27,466,293	1.37	1.31
2001	37,869,206	24,807,031	1.53	1.33
2002	36,952,430	26,160,853	1.41	1.36
2003	38,286,267	24,328,696	1.57	1.39
2004	39,870,572	23,702,414	1.68	1.41
2005	41,782,340	28,576,953	1.46	1.44
2006	42,966,082	30,401,301	1.41	1.47
2007	44,399,366	29,160,072	1.52	1.49
2008	45,413,386	31,052,373	1.46	1.52
2009	44,291,566	32,218,638	1.37	1.54
2010	43,371,668	28,033,541	1.55	1.57
2011	42,450,160	34,776,320	1.22	1.60
2012 (baseline)	***47,657,349***	***25,676,323***	***1.86***	***1.62***
2018 (target)				***1.87***

[1] Volume at supply source level

[2] Value estimated through a linear regression

Objective 6. To consolidate Mexico's international involvement in water issues

Indicator 8. International cooperation projects addressed

Mexico aims to be an important actor in the international arena, and will consolidate its leadership in water issues through its strategically coordinated and guided actions. This will be accomplished through the implementation of an international cooperation strategy based on the basic elements of Mexico's foreign policy on development, as an offerer, and on the knowledge society framework, as a recipient.

In establishing the 2012 baseline and the 2018 target for this indicator, it is important to note that all the projects submitted to Conagua annually must be handled properly and according to schedule.

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