Statistics on Water in Mexico, 2010 edition

"10 years of presenting water in figures"

Gobierno Federal

México 2010

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Statistics on Water in Mexico, 2010 edition

National Water Commission of Mexico

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Cover picture: "Dios del Agua" (God of Water) by Yuleida Velásquez, 2006.

Introduction

As part of the National Information System on Water quantity, quality, uses and conservation (SINA in Spanish), Statistics on Water in Mexico is published annually, with information from different areas of the National Water Commission of Mexico (CONAGUA) and other institutions, among them the National Institute of Statistics and Geography (INEGI).

With this document, the CONAGUA is celebrating 10 years of publishing information on all aspects related with water on which hard data is available. This edition presents the reader with the historical series of the information for the longest period possible available on some topics of interest.

The book consists of eight chapters, in addition to a number of annexes which present information at the nationwide, regional and state levels, the geographical and socio-economic context and the occurrence and uses of water. Similarly, it includes information on the index and degree of poverty, precipitation, runoff, aquifer recharge, meteorological phenomena and water quality. On the theme of water infrastructure, it includes storage reservoirs, aqueducts, water treatment plants and wastewater treatment plants, amongst others. In the same way, the tools that exist in Mexico to carry out a better management of water resources are mentioned. Additionally, information is provided on the relationship between water and the themes of health and the environment. An overview is offered of water up to 2030 and the aspects related with water planning to achieve the vision of water for that year. Finally, several indicators are compared which allow us to place the information on Mexico into context with other countries.

The amount of information accumulated is impossible to fit into a 250-page printed document, so a DVD has been prepared to accompany this edition, in which the reader will find a significant quantity of additional information, with a greater degree of disaggregation, and further themes, graphics and maps. The information included in this DVD is in spreadsheets which facilitates its manipulation for the purpose of analysis.

Between the different editions of this book, some variations in the figures presented may be observed, which are the consequence of greater precision in the data studies available at the time of going to press with each edition.

The 2010 edition presents the information as of December 2008; however, some indicators have been included up to the end of 2009, such as the water stored in the country's reservoirs and lakes, which represent the values of the surface water assets available to Mexico.

We are sure that this publication will contribute to enhancing the appreciation of the situation as regards water in Mexico and create awareness on the responsible use and fair payment for water, which are fundamental pillars of a sustainable water policy.

José Luis Luege Tamargo
Director General of the
National Water Commission of Mexico
Mexico City, March 2010

Table of Contents

Chapter 1. Geographical and socio-economic context

In this first chapter, the broad dimensions of Mexico can be appreciated, as well as the differences that exist as regards the socio-economic aspects and in the availability of water between the different regions of the country.

Particularly notable are the marked growth in the population in recent decades and the transformation from a rural to an urban country, concentrated mainly in around thirty population centers. Added to the population growth, information is presented on the economic growth. Both factors are pivotal to understanding the evolution in the demand on water resources.

The information is presented not only by state, but also according to the Hydrological-Administrative Regions (HAR) into which the country has been divided for the purpose of water management, respecting the limits imposed by nature on the hydrologic cycle.

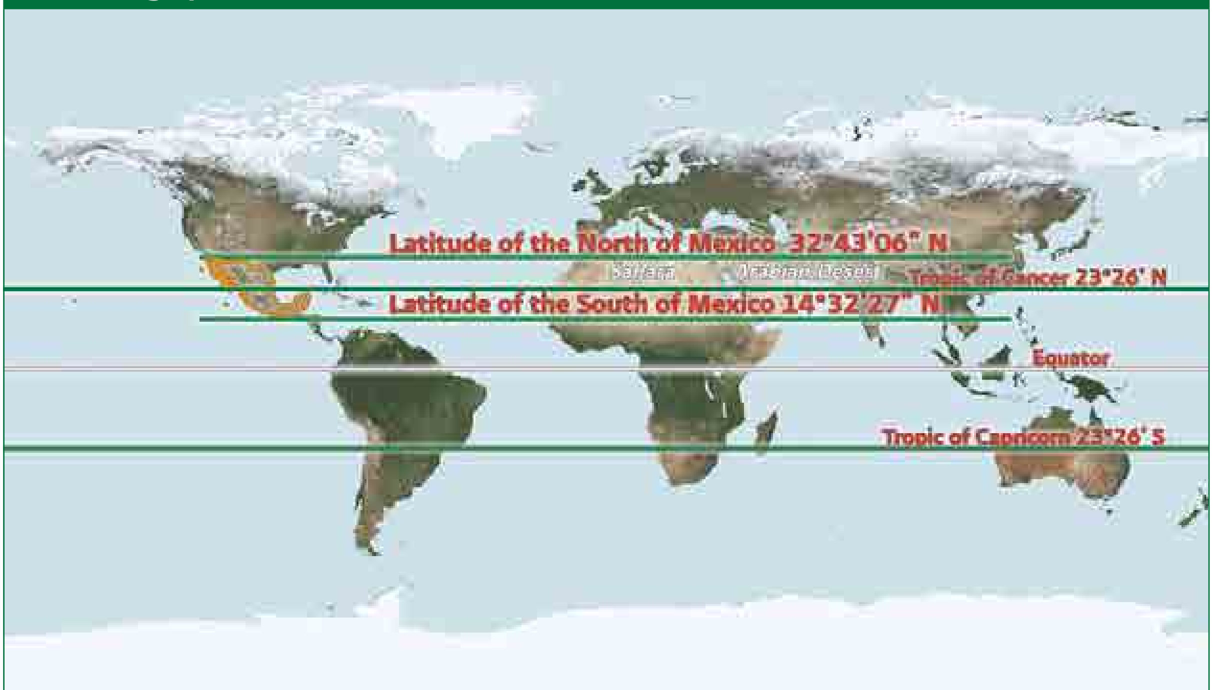
1.1 Geographical and demographic aspects

The United Mexican States extend over a surface area of 1 964 million km^2, of which 1 959 million km^2 corresponds to the mainland area and the remainder to the islands. The Exclusive Economic Zone should also be considered, defined as a strip, 370 km wide on average[1], from the coastal baseline[2], the extension of which is estimated approximately at 3 million km^2.

There are two factors which are decisive for Mexico's climate. As a result of its geographical location, the southern part of Mexico is in the inter-tropical area of the globe, whereas the northern part is located in the temperate area. Mexico is situated at the same latitude as the Sahara and Arabian deserts (see M1.1).

[1] Defined internationally as 200 nautical miles, in the United Nations Convention on the Law of the Sea. 1 nautical mile is the equivalent of 1.852 kilometers.
[2] Defined as the low tide line along the coast.

M1.1 Geographical location of Mexico in the world

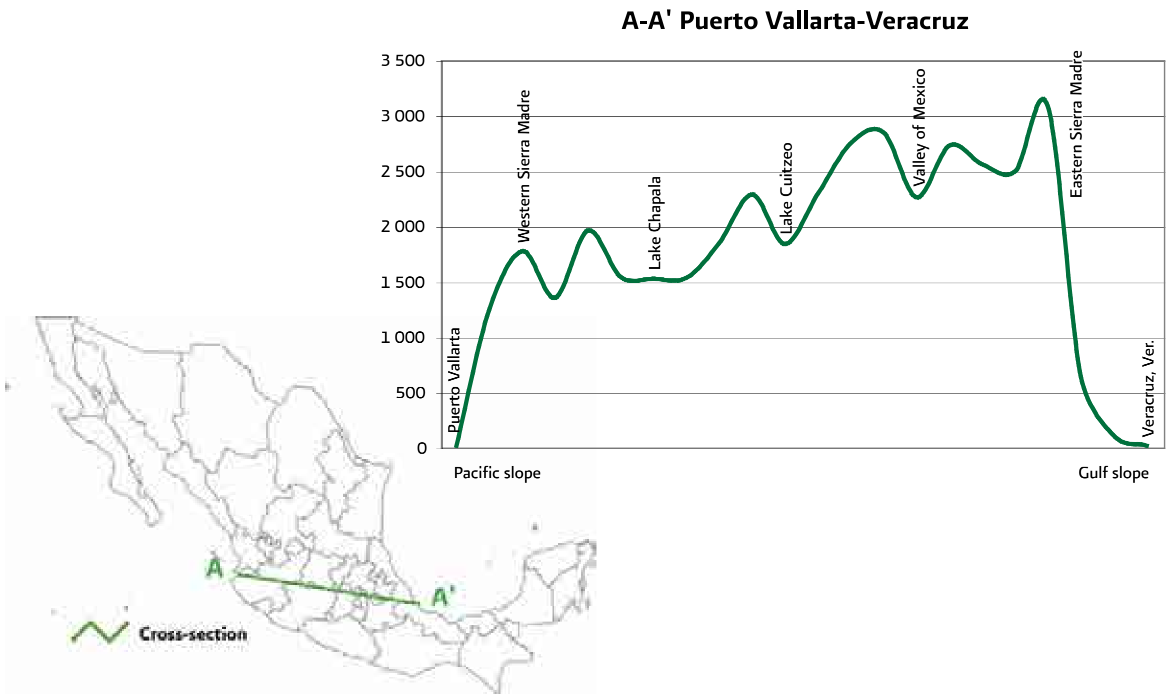


SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
NASA Earth Observatory. Blue Marble: Next Generation. Monthly images: April. Consulted on http://earthobservatory.nasa.gov/Features/BlueMarble/BlueMarble.php (15/07/2009).

The second factor is that, due to the significant geographical accidents which characterize Mexico's relief (see graph G1.1), there is a great variety of climates. The geographical location and the relief have a direct impact on the availability of water resources.

Two thirds of the territory of Mexico is considered arid or semi-arid, with annual precipitation of less than 500 mm, whereas the southeast is humid with average precipitations of over 2 000 mm per year. In the majority of the territory, the rainfall is more intense in the summer, when it is mainly torrential.

G1.1 Profile of the elevation from Puerto Vallarta to Veracruz (meters above sea level)



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
Jarvis A., H.I. Reuter, A. Nelson, E. Guevara, 2008, Hole-filled seamless SRTM data V4, International Center for Tropical Agriculture (CIAT).
Consulted on: http://srtm.csi.cgiar.org (15/07/2009).

T1.1 Location and territorial extension of Mexico

Territorial extension		International borders	
Total surface area:	**1 964 375 km^2**	With the United States of America	3 152 km
Mainland:	1 959 248 km^2	With Guatemala	956 km
Island:	5 127 km^2	With Belize	193 km
Length of the coastline:	**11 122 km**	**Extreme geographical coordinates:**	
Pacific Ocean	**7 828 km**	• **To the North:** 32° 43′ 06″ latitude North. Monument 206, on the border with the United States of America.	
Gulf of Mexico and Caribbean Sea	3 294 km	• **To the South:** 14° 32′ 27″ latitude North. At the mouth of the Suchiate river, at the border with Guatemala.	
		• **To the East:** 86° 42′ 36″ longitude West. Isla Mujeres.	
		• **To the West:** 118° 22′00″ longitude West. Isla Guadalupe.	

SOURCE: INEGI. Yearbook of Statistics by State, 2009 Edition. Mexico, 2009.

Mexico is made up of 31 states and one Federal District (known as the D.F. in Spanish, and which we shall refer to as Mexico City for the purpose of this publication), which can be further broken down into 2 440 municipalities and 16 delegations of Mexico City respectively[3].

From the mid-point of the twentieth century onwards, the population shows a marked tendency towards leaving small rural localities and congregating in urban areas.

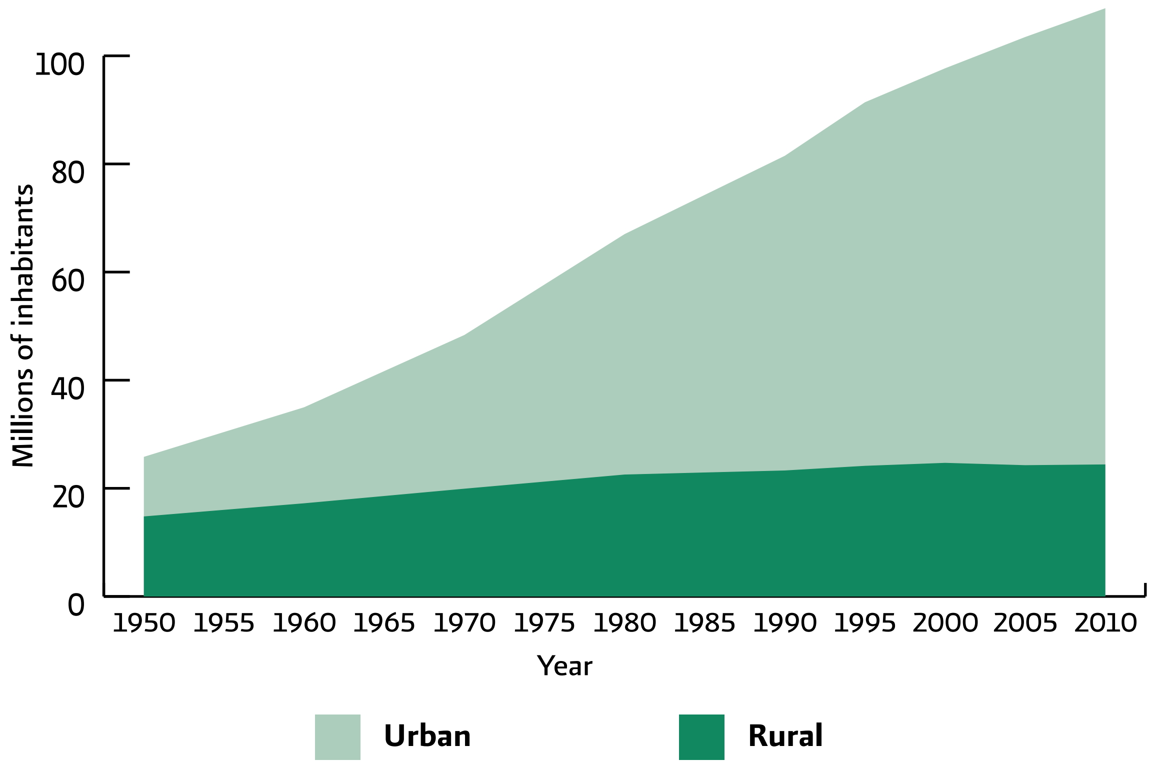
3 INEGI. Catalog of Keys for States, Municipalities and Localities. 2009.

From 1950 to 2005, the country's population quadrupled, and went from being predominantly rural (57.4%) to mainly urban (76.5%), as can be observed in figure G1.2.

According to the results of the II Census of Population and Housing from 2005, in Mexico there are 187 938 inhabited localities, spread out according to its population as shown in table T1.2.

In 2005, 54.1% of the population of Mexico lived in areas over 1 500 meters above sea level, as can be appreciated from figure G1.3.

G1.2 Evolution of Mexico's urban and rural population, from 1950 to 2005, and projection to 2010 (millions of inhabitants)



Year	1950	1955	1960	1965	1970	1975	1980	1985	1990	1995	2000	2005	2010
Urban	11.02	14.39	17.76	23.10	28.43	36.45	44.47	51.34	58.21	67.25	72.98	79.20	84.38
Rural	14.80	16.02	17.23	18.58	19.93	21.24	22.55	22.93	23.30	24.16	24.71	24.28	24.42
TOTAL	25.82	30.41	35.00	41.68	48.36	57.69	67.02	74.27	81.51	91.41	97.69	103.49	108.81

NOTE: For the years from 1950 to 2005, the population was interpolated on December 31 of each year based on the data from the censuses. (Translator's Note: In Mexico there are two types of Census, referred to as "Censo" and "Conteo". Both are carried out every ten years, the "Censo" in years ending with 0 and the "Conteo" in years ending in 5. For the purpose of this publication, they will only be referred to by the English term "Census".)
The rural population is considered as that which lives in localities of less than 2 500 inhabitants, whereas the urban population refers to populations of 2 500 inhabitants or more.
The population projected to 2010 includes the growth rates from CONAPO (the National Population Council).
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
INEGI. General Censuses on Population and Housing.

T1.2 Distribution of the population by size of locality, 2005

Size of the locality (population)	Number of localities	Population (millions of inhabitants)	Percentage of the population
Greater than 500 000	34	29.1	28.20
From 50 000 to 499 999	162	26.5	25.61
From 2 500 to 49 999	2 994	23.4	22.67
From 100 to 2 499	47 233	21.8	21.15
Less than 100	137 515	2.4	2.36
TOTAL	187 938	103.3	100.00

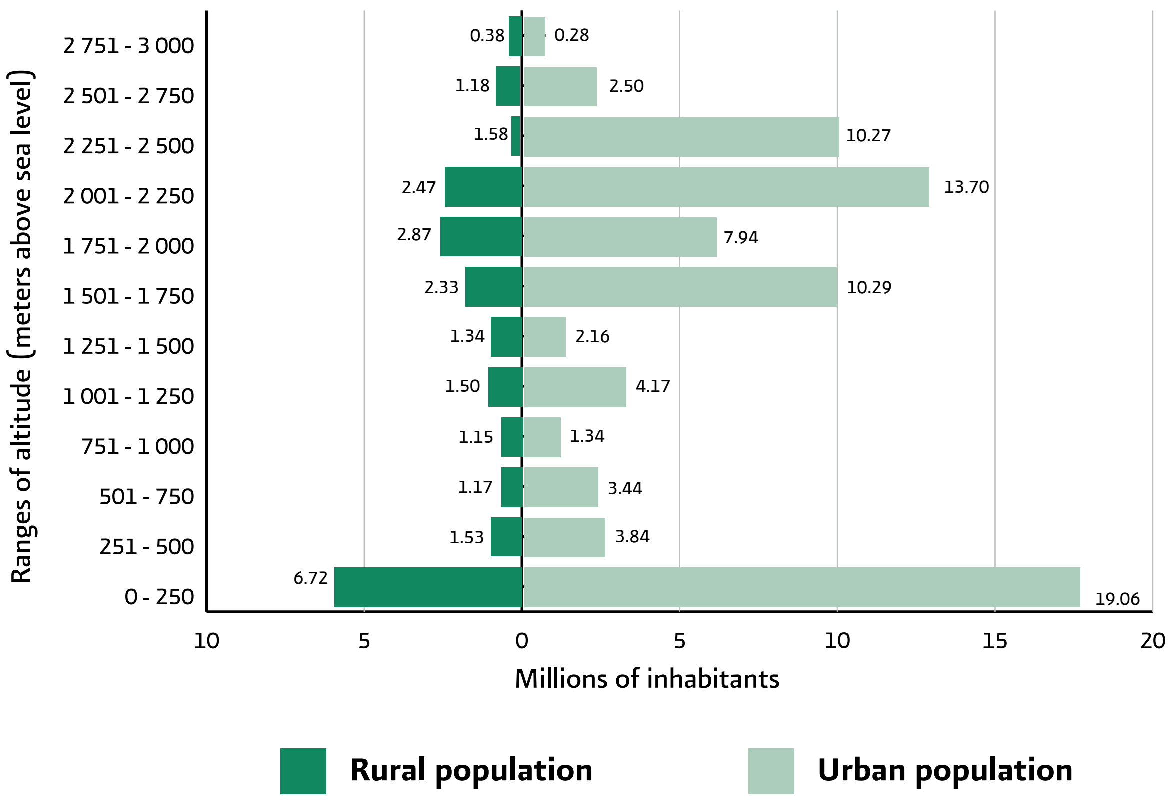
NOTE: Data at the date of the last Census (October 17, 2005).
SOURCE: INEGI. II Census of Population and Housing 2005.

R1.1 Distribution of small localities in the national orography

Of the 187 938 localities identified in the II Census of Population and Housing 2005, 21 220 are small localities of 100 inhabitants or less, with an altitude greater than or equal to 2 000 meters above sea level. These small localities account for 11.3% of the total of localities identified in the Census, and represent a population of almost half a million inhabitants.

In the DVD, you will find the data related to each theme in the corresponding spreadsheets (in Spanish only):
- TM(Poblacion),
- TM(Coberturas),
- TM(Proyeccion_final_año) and,
- TM(Proyeccion_mitad_año).

G1.3 Distribution of the urban and rural population by range of altitude of localities (millions of inhabitants)



NOTE: In 2005 there were 209 small localities with a total population of 48 042 inhabitants, above 3 000 meters of altitude.
SOURCE: INEGI. II Census of Population and Housing 2005.

1.2 Population centers

In 2008 there were 30 population centers in Mexico with more than 500 000 inhabitants, of which 27 were part of a metropolitan zone (MZ) and the remainder were non-suburban municipalities. These centers of population are shown in map M1.2.

It is worth mentioning that in Mexico there are 56 metropolitan zones[4] in which, up to 2005, 57.9 million inhabitants congregated, or 56.0% of the

[4] A metropolitan zone is defined as the sum of two or more municipalities which includes a city of 50 000 or more inhabitants, the urban area, functions and activities of which go beyond the municipal limit into which they were originally confined, incorporating as part of it or of its area of direct influence mainly urban neighboring municipalities, with which they maintain a high degree of socio-economic integration; this definition also includes those municipalities which, due to their particular characteristics, are relevant for urban planning and politics.

M1.2 Population centers with more than 500 000 inhabitants, 2008 projection

NOTE: Includes metropolitan zones and non-suburban municipalities.
MZ: Metropolitan Zone.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
SEDESOL, INEGI and CONAPO. Limits of the Metropolitan Zones in Mexico 2005. Mexico, 2007.
INEGI. II Census of Population and Housing 2005.

total population. The surface area covered by these metropolitan zones is 167 075 km^2, spread out over 345 municipalities[5].

The process of concentration of the population in urban localities has resulted in their accelerated growth, which has implied stronger pressure on the environment and on institutions, derived from the increasing demand for services.

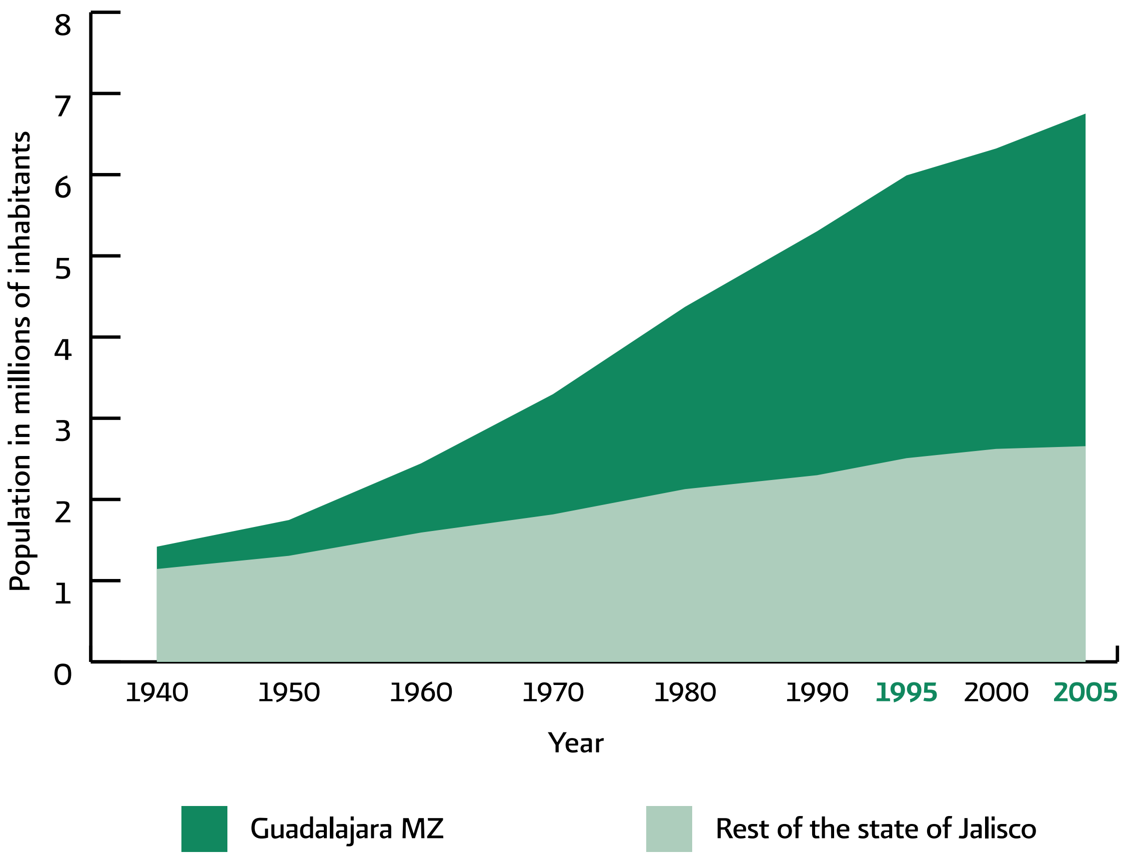
The example of the growth of the metropolitan zone of Guadalajara in the period from 1940 to 2005, compared with the rest of the state of Jalisco, can be appreciated in figure G1.4. The Guadalajara metropolitan zone went from representing 19% of the total population of that state in 1940 to 61% in 2005.

It is estimated that in 2008, in the Valley of Mexico, Guadalajara, Monterrey, Puebla-Tlaxcala and Toluca metropolitan zones, 30.4% of the population of Mexico is congregated, or 32.58 million inhabitants.

In the DVD you will find the data related to this issue in the following spreadsheet:
- TM(Zonas_metropolitanas).

5 Includes the 16 delegations of Mexico City.

G1.4 Population in the state of Jalisco and the Guadalajara metropolitan zone, selected years (millions of inhabitants)



NOTE: The years of the two types of Censuses are shown, "Censos" and "Conteos", the latter shown in green.
SOURCE: For the population values of the Guadalajara MZ, 1940-1980: Arroyo Alejandre, Jesús . 1994. Guadalajara Metropolitan Zone / the transition of the population growth, DemoS, No. 007, January 1994.
For the population values of the Guadalajara metropolitan zone, 1990-2005: SEDESOL, INEGI and CONAPO. Limits of the Metropolitan Zones in Mexico 2005. Mexico, 2007.
For the population values of the state of Jalisco in the period: Jalisco State Population Council. Total population and mean annual growth rate, 1895-2005. 2009.

1.3 Economic indicators

Mexico's Gross Domestic Product (GDP) per capita in 2008 was 10 235 dollars, in a turbulent environment in the international financial markets. The downturn of economic activity in that year affected both emerging and advanced economies. In Mexico, the Bank of Mexico considered in its 2008 annual report that the nation's economy went through a 1.3% GDP expansion that year. The annual inflation was 6.53%, as can be observed in table T1.3.

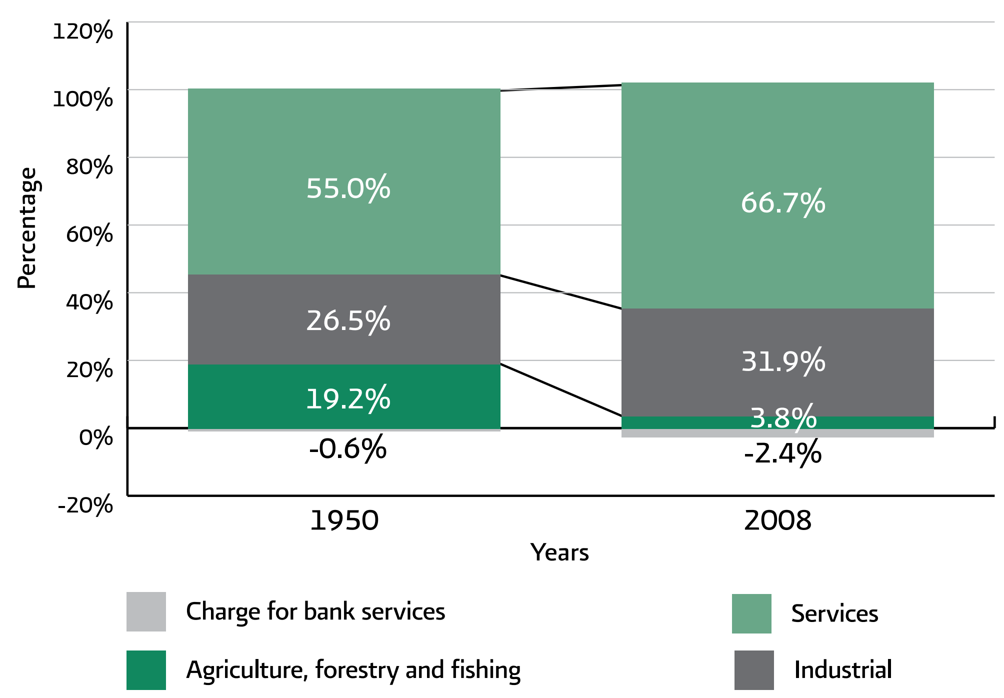
Throughout the twentieth century, the contribution of agricultural, forestry and fishing activities to Mexico's GDP has progressively decreased, whereas industry and services have expanded, as can be observed in figure G1.5.

T1.3 Main economic indicators in Mexico, from 1990 to 2008

Indicators	1990	1995	2000	2005	2008
Gross Domestic Product (GDP) in billions of pesos, (constant prices)	5 246	5 660	7 381	8 110	8 929
GDP per capita in pesos (constant prices)	63 034	62 094	75 346	78 671	83 982
Inflation based on the National Consumer Price Index (December each year)	29.93%	51.97%	8.96%	3.33%	6.53%

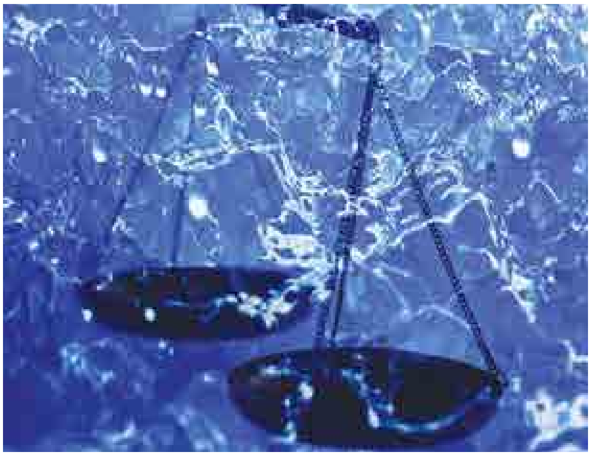
NOTE: Constant baseline 2003 prices.
SOURCE: For the GDP: International Monetary Fund. 2009. World Economic Outlook Database April 2009. Consulted on: http://www.imf.org (26/08/2009).
For the inflation: Bank of Mexico. 2009. Consulted on http://www.banxico.org.mx/PortalesEspecializados/inflacion/inflacion.html#ANUAL (26/08/2009).

G1.5 Change in the composition of the Gross Domestic Product



NOTE: Among the components of the GDP are the charges for bank services, which represent indirectly measured financial intermediation services, shown with minus signs. When they are included, the sum calculated is 100%.
SOURCE: For 1950: ITAM. Historical statistics in Mexico– Gross Domestic Product for Activities 1950-1985, based on Economic Indicators from the Bank of Mexico. Consulted on http://biblioteca.itam.mx/recursos/ehm.html (15/07/2009).
For 2008: INEGI. Bank of Economic Information – Trimestrial 2003 baseline Gross Domestic Product with 2003 prices, absolute values. Consulted on http://dgcnesyp.inegi.org.mx/cgi-win/bdieintsi.exe/NIVA10010000100010#ARBOL (15/07/2009).

1.4 Index and degree of poverty



In conformity with the General Law of Social Development, the definition, identification and measurement of poverty in Mexico is the responsibility of the National Council for the Evaluation of the Social Development Policy (CONEVAL), a body created in 2006.

According to the value of the poverty index, calculated by CONEVAL based on the II Census of Population and Housing 2005, the degree of poverty

T1.4 Municipalities with the highest poverty indices, 2005

Index	Municipality	State	Total population	Rural drinking water coverage	Rural improved sanitation coverage	Altitude (meters above sea level)
1	Cochoapa el Grande	Guerrero	15 572	40.9%	0.5%	1 020
2	Batopilas	Chihuahua	13 298	28.8%	13.8%	570
3	Coicoyán de las Flores	Oaxaca	7 598	68.2%	7.9%	1 920
4	Sitalá	Chiapas	10 246	40.7%	16.4%	1 100
5	Del Nayar	Nayarit	30 551	44.7%	14.3%	420
6	Acatepec	Guerrero	28 525	28.4%	4.7%	1 765
7	Metlatónoc	Guerrero	17 398	64.9%	0.9%	2 020
8	San Juan Petlapa	Oaxaca	2 717	39.2%	0.3%	720
9	José Joaquín de Herrera	Guerrero	14 424	56.6%	16.7%	1 640
10	Chalchihuitán	Chiapas	13 295	32.2%	2.4%	1 400
11	Tehuipango	Veracruz de Ignacio de la Llave	20 406	31.6%	1.3%	2 260
12	Mixtla de Altamirano	Veracruz de Ignacio de la Llave	9 572	26.9%	42.7%	1 650
13	Santiago Amoltepec	Oaxaca	11 113	12.8%	0.2%	1 720
14	San José Tenango	Oaxaca	18 120	8.7%	11.7%	762
15	Santa Lucía Miahuatlán	Oaxaca	3 023	68.1%	1.1%	2 010
16	Copanatoyac	Guerrero	17 337	62.8%	3.2%	1 370
17	San Martín Peras	Oaxaca	12 406	79.0%	6.7%	2 020
18	Santa Cruz Zenzontepec	Oaxaca	16 773	8.1%	3.7%	963
19	Santiago el Pinar	Chiapas	2 854	59.1%	17.5%	1 680
20	Mitontic	Chiapas	9 042	33.2%	26.2%	1 820

NOTE: The altitude is that of the headquarters of the municipal government.
SOURCE: CONEVAL. Poverty Maps in Mexico. 2007.
CONAGUA. Statistics on Water in Mexico 2008-Master Tables of Drinking Water and Sanitation Coverage 1990-2005. 2008.
CONAGUA. Hyper-cubes of municipal information. 2008.

is determined, which can be very low, low, medium, high or very high. Table T1.4 presents the municipalities in Mexico with the highest poverty indexes, starting with the municipality with the highest rating and going down from there.

In the DVD you will find the data related to this issue in the spreadsheet:
- TM(Municipios_rezago_social).

All the municipalities in table T1.4 are classified as having a very high degree of poverty. They present mostly rural populations, and as can be observed, have low rates of drinking water and improved sanitation coverage. On occasions, the headquarters of the municipal government are also at significant altitude, highlighting possibly the difficulty of providing services at great heights.

In 2005, 18.2% of the population of Mexico was facing a situation of food poverty[6], 24.7% was in poverty of basic means[7], whereas 47% was estimated to be in a situation of asset poverty[8]. In the 106 municipalities with the highest poverty ratings, with a population of 1.4 million people, 70% of the inhabitants are facing food poverty and 89% presented asset poverty.

There are other measurements of poverty in Mexico, such as the Human Development Index, developed by the United Nations Development Programme (UNDP). At the municipal level, a calculation is carried out based on the II Census of Population and Housing 2005. Nationwide, the last available calculation corresponds to 2006-2007.

6 Inability to acquire the basic food basket.

7 In addition to food poverty, this indicator establishes the lack of resources to make necessary expenses such as for health and education.

8 In addition to poverty of basic means, this indicator establishes the lack of resources to make necessary expenses on clothes, housing and transport.

1.5 The Hydrological-Administrative Regions for water management

For the purpose of the management and preservation of Mexico's water, from 1997 onwards the country was divided into 13 Hydrological-Administrative Regions. The Hydrological-Administrative Regions are made up by grouping together catchments, considered the basic units for water resources management, but their limits respect the municipalities, so as to facilitate the integration of socio-economic information.

The National Water Commission of Mexico (CONAGUA), an administrative, standard-bearing, technical and consultative agency in charge of water management in the country, carries out its functions through 13 River Basin Organizations (formerly known as Regional Departments), the scope of competence of which are the Hydrological-Administrative Regions, shown in map M1.3.

The municipalities that make up each one of these Hydrological-Administrative Regions are indicated in the River Basin Organizations' Territorial Constituency Agreement, published in the Official Government Gazette on December 12th, 2007.

In the DVD you will find the data related to this issue in the spreadsheet:

- HC(Caracteristicas_municipales).

In addition, the CONAGUA has 20 Local Offices (formerly known as State Departments) in the states in which no River Basin Organization has its headquarters.

M1.3 Hydrological-Administrative Regions and their headquarters

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on the CONAGUA's By-Laws and the CONAGUA's River Basin Organizations' Territorial Constituency Agreement, published in the Official Government Gazette on December 12th, 2007.

1.6 Regional contrast between development and renewable water resources

The aggregate national values, such as population, renewable water resources (see chapter 2) or the Gross Domestic Product (GDP), cover up the great regional diversity in Mexico. The Hydrological-Administrative Regions can thus be classified into broader groups according to their contribution to the nation's GDP.

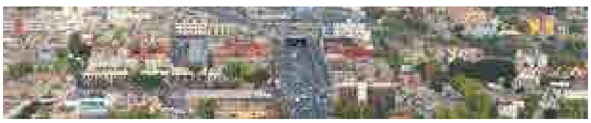
The region XIII, Waters of the Valley of Mexico, presents a relatively large population but a low quantity of renewable water resources, and contributes a large proportion of the nation's GDP. In contrast, other regions present differing characteristics as regards their contribution to the GDP, population and renewable water resources. One example is the region XI Southern Border, with the lowest regional quantity of renewable water resources, a relatively low population and contribution to the GDP. These contrasts are presented in figure T1.5 and map M1.4.

T1.5 Grouping of regions according to their contribution to the nation's GDP

No	HAR	Mainland surface area (km^2)	Renewable water resources (hm^3/year)	Population up to December 2008	Contribution to the nation's GDP (%)	Grouping
1	Baja California Peninsula	145 385	4 626	3 681 032	3.51	Type III (Medium)
2	Northwest	205 218	8 323	2 594 182	2.58	Type III (Medium)
3	Northern Pacific	152 013	25 627	3 960 006	3.12	Type III (Medium)
4	Balsas	119 248	21 680	10 581 511	11.03	Type II (High)
5	Southern Pacific	77 525	32 794	4 122 518	1.83	Type III (Medium)
6	Rio Bravo	379 552	11 937	10 844 542	14.70	Type II (High)
7	Central Basins of the North	202 562	7 884	4 154 483	2.66	Type III (Medium)
8	Lerma-Santiago-Pacific	190 367	34 160	20 802 160	14.53	Type II (High)
9	Northern Gulf	127 166	25 543	4 955 427	6.79	Type II (High)
10	Central Gulf	104 790	95 866	9 616 781	4.78	Type III (Medium)
11	Southern Border	101 231	157 754	6 561 406	4.76	Type III (Medium)
12	Yucatán Peninsula	137 753	29 645	3 983 652	8.45	Type II (High)
13	Waters of the Valley of Mexico	16 438	3 514	21 258 911	21.27	Type I (Very high)
TOTAL		1 959 248	459 351	107 116 608	100.00	

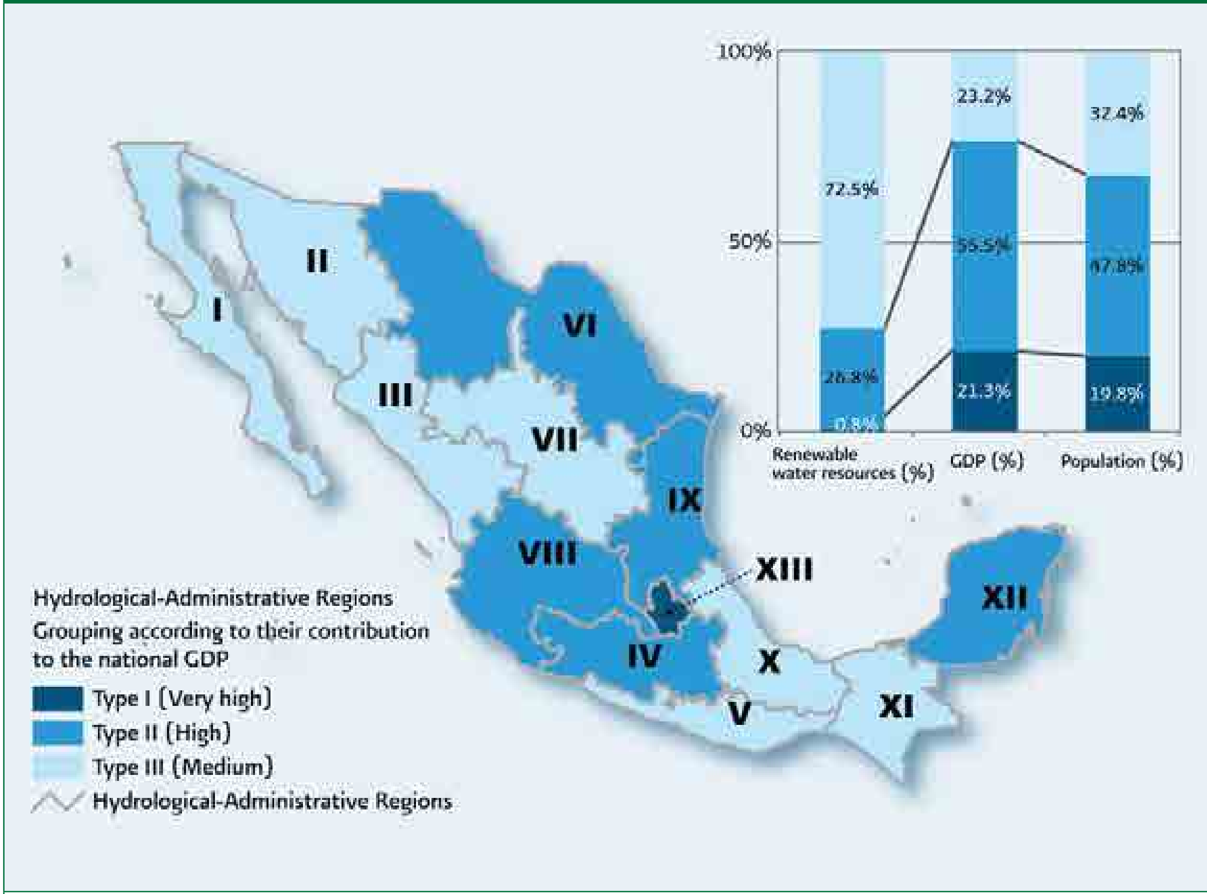
NOTE: The GDP by Hydrological-Administrative Region was calculated based on the Gross Censual Added Value by municipality.
The surface area of the municipality 14125 San Ignacio Cerro Gordo was adjusted to harmonize the total surface areas of the Municipal Geostatistical Framework between versions 3.1 and 3.1.1.
SOURCE: For the mainland surface area: INEGI, Municipal Geostatistical Framework, Version 3.1.1. 2008.
For the calculation of renewable water resources: CONAGUA. Deputy Director General's Office for Planning, produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.
INEGI. Mexico's System of National Accounts. Gross Domestic Product by State, 2003-2007. Baseline of 2003.

Baja California, Mexico



Mexico City

M1.4 Regional contrast between development and the availability of water, 2008



NOTE: The GDP by Hydrological-Administrative Region was calculated based on the Gross Censual Added Value by municipality.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.
INEGI. Economic Censuses 2004.
INEGI. Mexico's System of National Accounts. Gross Domestic Product by State, 2003-2007. Baseline of 2003.

Templo Mayor, Mexico City

Chiapas, Mexico

1.7 Summary of data by Hydrological-Administrative Region and state

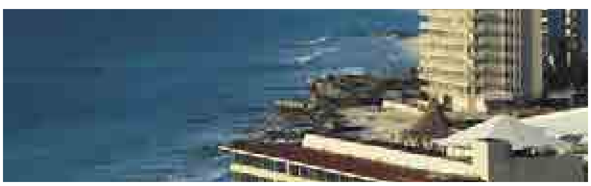
In table T1.6, the main geographical and socio-economic data for each Hydrological-Administrative Region are shown. It should be mentioned that the majority of the country's economic activity is concentrated in the Hydrological-Administrative Regions XIII Waters of the Valley of Mexico, VI Rio Bravo, VIII Lerma-Santiago-Pacific and IV Balsas, which between them generate two thirds of the national Gross Domestic Product (GDP).

As regards the states, the geographical and socio-economic data is presented in table T1.7, including the participation of each of them to the nation's Gross Domestic Product. It is worth mentioning that Mexico City concentrates almost one fifth of the nation's GDP.

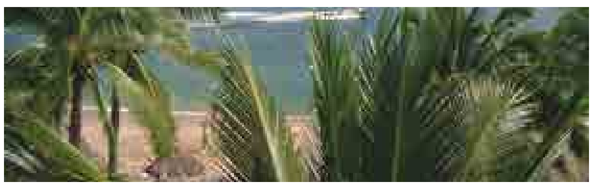
T1.6 Geographical and socio-economic data by Hydrological-Administrative Region

No	Hydrological-Administrative Region	2008 population (inhabitants)	Mainland surface area (km^2)	Population density in 2008 (inhabitants/km^2)	2007 GDP (%)	Municipalities and delegations (number)
1	Baja California Peninsula	3 681 032	145 385	25	3.51	10
2	Northwest	2 594 182	205 218	13	2.58	79
3	Northern Pacific	3 960 006	152 013	26	3.12	51
4	Balsas	10 581 511	119 248	89	11.03	422
5	Central Basins of the North	4 122 518	77 525	53	1.83	363
6	Rio Bravo	10 844 542	379 552	29	14.70	141
7	Cuencas Centrales del Norte	4 154 483	202 562	21	2.66	83
8	Lerma-Santiago-Pacific	20 802 160	190 367	109	14.53	329
9	Northern Gulf	4 955 427	127 166	39	6.79	154
10	Central Gulf	9 616 781	104 790	92	4.78	445
11	Southern Border	6 561 406	101 231	65	4.76	138
12	Yucatán Peninsula	3 983 652	137 753	29	8.45	125
13	Waters of the Valley of Mexico	21 258 911	16 438	1 293	21.27	116
	TOTAL	107 116 608	1 959 248	55	100.00	2 456

NOTE: The population for 2008 was calculated based on projections from CONAPO 2005-2030. The population is considered up to December.
The surface area of the municipality 14125 San Ignacio Cerro Gordo was adjusted to harmonize the total surface areas of the Municipal Geostatistical Framework between versions 3.1 and 3.1.1.
The GDP by Hydrological-Administrative Region was calculated based on the Gross Censual Added Value by municipality.
The municipalities include Tulúm and Quintana Roo, which were recently created.
The region XIII Waters of the Valley of Mexico includes the 16 delegations of Mexico City in the number of municipalities and delegations.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from:
INEGI. General Censuses.
INEGI. Mexico's System of National Accounts. Gross Domestic Product by State, 2003-2007. Baseline of 2003.
INEGI. Municipal Geostatistical Framework, Version 3.1.1. 2008.



Cancun, Mexico



Puerto Vallarta, Mexico

T1.7 Geographical and socio-economic data by state

No	State	Population as of the 2000 Census (inhabitants)	Population as of 2008 (inhabitants)	Mainland surface area (km^2)	Population density in 2008 (inhabitants/ km^2)	2007 GDP (%)	Municipalities or delegations of Mexico City (number)
1	Aguascalientes	944 285	1 133 117	5 618	202	1.1	11
2	Baja California	2 487 367	3 122 570	71 463	44	2.9	5
3	Baja California Sur	424 041	558 463	73 922	8	0.6	5
4	Campeche	690 689	791 368	51 352	15	5.6	11
5	Coahuila de Zaragoza	2 298 070	2 615 413	151 623	17	3.4	38
6	Colima	542 627	597 074	5 625	106	0.5	10
7	Chiapas	3 920 892	4 483 595	73 178	61	1.7	118
8	Chihuahua	3 052 907	3 375 776	247 478	14	3.2	67
9	Durango	1 448 661	1 547 516	123 287	13	1.2	39
10	Guanajuato	4 663 032	5 032 768	30 609	164	3.7	46
11	Guerrero	3 079 649	3 143 093	63 652	49	1.5	81
12	Hidalgo	2 235 591	2 415 384	20 824	116	1.6	84
13	Jalisco	6 322 002	6 988 697	78 598	89	6.3	125
14	Mexico City (Federal District)	8 605 239	8 838 981	1 496	5 909	17.5	16
15	Michoacán de Ocampo	3 985 667	3 970 987	58 614	68	2.4	113
16	Morelos	1 555 296	1 668 304	4 882	342	1.1	33
17	Nayarit	920 185	968 268	27 815	35	0.6	20
18	Nuevo León	3 834 141	4 420 582	64 226	69	7.7	51
19	Oaxaca	3 438 765	3 551 544	93 524	38	1.6	570
20	Puebla	5 076 686	5 623 566	34 283	164	3.4	217
21	Querétaro	1 404 306	1 705 299	11 707	146	1.8	18
22	Quintana Roo	874 963	1 290 575	38 784	33	1.5	9
23	San Luis Potosí	2 299 360	2 479 314	61 112	41	1.8	58
24	Sinaloa	2 536 844	2 650 391	57 377	46	2.0	18
25	Sonora	2 216 969	2 499 085	179 484	14	2.6	72
26	State of Mexico	13 096 686	14 737 822	22 357	659	8.9	125
27	Tabasco	1 891 829	2 045 247	24 743	83	3.0	17
28	Tamaulipas	2 753 222	3 173 982	80 243	40	3.4	43
29	Tlaxcala	962 646	1 127 332	4 006	281	0.5	60
30	Veracruz de Ignacio de la Llave	6 908 975	7 269 905	71 846	101	4.7	212
31	Yucatán	1 658 210	1 910 023	37 409	51	1.4	106
32	Zacatecas	1 353 610	1 380 576	75 313	18	0.8	58
	TOTAL	97 483 412	107 116 608	1 946 449	55	100.00	2 456

NOTE: The population for 2008 was calculated based on projections from CONAPO 2005-2030. The population is considered up to December.
The total does not add up the total surface area of 1 959 248 km^2 since, according to the Municipal Geostatistical Framework Version 3.1.1 (2008), there are still seven unassigned areas of the country, adding up to 12 799 km^2.
The municipalities include Tulúm and Quintana Roo, which were recently created.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: INEGI. General Censuses.
Mexico's System of National Accounts. Gross Domestic Product by State, 2003-2007. Baseline of 2003.
INEGI. Municipal Geostatistical Framework, Version 3.1.1. 2008.

Chapter 2. State of Water Resources

This chapter presents the information available on the quantitative and qualitative aspects of the components of the hydrologic cycle, including data on precipitation, surface runoff, aquifer recharge and the quality of water bodies.

The chapter also includes information on cyclones, droughts, water imports and exports, storage volumes in lakes and overdrafting of aquifers. Data is also provided on the status of measurement networks.

With this information, the reader is provided with a clear oversight on the quantity and quality of water available to each of the regions of Mexico and the problems that affect the availability of water.

2.1 Mexico's catchments and aquifers

In the hydrologic cycle, a significant proportion of the precipitation returns to the atmosphere in the form of evapotranspiration, whereas the rest runs off to the country's rivers and streams, grouped together in catchments, or filters through to the country's aquifers.

According to studies carried out by the CONAGUA, INEGI and INE, 1 471 catchments have been identified in Mexico, which, for the purpose of publishing the availability of surface water, have been grouped and/or divided into watersheds. Up to December 31st, 2009, the availability of water in 722 watersheds had been published, as per the standard NOM-011-CONAGUA-2000. The country's catchments have been organized into 37 hydrological regions that are shown in map M2.1, which are in turn grouped into the 13 Hydrological-Administrative Regions mentioned in the previous chapter.

R2.1 Availability in the context of water management

Mean annual availability of surface water in a watershed: the value resulting from the difference between the mean annual volume that runs off downstream from a watershed and the current annual volume committed downstream.

Mean annual availability of groundwater in a hydrological unit: the mean annual volume of groundwater that can be withdrawn from a hydrological unit for different purposes, in addition to the withdrawal already allocated and the natural discharge committed, without endangering the balance of the ecosystems.

SOURCE: Official Government Gazette. 2002. Official Mexican Standard NOM-011-CNA-2000, Conservation of water resources – which establishes the specifications and the method to determine the mean annual availability of the nation's water. April 17th, 2002.

In the DVD you will find the availability agreements by watershed published to date, in the spreadsheet:

- TM(Cuencas_hidrologicas).

As regards the catchments, please refer to the sheet:

- TM(Cuencas_hidrograficas).

R2.2 Catchments and watersheds

Surface runoff occurs when precipitation flows over the ground surface. A part of this runoff ends up in channels and water bodies, both natural and artificial. The ground surface that contributes surface runoff to any particular point of interest is known as a river basin. River basins can be defined through a consistent set of rules related to the topographic characteristics of the physical medium, in which case they are known as **catchments** (or *cuencas hidrográficas* in Spanish). River basins are also defined based on drainage points such as dams, river junctions or stream gages, with the aim of calculating the availability of water, in which case they are referred to as **watersheds** (or *cuencas hidrológicas* in Spanish).

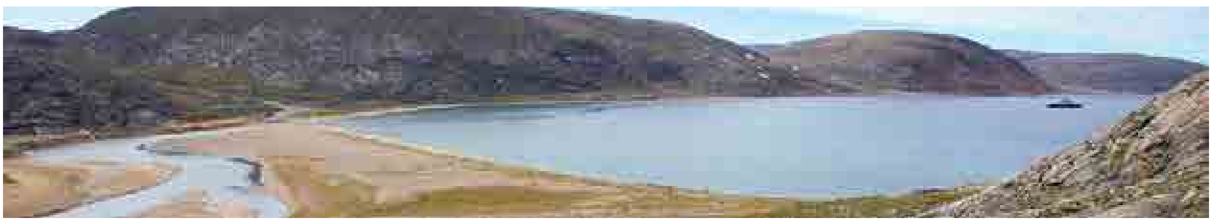
In Mexico, the watersheds defined for the calculation of availability tend to group together small-sized catchments, for example small coastal catchments; and to sub-divide larger-sized catchments.

SOURCE: Maidment, D.R. (editor). Arc Hydro. GIS for Water Resources. ESRI Press, Redlands, 2002.

M2.1 Hydrological Regions

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

1. Baja California Northwest	14. Ameca River	27. North of Veracruz (Tuxpan-Nautla Rivers)
2. Baja California Central-West	15. Jalisco Coast	28. Papaloapan
3. Baja California Southwest	16. Armeria-Coahuayana	29. Coatzacoalcos
4. Baja California Northeast	17. Michoacán Coast	30. Grijalva-Usumacinta
5. Baja California Central-East	18. Balsas	31. Yucatán West
6. Baja California Southeast	19. Greater Guerrero Coast	32. Yucatán North
7. Colorado River	20. Lower Guerrero Coast	33. Yucatán East
8. Sonora North	21. Oaxaca Coast	34. Closed Catchments of the North
9. Sonora South	22. Tehuantepec	35. Mapimi
10. Sinaloa	23. Chiapas Coast	36. Nazas-Aguanaval
11. Presidio-San Pedro	24. Bravo-Conchos	37. El Salado
12. Lerma-Santiago	25. San Fernando-Soto La Marina	
13. Huicicila River	26. Panuco	



As regards groundwater, the country is divided into 653 aquifers, as published in the Official Government Gazette on December 5th, 2001, and the limits of which are presented in map M2.2, according to the coordinates of the simplified polygons presented in the Official Government Gazette on August 13th, 2007, January 3rd, 2008 and August 28th, 2009.

The CONAGUA has 4 080 stations in operation to measure climate and hydrometric variables. The climate stations measure the temperature, precipitation, evaporation, wind speed and direction. The stream gages measure the flow of water in rivers, as well as the withdrawal of water through dam intakes. The hydroclimate stations measure climatic and hydrometric parameters.

Table T2.1 includes 1 064 climate reference stations, employed for the calculation of the normal precipitation. Please refer to Precipitation in this same chapter for more information.

T2.1 Number of climate stations and stream gages in Mexico, 2008

Type of stations	Number of stations
Climate stations	3 324
Stream gages	490
Hydroclimate stations	266
TOTAL	4 080

NOTE: Of the total of 5 368 climate stations, 3 324 are in operation at the time of going to press.
SOURCE: For stream gages and hydroclimate stations: CONAGUA. Deputy Director General's Office for Technical Affairs. Surface Water and River Engineering Department.
For the climate stations: CONAGUA. Coordination of the National Meteorological Service.

M2.2 Limits of the aquifers by Hydrological-Administrative Region

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

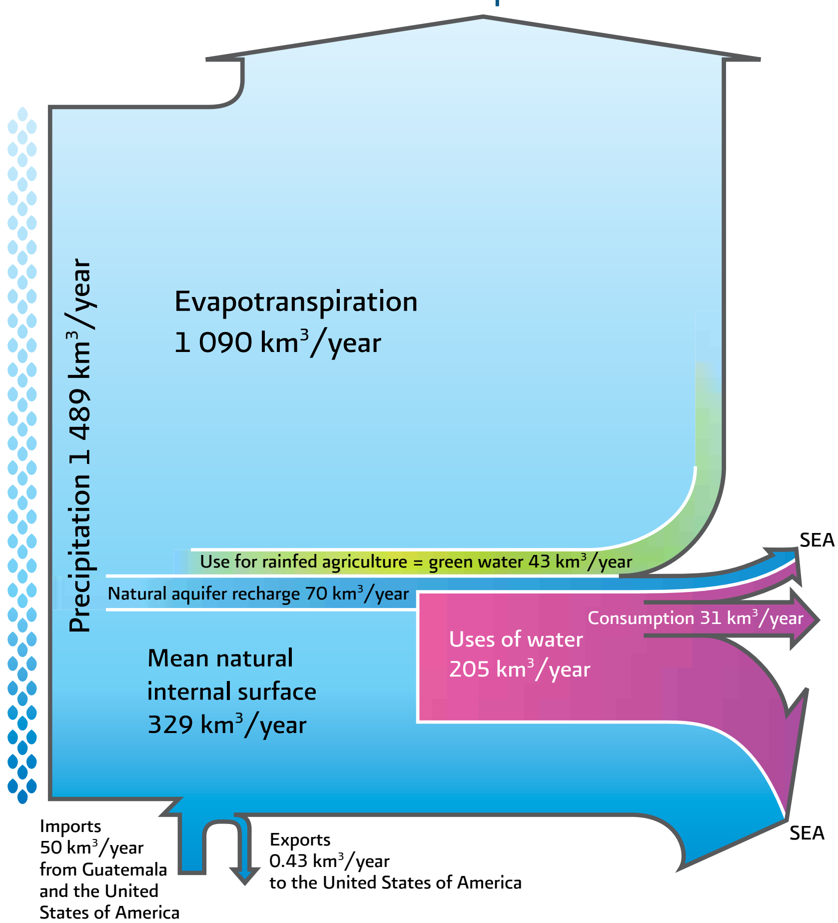
2.2 Renewable water resources

In the hydrologic cycle, during the stage that occurs on the ground surface, water flows through surface currents and filters down, evaporates and is stored in water bodies and aquifers.

Some of the aquifers have renewal periods, defined as the rate of their estimated storage divided by their annual recharge, which are exceptionally long. These aquifers are thus considered as non-renewable water resources.

Every year, Mexico receives around 1 489 billon cubic meters of water in the form of precipitation. Of this water, it is estimated that 73.2% evaporates and returns to the atmosphere, 22.1% runs off into rivers and streams and the remaining 4.7% naturally filters through to the subsoil and recharges the aquifers. Taking into account the water exports and imports with the neighboring countries, as well as the incidental recharge (see glossary), every year the country has 459 billion cubic meters of renewable freshwater. Graph G2.1 shows the components and values that make up the calculation of renewable water resources.

G2.1 Mean annual values of the components of the hydrologic cycle in Mexico (billions of cubic meters, km³)



NOTE: The mean annual precipitation refers to the period 1971-2000. The remaining values are averages reported for 2008.
The natural aquifer recharge reported in the graph, plus 11 km³ of incidental recharge, constitute the total mean recharge.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced with data from:
CONAGUA. Deputy Director General's Office for Technical Affairs.
CONAGUA. Deputy Director General's Office for Water Management.

R2.3 Renewable water resources

The renewable water resources of a region or country refer to the maximum quantity of water that can feasibly be used every year, meaning the quantity of water that is renewed by rainfall and the water that comes from other regions or countries (imports).

Renewable water resources are calculated as the mean natural annual internal surface runoff, plus the total annual recharge of aquifers, plus the water imports from other regions or countries, minus the water exports to other regions or countries. In the case of Mexico, for the mean natural annual internal surface runoff and the aquifer recharge, the mean values established as the result of studies carried out in each region are used.

The quantity of annual renewable water resources divided by the number of inhabitants in the region or country results in the per capita renewable water resources. It is generally considered that a country or region lives in a state of water stress if its renewable water resources are 1 700 m^3/inhabitant/year or less.

SOURCE: Gleick, P. The World's Water 2002-2003. The biennial report on freshwater resources 2002-2003. 2002.

The imports from other countries represent the volume of water generated in the eight watersheds shared with the three countries with which Mexico has borders (United States of America, Guatemala and Belize) and which run off to Mexico. The exports represent the volume of water that Mexico is bound

T2.2 Per capita renewable water resources, by Hydrological-Administrative Region

No	Hydrological-Administrative Region	Renewable water resources (hm^3/year)	Population as of December 2008 (millions of inhabitants)	Per capita renewable water resources 2008 (m^3/inhab/year)	Total mean natural surface runoff[a] (hm^3/year)	Total mean aquifer recharge (hm^3/year)
I	Baja California Peninsula	4 626	3.68	1 257	3 367	1 259
II	Northwest	8 323	2.59	3 208	5 074	3 250
III	Northern Pacific	25 627	3.96	6 471	22 364	3 263
IV	Balsas	21 680	10.58	2 049	17 057	4 623
V	Southern Pacific	32 794	4.12	7 955	30 800	1 994
VI	Rio Bravo	11 937	10.84	1 101	6 857	5 080
VII	Central Basins of the North	7 884	4.15	1 898	5 506	2 378
VIII	Lerma-Santiago-Pacifico	34 160	20.80	1 642	26 431	7 728
IX	Northern Gulf	25 543	4.96	5 155	24 227	1 316
X	Central Gulf	95 866	9.62	9 969	91 606	4 260
XI	Southern Border	157 754	6.56	24 043	139 739	18 015
XII	Yucatán Peninsula	29 645	3.98	7 442	4 329	25 316
XIII	Waters of the Valley of Mexico	3 514	21.26	165	1 174[b]	2 340
	NATIONAL TOTAL	459 351	107.12	4 288	378 530	80 822

NOTE: The quantities expressed in this table are indicative in nature and for planning purposes only; they may not be used by themselves to grant water concessions or determine the feasibility of a project.
The calculations of renewable water resources refer to historical values according to the availability of hydrological studies.
[a] Composed of the mean natural internal surface runoff plus the imports, minus the exports from other countries.
[b] Includes Mexico City's wastewater.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from:
CONAGUA. Deputy Director General's Office for Technical Affairs.
CONAPO. Population Projections in Mexico 2005-2050. Mexico, 2008.

to deliver to the United States of America according to the 1944 "Water Treaty".

It is worth mentioning that renewable water resources should be analyzed from three perspectives:

- **Distribution over time,** since in Mexico there is significant variation in renewable water resources throughout the year and the majority of the rainfall occurs in the summer, whereas the rest of the year is relatively dry.
- **Distribution in space,** since some regions of the country have an abundant precipitation and low population density, whereas in others regions exactly the opposite phenomenon occurs.
- **The area of analysis,** since water problems and the attention paid to them are predominantly local in scale. Indicators calculated at a large scale hide some strong variations which exist throughout the country.

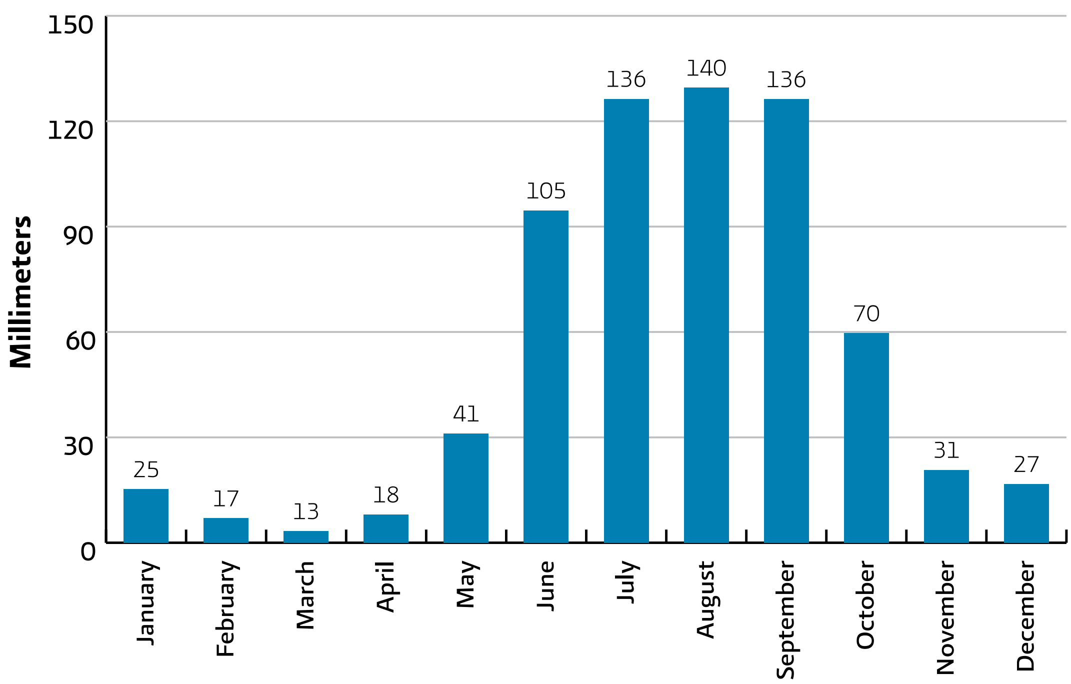
In some Hydrological-Administrative Regions, such as I Baja California Peninsula, XIII Waters of the Valley of Mexico, VI Rio Bravo and VIII Lerma-Santiago-Pacific, the per capita renewable water resources are alarmingly low. In table T2.2 the renewable water for each of the regions of the country may be observed.

Precipitation

The country's normal precipitation in the period from 1971 to 2000 was 760 mm. The "normal" values, according to the World Meteorological Organization, correspond to average measurements calculated for a uniform and relatively long period, which must include at least 30 years of data collection, which is considered as a minimum representative climate period, and which starts on January 1st of a year ending with one, and ends on December 31st of a year ending in zero.

It should be mentioned that the monthly distribution of the precipitation accentuates the problems related with the availability of water resources, since 68% of the normal monthly precipitation falls between the months of June and September, as can be observed in graph G2.2.

G2.2 Normal monthly precipitation in Mexico, in the period 1971-2000 (millimeters)



SOURCE: CONAGUA. Coordination of the National Meteorological Service.

Tables T2.3 and T2.4 present the normal precipitation by Hydrological-Administrative Region and by state, in the period from 1971 to 2000. In the majority of states, the precipitation occurs predominately between June and September, with the exception of Baja California and Baja California Sur, where precipitation mainly takes place in the winter.

T2.3 Normal monthly precipitation by Hydrological-Administrative Region, in the period 1971-2000 (millimeters)

Hydrological-Administrative Region	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
I Baja California Peninsula	23	22	17	4	1	1	9	23	24	12	12	21	169
II Northwest	25	23	13	5	5	18	111	107	56	28	20	33	445
III Northern Pacific	27	12	5	5	8	62	188	193	136	54	29	28	747
IV Balsas	15	5	6	14	52	186	198	192	189	83	16	7	963
V Southern Pacific	9	8	8	20	78	244	205	225	249	111	21	9	1187
VI Rio Bravo	16	12	10	16	31	50	75	81	81	36	15	17	438
VII Central Basins of the North	16	6	5	12	27	59	87	86	72	32	13	15	430
VIII Lerma-Santiago-Pacific	22	6	3	6	23	131	201	185	150	59	18	12	816
IX Northern Gulf	27	17	21	40	76	142	145	130	176	82	30	29	914
X Central Gulf	45	34	30	41	85	226	255	253	281	161	88	61	1558
XI Southern Border	60	52	38	52	135	278	219	266	332	222	114	77	1846
XII Yucatán Peninsula	48	31	29	38	83	172	158	173	212	147	76	52	1218
XIII Waters of the Valley of Mexico	10	8	13	28	56	105	115	104	98	50	13	7	606
TOTAL	**25**	**17**	**13**	**18**	**41**	**105**	**136**	**140**	**136**	**70**	**31**	**27**	**760**

NOTE: The sums may not add up perfectly due to the rounding up or down of the figures.
SOURCE: CONAGUA. Coordination of the National Meteorological Service.

T2.4 Normal monthly precipitation by state, in the period 1971-2000 (millimeters)

State	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Anual
Aguascalientes	18	6	2	7	21	75	129	113	77	36	11	11	508
Baja California	31	34	30	8	2	1	3	8	9	11	14	25	177
Baja California Sur	16	9	4	1	1	1	15	38	38	12	9	18	160
Campeche	49	31	26	33	78	191	175	205	243	167	87	53	1337
Chiapas	41	37	31	52	146	291	230	276	333	191	86	53	1768
Chihuahua	17	13	7	7	12	39	112	108	75	31	16	21	459
Coahuila de Zaragoza	15	11	8	17	34	51	55	62	71	34	14	15	386
Colima	29	3	1	1	14	129	202	213	216	88	28	11	935
Durango	20	7	4	6	13	68	139	139	102	39	18	19	574
Guanajuato	13	6	6	14	36	101	142	121	97	41	10	9	595
Guerrero	14	4	3	7	45	237	234	246	264	119	17	7	1196
Hidalgo	20	17	22	39	67	125	131	119	154	82	32	20	829
Jalisco	23	6	2	5	20	150	222	200	163	65	21	12	889
Mexico City (Federal District)	9	7	12	28	65	156	178	175	146	68	12	7	863
Michoacán de Ocampo	22	4	4	7	30	156	208	197	176	78	18	9	910
Morelos	11	4	5	14	61	209	192	199	185	74	14	6	976
Nayarit	29	9	2	2	10	139	309	317	256	77	24	20	1193
Nuevo León	24	16	18	35	66	79	57	80	118	55	20	20	589
Oaxaca	14	14	13	28	90	225	205	215	225	101	34	19	1183
Puebla	19	17	21	40	84	185	168	161	191	97	36	21	1040
Querétaro	16	10	13	28	54	123	138	120	138	63	20	13	736
Quintana Roo	58	37	33	45	94	172	148	152	203	152	84	61	1237
San Luis Potosí	21	11	13	30	60	112	130	99	127	57	20	20	699
Sinaloa	25	11	4	3	4	41	186	197	138	59	33	28	730
Sonora	24	22	13	5	4	14	104	101	52	27	19	33	419
State of Mexico	13	8	10	22	61	155	176	165	144	67	16	9	847
Tabasco	116	97	58	55	106	243	190	241	331	314	196	148	2095
Tamaulipas	26	15	19	39	77	117	99	106	144	68	23	27	760
Tlaxcala	8	9	16	38	74	130	121	118	108	56	15	7	700
Veracruz de Ignacio de la Llave	54	40	34	43	84	220	254	246	295	176	99	72	1617
Yucatán	40	30	28	37	79	148	147	151	183	121	55	45	1062
Zacatecas	18	6	3	7	21	70	104	100	72	34	13	14	463
NATIONAL	**25**	**17**	**13**	**18**	**41**	**105**	**136**	**140**	**136**	**70**	**31**	**27**	**760**

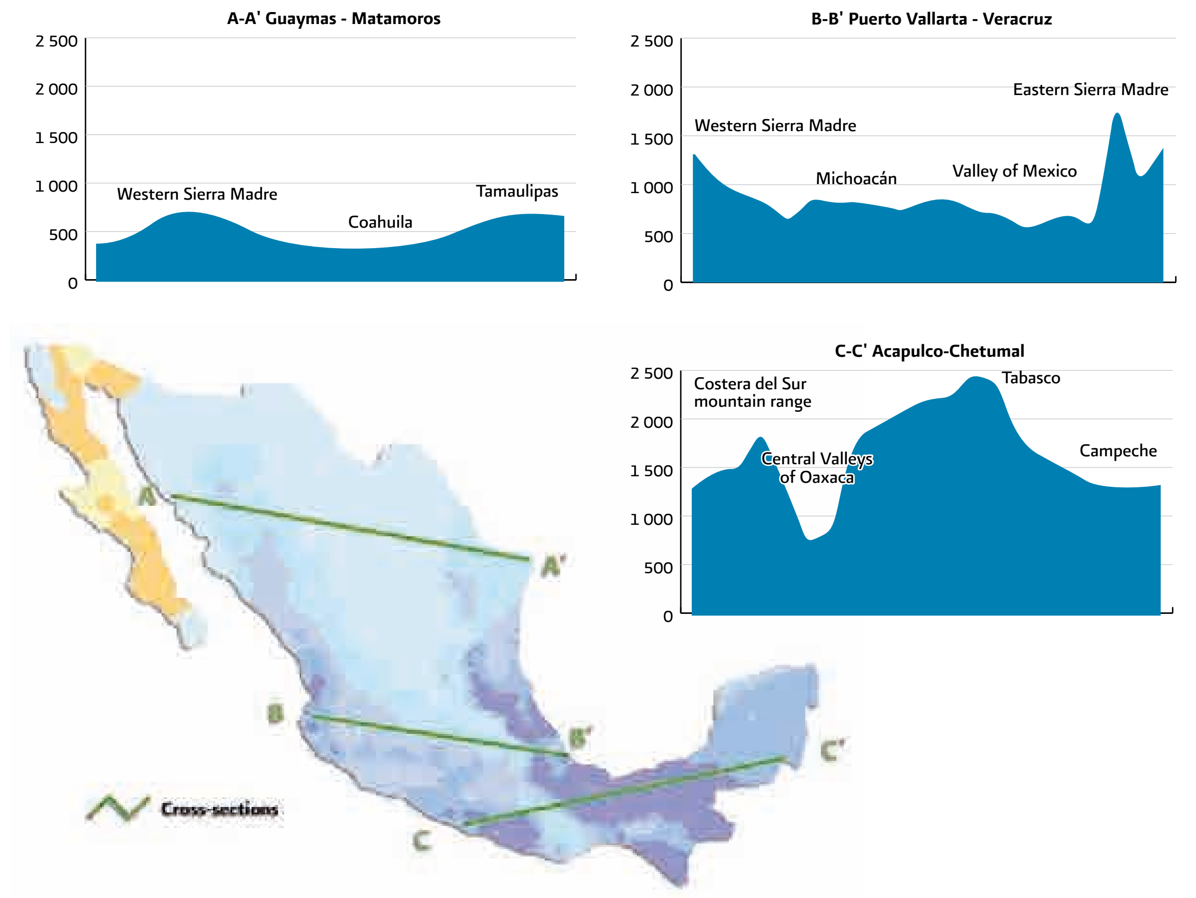
NOTE: The sums may not add up perfectly due to the rounding up or down of the figures.
SOURCE: CONAGUA. Coordination of the National Meteorological Service.

It may be observed, for example, that in Tabasco, the rainiest state, the precipitation during this period was almost 13 times more than in Baja California Sur, the driest state. This regional variation in the normal precipitation is self-evident in graph G2.3 and map M2.3.

In order to illustrate the regional variation in the rainfall, graph G2.3 has thee cross-sections that allow the precipitation profiles to be visualized in Guaymas-Matamoros (A-A'), Puerto Vallarta-Veracruz (B-B') and Acapulco-Chetumal (C-C'). The graphs show in blue the profile of the variation in the precipitation over the period 1971-2000, throughout these cross-sections.

The accumulated precipitation in the Mexican Republic from January 1st to December 31st, 2008 reached a sheet of 869 mm, which was 14% higher than the normal value for the period from 1971 to 2000 (760 mm). The annual series of accumulated precipitation from 2000 to 2008 can be appreciated in graph G2.4.

G2.3 Precipitation profiles (millimeters)

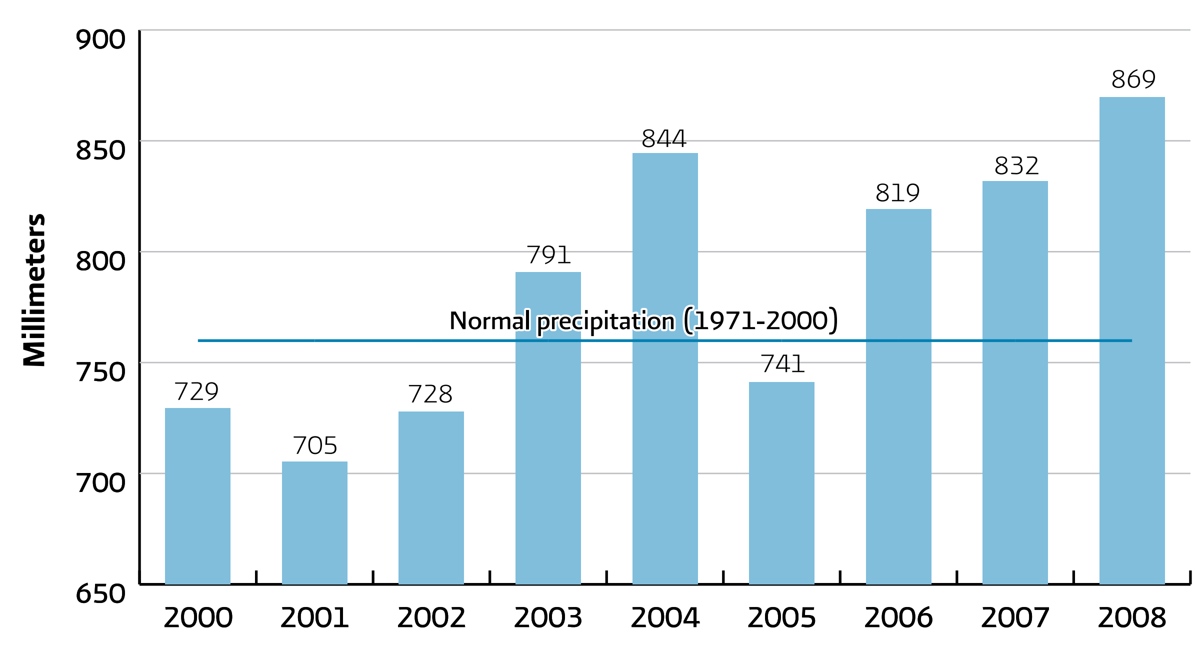


SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Coordination of the National Meteorological Service.

M2.3 Distribution of the annual precipitation in Mexico (1971-2000)

SOURCE: CONAGUA. Coordination of the National Meteorological Service.

G2.4 Annual precipitation, period 2000-2008 (millimeters)



SOURCE: CONAGUA. Coordination of the National Meteorological Service.

2.3 Meteorological phenomena

Tropical cyclones

Tropical cyclones are natural phenomena that generate the majority of the movement of sea humidity to the semi-arid zones of the country. In several regions of Mexico, cyclonic rains represent the majority of the annual precipitation.

Cyclones are classified according to the intensity of the maximum sustained winds. When they are stronger than 119 km/h (33.1 m/s), they are referred to as hurricanes; when they are between 61 km/h (16.9 m/s) and 119 km/h (33.1 m/s), they are called tropical storms; and finally when the winds are less than 61 km/h (16.9 m/s), they are defined as tropical depressions.

R2.4 Hurricanes and the Saffir-Simpson scale

A hurricane is a tropical cyclone in which the maximum sustained winds are equal to or above 119 km/h. The cloudy area covers an extension between 500 and 900 km of diameter, producing intense rains. The eye of the hurricane normally reaches a diameter that varies between 24 and 40 km, however, it can be anything up to 100 km. Hurricanes are classified through the Saffir-Simpson scale:

Category	Maximum wind (km/h)	Storm tide that it normally generates (m)	Characteristics of the possible material damage and floods
H1	119.1 to 154	1.2 to 1.5	Small trees toppled; some flooding on the lowest-lying coastal highways.
H2	154.1 to 178	1.8 to 2.5	Rooftops, doors and windows damaged; trees uprooted.
H3	178.1 to 210	2.5 to 4.0	Cracks in small buildings; flooding in low-lying and flat grounds.
H4	210.1 to 250	4.0 to 5.5	Household roofs come loose; significant erosion on beaches and river and stream channels. Imminent damage to drinking water and sanitation services.
H5	Greater than 250	Greater than 5.5	Very severe and extensive damage to windows and doors. Roofs lifted off many residences and industrial buildings.

SOURCE: CONAGUA. Coordination of the National Meteorological Service. Consulted on: http://www.conagua.gob.mx (15/07/2009).

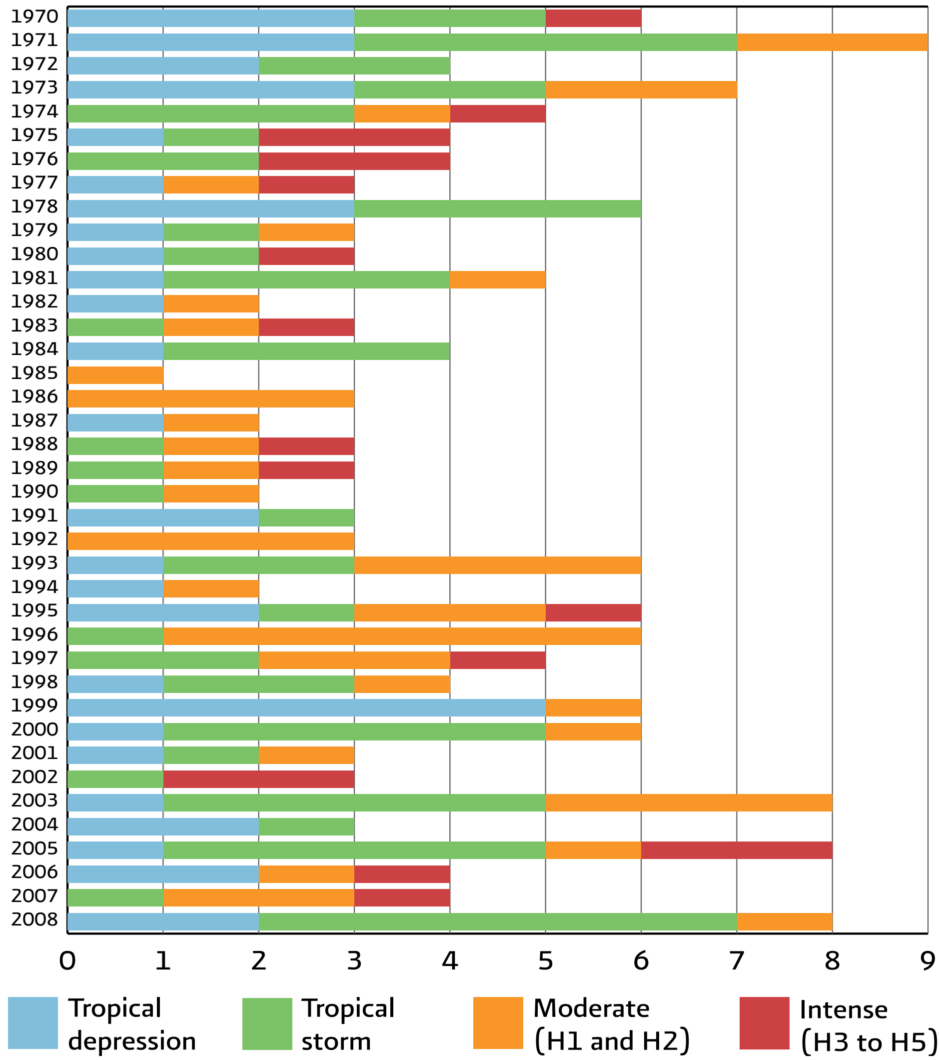
T2.5 Tropical cyclones that hit Mexico between 1970 and 2008

Ocean	Tropical depressions	Tropical storms	Moderate hurricanes (H1 and H2)	Intense hurricanes (H3 to H5)	Total
Atlantic	22	21	10	11	64
Pacific	22	40	36	8	106
TOTAL	44	61	46	19	170

NOTE: The classification of hurricanes uses the initial H followed by the number corresponding to the Saffir-Simpson scale.
SOURCE: CONAGUA. Coordination of the National Meteorological Service.

Between 1970 and 2008, 170 tropical cyclones hit the coasts of Mexico. Table T2.5 presents their occurrence on the Atlantic and Pacific Oceans, from which it can be observed that despite a greater number of cyclones having hit the Pacific, intense hurricanes have been more frequent in the Atlantic.

G2.5 Number and category of cyclones tropical that hit Mexico between 1970 and 2008



SOURCE: CONAGUA. Coordination of the National Meteorological Service.

Map M2.4 and the chronological table T2.6 present the 19 intense hurricanes (category H3, H4 or H5) that occurred in Mexico between 1970 and 2008. It is worth mentioning that there were no intense hurricanes in 2008.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Ciclones).

M2.4 Intense hurricanes (categories H3, H4 and H5), 1970 to 2008

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Coordination of the National Meteorological Service.

T2.6 Intense hurricanes that hit Mexico, according to their date of occurrence, in the period 1970-2008

No	Name	Point where it hit ground [a]	Period (start-finish)	Maximum winds at the point of impact	Category of the impact [b]	Coast
1	**Ella**	Akumal, Q. Roo. (La Pesca, Tamps.)	Sep 8-13, 1970	55 (195)	DT (H3)	Atlantic
2	**Carmen**	Punta Herradura, Q. Roo.	Aug 29-Sep 10 1974	222	H4	Atlantic
3	**Caroline**	La Pesca, Tamps.	Aug 24-Sep 1, 1975	185	H3	Atlantic
4	**Olivia**	Villa Unión, Sin.	Oct 22-25, 1975	185	H3	Pacific
5	**Liza**	La Paz, BCS (Topolobampo, Sin.)	Sep 25-Oct 2, 1976	220 (215)	H4	Pacific
6	**Madeline**	B. Petacalco, Gro.	Sep 28-Oct 8, 1976	230	H4	Pacific
7	**Anita**	La Pesca, Tamps.	Aug 29-Sep 3, 1977	280	H5	Atlantic
8	**Allen**	Río Bravo, Tamps.	Jul 31-Aug 11, 1980	185	H3	Atlantic
9	**Tico**	Caimanero, Sin.	Oct 11-19, 1983	205	H3	Pacific
10	**Gilbert**	Pto. Morelos, Q. Roo. (La Pesca, Tamps.)	Sep 8-20, 1988	287 (215)	H5 (H4)	Atlantic
11	**Kiko**	B. Los Muertos, BCS	Aug 24-29, 1989	195	H3	Pacific
12	**Roxanne**	Tulúm, Q. Roo. (Mtz. de la Torre, Ver.)	Oct 8-20, 1995	185 (45)	H3 (DT)	Atlantic
13	**Pauline**	Puerto Ángel, Oax. (Acapulco, Gro.)	Oct 6-10, 1997	195 (165)	H3 (H2)	Pacific
14	**Isidore**	Telchac Puerto, Yuc.	Sep 14-26, 2002	205	H3	Atlantic
15	**Kenna**	San Blas, Nay.	Oct. 21-25, 2002	230	H4	Pacific
16	**Emily**	20 km al N de Tulúm, Q. Roo. (San Fernando, Tamp.)	Jul 10-21, 2005	215 (205)	H4 (H3)	Atlantic
17	**Wilma**	Cozumel-Playa del Carmen, Q. Roo.	Oct 15-25, 2005	230	H4	Atlantic
18	**Lane**	La Cruz de Elota, Sin.	Sep 13-17, 2006	205	H3	Pacific
19	**Dean**	Puerto Bravo, Q. Roo. (Tecolutla, Ver.)	Aug 13-23, 2007	260 (155)	H5 (H2)	Atlantic

NOTE: [a] When the hurricane hit ground in two places, the second is indicated in brackets.
[b] Categories: TD= Tropical Depression (a tropical cyclone in which the mean maximum surface wind is 62 km/h or less). TS= Tropical Storm (a well-organized tropical cyclone with a warm core in which the mean maximum surface wind is between 63 km/h and 117 km/h). H= Hurricane (a tropical cyclone with a warm core in which the mean maximum surface wind is 118 km/h or more). The number corresponds to the Saffir-Simpson scale.
SOURCE: CONAGUA. Coordination of the National Meteorological Service.
National Weather Service of the United States of America. Consulted on: http://www.nhc.noaa.gov/aboutsshs.shtml (15/06/2009).

Droughts

Every year, two estimations are carried out of droughts in North America, as part of the "North American Drought Monitor" (NADM) project.

For the first estimation, corresponding to the end of the dry season, in May 2008 (see map M2.5), the drought conditions in the north of the states of Coahuila, Nuevo León and Tamaulipas improved from exceptional (D4) and extreme drought (D3) to conditions of severe (D2) and moderate drought (D1), due to the strong rainfall in that region. However, the moderate drought conditions in the majority of the region continued, causing losses to farmers and livestock farmers.

Despite these significant rains, brought about by the passing of cold fronts over northern Mexico, abnormally dry conditions (D0) prevailed over large parts of Sonora, Chihuahua, western Coahuila and northern Durango.

The limited precipitation registered during the months prior to the May 2008 estimation, as well as the high temperatures over the south of Chihuahua, Sinaloa, Zacatecas, Tamaulipas, Jalisco, Colima, Michoacán, State of Mexico and Guerrero, maintained the moderate drought conditions (D1).

M2.5 Drought conditions at the end of the dry season, 2008

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs. Coordination of the National Meteorological Service.
Consulted on http://smn.cna.gob.mx/productos/sequia/ (15/07/2009).

In the west of Mexico, light rainfall was observed, but this was not enough to lighten the prolonged or hydrological drought conditions, both due to the limited quantity of water that remained and the high temperatures (greater than 40°C) witnessed in some areas of Nayarit and Jalisco, as a result of which the extreme drought (D3) extended towards the north, affecting the center and south of Durango. The severe drought (D2) that had been affecting the southeast of Jalisco and the northwest of Michoacán for the two previous months also increased to extreme drought (D3).

A new area of severe drought (D2) located over Michoacán extended towards the south of the state, north of Guerrero and south of the State of Mexico. The Baja California Peninsula maintained the abnormally dry conditions (D0) to severe drought (D2), which had persisted in previous months.

An abnormally dry strip (D0) occurred in the center-south of Mexico, affecting parts of the states of Guanajuato, Querétaro, Hidalgo, Tlaxcala, Puebla, Guerrero and Oaxaca.

Veracruz, Tabasco, Campeche, Quintana Roo, parts of Yucatán and Chiapas presented abnormally dry conditions (D0) to severe drought (D2), despite those states being favored with some rainfall.

In the second estimation, at the end of the rainy season, in the month of November 2008 (see map M2.6), the distribution of the rainfall occurred mainly in the northwest and northeast of the country, as well as in the north and center of the coastal region of the Gulf of Mexico.

The state that received the greatest quantity of precipitation was Baja California with a total of 168.1%. On the other hand, the states that presented precipitation

M2.6 Drought conditions at the end of the rainy season 2008

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs, Coordination of the National Meteorological Service.
Consulted on http://smn.cna.gob.mx/productos/sequia/ (15/07/2009).

below the historical mean were: Mexico City (Federal District), Guanajuato, State of Mexico, Michoacán, Morelos, Querétaro and Tlaxcala.

As regards the drought conditions in Mexico, no significant changes were observed: the north and center of Baja California Peninsula, where the drought persisted with abnormally dry (D0) to severe drought (D2) categories. In the northwest, particularly in the state of Sonora, the abnormally dry conditions (D0) extended despite a normal rain regime over the majority of the state, and a new area also appeared (D0) in the south of the state, which furthermore covered a part of the northwest and north of Sinaloa. Other areas that remained abnormally dry (D0) were over the northeast and southwest of Coahuila.

The drought belt continued in the center of the country, which extended from west to east, affecting the west of Nayarit, coast of Jalisco and Colima, north and center of Michoacán, Guanajuato, State of Mexico, Mexico City, Morelos, Tlaxcala, north and center of Puebla, north of Veracruz and north of Guerrero. In this strip the predominate condition was abnormally dry (D0) with some areas affected by a moderate drought (D1) in parts of Jalisco and Guanajuato; north, center and east of Michoacán; State of Mexico, Tlaxcala, north of Puebla. An expansion of the severe drought conditions (D2) was also registered over the State of Mexico and east of Michoacán.

The center and south of Veracruz, north of Oaxaca, east and south of Chiapas, north and west of Campeche as well as the west of Mérida registered abnormally dry conditions (DO). In Tabasco, the drought conditions intensified from abnormally dry to moderate.

2.4 Surface water

Rivers

Mexico's rivers and streams constitute a hydrographic network of 633 000 kilometers, in which 50 main rivers stand out, through which 87% of the country's surface runoff flows, and whose catchments cover 65% of the country's mainland surface area.

Two thirds of the surface runoff belongs to seven rivers: Grijalva-Usumacinta, Papaloapan, Coatzacoalcos, Balsas, Pánuco, Santiago and Tonalá. The surface area of their watersheds represents 22% of the surface of Mexico. The Balsas and Santiago rivers flow into the Pacific Ocean and the other five flow into the Gulf of Mexico. For the surface area they cover, the catchments of the Rio Grande and Balsas River stand out, as do the Rio Grande and Grijalva-Usumacinta River, for their length. The Lerma, Nazas and Aguanaval are inland rivers.

In tables T2.7, T2.8 and T2.9, the most important data on the country's rivers is presented, according to the water body into which they flow.

In the DVD you will find the data related to this issue in the spreadsheet:
- TM(Rios_principales).

Grijalva River

M2.7 Main rivers with their catchments

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs.

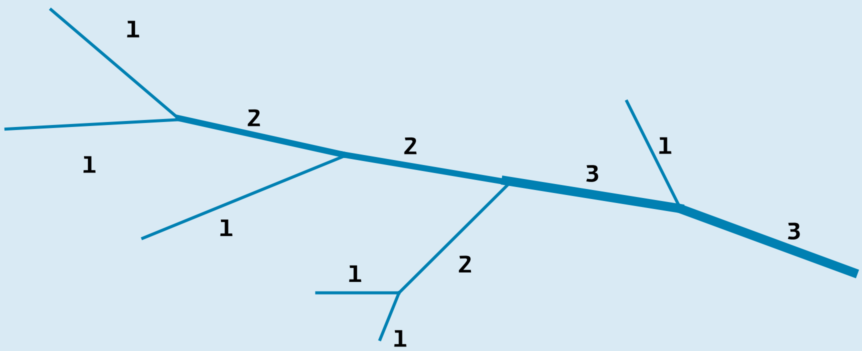
The Tijuana River extends from the Abelardo L. Rodríguez dam to the international border with the United States of America

R2.5 Strahler stream order

The stream order allows rivers to be classified according to their tributaries, describing the complexity of their hydrographic network. The Strahler method is applied for this purpose.

This method considers both perennial and intermittent currents. The smallest tributary currents, which do not in turn have other tributaries, are classified as being first-order. The point where two first-order streams come together is the start of a second-order segment. Third-order segments begin where two second-order streams come together, and so on.

For example, the Amazon, in Brazil, is a twelfth-order river, whereas the Mississippi, in the United States of America, is tenth-order.



SOURCE: Viessman, Warren Jr. and others. Introduction to Hydrology. Harper & Row, New York, 1989.

T2.7 Characteristics of the main rivers that flow into the Pacific Ocean and Gulf of California, ordered by their mean natural runoff

No	River	Hydrological-Administrative Region	Mean natural surface runoff[a] (millions of m³/year)	Catchment area (km²)	Length of the river (km)	Maximal stream order
1	Balsas	IV Balsas	16 587	117 406	770	7
2	Santiago	VIII Lerma-Santiago-Pacific	7 849	76 416	562	7
3	Verde	V South Pacific	5 937	18 812	342	6
4	Ometepec	V South Pacific	5 779	6 922	115	4
5	El Fuerte	III North Pacific	5 176	33 590	540	6
6	Papagayo	V South Pacific	4 237	7 410	140	6
7	San Pedro	III North Pacific	3 417	26 480	255	6
8	Yaqui	II Northwest	3 163	72 540	410	6
9	Culiacán	III North Pacific	3 161	15 731	875	5
10	Suchiate[b,c]	XI Southern Border	2 737	203	75	2
11	Ameca	VIII Lerma-Santiago-Pacific	2 236	12 214	205	5
12	Sinaloa	III North Pacific	2 126	12 260	400	5
13	Armería	VIII Lerma-Santiago-Pacific	2 015	9 795	240	5
14	Coahuayana	VIII Lerma-Santiago-Pacific	1 867	7 114	203	5
15	Colorado[b]	I Baja California Peninsula	1 949	3 840	160	6

T2.7 Characteristics of the main rivers that flow into the Pacific Ocean and Gulf of California, ordered by their mean natural runoff

No	River	Hydrological-Administrative Region	Mean natural surface runoff[a] (millions of m^3/year)	Catchment area (km^2)	Length of the river (km)	Maximal stream order
16	Baluarte	III North Pacific	1 838	5 094	142	5
17	San Lorenzo	III North Pacific	1 680	8 919	315	5
18	Acaponeta	III North Pacific	1 438	5 092	233	5
19	Piaxtla	III North Pacific	1 415	11 473	220	5
20	Presidio	III North Pacific	1 250	6 479	NA	4
21	Mayo	II Northwest	1 232	15 113	386	5
22	Tehuantepec	V South Pacific	950	10 090	240	5
23	Coatán[b]	XI Southern Border	751	605	75	3
24	Tomatlán	VIII Lerma-Santiago-Pacific	668	2 118	NA	4
25	Marabasco	VIII Lerma-Santiago-Pacific	648	2 526	NA	5
26	San Nicolás	VIII Lerma-Santiago-Pacific	543	2 330	NA	5
27	Elota	III North Pacific	506	2 324	NA	4
28	Sonora	II Northwest	408	27 740	421	5
29	Concepción	II Northwest	123	25 808	335	2
30	Matape	II Northwest	90	6 606	205	4
31	Tijuana[b]	I Baja California Peninsula	78	3 231	186	4
32	Sonoyta	II Northwest	16	7 653	311	5
Number of rivers: 32			81 870	563 934		

NOTE: 1 hm^3 = 1 million cubic meters.
[a] The data on mean natural surface runoff represents the mean annual value of their historical registry and include the runoff from transboundary .
[b] The mean natural surface runoff from this river includes imports from other countries, except in the case of the Tijuana River, the runoff from which corresponds solely to the Mexican side. The area and length of the catchment refer only to the Mexican part, strictly to the catchment itself. The runoff from the Colorado River considers the imports as per the 1944 Treaty, plus the runoff generated in Mexico.
[c] The length of the Suchiate River belongs to the border between Mexico and Guatemala.
NA: Not available.
Stream order determined according to the Strahler method.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

Grijalva River

T2.8 Characteristics of the main rivers that flow into the Gulf of Mexico and Caribbean Sea, ordered by their mean natural runoff

No	River	Hydrological-Administrative Region	Mean natural surface runoff[a] (millions of m³/year)	Catchment area (km²)	Length of the river (km)	Maximal stream order
1	Grijalva-Usumacinta[b]	XI Southern Border	115 536	83 553	1 521	7
2	Papaloapan	X Central Gulf	44 662	46 517	354	6
3	Coatzacoalcos	X Central Gulf	28 093	17 369	325	5
4	Pánuco	IX Northern Gulf	20 330	84 956	510	7
5	Tonalá	XI Southern Border	11 389	5 679	82	5
6	Tecolutla	X Central Gulf	6 095	7 903	375	5
7	Bravo[b]	VI Rio Bravo	5 588	225 242	NA	7
8	Jamapa	X Central Gulf	2 563	4 061	368	4
9	Nautla	X Central Gulf	2 217	2 785	124	4
10	La Antigua	X Central Gulf	2 139	2 827	139	5
11	Soto La Marina	IX Northern Gulf	2 086	21 183	416	6
12	Tuxpan	X Central Gulf	2 076	5 899	150	4
13	Candelaria[b]	XII Yucatán Peninsula	2 011	13 790	150	4
14	Cazones	X Central Gulf	1 712	2 688	145	4
15	San Fernando	IX Northern Gulf	1 545	17 744	400	5
16	Hondo[c]	XII Yucatán Peninsula	533	7 614	115	4
	Number of rivers: 16		248 575	549 810		

NOTE: 1 hm³ = 1 million cubic meters.
[a] The data on mean natural surface runoff represents the mean annual value of their historical registry and includes the runoff from transboundary catchments.
[b] The mean natural surface runoff from this river includes imports from other countries, except in the case of the Rio Grande and the Hondo River, the runoff from which corresponds solely to the Mexican side.
The area and length of the catchment refer only to the Mexican side.
[c] The length of the Hondo River reported belongs to the border between Mexico and Belize.
NA: Not available.
Stream order determined according to the Strahler method.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs

T2.9 Characteristics of the main inland rivers, ordered by the mean natural surface runoff

No	River	Hydrological-Administrative Region	Mean natural surface runoff[a] (millions of m³/year)	Catchment area (km²)	Length of the river (km)	Maximal stream order
1	Lerma[b]	VIII Lerma-Santiago-Pacific	4 742	47 116	708	6
2	Nazas-Aguanaval	VII Central Basins of the North	1 912	89 239	1 081	7
	Number of rivers: 2		6 654	136 355		

NOTE: [a] The data on mean natural surface runoff represents the mean annual value of their historical registry.
[b] This river is considered an inland river because it flows into Lake Chapala.
Stream order determined according to the Strahler method.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

Mexico's transboundary catchments

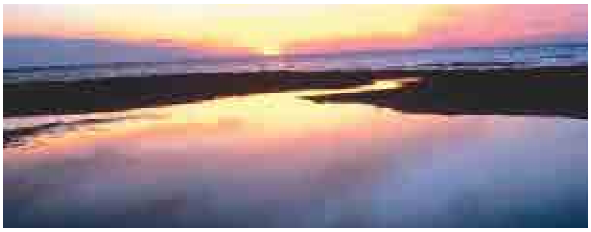
Mexico shares eight catchments in total with its neighboring countries: three with the United States of America (Grande, Colorado and Tijuana), four with Guatemala (Grijalva-Usumacinta, Suchiate, Coatán and Candelaria) and one with both Belize and Guatemala (River Hondo), the data on which is presented in table T2.10.

The waters of the Rio Grande, and the Colorado and Tijuana rivers are shared according to the indications of the "Treaty between the Government of the United Mexican States and the Government of the United States of America on the Distribution of the International Waters of the Colorado and Tijuana Rivers and the Rio Grande, from Fort Quitman, Texas, to the Gulf of Mexico", signed in Washington, D.C. on February 3rd, 1944.

T2.10 Characteristics of the rivers with transboundary catchments, by Hydrological-Administrative Region

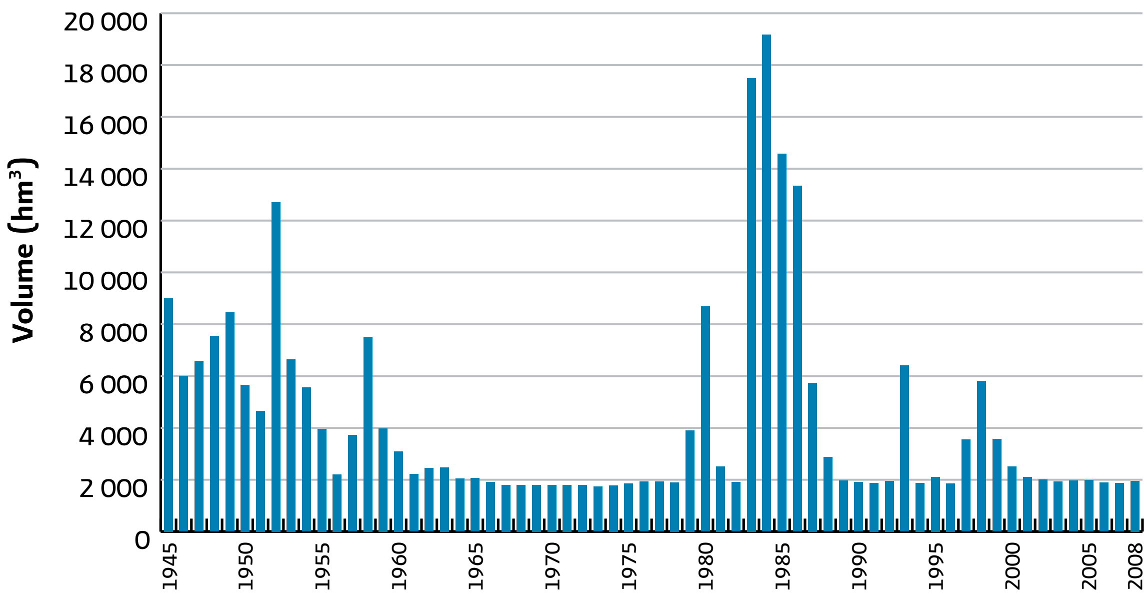
No	River	Hydrological-Administrative Region	Country	Mean natural surface runoff (millions of m³/year)	Catchment area (km²)	Length of the river (km)
1	Bravo	VI Rio Bravo	Mexico	5 588	225 242	NA
			USA	502	241 697	1 074
			Bilateral	NA	NA	2 034
2	Colorado	I Baja California Peninsula	Mexico	13	3 840	160
			USA	17 885	626 943	2 140
			Bilateral	NA	NA	37
3	Tijuana	I Baja California Peninsula	Mexico	78	3 231	186
			USA	92	1 221	9
4	Grijalva-Usumacinta	XI Southern Border	Mexico	71 716	83 553	1 521
			Guatemala	43 820	44 837	390
5	Suchiate[a]	XI Southern Border	Mexico[a]	184	203	75
			Guatemala	2 553	1 084	60
6	Coatán	XI Southern Border	Mexico	354	605	75
			Guatemala	397	280	12
7	Candelaria	XII Yucatán Peninsula	Mexico	1 750	13 790	150
			Guatemala	261	1 558	8
8	Hondo[b]	XII Yucatán Peninsula	Mexico[b]	533	7 614	115
			Guatemala	NA	2 873	45
			Belize	NA	2 978	16

NOTE: 1 hm³ = 1 million cubic meters.
[a] The 75 km belong to the border between Mexico and Guatemala.
[b] The 115 km belong to the border between Mexico and Belize.
NA: Not applicable.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.



Colorado River

G2.6 Annual volume of water from the Colorado River delivered by the United States of America to Mexico, annual series from 1945 to 2008 (millions of cubic meters, hm³)



SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

In the case of the Colorado River, the Treaty specifies that the United States of America should deliver 1 850.2 million cubic meters (1.5 million AF per year) to Mexico. The annual series of this delivery from 1945 to 2008 is shown in graph G2.6.

As regards the Tijuana River, the Treaty only establishes that both countries, through the International Boundary and Water Commission (IBWC), will make recommendations for the equitable sharing of its

Colorado River, Baja California

T2.11 Distribution of the water of the Rio Grande, as per the 1944 Treaty

The United Mexican States' share	The United States of America's share
The total of the runoff of the Alamo and San Juan rivers.	The total of the runoff from the Pecos and Devils rivers, from the Goodenough spring and from the Alamito, Terlingua, San Felipe and Pinto streams.
Two thirds of the water that enters the mainstream of the Rio Grande from the following six Mexican channels: the Conchos, San Diego, San Rodrigo, Escondido and Salado rivers, and the Las Vacas stream.	One third of the water that enters the mainstream of the Rio Grande from the following six Mexican channels: the Conchos, San Diego, San Rodrigo, Escondido and Salado rivers, and the Las Vacas stream.
One half of the runoff not assigned in the Treaty that reaches the main channel, between Fort Quitman and Falcon.	One half of the runoff not assigned in the Treaty that reaches the main channel, between Fort Quitman and Falcon.
One half of the runoff of the Rio Grande watershed, downstream from Falcon.	One half of the runoff of the Rio Grande watershed, downstream from Falcon.

SOURCE: IBWC. Treaties and Conventions. Consulted on http://www.sre.gob.mx/cila/ (15/07/2009).

Colorado River

waters, will draw up projects for storage infrastructure and flood control, will estimate the costs and build the infrastructure that is agreed upon, sharing the construction and operation costs equitably.

As regards the Rio Grande (referred to in Mexico as the Rio Bravo), table T2.11 describes the distribution of its waters as established in the Treaty.

In the Treaty, three criteria are established on the six Mexican channels previously referred to, which should be mentioned:

1. The volume that Mexico should provide to the United States of America, as part of the third of the volume in the six aforementioned Mexican channels, shall not be greater on the whole, on average and in consecutive five-year cycles than 431.72 million cubic meters (350 000 acre feet) per year, the equivalent of supplying a minimum volume of 2 158.6 million cubic meters (1 750 000 acre feet) in each cycle.
2. In cases of extraordinary drought or a serious accident in the hydraulic systems of the Mexican tributaries that might make it difficult for Mexico to allow the 431.72 million cubic meters to flow, any remaining flow that might exist at the end of the five-year cycle will be recovered in the following cycle with water from the same tributaries.
3. If the United States of America's assigned capacity in the international dams shared by both countries (La Amistad and Falcon) is reached, with water which belongs to the United States, the five-year cycle is considered finished and all volumes not yet delivered will be totally covered, a new cycle starting from that point.

T2.12 Capacities assigned in the international dams (millions of cubic meters, hm^3)

Country	La Amistad	Falcon
Mexico	1 770	1 352
United States of America	2 271	1 913

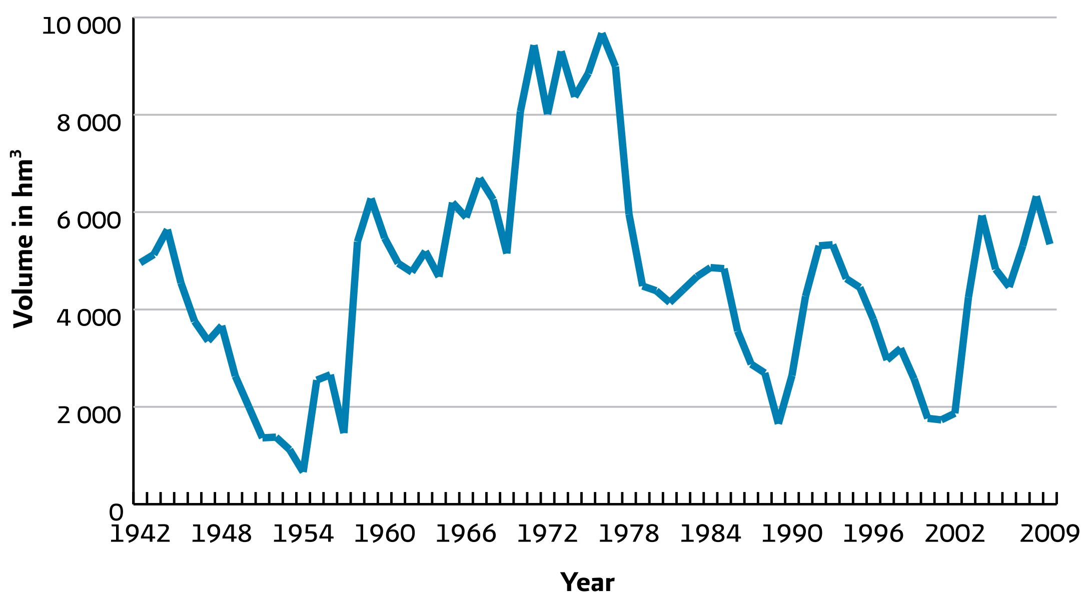
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs

Views of the Falcon dam, State of Tamaulipas

Mexico's Main Lakes

Lake Chapala is the biggest inland lake in Mexico. It has an extension of 1 116 km² and an average depth that varies between 4 and 6 m. The behavior of its volumes stored per year is shown in graph G2.7.

G2.7 Volumes stored in Lake Chapala, from 1942 to 2009 (millions of cubic meters, hm^3)



NOTE: 1 hm^3 = 1 million cubic meters.
The values indicated are as of December 31st each year.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

T2.13 Area and storage volume in Mexico's main lakes, by Hydrological-Administrative Region and State

No	Lake	Catchment area (km²)	Storage capacity (millions of m^3)	Hydrological-Administrative Region	State
1	Chapala	1 116	8 126	VIII Lerma-Santiago-Pacific	Jalisco and Michoacán de Ocampo
2	Cuitzeo[a]	306	920[a]	VIII Lerma-Santiago-Pacific	Michoacán de Ocampo
3	Pátzcuaro[a]	97	550[a]	VIII Lerma-Santiago-Pacific	Michoacán de Ocampo
4	Yuriria	80	188	VIII Lerma-Santiago-Pacific	Guanajuato
5	Catemaco	75	454	X Central Gulf	Veracruz de Ignacio de la Llave
6	Tequesquitengo[a]	8	160[a]	IV Balsas	Morelos
7	Nabor Carrillo[a]	10	12[a]	XIII Waters of the Valley of México	State of Mexico

NOTE: [a] The data refers to the mean volume stored, since up-to-date studies on their storage capacity are unavailable.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

2.5 Groundwater

The importance of groundwater is manifest due to the magnitude of the volume employed by the main users; almost 37% (29.5 billion m^3/year in 2008) of the total volume allocated for offstream uses is from groundwater sources. For the purpose of groundwater management, the country has been divided into 653 aquifers, the official names of which were published in the Official Government Gazette on December 5th, 2001. As of December 31st, 2009, the availability of groundwater in 282 aquifers had been published in the Official Government Gazette.

In the DVD you will find the official determination of availability by aquifer published at the time of going to press, as well as the data related to this issue in the spreadsheet:
- TM(Acuiferos).

Overdrafting of aquifers

From the 1970s onwards, the number of overexploited aquifers grew steadily, from 32 aquifers in 1975, 80 in 1985, 97 in 2001, and 101 overdrafted aquifers as of December 31st, 2008. From these overdrafted aquifers, 58% of groundwater is extracted for all uses. According to the results of recent studies, it is defined whether aquifers remain overdrafted or cease to be so, based on the ratio of withdrawal/recharge. The statistics on aquifers are presented in table T2.14, as is the case in map M2.8 with overdrafted aquifers.

T2.14 Mexico's aquifers, by Hydrological-Administrative Region, 2008

Hydrological-Administrative Region		Number of aquifers				Mean recharge (hm^3)
		Total	Overdrafted	With saltwater intrusion	Suffering from the phenomenon of soil salinization and brackish groundwater	
I	Baja California Peninsula	87	8	9	5	1 258.9
II	Northwest	63	13	5	0	3 249.5
III	Northern Pacific	24	2	0	0	3 263.0
IV	Balsas	46	2	0	0	4 623.2
V	Southern Pacific	35	0	0	0	1 994.1
VI	Rio Bravo	100	14	0	7	5 079.9
VII	Central Basins of the North	68	24	0	19	2 377.7
VIII	Lerma-Santiago-Pacific	127	32	0	0	7 728.4
IX	Northern Gulf	40	2	0	0	1 316.4
X	Central Gulf	22	0	2	0	4 259.8
XI	Southern Border	23	0	0	0	18 015.2
XII	Yucatán Peninsula	4	0	0	1	25 315.7
XIII	Waters of the Valley of Mexico	14	4	0	0	2 339.8
TOTAL		653	101	16	32	80 821.6

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs. Groundwater Department.

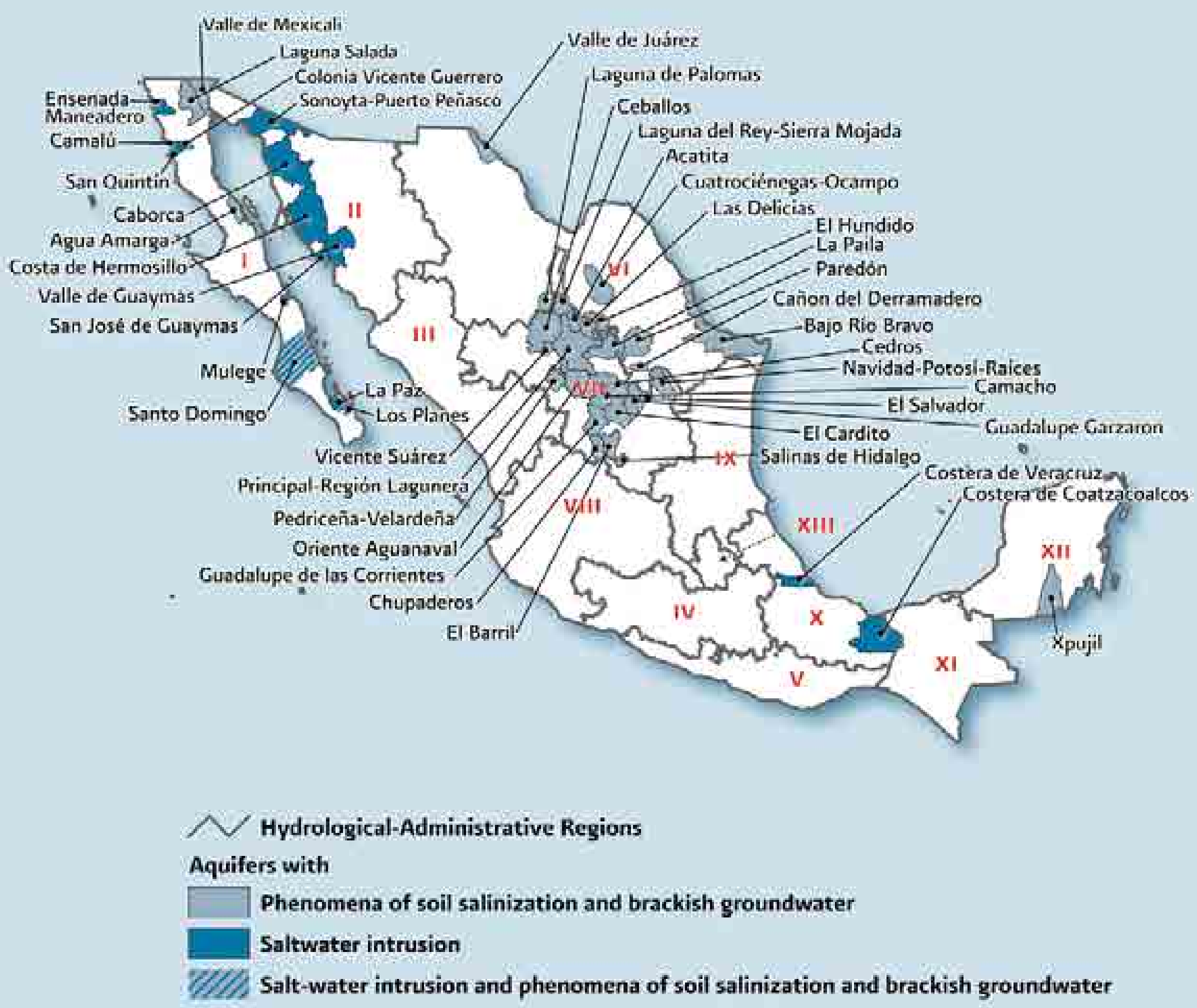
M2.8 Overdrafted aquifers by Hydrological-Administrative Region, 2008

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs. Groundwater Department.

Aquifers with saltwater intrusion and/or suffering from the phenomenon of soil salinization and brackish groundwater

For 2008, saltwater intrusion had been encountered in 16 aquifers nationwide, located in the states of Baja California, Baja California Sur, Sonora and Veracruz de Ignacio de la Llave. These aquifers are Ensenada, Maneadero, Camalú, Colonia Vicente Guerrero and San Quintín in Baja California; Santo Domingo, Los Planes, and La Paz and Mulegé in Baja California Sur; Sonoyta-Puerto Peñasco, Caborca, Costa de Hermosillo, Valle de Guaymas and San José de Guaymas in Sonora; Costera de Veracruz and Costera de Coatzacoalcos in Veracruz de Ignacio de la Llave.

M2.9 Aquifers with saltwater intrusion and/or suffering from the phenomenon of soil salinization and brackish groundwater, 2008



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs. Groundwater Department.

The phenomenon of soil salinization and the presence of brackish groundwater indicate high levels of soil salinity and groundwater produced by high indices of evaporation in areas of low groundwater levels, the dissolution of evaporite minerals and the presence of high-salinity connate water. Brackish water occurs specifically in those aquifers located in geological provinces characterized by ancient, superficial, of marine origin and evaporite sedimentary formations, in which the interaction of groundwater with the geological material through which it passes produces the higher salt content.

As of the end of 2008, 32 aquifers with saline soils and brackish water had been identified, mainly located in the Baja California Peninsula and in the Mexican Plateau, which brings together conditions of limited precipitation, high indices of solar radiation and thus evaporation, as well as the presence of connate water and easily-dissolved evaporite minerals.

2.6 Water quality

Monitoring of water quality

In 2008, the National Monitoring Network had 1 186 sites, distributed throughout the country, as described in table T2.15.

T2.15 Sites of the National Monitoring Network, 2008

Network	Area	Sites (number)
Primary Network	Surface bodies	209
	Coastal zones	48
	Groundwater	139
Secondary Network	Surface bodies	244
	Coastal zones	23
	Groundwater	23
Special Studies	Surface bodies	97
	Coastal zones	47
	Groundwater	266
Groundwater Reference Network		90
TOTAL		1 186

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

The physical-chemical and biological determinations are carried out in the National Laboratory Network, which is made up of 13 laboratories in the River Basin Organizations, 14 in the local offices and one National Reference Laboratory in Mexico City.

In 2008, 344 surface water bodies were covered in 105 catchments, including 40 of the 50 water bodies of national importance, with fixed sites to evaluate the evolving trends in time, known as the Primary Network.

In addition to the aforementioned physical-chemical and microbiological parameters, biological monitoring has been carried out since 2005 in some regions of the country, which have allowed water quality to be evaluated, using simple low-cost methods, such as the benthic organism diversity index.

T2.16 Samples for biological monitoring, by Hydrological-Administrative Region, 2008

Hydrological-Administrative Region	No. of samples
IV Balsas	40
VII Central Basins of the North	23
IX Northern Gulf	7
X Central Gulf	5
TOTAL	75

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

Evaluation of water quality

The evaluation of water quality is carried out by using three indicators: five-day Biochemical Oxygen Demand (BOD_5), Chemical Oxygen Demand (COD) and Total Suspended Solids (TSS). The BOD_5 and COD are used to determine the quantity of organic matter present in water bodies, mainly from municipal and non-municipal wastewater discharges.

The BOD_5 determines the quantity of biodegradable organic matter whereas the COD measures the total quantity of organic matter. The increase in the concentration of these parameters has an impact on the decrease of the dissolved oxygen content in water bodies with the consequent affectation of aquatic ecosystems.

Additionally, the increase in COD indicates the presence of substances coming from non-municipal discharges.

TSSs originate in wastewater and through soil erosion. The increase in the levels of TSSs results in the water body losing its capacity to support the diversity of aquatic life. These parameters allow levels to be identified that vary from a relatively normal condition or with no influence of human activity, to water which shows significant signs of municipal and non-municipal wastewater discharges, as well as areas with severe deforestation.

It should be mentioned that the sites with water quality monitoring are situated in areas with a high anthropogenic influence. According to their concentration, the criteria that make up the water quality classification scale are shown in table T2.17.

T2.17 Classification scales of water quality

Criteria (mg/l)	Classification	Color
Biochemical Oxygen Demand (BOD_5)		
$BOD_5 \leq 3$	**EXCELLENT.** Not polluted	BLUE
$3 < BOD_5 \leq 6$	**GOOD QUALITY.** Surface water with a low content of biodegradable organic matter	GREEN
$6 < BOD_5 \leq 30$	**ACCEPTABLE.** With some signs of pollution. Surface water with a capacity of self-purification or with biologically treated wastewater discharges	YELLOW
$30 < BOD_5 \leq 120$	**POLLUTED.** Surface water with raw, mainly municipal, wastewater discharges	ORANGE
$BOD_5 > 120$	**HEAVILY POLLUTED.** Surface water with a strong impact of raw municipal and non-municipal wastewater discharges	RED
Chemical Oxygen Demand (COD)		
$COD \leq 10$	**EXCELLENT.** Not polluted	BLUE
$10 < COD \leq 20$	**GOOD QUALITY.** Surface water with a low content of biodegradable and non-biodegradable organic matter	GREEN
$20 < COD \leq 40$	**ACCEPTABLE.** With some signs of pollution. Surface water with a capacity of self-purification or with biologically treated wastewater discharges	YELLOW
$40 < COD \leq 200$	**POLLUTED.** Surface water with raw, mainly municipal, wastewater discharges	ORANGE
$COD > 200$	**HEAVILY POLLUTED.** Surface water with a strong impact of raw municipal and non-municipal wastewater discharges	RED
Total Suspended Solids (TSS)		
$TSS \leq 25$	**EXCELLENT.** Exceptional, very high quality	BLUE
$25 < TSS \leq 75$	**GOOD QUALITY.** Surface water with a low content of suspended solids, generally in natural conditions. Favors the conservation of aquatic communities and unrestricted agricultural irrigation	GREEN
$75 < TSS \leq 150$	**ACCEPTABLE.** Surface water with some signs of pollution. With biologically treated wastewater discharges. A regular condition for fish. Restricted agricultural irrigation	YELLOW
$150 < TSS \leq 400$	**POLLUTED.** Poor quality surface water with raw wastewater discharges. Water with a high content of suspended material	ORANGE
$TSS > 400$	**HEAVILY POLLUTED.** Surface water with a strong impact of raw municipal and non-municipal wastewater discharges with a high polluting load. Poor conditions for fish	RED

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

The evaluation of water quality for 2008 for these quality indicators was carried out according to the terms established in table T2.18, with the results recorded in the subsequent tables and graphs.

T2.18 Number of monitoring sites with data for each water quality indicator, 2008

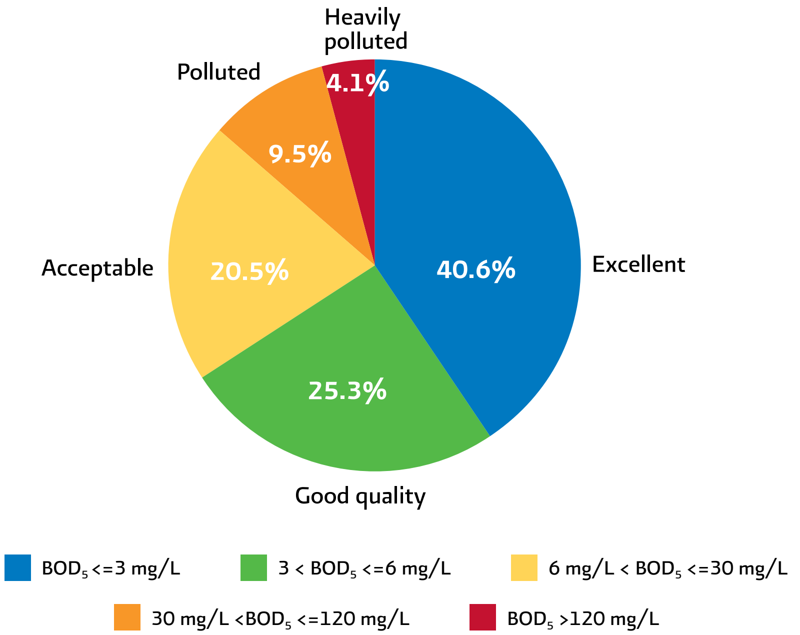
Water quality indicator	Number of monitoring sites
Biochemical Oxygen Demand (BOD_5)	518
Chemical Oxygen Demand (COD)	532
Total Suspended Solids (TSS)	586

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

M2.10 Water quality according to the BOD_5 indicator, in surface water monitoring sites, 2008

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

G2.8 Percentage distribution of surface water quality monitoring sites, by category of BOD_5, 2008



SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

T2.19 Percentage distribution of surface water quality monitoring sites by Hydrological-Administrative Region, according to the BOD_5 indicator, 2008

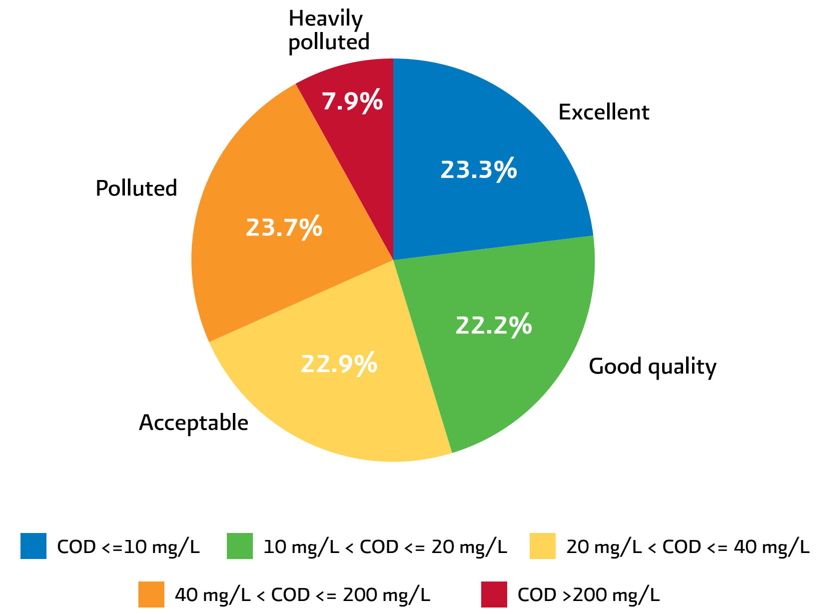
Hydrological-Administrative Region		EXCELLENT	GOOD QUALITY	ACCEPTABLE	POLLUTED	HEAVILY POLLUTED
I	Baja California Peninsula	25.0	8.3	50.0	12.5	4.2
II	Northwest	60.0	10.0	20.0	5.0	5.0
III	Northern Pacific	68.3	14.6	14.6	2.5	0.0
IV	Balsas	32.7	20.7	32.8	8.6	5.2
V	Southern Pacific	0.0	0.0	0.0	0.0	0.0
VI	Rio Bravo	23.9	54.3	17.4	4.4	0.0
VII	Central Basins of the North	85.7	9.5	4.8	0.0	0.0
VIII	Lerma-Santiago-Pacific	40.4	14.4	24.2	19.0	2.0
IX	Northern Gulf	80.5	12.2	4.9	2.4	0.0
X	Central Gulf	0.0	74.4	18.6	4.7	2.3
XI	Southern Border	21.8	71.9	6.3	0.0	0.0
XII	Yucatán Peninsula	100.0	0.0	0.0	0.0	0.0
XIII	Waters of the Valley of Mexico	4.0	0.0	28.0	20.0	48.0
NATIONAL TOTAL		40.6	25.3	20.5	9.5	4.1

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

M2.11 Water quality according to the COD indicator, in surface water monitoring sites, 2008

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

G2.9 Percentage distribution of surface water quality monitoring sites, by category of COD, 2008



SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

T2.20 Percentage distribution of surface water quality monitoring sites by Hydrological-Administrative Region, according to the COD indicator, 2008

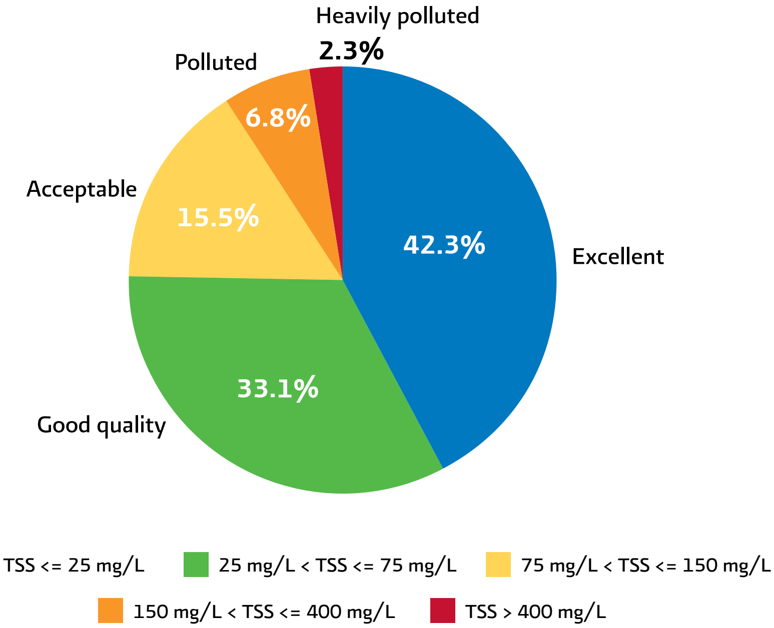
Hydrological-Administrative Region		EXCELLENT	GOOD QUALITY	ACCEPTABLE	POLLUTED	HEAVILY POLLUTED
I	Baja California Peninsula	12.4	12.5	6.3	62.5	6.3
II	Northwest	28.5	35.7	14.3	17.9	3.6
III	Northern Pacific	18.7	12.5	37.5	31.3	0.0
IV	Balsas	15.5	17.2	31.0	20.7	15.6
V	Southern Pacific	71.4	21.4	0.0	7.2	0.0
VI	Rio Bravo	32.8	31.1	19.7	16.4	0.0
VII	Central Basins of the North	14.3	28.6	57.1	0.0	0.0
VIII	Lerma-Santiago-Pacific	1.3	14.1	29.5	44.3	10.8
IX	Northern Gulf	50.9	27.3	14.5	5.5	1.8
X	Central Gulf	44.1	23.3	14.0	16.3	2.3
XI	Southern Border	31.2	46.9	15.6	6.3	0.0
XII	Yucatán Peninsula	64.3	21.4	14.3	0.0	0.0
XIII	Waters of the Valley of Mexico	4.0	8.0	16.0	20.0	52.0
NATIONAL TOTAL		23.3	22.2	22.9	23.7	7.9

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

M2.12 Water quality according to the TSS indicator, in surface water monitoring sites, 2008

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

G2.10 Percentage distribution of surface water quality monitoring sites, by category of Total Suspended Solids (TSS), 2008



SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

T2.21 Percentage distribution of surface water quality monitoring sites, by Hydrological-Administrative Region, according to category of TSS, 2008

Hydrological-Administrative Region		EXCELLENT	GOOD QUALITY	ACCEPTABLE	POLLUTED	HEAVILY POLLUTED
I	Baja California Peninsula	33.3	40.0	23.3	3.4	0.0
II	Northwest	3.6	71.4	10.7	10.7	3.6
III	Northern Pacific	39.0	39.0	22.0	0.0	0.0
IV	Balsas	27.6	34.5	20.7	8.6	8.6
V	Southern Pacific	39.9	46.7	0.0	6.7	6.7
VI	Rio Bravo	65.6	19.7	13.1	0.0	1.6
VII	Central Basins of the North	42.8	38.1	14.3	0.0	4.8
VIII	Lerma-Santiago-Pacific	40.2	32.3	17.7	7.9	1.9
IX	Northern Gulf	63.5	26.9	3.8	5.8	0.0
X	Central Gulf	75.0	13.5	7.7	3.8	0.0
XI	Southern Border	3.1	62.5	25.0	9.4	0.0
XII	Yucatán Peninsula	100.0	0.0	0.0	0.0	0.0
XIII	Waters of the Valley of Mexico	16.0	20.0	24.0	36.0	4.0
NATIONAL TOTAL		42.3	33.1	15.5	6.8	2.3

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

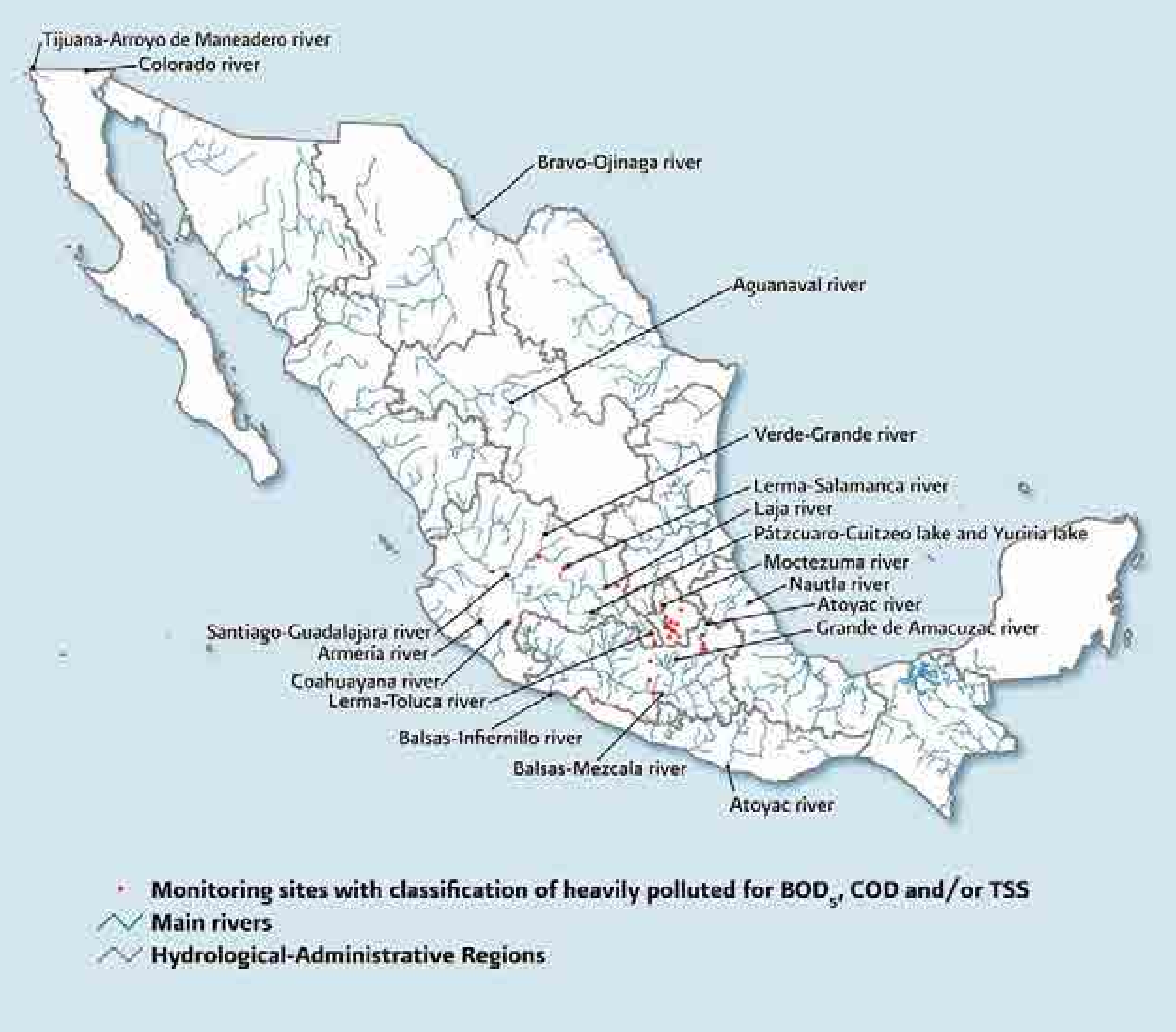
According to the results of the water quality evaluations of the three indicators (BOD_5, COD and TSS) applied to the monitoring sites in 2008, it was determined that 19 catchments were classified as heavily polluted in one, two or all three of these indicators. These catchments are shown in table T2.22 and map M2.13.

T2.22 Catchments and water bodies with monitoring sites classified as heavily polluted for BOD_5, COD and/or TSS, 2008

Hydrological-Administrative Region		Catchments or sub-catchments	Water bodies with heavily polluted monitoring sites
I	Baja California Peninsula	Tijuana River - Maneadero Stream	Tijuana River
		Colorado River	Nuevo River
IV	Balsas	Atoyac River	Alseseca River
			Atoyac River
			Zahuapan River
		Balsas River – Infiernillo	Estuary of Balsas River
		Balsas River – Mezcala	Balsas River - Mezcala
			Iguala River
		Grande de Amacuzac River	Arroyo Salado
			Cuautla River
V	South Pacific	Atoyac River	Verde River
VI	Rio Bravo	Rio Grande – Ojinaga	Rio Bravo
VII	Central Basins of the North	Aguanaval River	Aguanaval River
VIII	Lerma-Santiago-Pacific	Coahuayana River	Tamazula River
		Lake Pátzcuaro – Cuitzeo and Lake Yuriria	Lake Cuitzeo
		Verde River – Rio Grande	Aguascalientes River
			San Juan de los Lagos River
			Verde River
		Lerma - Salamanca River	Turbio River
		Lerma - Toluca River	Almoloya del Río Lagoon
			Lerma River
			Mezapa Stream
		Armería River	Tuxcacuesco River
		La Laja River	La Laja River
		Santiago - Guadalajara River	Santiago River
IX	Northern Gulf	Moctezuma River	San Juan del Rio River
X	Central Gulf	Nautla River and others	El Diamante Stream
XIII	Waters of the Valley of Mexico	Moctezuma River	Churubusco River
			Rio de las Avenidas
			Rio de los Remedios
			San Juan Teotihuacan River
			Rio de la Compañía
			San Buenaventura River
			Tlamaco – Juandho Weir

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

M2.13 Monitoring sites with the classification of heavily polluted for BOD_5, COD and/or TSS, 2008



NOTE: The names of the rivers indicate schematically the catchment registered for the water quality monitoring sites.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs.

Groundwater quality

One of the parameters that allows groundwater salinization to be evaluated is the total solids. According to their concentration, groundwater is classified as fresh (<1 000 mg/L), lightly brackish (1 000-2 000 mg/l), brackish (2 000-10 000 mg/L) or saline (>10,000 mg/L).

The limit between freshwater and lightly brackish water matches the maximum concentration indicated by the modification of the Official Mexican Standard NOM-127-SSA1-1994, which "establishes the maximum permissible limits that water should comply with for human consumption and treatment as regards water quality for human consumption".

Water quality on beaches

Through the Clean Beach Program, the cleaning of beaches and their associated watersheds and aquifers is promoted. The finality of the program is to prevent and revert the pollution of Mexico's beaches, respecting the native ecology, making them competitive and thus raising the quality and standard of living of the local population, as well as increasing tourism.

For the development of the program, Clean Beach Committees have been set up, which are headed by the President of the municipality and which have the active presence of representatives of SEMARNAT, PROFEPA, SEMAR, SECTUR, COFEPRIS and the CONAGUA, as well as representatives of associations and private initiatives.

In order to evaluate water quality on beaches, the bacteriological indicator of enterococcus faecalis is used, which is considered the most efficient means of evaluating seawater quality for first-contact recreational use.

Based on the aforementioned, the Ministry of Health, in accordance with studies carried out by the World Health Organization (WHO), determined that a level of enterococcus of 200 MLN/100 ml is considered the maximum limit for recreational use.

Qualification criteria on beaches:

- 0-200 MLN/100 ml, the beach is considered SUITABLE for recreational use.
- › 200 MLN/100 ml, the beach is considered UNSUITABLE for recreational use.

NOTE: MLN (most likely number).

According to the reports by the Bacteriological Beach Quality Monitoring System, carried out by the Ministry of Health through its state representation and published on the website of COFEPRIS, between 2003 and 2009, the water quality on Mexico's beaches improved, as shown in table T2.23.

Map M2.14 shows the bacteriological quality on beaches in tourist destinations for 2008.

T2.23 Results of the beach water quality monitoring program, annual series from 2003 to 2008

Year	2003	2004	2005	2006	2007	2008
Number of tourist destinations	35	37	44	45	46	53
Number of beaches	226	209	259	274	276	334
Number of coastal states	17	17	17	17	17	17
Samples that comply with the quality criteria (%)	93.7	94.5	96.5	96.2	98.4	98.8

SOURCE: COFEPRIS. Beach Census. 2009.

Tulum, Mexico

Careyes, Mexico

M2.14 Bacteriological water quality on beaches in tourist destinations, 2008

NOTE: The height of the bar is proportional to the number of beaches sampled by the Clean Water Program. In the key, the height corresponding to 10 beaches is shown.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
SEMARNAT. CONAGUA. PROFEPA. SEMAR. SECTUR. COFEPRIS. Clean Beach Program. Mexico, 2008.

Chapter 3. Uses of Water

In the following pages, the information required in order to understand the ways in which water is used for the country's different economic activities is presented. The volume of water employed in agriculture, such as for growing crops, should be emphasized, since it represents 77% of the total destined for offstream uses.

The majority of the information is derived from the Public Registry of Water Duties (REPDA), in which all the allocation or assignation deeds for the use of the nation's waters granted by the CONAGUA are registered. Data is broken down by Hydrological-Administrative Region and by state, showing the available historical series.

At the end of the chapter, the evolution of virtual water imports and exports is shown, which refers to the water used in the products exchanged between countries.

3.1 Classification of the uses of water

Water is used in different ways in practically all areas of human activity, whether it be for survival or for the provision and exchange of goods and services.

In the Public Registry of Water Duties (REPDA), the volumes allocated to the users of the nation's water are registered. In this Registry, the uses of water are classified into 12 groups, which for practical purposes have been grouped into five headings; four that correspond to offstream uses, namely agriculture, public supply, self-supplying industry and thermoelectric, as well as hydropower, which is considered separately since it corresponds to an instream use of water.

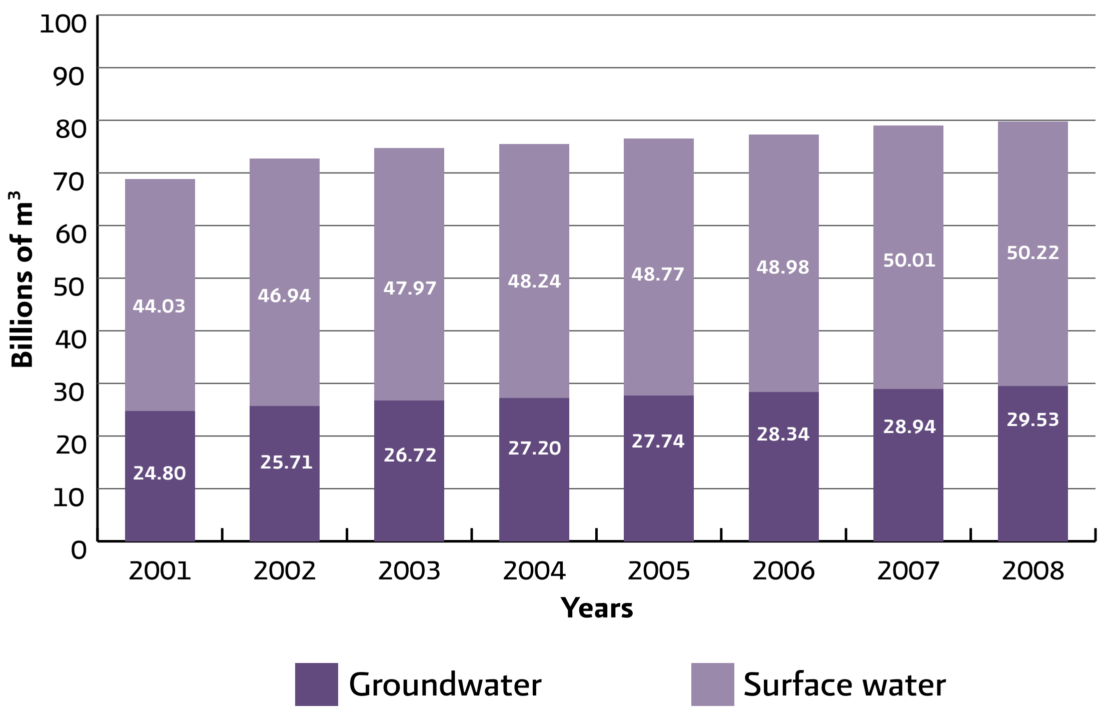
In graph G3.1, the evolution in the volume allocated for offstream uses can be observed. As may be appreciated, 63% of the water used in Mexico for offstream uses comes from surface water sources (rivers, streams and lakes), whereas the remaining 37% comes from groundwater sources (aquifers). In the period reported on, the surface water allocated grew by 14%, whereas the groundwater increased by 19%.

R3.1 Use of water

Use is defined as the application of water for an activity. When it is "consumed", meaning that there is a difference between the volume supplied and the volume discharged, it is referred to as a consumptive or offstream use.

There are other uses of water that do not consume water, such as the generation of hydropower, which uses the volume stored in reservoirs. These uses are known as non-consumptive or instream uses.

G3.1 Evolution of the volume allocated for offstream uses by type of source, 2001-2008 (billions of cubic meters)



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Water Management.

T3.1 Offstream uses, according to the type of source of withdrawal, 2008 (billions of cubic meters, km³)

Use	Origin		Total volume	Percentage of withdrawal
	Surface water	Groundwater		
Agriculture [a]	40.7	20.5	61.2	76.8
Public water supply [b]	4.2	7.0	11.2	14.0
Self-supplying industry [c]	1.6	1.6	3.3	4.1
Thermoelectic plants	3.6	0.4	4.1	5.1
TOTAL	50.2	29.5	79.8	100.0

NOTE: 1 km³ = 1 000 hm³ = one billion m³.
The data corresponds to volumes allocated as of December 31st, 2008.
[a] Includes the agricultural, livestock, aquaculture, multiple and "others" headings of the REPDA classification. Also includes 1.30 km³ of water corresponding to Irrigation Districts awaiting registration.
[b] Includes the public urban and domestic headings of the REPDA classification.
[c] Includes the industrial, agro-industrial, service and trade headings of the REPDA classification.
SOURCE: CONAGUA. Deputy Director General's Office for Water Management.

In the DVD you will find the data related to this issue in the spreadsheet::
- TM(Usos).

We recommend consulting the annual publication "Statistical Compendium of Water Management", produced by the National Water Commission (the figures may vary due to updates to the REPDA database).

The greatest volume allocated for offstream uses of water is the one corresponding to agricultural activities, as can be observed in table T3.1. This consideration mainly includes the water employed in irrigation. It should be mentioned that Mexico is one of the countries with the most substantial irrigation infrastructures in the world (see chapter 4).

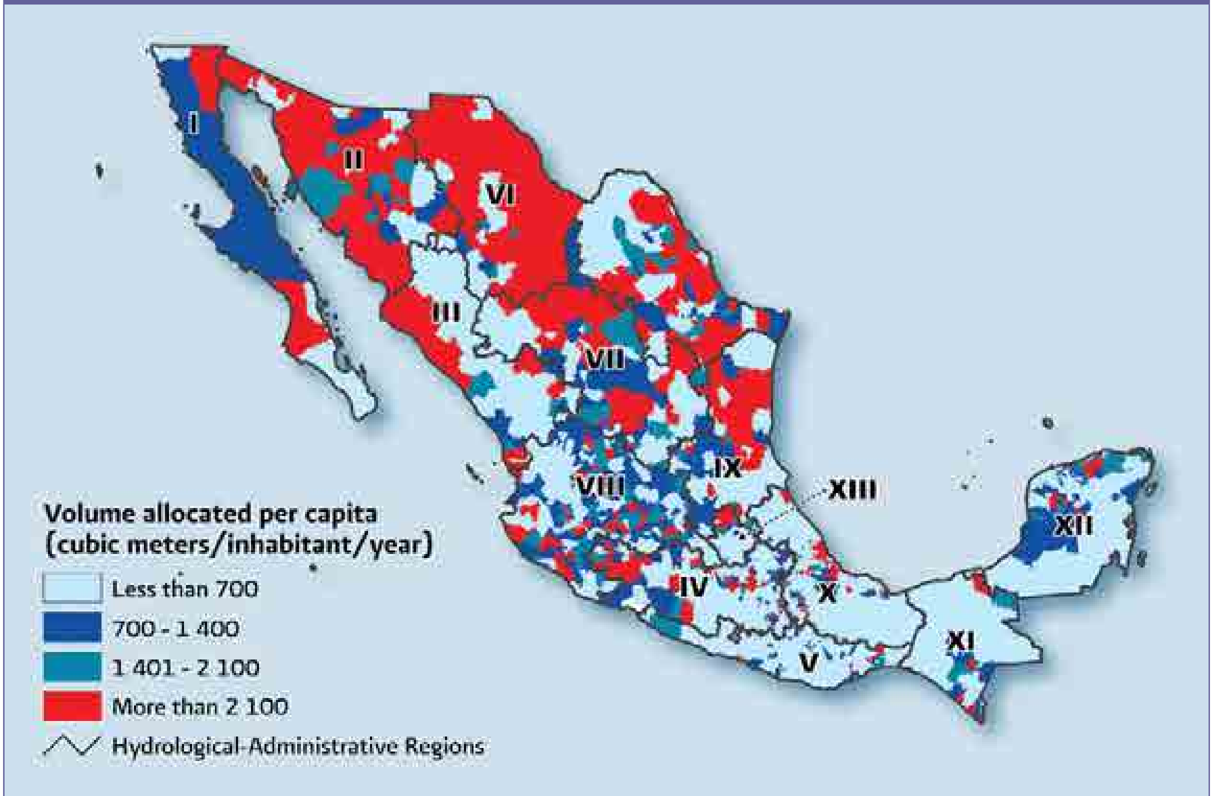
As regards hydropower plants, which represent an instream use of water resources, 150.7 billion cubic meters (km³) of water were used nationwide in 2008. It should be pointed out that for this use, the same water is used and counted several times, in all the country's plants.

3.2 Distribution of uses throughout Mexico

Map M3.1 presents the per capita volume allocated for offstream uses by municipality in 2008.

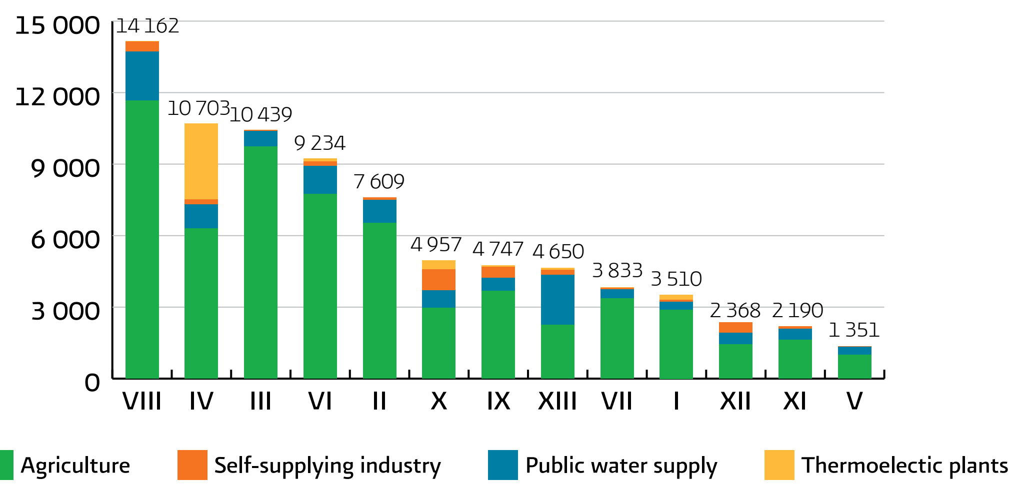
Graph G3.2 and table T3.2 show the way in which volumes of water have been allocated for offstream uses in Mexico. It can be observed that the Hydrological-Administrative Regions with the greatest allocation of water are: VIII Lerma-Santiago-Pacific, IV Balsas, III Northern Pacific and VI Rio Bravo. It is worth noting that agricultural use is above 80% of total allocations in these regions, with the exception of the region IV Balsas, where the Petacalco thermoelectric plant, located near the mouth of the Balsas River, occupies a significant volume of water.

M3.1 Intensity of offstream uses of water by municipality, 2008



NOTE: The regionalization of volumes was carried out based on the location of the use as registered in the REPDA, rather than the area of jurisdiction of the corresponding deeds.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Water Management.

G3.2 Volumes allocated for offstream uses by Hydrological-Administrative Region, 2008 (millions of cubic meters)



NOTE: The regionalization of volumes was carried out based on the location of the use as registered in the REPDA, rather than the area of jurisdiction of the corresponding deeds.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management. Volumes registered in the REPDA as of December 31st, 2008.

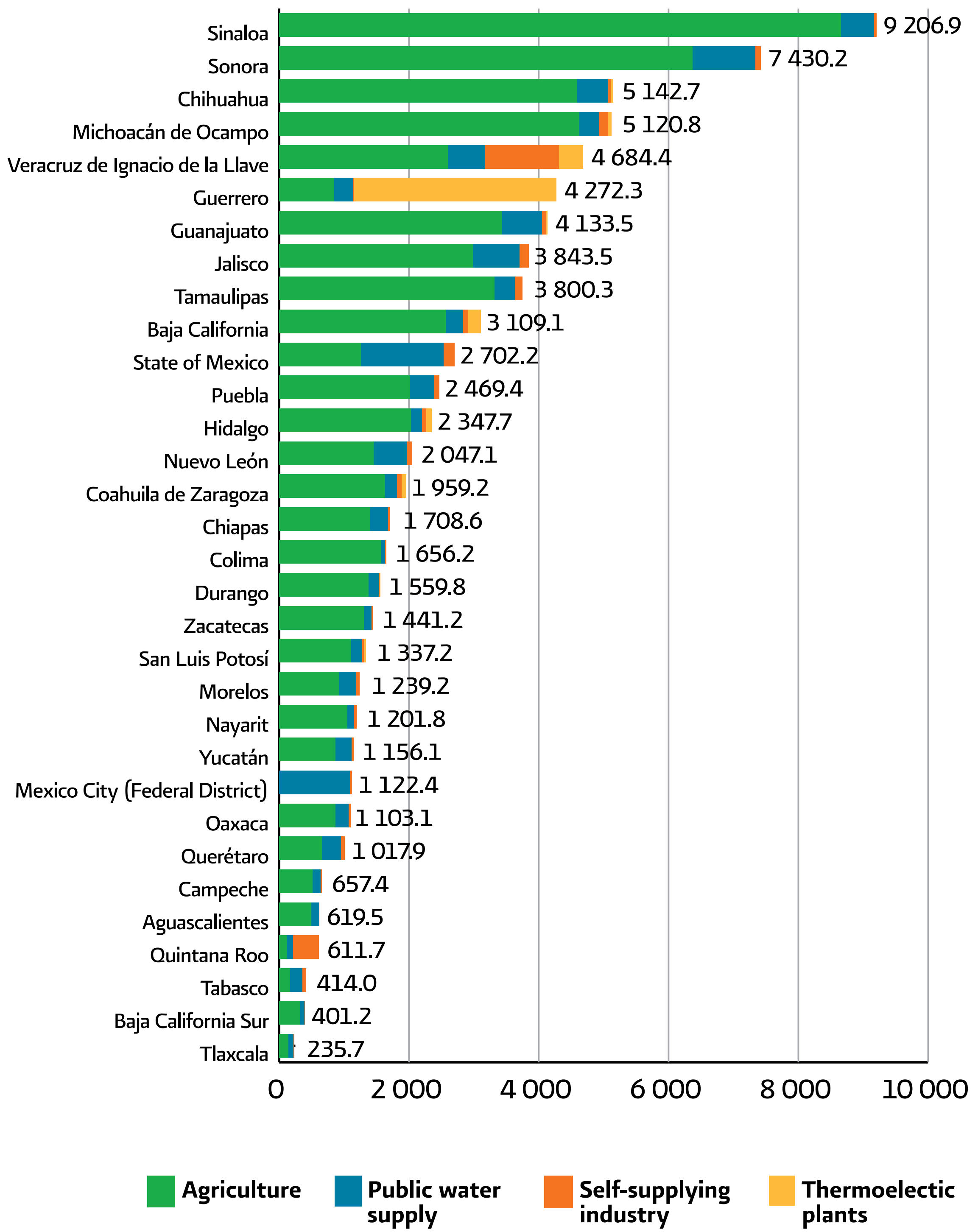
T3.2 Volumes allocated for offstream uses by Hydrological-Administrative Region, 2008 (millions of cubic meters)

No	Hydrological-Administrative Region	Total volume allocated	Agriculture [a]	Public water supply [b]	Self-supplying industry excluding thermoelectric plants [c]	Thermoelectic plants [d]
I	Baja California Peninsula	3 510.3	2 892.7	327.5	91.1	199.0
II	Northwest	7 608.8	6 526.8	983.6	91.4	7.0
III	Northern Pacific	10 439.0	9 741.7	639.3	58.0	0.0
IV	Balsas	10 702.6	6 307.7	997.5	227.1	3 170.2
V	Southern Pacific	1 351.5	1 000.0	333.1	18.4	0.0
VI	Rio Bravo	9 234.3	7 735.1	1 182.5	205.0	111.6
VII	Central Basins of the North	3 832.5	3 371.8	371.1	61.2	28.3
VIII	Lerma-Santiago-Pacific	14 162.0	11 668.6	2 057.5	411.4	24.5
IX	Northern Gulf	4 746.8	3 688.0	526.6	466.6	65.6
X	Central Gulf	4 956.6	2 960.0	744.0	875.7	377.0
XI	Southern Border	2 190.1	1 630.5	456.9	102.7	0.0
XII	Yucatán Peninsula	2 368.2	1 443.3	471.0	444.5	9.4
XIII	Waters of the Valley of Mexico	4 649.6	2 248.7	2 106.8	211.5	82.6
NATIONAL TOTAL		79 752.3	61 214.9	11 197.5	3 264.6	4 075.2

NOTE: The sums may not add up perfectly, due to the rounding up or down of figures.
The volumes are as of December 31st, 2008.
The regionalization of volumes was carried out based on the location of the use as registered in the REPDA, rather than the area of jurisdiction of the corresponding deeds.
[a] Includes the agricultural, livestock, aquaculture, multiple and "others" headings of the REPDA classification.
[b] Includes the public urban and domestic headings of the REPDA classification.
[c] Includes the industrial, agro-industrial, service and trade headings of the REPDA classification.
[d] Includes the total volume allocated for the generation of electricity, not including hydropower.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management. Volumes registered in the REPDA as of December 31st, 2008.

Table G3.3 and graph T3.3 present the information on volumes of water allocated by state, among which Sinaloa and Sonora stand out, for their extensive areas under irrigation.

G3.3 Volumes allocated for offstream uses, by state, 2008 (millions of cubic meters, hm³)



NOTE: The regionalization of volumes was carried out based on the location of the use as registered in the REPDA, rather than the area of jurisdiction of the corresponding deeds.
The volumes are as of December 31st, 2008.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management.

T3.3 Volumes allocated for offstream uses, by state, 2008 (millions of cubic meters)

No	State	Volume allocated	Agriculture [a]	Public water supply [b]	Self-supplying industry excluding thermoelectric plants [c]	Thermoelectic plants [d]
1	Aguascalientes	619.5	488.7	119.1	11.7	0.0
2	Baja California	3 109.1	2 566.3	266.0	81.6	195.2
3	Baja California Sur	401.2	326.3	61.5	9.5	3.9
4	Campeche	657.4	512.0	127.8	17.6	0.0
5	Coahuila de Zaragoza	1 959.2	1 624.6	186.5	73.2	74.9
6	Colima	1 656.2	1 565.8	62.2	24.4	3.8
7	Chiapas	1 708.6	1 402.2	271.8	34.6	0.0
8	Chihuahua	5 142.7	4 587.6	476.4	51.1	27.6
9	Durango	1 559.8	1 376.5	152.7	19.1	11.5
10	Guanajuato	4 133.5	3 433.0	619.7	60.3	20.5
11	Guerrero	4 272.3	847.1	288.5	14.6	3 122.1
12	Hidalgo	2 347.7	2 028.6	169.6	67.0	82.6
13	Jalisco	3 843.5	2 983.8	719.5	140.1	0.1
14	Mexico City (Federal District)	1 122.4	1.3	1 089.8	31.4	0.0
15	Michoacán de Ocampo	5 120.8	4 618.3	310.7	143.7	48.2
16	Morelos	1 239.2	921.5	260.6	57.1	0.0
17	Nayarit	1 201.8	1 048.0	105.8	48.0	0.0
18	Nuevo León	2 047.1	1 452.6	511.8	81.9	0.8
19	Oaxaca	1 103.1	866.6	201.8	34.8	0.0
20	Puebla	2 469.4	2 008.7	381.7	72.5	6.5
21	Querétaro	1 017.9	657.3	292.4	62.5	5.7
22	Quintana Roo	611.7	114.6	98.3	398.9	0.0
23	San Luis Potosí	1 337.2	1 105.4	171.2	29.6	31.0
24	Sinaloa	9 206.9	8 656.0	508.3	42.6	0.0
25	Sonora	7 430.2	6 371.2	961.5	90.5	7.0
26	State of Mexico	2 702.2	1 257.5	1 275.7	169.0	0.0
27	Tabasco	414.0	169.0	183.3	61.8	0.0
28	Tamaulipas	3 800.3	3 319.0	318.2	109.1	54.0
29	Tlaxcala	235.7	137.4	78.7	19.6	0.0
30	Veracruz de Ignacio de la Llave	4 684.4	2 595.3	568.6	1 149.9	370.5
31	Yucatán	1 156.1	866.9	245.4	34.3	9.4
32	Zacatecas	1 441.2	1 306.0	112.5	22.7	0.0
	TOTAL	79 752.3	61 214.9	11 197.5	3 264.6	4 075.2

NOTE: The sums may not add up perfectly, due to the rounding up or down of figures. The volumes are as of December 31st, 2008.
The regionalization of volumes was carried out based on the location of the use as registered in the REPDA, rather than the area of jurisdiction of the corresponding deeds.
Due to the rounding up or down of figures, the values of the national total may differ from the sum of the state totals.
[a] Includes the agricultural, livestock, aquaculture, multiple and "others" headings of the REPDA classification.
[b] Includes the public urban and domestic headings of the REPDA classification.
[c] Includes the industrial, agro-industrial, service and trade headings of the REPDA classification.
[d] Includes the total volume allocated for the generation of electricity, not including hydropower.
SOURCE: CONAGUA. Deputy Director General's Office for Water Management.

3.3 Agricultural use

The main use of water in Mexico is for agriculture, which in terms of the use of the nation's water mainly refers to the water used for the irrigation of crops.

The surface area in agricultural production units was 30.22 million hectares for 2007, according to the VII Agricultural, Livestock and Forest Census. It should be mentioned that the Census found that 18% of that surface is used for irrigation, and the remaining surface is used on a rainfed basis.

The area harvested every year varies between 20 and 23 million hectares[1]. In 2007, the area harvested was 22.7 million hectares, according to the VII Census.

R3.2 Blue water and green water

Blue water is that which is found in aquifers, lakes, rivers, reservoirs and channels, whereas green water refers to rainfed soil humidity, which feeds terrestrial biomass producing systems, such as crops, forests, grasslands and savannas.

SOURCE: Falkenmark, M. and J. Rockström. The New Blue and Green Water Paradigm: Breaking New Ground for Water Resources Planning and Management. Journal of Water Resources Planning and Management. Volume 132, Tome 3, pp. 129-132 May-June 2006.

Annually, the area harvested varies between 17 and 21 million hectares per year (Food, Agriculture and Fishing Information Service (SIAP-SAGARPA), 2009). At constant 2003 prices, the contribution of the agriculture, livestock, forest use, fishing and hunting sub-sector to the Gross Domestic Product (GDP) went down slightly from 3.8% in 2003 to 3.6% in 2007[2].

According to the National Inquiry of Occupation and Employment (ENOE in Spanish), the population occupied in this subsector up to the fourth trimester of 2008 was 5.9 million people, which represents 13% of the economically active population of Mexico[3]. Based on this, it has been estimated that 30 million Mexicans directly depend upon this activity, the majority of them rurally-based.

It is worth mentioning that in 2007, SIAP-SAGARPA calculated that the yield of irrigation agriculture was 27.3 metric tonnes per hectare, whereas the value corresponding to rainfed agriculture was 7.8 metric tonnes per hectare.

Mexico is in sixth place worldwide in terms of the area with irrigation infrastructure, with 6.46 million hectares, of which 54% corresponds to 85 Irrigation Districts and the remainder to more than 39 000 Irrigation Units (see Glossary).

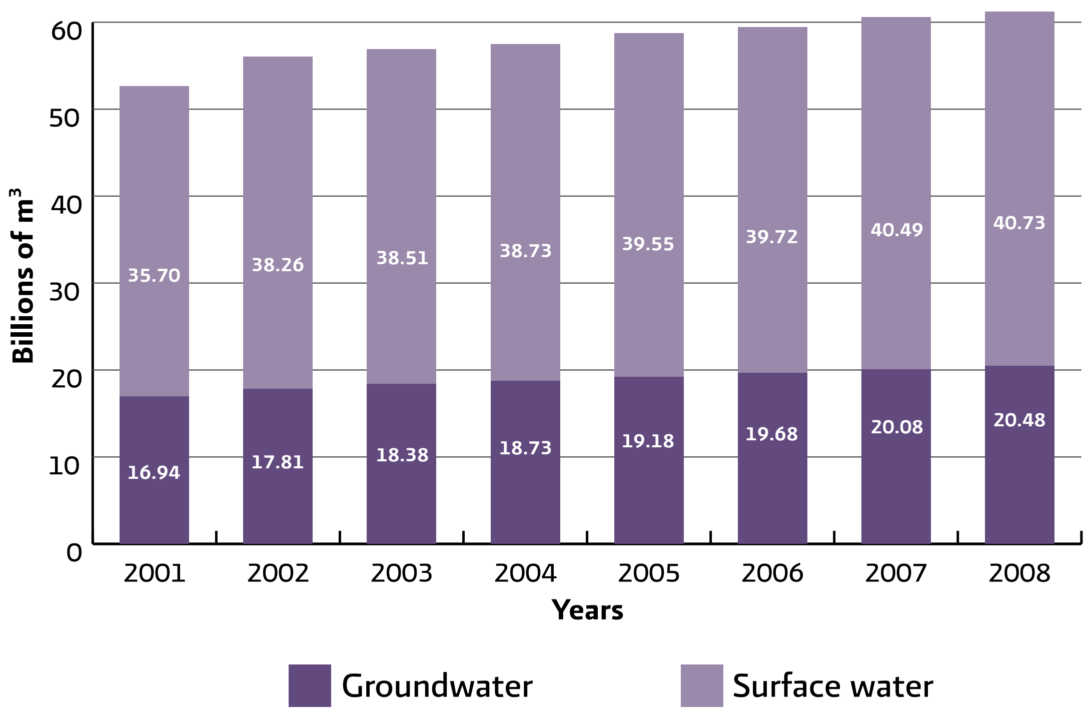
One third of the water allocated for agricultural uses, which brings together agriculture, aquaculture, livestock, multiple and "others" uses, comes from groundwater sources, as can be observed in graph G3.4.

1 CONAGUA. National summary from state data. Produced based on SAGARPA, Food, Agriculture and Fishing Information Service. Consulted on http://w4.siap.sagarpa.gob.mx/Artus/eis/loadstage.asp (15/07/2009).

2 INEGI. System of National Accounts in Mexico – Accounts of Goods and Services 2003-2007, 2003 Baseline. 2008.

3 STPS. National Inquiry of Occupation and Employment (ENOE). Quarterly indicators. Consulted on http://interdsap.stps.gob.mx:150/302_0058enoe.asp (15/07/2009).

G3.4 Evolution of the volume allocated for agricultural use by type of source, 2001-2008 (billions of cubic meters)



NOTE: Includes the agricultural, livestock, aquaculture, multiple and "others" headings of the REPDA classification.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management.

We recommend consulting the annual publication "Agricultural Statistics in Irrigation Districts", produced by the National Water Commission.

3.4 Use for public water supply

The use for public supply includes all water delivered through the drinking water networks, which supply domestic users, as well as the different industries and services connected to these networks.

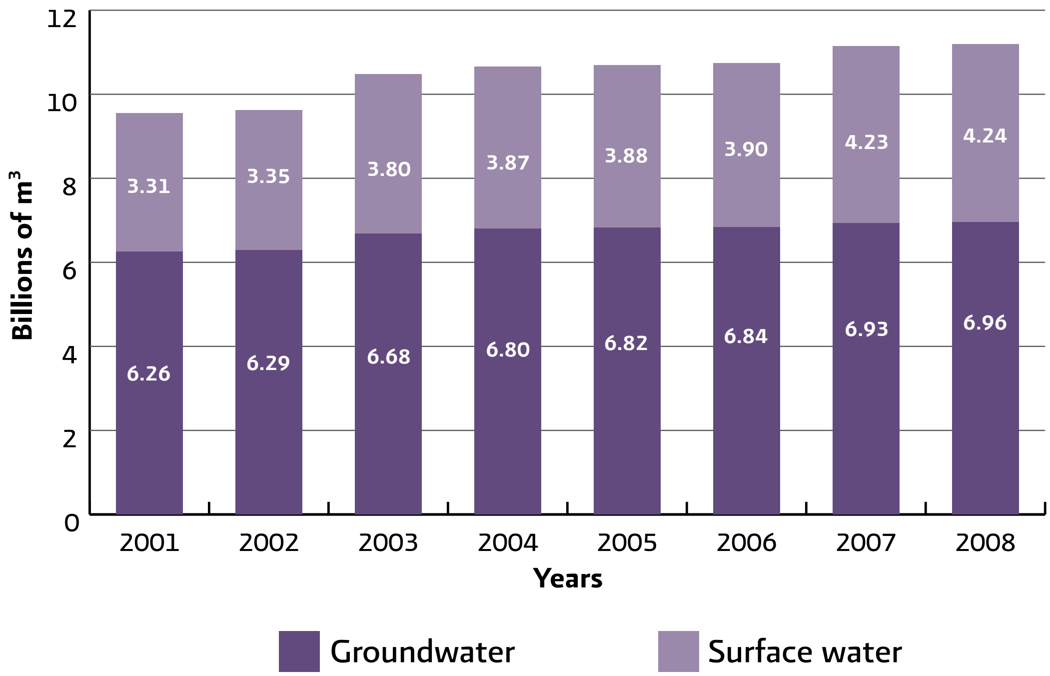
Having access to water in sufficient quantity and quality for human consumption is one of the basic needs of the population, since it has a direct influence on their health and general wellbeing. This characteristic is recognized by the guiding tools for national planning: the National Development Plan 2007-2012 and the National Water Resources Program 2007-2012.

In Mexico, drinking water services, together with sanitation, sewerage, treatment and disposal of wastewater, are under the responsibility of the municipalities.

We recommend consulting the annual publication "Situation of the Drinking Water, Sewerage and Sanitation Subsector", produced by the National Water Commission.

For public water supply, which covers the public urban and domestic headings, the predominant source is groundwater, with 62% of the volume, as can be appreciated in graph G3.5. It is worth noting that in the period shown, the surface water allocated for this use grew by 28%.

G3.5 Evolution of the volume allocated for public water supply by type of source, 2001-2008 (billions of cubic meters)



NOTE: Includes the public urban and domestic headings of the REPDA classification.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management.

3.5 Use in self-supplying industry

This heading includes the industry that takes its water directly from the country's rivers, streams, lakes or aquifers.

According to the North American Industrial Classification System (NAICS)[4], secondary activities, known traditionally as "industry", are made up of the mining, electricity, water and piped gas supply sectors, as well as the construction and manufacturing industry. It should be added that the classification of uses in the REPDA does not exactly follow this classification, even though it is considered that there is a reasonable level of overlap.

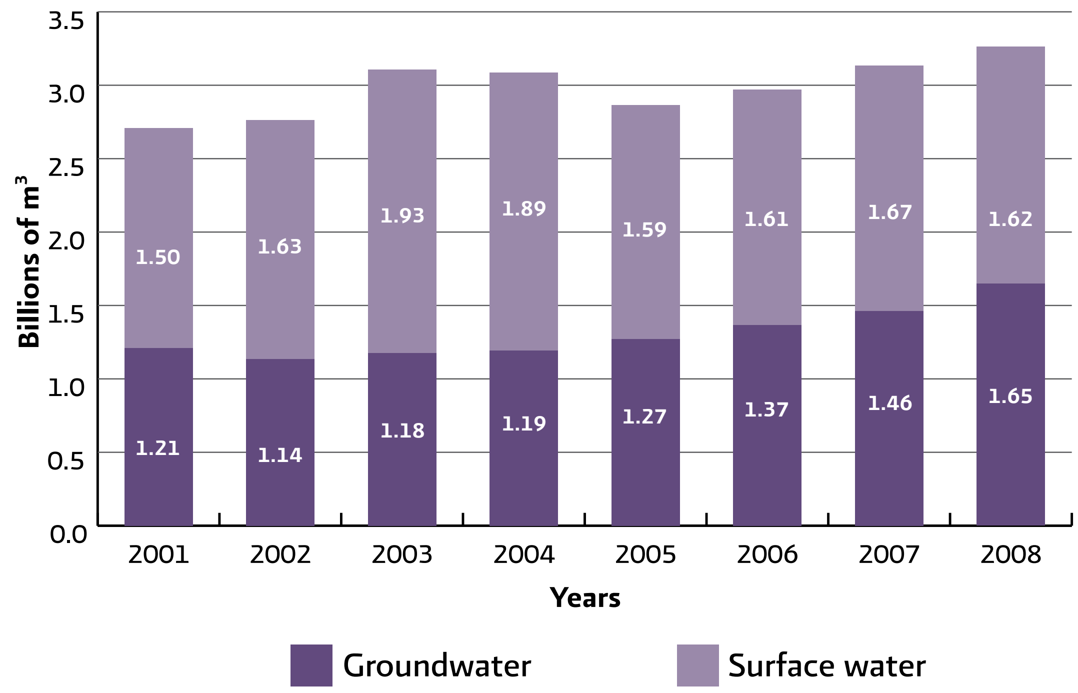
According to the 2004 Economic Census[5], the main subsectors that make up industry, not including those aimed at the generation of electricity, are petroleum and gas extraction, the manufacture of transportation equipment, the chemical industry and food industry. This list is presented in descending order according to the value of the production added during the work process, known as the Total Census Value Added. These four subsectors represent 57% of the Total Census Value Added generated by secondary activities (without considering the generation of electricity).

Even if it only represents 4% of the total uses of water, the integrated self-supplying industrial use, which includes industrial, service, agro-industrial and commercial uses, presents a strong growth trend, as can be observed in graph G3.6.

[4] INEGI. Structure of the NAICS Mexico. Consulted on http://www.inegi.gob.mx/est/contenidos/espanol/metodologias/censos/scian/estructura.pdf (15/07/2009).

[5] INEGI. Economic Censuses 2004. Consulted on http://www.inegi.org.mx/inegi/default.aspx?s=est&c=10213 (15/7/2009)

G3.6 **Evolution of the volume allocated for use in self-supplying industry by type of source, 2001-2008 (billions of cubic meters)**



NOTE: Includes the industrial, agro-industrial, service and trade headings of the REPDA classification.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management.

3.6 Use in thermoelectric plants

The water included under this heading refers to that used in dual steam, coal-electric, combined cycle, turbo-gas and internal combustion plants.

According to the findings of the Federal Commission for Electricity (CFE in Spanish), in 2008 the country's thermoelectric plants generated 193.56 TWh, which represents 83.6% of the total of electricity produced in Mexico. The corresponding plants have an installed capacity of 38 876 MW, or 77.9% of the country's total. It should be noted that 76.7% of the water allocated to thermoelectric plants in Mexico corresponds to the coal-electric plant in Petacalco, situated on the Guerrero coast, very close to the mouth of the river Balsas.

T3.4 Generation of thermoelectric energy and installed capacity, annual series from 1999 to 2008

Parameter/Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Generation of thermoelectric energy (TWh)	147.07	157.39	167.11	174.60	181.95	181.24	188.78	191.78	198.79	193.56
Total electricity generation (TWh)	179.07	190.00	194.92	198.88	200.94	205.39	215.63	221.00	228.49	231.39
Percentage compared to the total generation	82.1	82.8	85.7	87.8	90.5	88.2	87.5	86.8	87.0	83.6
Thermoelectric capacity (MW)	25 449	25 995	28.312	30 971	34 348	35 423	35 306	37 572	38.799	38 876
Installed capacity (MW)	34 839	35 385	37 691	40 350	43 727	45 687	45 576	47 857	49 854	49 931
Percentage compared to the total capacity	73.05	73.46	75.12	76.76	78.55	77.53	77.47	78.51	77.83	77.86

NOTE: 1 TWh = 1000 GWh
This table considers the generation in fuel oil or gas, dual steam, combined cycle, turbo gas and internal combustion, coal-electric, nuclear energy, geo-thermoelectric and wind energy plants.
The thermoelectric installed capacity and the total installed capacity include 11 457 MW of thermoelectric capacity from Independent Power Producers (IPPs).
The generation of thermoelectric energy and the total electricity generation include 74.23 TWh generated by IPPs.
Energy for the Center ("Luz and Fuerza del Centro" in Spanish), not reported in this table, had a generation capacity in 2008 of 1 174.33 MW, of which 224 MW corresponds to one Thermoelectric Plant and 662 MW is from turbo gas.
SOURCE: Federal Commission for Electricity. Electricity generation. Consulted on: http://www.cfe.gob.mx/es/LaEmpresa/generacionelectricidad (15/07/2009).
Federal Commission for Electricity. Annual Report 2008. Consulted on: http://www.cfe.gob.mx/informe2008/capitulo3_1.html (15/07/2009).

3.7 Use in hydropower plants

Nationwide, the Hydrological-Administrative Regions XI Southern Border and IV Balsas are those which have the greatest allocation of water for this use, since in these regions the rivers with the heaviest flows and consequently the country's largest hydropower plants are to be found.

T3.5 Volumes declared for the payment of duties for hydropower production, by Hydrological-Administrative Region, annual series from 1999 to 2008

	Hydrological-Administrative Region	Volume of water declared									
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
I	Baja California Peninsula	0	0	0	0	0	0	0	0	0	0
II	Northwest	2 758	3 369	2 740	2 613	1 987	1 014	3 251	2 929	3 351	3 405
III	Northern Pacific	7 950	8 309	9 479	5 859	5 168	7 284	11 598	10 747	11 184	13 217
IV	Balsas	41 524	32 596	25 992	45 588	30 969	35 207	32 141	21 820	31 099	30 573
V	Southern Pacific	2 075	2 104	1 891	1 705	1 925	2 049	1 890	1 949	2 140	2 245
VI	Rio Bravo	2 503	2 867	2 067	1 550	1 110	462	2 074	2 263	2 890	1 968
VII	Central Basins of the North	0	0	0	0	0	0	0	0	0	0
VIII	Lerma-Santiago-Pacific	13 468	6 122	4 126	5 572	7 792	10 418	7 361	4 658	10 517	13 517
IX	Northern Gulf	1 230	1 230	1 180	989	997	1 598	1 488	810	1 105	2 912
X	Central Gulf	19 407	16 844	15 510	12 603	12 108	16 043	13 979	17 835	14 279	14 041
XI	Southern Border	62 322	92 365	65 821	44 454	34 056	36 454	41 573	77 246	46 257	68 793
XII	Yucatán Peninsula	0	0	0	0	0	0	0	0	0	0
XIII	Waters of the Valley of Mexico	33	38	42	50	52	54	31	39	11	0
	NATIONAL TOTAL	153 269	165 843	128 849	120 982	96 164	110 581	115 386	140 295	122 832	150 669

SOURCE: CONAGUA. Coordination of Fiscal Revision and Payments.

In 2008, the country's hydropower plants employed a volume of 150.7 billion cubic meters of water, which allowed 37.84 TWh of electricity to be generated, or 16.4% of the country's total generation. The installed capacity in the hydropower plants is 11 055 MW, which corresponds to 22.1% of Mexico's installed total (CFE).

T3.6 Total generation of electricity and installed capacity in Mexico, annual series from 1999 to 2008

Parameter/Year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Generation of hydropower (TWh)	32.01	32.61	27.81	24.28	18.99	24.16	26.85	29.22	29.70	37.84
Total generation of electricity (TWh)	179.07	190.00	194.92	198.88	200.94	205.39	215.63	221.00	228.49	231.39
Percentage compared to total generation	17.9	17.2	14.3	12.2	9.5	11.8	12.5	13.2	13.0	16.4
Installed hydropower capacity (MW)	9 390	9 390	9 379	9 379	9 379	10 264	10 270	10 285	11 055	11 055
Total installed capacity (MW)	34 839	35 385	37 691	40 350	43 727	45 687	45 576	47 857	49 854	49 931
Percentage compared to total capacity	27.0	26.5	24.9	23.2	21.4	22.6	22.5	21.5	22.2	22.1

NOTE: 1 TWh = 1000 GWh
This table only considers the generation in hydropower plants.
The total installed capacity includes 11 457 MW of thermoelectric capacity from Independent Power Producers (IPPs). IPPs do not generate electricity through hydropower plants.
The total electricity generation includes 74.23 TWh generated by IPPs.
Energy for the Center ("Luz and Fuerza del Centro" in Spanish), not reported in this table, had a generation capacity in 2008 of 1 174.33 MW, of which 288.33 MW corresponds to hydropower.
SOURCE: Federal Commission for Electricity. Electricity generation. Consulted on: http://www.cfe.gob.mx/es/LaEmpresa/generacionelectricidad (15/07/2009).
Federal Commission for Electricity. Annual Report 2008. Consulted on: http://www.cfe.gob.mx/informe2008/capitulo3_1.html (15/07/2009).

3.8 Water stress

The percentage of water used for offstream uses as compared to the renewable water resources is an indicator of the water stress in any given country, catchment or region. It is considered that if the percentage is greater than 40%, there is a high water stress.

On the whole, Mexico is experiencing a water stress of 17.4%, which is considered moderate; however, the central, northern and northwest area of the country is experiencing a high water stress. In table T3.7 and map M3.2, this indicator is shown for each of the country's Hydrological-Administrative Regions.

T3.7 Water stress, by Hydrological-Administrative Region, 2008

No	Hydrological-Administrative Region	Total volume of water allocated (millions of m^3)	Mean renewable water resources (millions of m^3)	Water stress index (%)	Classification of water stress
I	Baja California Peninsula	3 510	4 626	75.9	High
II	Northwest	7 609	8 323	91.4	High
III	Northern Pacific	10 439	25 627	40.7	High
IV	Balsas	10 703	21 680	49.4	High
V	Southern Pacific	1 351	32 794	4.1	Low
VI	Rio Bravo	9 234	11 937	77.4	High
VII	Central Basins of the North	3 833	7 884	48.6	High
VIII	Lerma-Santiago-Pacific	14 162	34 160	41.5	High
IX	Northern Gulf	4 747	25 543	18.6	Moderate
X	Central Gulf	4 957	95 866	5.2	Low
XI	Southern Border	2 190	157 754	1.4	Low
XII	Yucatán Peninsula	2 368	29 645	8.0	Low
XIII	Waters of the Valley of Mexico	4 650	3 514	132.3	Very high
NATIONAL TOTAL		79 752	459 351	17.4	Moderate

NOTE: The sums may not add up perfectly, due to the rounding up or down of figures.
Water stress = 100*(Total volume of water allocated/renewable water resources).
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management.
CONAGUA. Deputy Director General's Office for Technical Affairs.

M3.2 Water stress by Hydrological-Administrative Region, 2008

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs
CONAGUA. Deputy Director General's Office for Water Management.

3.9 Virtual water in Mexico

Virtual water is defined as the total quantity of water used by or embedded in a product, good or service. For example, in order to produce one kilogram of wheat in Mexico, an average of 1 000 liters of water is required, whereas to put a kilogram of beef on the table requires 13 500 liters. These values vary between countries.

Through Mexico's commercial exchanges with other countries, in 2008 Mexico exported 6 961 million cubic meters of virtual water, and imported 34 601, meaning that it had a net import of 27 640 million cubic meters of virtual water. Of this amount, 53.2% is related with agricultural products, 38.4% with animal products and the remaining 8.4% with industrial products.

The three products that consume the most virtual water that were exported in 2008 were: cereals with 1 179.41 million cubic meters, edible fruit with 1 108.59 million cubic meters, meats and edible remains with 840.22 million cubic meters.

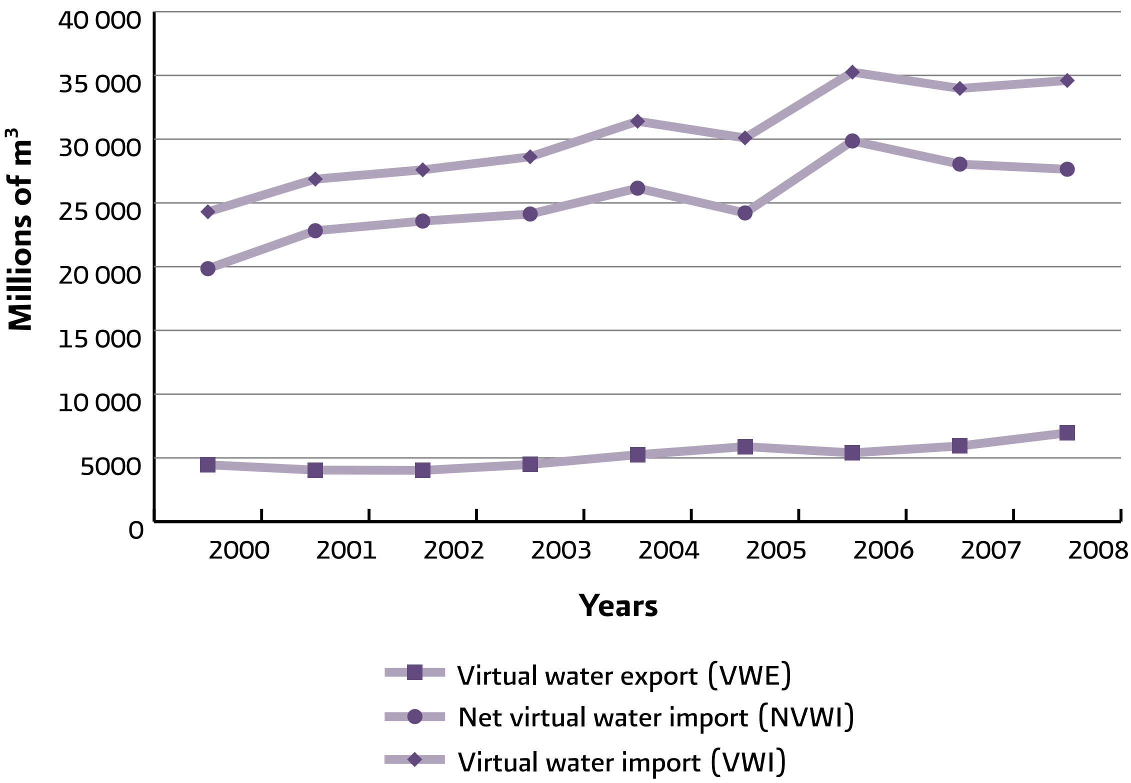
The industrial products which export the most virtual water were the iron and steel industry with 563.56 million cubic meters, a 14.1% reduction since 2007, and the petrol industry with 132.4 million cubic meters, which also went down by 14.4%, compared to the 2007 values.

On the other hand, the three products with which the most virtual water was imported were cereals, with 11 290.62 million cubic meters, meats and edible remains with 10 190.35 million cubic meters and grains and fruit with 6 820.79 million cubic meters. As regards industry, the greatest imports were obtained in the field of iron and steel, with 755.98 million cubic meters, a 16.7% decrease from 2007, and textile products-fabrics, 473.75 million cubic meters, a 220.2% increase since 2007.

Evolution of imports and exports

Graph G3.7 presents the annual evolution of virtual water imports and exports in the period 2000-2008.

G3.7 **Net virtual water imports in Mexico from 2000 to 2008 (millions of cubic meters per year)**



SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs

T3.8 **Net virtual water import in Mexico from 2000 to 2008 (millions of cubic meters per year)**

Concept/Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
Virtual water export (VWE)	4 641	4 045	4 022	4 488	5 251	5 884	5 396	5 936	6 961
Virtual water import (VWI)	24 304	26 864	27 596	28 617	31 405	30 097	35 255	33 977	34 601
Net virtual water import (NVWI)	19 843	22 819	23 575	24 129	26 154	24 213	29 859	28 041	27 640

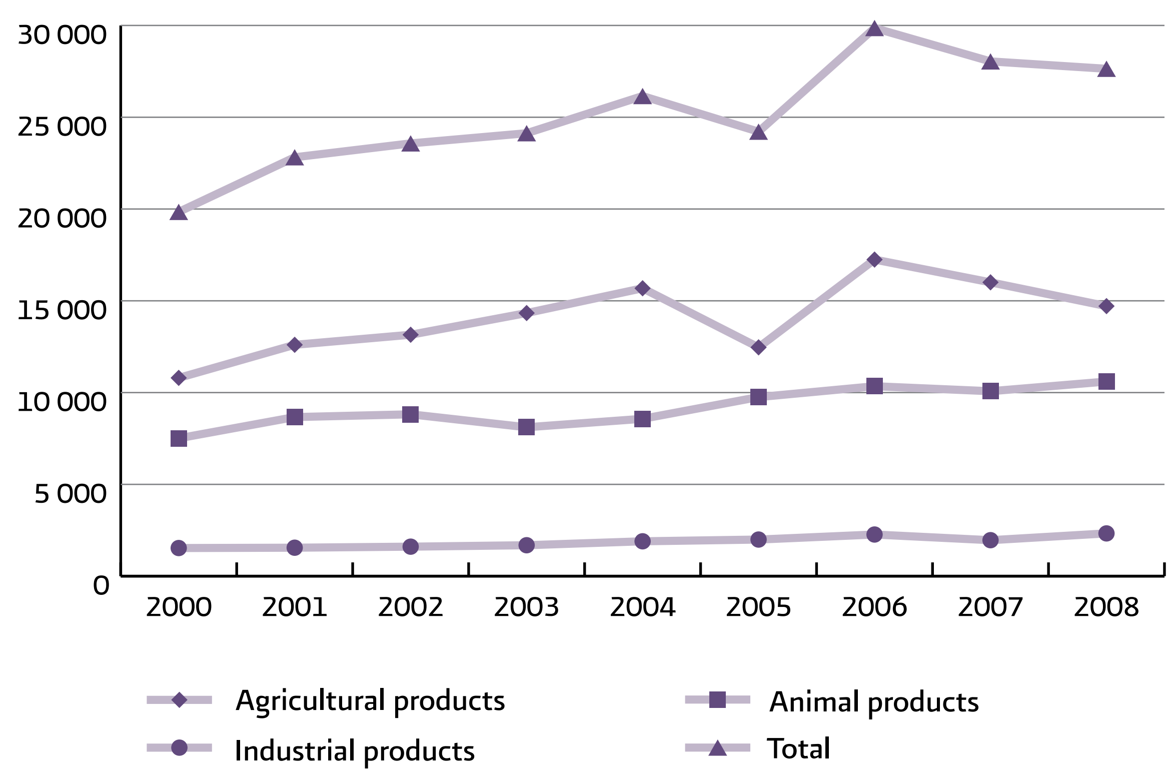
SOURCE: CONAGUA Deputy Director General's Office for Technical Affairs

The net virtual water import, which is the difference between virtual water export and import, decreased slightly in 2008, by 1.4% as compared to the 2007 value.

This decrease in the net import is mainly due to an increase in the exports of cereals and sugar, and a decrease in the exports of petrol, iron and steel products, between 2007 and 2008.

As regards the behavior of the net virtual water import for agricultural products, a 14.7% decrease can be observed over the last two years. For industrial and animal products, the level remained almost on an even footing, as can be noted from graph G3.8.

G3.8 Net virtual water import in Mexico by type of product 2000 to 2008 (millions of cubic meters per year)



SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs

Chapter 4. Water infrastructure

Through this chapter, information is presented on the different types of water infrastructure in Mexico, to use water, to adequately discharge wastewater, and to protect the population and productive areas from floods.

The evolution in the volumes of water stored in Mexico's reservoirs is shown. Information is provided on the Irrigation Districts and Units, which place Mexico in sixth place worldwide in terms of its surface under irrigation.

Relevant data on drinking water and improved sanitation coverage is also included, as well as on the wastewater treatment plants in operation throughout the country.

The reuse of water, through which the cycle of water use by human beings is closed, is another of the issues approached in this chapter.

4.1 Mexico's water infrastructure

Among the hydraulic infrastructure available within the country to provide the water required for the various national users, the following stands out:

- 4 462 dams and water retention berms[1].
- 6.50 million hectares with irrigation.
- 2.74 million hectares with technified rainfed infrastructure.
- 604 municipal treatment purification plants in operation.
- 1 833 municipal wastewater treatment plants in operation.
- 2 082 industrial wastewater treatment plants in operation.
- 3 000 km of aqueducts.

[1] An approximate number, due to the insufficient registry of berms.

4.2 Dams

There are more than 4 462 dams and water retention berms in Mexico, of which 667 are classified as large

R4.1 The classification of dams and water retention berms

According to their dimensions, the CONAGUA applies the following classification criteria to storage infrastructure, developed based on the ICOLD criteria.

Size	Height of the dam	Storage
Large	$\geq$ 15 m	
	5 m $\leq$ h < 15 m	$\geq$ 3 hm^3
Small	5 m $\leq$ h < 15 m	Between 0.5 hm^3 and < 3 hm^3
Water retention berms	< 3 m	$\leq$ 0.5 hm^3

SOURCE: Arreguín C., F. and others. Water retention berms in Mexico. Civil Engineering. Pp. 12-18. Number 483. College of Civil Engineers of Mexico. Mexico, DF. July 2009.

Photograph of the Francisco I. Madero dam, also known as Las Vírgenes, Municipality of Rosales, Chihuahua, 1949

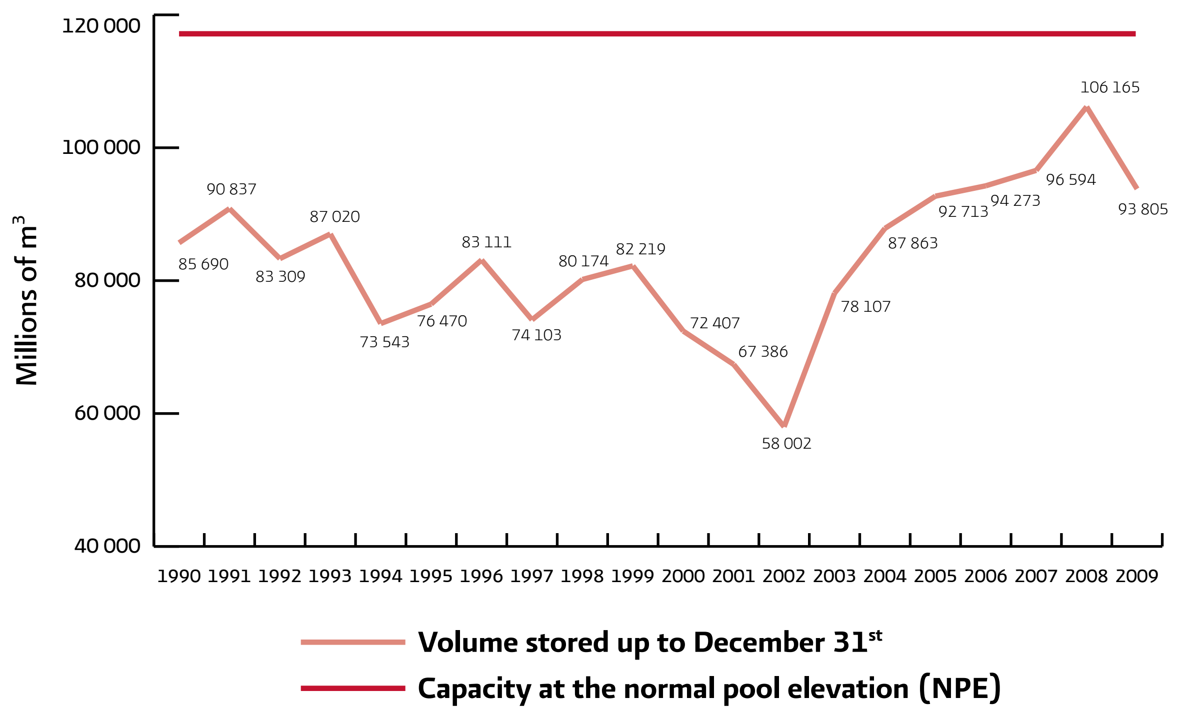
dams, according to the definition of the International Commission on Large Dams (ICOLD).

There is an incomplete registry of water retention berms, known in Spanish as "bordos", which are smaller storage works mainly present on dirt tracks. Up to July 2009, 1 085 of these berms had been registered with the CONAGUA.

The storage capacity in the country's reservoirs is approximately 150 billion m^3. The volume stored in the 100 largest reservoirs[2] every year in the period from 1990 to 2009 is shown in the following figures, both nationally, in graph G4.1, and regionally, in G4.2. This volume depends upon the precipitation and runoff in the different regions of the country, as well as the dams' operation policies, defined by their purposes, both in terms of supply for the various uses and flood control.

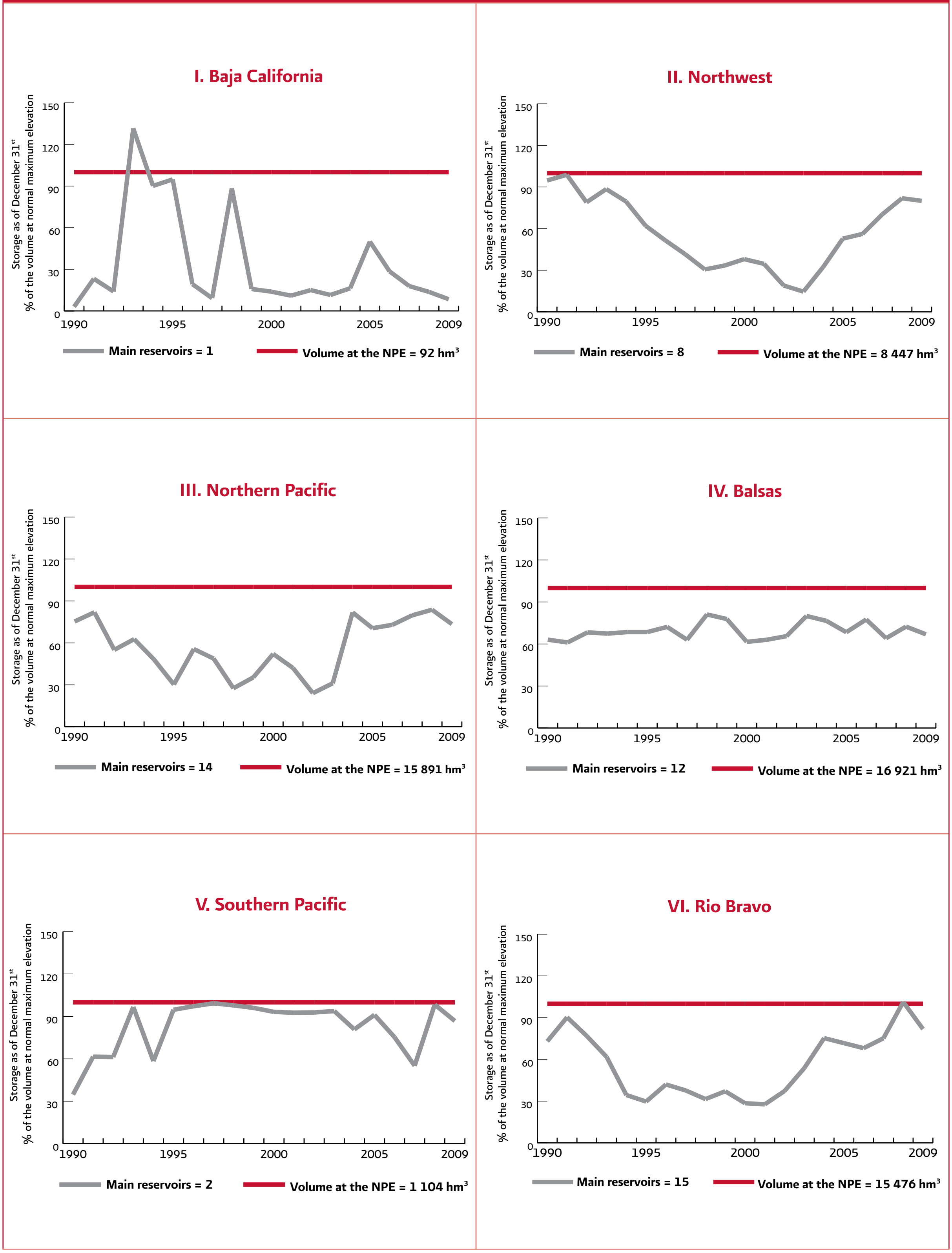
2 Those with the greatest storage capacity.

G4.1 Volume of storage in Mexico's main reservoirs as of December 31st each year, annual series from 1990 to 2009 (millions of cubic meters)

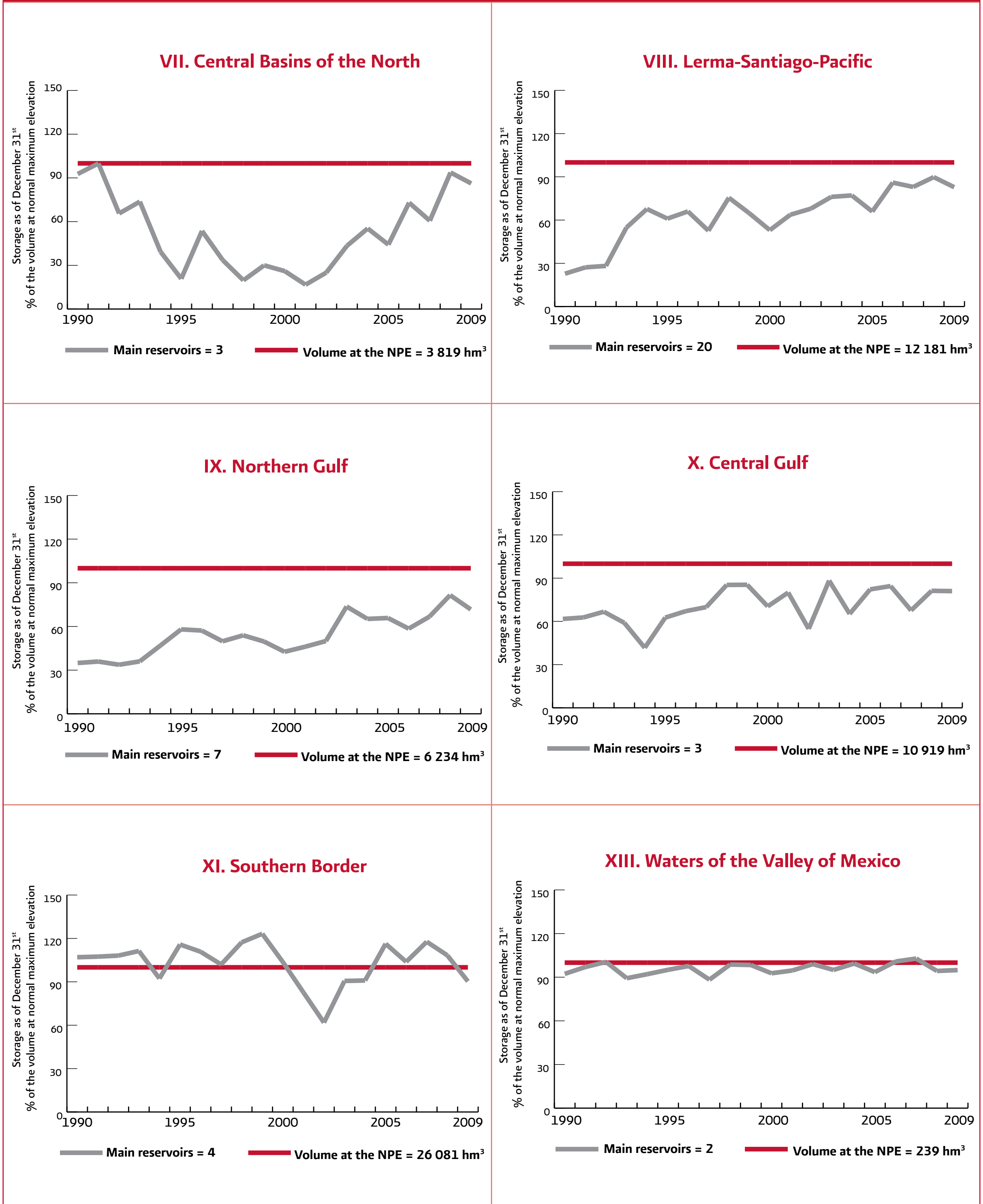


NOTE: 1 hm^3 = 1 million cubic meters.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.

G4.2 Percentage of storage capacity reached by Hydrological-Administrative Region in Mexico's main reservoirs, annual series from 1990 to 2009



G4.2 Percentage of storage capacity reached by Hydrological-Administrative Region in Mexico's main reservoirs, annual series from 1990 to 2009



NOTE: In the region XII there are no dams which are included in the list of the country's main dams, as regards their storage capacity.
The percentage shows the useful volume stored as of December 31st compared to the volume at the NPE (Normal Pool Elevation), which explains how the values may be higher than 100%.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.

These 100 main reservoirs represent almost 79% of the country's total storage capacity. Their location is shown in map M4.1 and their main characteristics in table T4.1. The location of the large dams follows, among other factors, the hydrological regime of the current, the topography and the geological characteristics of the site, as well as the uses to which they are destined, among them hydropower generation, public water supply, irrigation and flood control.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Presas_principales).

M4.1 Main reservoirs in Mexico for their storage capacity, 2008

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.

T4.1 Storage capacity and use of Mexico's main dams, 2008

No	Code	Official name	Given name	Capacity at the NPE (hm^3)	Year of completion	Hydrological-Administrative Region	Uses
1	693	Dr. Belisario Domínguez	La Angostura	12 762	1974	Southern Border	G
2	1453	Infiernillo	Infiernillo	12 500	1964	Balsas	G, C
3	706	Netzahualcóyotl	Malpaso or Raudales	10 596	1964	Southern Border	G, C
4	2754	Presidente Miguel Alemán	Temascal	8 119	1955	Central Gulf	G, C
5	2516	Solidaridad	Aguamilpa	5 540	1993	Lerma-Santiago-Pacific	G, I
6	345	Internacional La Amistad	La Amistad	4 462	1968	Rio Bravo	G, I, P, C
7	3440	Internacional Falcón	Falcón	3 912	1953	Rio Bravo	P, C, G
8	3617	General Vicente Guerrero Consumador de la Independencia Nacional	Las Adjuntas	3 910	1971	Northern Gulf	I, P
9	1084	Lázaro Cardenas	El Palmito	3 336	1946	Central Basins of the North	I, C
10	3148	Adolfo López Mateos	El Humaya or Varejonal	3 072	1964	Northern Pacific	G, I
11	3243	Álvaro Obregón	El Oviachic	2 989	1952	Northwest	G, I
12	3320	Plutarco Elías Calles	El Novillo	2 963	1964	Northwest	G, I
13	3218	Miguel Hidalgo y Costilla	El Mahone	2 921	1956	Northern Pacific	G, I
14	3216	Luis Donaldo Colosio	Huites	2 908	1995	Northern Pacific	G, I
15	750	La Boquilla	Lago Toronto	2 894	1916	Rio Bravo	I, G
16	3210	José López Portillo	El Comedero	2 800	1983	Northern Pacific	G, I
17	2742	Miguel de la Madrid	Cerro de Oro	2 600	1988	Central Gulf	I
18	2538	Leonardo Rodríguez Alcaine	El Cajón	2 282	2006	Lerma-Santiago-Pacific	G
19	3203	Gustavo Díaz Ordaz	Bacurato	1 860	1981	Northern Pacific	G, I
20	701	Manuel Moreno Torres	Chicoasén	1 632	1980	Southern Border	G
21	1463	Carlos Ramírez Ulloa	El Caracol	1 521	1986	Balsas	G
22	3241	Adolfo Ruiz Cortines	Mocúzari	1 114	1955	Northwest	G, I
23	688	Angel Albino Corzo	Peñitas	1 091	1986	Southern Border	G
24	2689	Cuchillo-Solidaridad	El Cuchillo	1 025	1994	Rio Bravo	P, I
25	3490	Marte R. Gómez	El Azúcar	995	1946	Rio Bravo	I
26	2708	Presidente Benito Juárez	El Marqués	977	1961	Southern Pacific	I
27	1679	Ing. Fernando Hiriat Balderrama	Zimapán	930	1995	Northern Gulf	G
28	1436	Solís	Solís	870	1980	Lerma-Santiago-Pacific	I, C

T4.1 Storage capacity and use of Mexico's main dams, 2008

No	Code	Official name	Given name	Capacity at the NPE (hm^3)	Year of completion	Hydrological-Administrative Region	Uses
29	3302	Lázaro Cardenas	La Angostura	864	1942	Northwest	I, P
30	3229	Sanalona	Sanalona	673	1948	Northern Pacific	G, I
31	494	Venustiano Carranza	Don Martín	614	1930	Rio Bravo	I, P, C
32	3557	Estudiante Ramiro Caballero Dorantes	Las Ánimas	571	1976	Northern Gulf	I
33	3211	Josefa Ortiz de Domínguez	El Sabino	514	1967	Northern Pacific	I
34	1710	Cajón de Peña	Tomatlán or El Tule	511	1976	Lerma-Santiago-Pacific	I
35	2257	José María Morelos	La Villita	510	1968	Balsas	G, I
36	3693	Chicayán	Paso de Piedras	468	1977	Northern Gulf	I
37	2206	Constitución de Apatzingán	Chilatán	450	1989	Balsas	I, C
38	3154	Ing. Aurelio Benassini Viscaíno	El Salto or Elota	415	1988	Northern Pacific	I, C
39	1477	El Gallo	El Gallo	410	1998	Balsas	I
40	2126	Valle de Bravo [a]	Valle de Bravo	391	1944	Balsas	P
41	1045	Francisco Zarco [b]	Las Tórtolas	365	1968	Central Basins of the North	C, I
42	49	Plutarco Elías Calles	Calles	340	1931	Lerma-Santiago-Pacific	I
43	2826	Manuel Ávila Camacho	Valsequillo	331	1946	Balsas	I
44	1782	General Ramón Corona Madrigal	Trigomil	324	1993	Lerma-Santiago-Pacific	I
45	2382	Tepuxtepec	Tepuxtepec	323	1973	Lerma-Santiago-Pacific	G, I
46	825	Ing. Luis L. León	El Granero	309	1968	Rio Bravo	I, C
47	3202	Ing. Guillermo Blake Aguilar	El Sabinal	300	1985	Northern Pacific	C, I
48	2631	José López Portillo	Cerro Prieto	300	1984	Rio Bravo	P, I
49	813	Francisco I. Madero	Las Vírgenes	296	1949	Rio Bravo	I, C
50	1328	Laguna de Yuriria	Yuriria	288	1550	Lerma-Santiago-Pacific	I
51	1825	Manuel M. Diéguez	Santa Rosa	258	1964	Lerma-Santiago-Pacific	G
52	1035	Federalismo Mexicano	San Gabriel	255	1981	Rio Bravo	I, P, C
53	1507	Vicente Guerrero	Palos Altos	250	1968	Balsas	I
54	3478	Presidente Lic. Emilio Portes Gil	San Lorenzo	231	1983	Northern Gulf	I
55	4365	Trojes Solidaridad	Trojes	220	1980	Lerma-Santiago-Pacific	I

T4.1 Storage capacity and use of Mexico's main dams, 2008

No	Code	Official name	Given name	Capacity at the NPE (hm^3)	Year of completion	Hydrological-Administrative Region	Uses
56	3239	Abelardo L. Rodríguez	Hermosillo	220	1948	Northwest	I, P, C
57	2167	El Bosque	El Bosque	220	1951	Balsas	P, C
58	2286	Melchor Ocampo	El Rosario	200	1975	Lerma-Santiago-Pacific	I
59	3662	Canseco	Laguna de Catemaco	200	1960	Central Gulf	G
60	1583	Endhó	Endhó	182	1951	Waters of the Valley of Mexico	I, C
61	2136	Villa Victoria	Villa Victoria	177	1944	Balsas	P
62	3308	Ing. Rodolfo Félix Valdéz	El Molinito	150	1991	Northwest	I, C
63	1315	Ignacio Allende	La Begoña	150	1968	Lerma-Santiago-Pacific	I, C
64	1926	Tacotán	Tacotán	149	1958	Lerma-Santiago-Pacific	I, C
65	1702	Basilio Vadillo	Las Piedras	146	1976	Lerma-Santiago-Pacific	I
66	1304	La Gavia	La Gavia	145	1980	Lerma-Santiago-Pacific	C
67	3747	El Chique	El Chique	140	1992	Lerma-Santiago-Pacific	I
68	917	El Tintero	El Tintero	138	1949	Rio Bravo	I, C
69	1499	Revolución Mexicana	El Guineo	127	1984	Southern Pacific	I, C
70	2011	Huapango	Huapango	122	1780	Northern Gulf	I
71	3790	Gobernador Leobardo Reynoso	Trujillo	118	1949	Central Basins of the North	I
72	3197	Lic. Eustaquio Buelna	Guamúchil	113	1972	Northern Pacific	I, P, C
73	1365	La Purísima	La Purísima	110	1979	Lerma-Santiago-Pacific	I, C
74	1459	Andrés Figueroa	Las Garzas	103	1984	Balsas	I
75	711	Juan Sabines	El Portillo II o Cuxquepeques	100	1982	Southern Border	I
76	1203	Santiago Bayacora	Bayacora	100	1988	Northern Pacific	I
77	237	Abelardo L. Rodriguez	Rodríguez o Tijuana	92	1937	Baja California Peninsula	P, C
78	5133	Derivadora Las Blancas	Las Blancas	90	2000	Rio Bravo	I, C
79	836	Las Lajas	Las Lajas	90	1964	Rio Bravo	I, C
80	1887	El Salto	El Salto	85	1993	Lerma-Santiago-Pacific	P
81	731	Abraham González	Guadalupe	85	1961	Northwest	I, C
82	2202	Cointzio	Cointzio	85	1939	Lerma-Santiago-Pacific	I, P
83	1057	General Guadalupe Victoria	El Tunal	81	1962	Northern Pacific	I

T4.1 Storage capacity and use of Mexico's main dams, 2008

No	Code	Official name	Given name	Capacity at the NPE (hm^3)	Year of completion	Hydrological-Administrative Region	Uses
84	3807	Miguel Alemán	Excamé	81	1949	Lerma-Santiago-Pacific	I, G, C
85	1800	Ing. Elías González Chávez	Puente Calderón	80	1991	Lerma-Santiago-Pacific	P
86	1040	Francisco Villa	El Bosque	79	1968	Northern Pacific	I
87	2886	Constitución de 1917	Presa Hidalgo	70	1969	Northern Gulf	I
88	2113	Tepetitlán	Tepetitlán	68	1964	Lerma-Santiago-Pacific	I
89	4604	Corral de Palmas	Rompepicos	65	2004	Rio Bravo	C
90	3267	Cuauhtémoc	Santa Teresa	62	1950	Northwest	I
91	2359	San Juanico	La Laguna	60	1950	Balsas	I, C
92	1478	Hermenegildo Galeana	Ixtapilla	58	1970	Balsas	I
93	2005	Guadalupe	Guadalupe	57	1983	Waters of the Valley of Mexico	I
94	3562	República Española	Real Viejo o El Sombrero	55	1974	Northern Gulf	I
95	4677	Ing Juan Guerrero Alcocer	Vinoramas	55	1994	Northern Pacific	I, P, C
96	867	Pico del Águila		50	1993	Rio Bravo	I
97	1166	San Bartolo	Santa Lucía	46	1926	Northern Pacific	I
98	381	La Fragua	La Fragua	45	1991	Rio Bravo	I
99	1918	Ing. Santiago Camarena	La Vega	44	1956	Lerma-Santiago-Pacific	I
100	4758	La Patria es Primero	Las Alazanas	40	1971	Northern Gulf	I
		TOTAL		118 091			

NOTE: Abbreviations = G: Hydropower generation, I: Irrigation, P: Public supply, C: Flood control.
The code corresponds to the National Inventory of Dams.
[a] This dam is part of the Cutzamala System, operated by the Waters of the Valley of Mexico River Basin Organization.
[b] According to 2008's topobatimetric reading, the capacity at the NPE of this reservoir is 309 hm^3.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

Photograph of barrier showing the overflow spillway of the dam in operation. Ixtlahuaca and Almoloya de Juarez, Mexico, José Antonio Alzate Dam, 1970

4.3 Hydro-agricultural infrastructure

In Mexico, the area with infrastructure that allows irrigation is 6.5 million hectares, of which 3.5 million corresponds to 85 Irrigation Districts, illustrated in map M4.2, and the remaining 3.0 million hectares to more than 39 000 Irrigation Units.

The Irrigation Districts and Units were designed according to the prevailing technology for the application of water to plots, by means of gravity. In many cases, only the main channel and drain networks were built, with the actual construction on the plots remaining the responsibility of the users. This situation, along with the deterioration of the infrastructure, which has worsened over decades through the insufficient economic resources dedicated to its conservation and improvement, has brought about a decrease in the overall efficiency of water management.

However, it should be mentioned that the productivity of the surface area under irrigation regimes is 27.3 metric tonnes/ha, which exceeds significantly the productivity in rainfed areas, which is 7.8 tonnes/ha.

M4.2 Irrigation Districts in Mexico, 2008

NOTE: The numbers correspond to the codes of the Irrigation Districts, listed in table T4.2.
SOURCE: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

Irrigation Districts

Irrigation Districts are irrigation projects developed by the federal government since 1926, the year in which the National Irrigation Commission was created, and include various works, such as storage basins, direct diversions, pumping plants, wells, canals and pathways, among others.

The existing Irrigation Districts are shown in map M4.2 and table T4.2, whereas graph G4.3 illustrates the evolution in the water used in Irrigation Districts, for the agricultural years 1989-90 to 2007-08.

T4.2 Location and surface area of Irrigation Districts

No	Code	Name	Hydrological-Administrative Region	State	Total surface area (hectares)
1	001	Pabellon	VIII Lerma-Santiago-Pacific	Aguascalientes	11 938
2	002	Mante	IX Northern Gulf	Tamaulipas	18 094
3	003	Tula	XIII Waters of the Valley of Mexico	Hidalgo	51 825
4	004	Don Martin	VI Rio Bravo	Coahuila de Zaragoza and Nuevo León	29 605
5	005	Delicias	VI Rio Bravo	Chihuahua	82 324
6	006	Palestina	VI Rio Bravo	Coahuila	12 964
7	008	Metztitlan	IX Northern Gulf	Hidalgo	4 876
8	009	Juarez Valley	VI Rio Bravo	Chihuahua	24 492
9	010	Culiacan-Humaya	III Northern Pacific	Sinaloa	212 141
10	011	Upper Lerma River	VIII Lerma-Santiago-Pacific	Guanajuato	112 772
11	013	State of Jalisco	VIII Lerma-Santiago-Pacific	Jalisco and Nayarit	58 858
12	014	Colorado River	I Baja California Peninsula	Baja California and Sonora	208 805
13	016	State of Morelos	IV Balsas	Morelos	33 654
14	017	Lagoon Region	VII Central Basins of the North	Coahuila de Zaragoza and Durango	116 577
15	018	Colonias Yaquis	II Northwest	Sonora	22 794
16	019	Tehuantepec	V Southern Pacific	Oaxaca	44 074
17	020	Morelia-Querendar	VIII Lerma-Santiago-Pacific	Michoacán de Ocampo	20 665
18	023	San Juan del Rio	IX Northern Gulf	Querétaro	11 048
19	024	Chapala Marshes	VIII Lerma-Santiago-Pacific	Michoacán de Ocampo	45 176
20	025	Lower Rio Grande	VI Rio Bravo	Tamaulipas	248 001
21	026	Lower San Juan River	VI Rio Bravo	Tamaulipas	86 102
22	028	Tulancingo	IX Northern Gulf	Hidalgo	753
23	029	Xicotencatl	IX Northern Gulf	Tamaulipas	24 021
24	030	Valsequillo	IV Balsas	Puebla	49 932
25	031	Las Lajas	VI Rio Bravo	Nuevo León	3 693
26	033	State of México	VIII Lerma-Santiago-Pacific	State of Mexico, Michoacán de Ocampo and Querétaro	18 080
27	034	State of Zacatecas	VIII Lerma-Santiago-Pacific	Zacatecas	18 060

T4.2 Location and surface area of Irrigation Districts

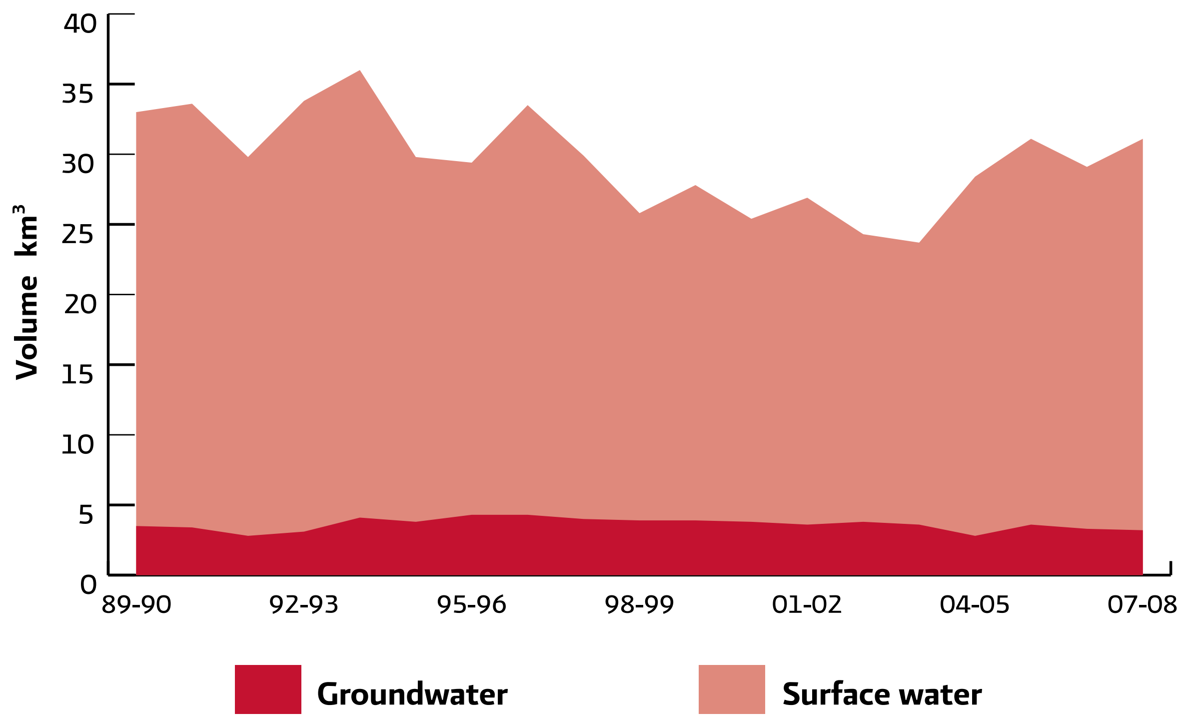
No	Code	Name	Hydrological-Administrative Region	State	Total surface area (hectares)
28	035	La Antigua	X Central Gulf	Veracruz de Ignacio de la Llave	21 851
29	037	Altar Pitiquito Caborca	II Northwest	Sonora	57 587
30	038	Mayo River	II Northwest	Sonora	97 046
31	041	Yaqui River	II Northwest	Sonora	232 944
32	042	Buenaventura	VI Rio Bravo	Chihuahua	7 718
33	043	State of Nayarit	VIII Lerma-Santiago-Pacific	Nayarit	47 253
34	044	Jilotepec	IX Northern Gulf	State of Mexico	5 507
35	045	Tuxpan	IV Balsas	Michoacán de Ocampo	19 376
36	046	Cacahoatan-Suchiate	XI Southern Border	Chiapas	8 473
37	048	Ticul	XII Yucatán Peninsula	Yucatán	9 689
38	049	River Verde	IX Northern Gulf	San Luis Potosi	3 507
39	050	Acuña-Falcon	VI Rio Bravo	Tamaulipas, Coahuila and Nuevo León	12 904
40	051	Hermosillo Coast	II Northwest	Sonora	66 296
41	052	State of Durango	III Northern Pacific	Durango	29 306
42	053	State of Colima	VIII Lerma-Santiago-Pacific	Colima, Jalisco and Michoacán de Ocampo	37 773
43	056	Atoyac-Zahuapan	IV Balsas	Tlaxcala	4 247
44	057	Amuco-Cutzamala	IV Balsas	Guerrero, State of México and Michoacán de Ocampo	34 515
45	059	Blanco River	XI Southern Border	Chiapas	8 432
46	060	El Higo (Panuco)	IX Northern Gulf	Veracruz de Ignacio de la Llave	2 250
47	061	Zamora	VIII Lerma-Santiago-Pacific	Michoacán de Ocampo	17 982
48	063	Guasave	III Northern Pacific	Sinaloa	100 125
49	066	Santo Domingo	I Baja California Peninsula	Baja California Sur	38 101
50	068	Tepecoacuilco-Quechultenango	IV Balsas	Guerrero	1 991
51	073	La Concepcion	XIII Waters of the Valley of Mexico	State of Mexico	964
52	074	Mocorito	III Northern Pacific	Sinaloa	40 742
53	075	Fuerte River	III Northern Pacific	Sinaloa	227 518
54	076	El Carrizo Valley	III Northern Pacific	Sinaloa	51 681
55	082	Blanco River	X Central Gulf	Veracruz de Ignacio de la Llave	21 657
56	083	Papigochic	II Northwest	Chihuahua	8 947
57	084	Guaymas	II Northwest	Sonora	16 667
58	085	La Begoña	VIII Lerma-Santiago-Pacific	Guanajuato	10 823
59	086	Soto La Marina River	IX Northern Gulf	Tamaulipas	35 925

T4.2 Location and surface area of Irrigation Districts

No	Code	Name	Hydrological-Administrative Region	State	Total surface area (hectares)
60	087	Rosario-Mezquite	VIII Lerma-Santiago-Pacific	Michoacán de Ocampo, Jalisco and Guanajuato	63 144
61	088	Chiconautla	XIII Waters of the Valley of Mexico	State of Mexico	4 498
62	089	El Carmen	VI Rio Bravo	Chihuahua	20 805
63	090	Bajo Río Conchos	VI Rio Bravo	Chihuahua	13 313
64	092	Panuco River, Las Animas	VI Rio Bravo	Tamaulipas	44 483
65	092	Panuco River, Chicayan	VI Rio Bravo	Veracruz de Ignacio de la Llave	54 882
66	092	Panuco River, Pujal Coy I	IX Northern Gulf	San Luis Potosi	41 382
67	093	Tomatlan	VIII Lerma-Santiago-Pacific	Jalisco	19 773
68	094	Southern Jalisco	VIII Lerma-Santiago-Pacific	Jalisco	16 940
69	095	Atoyac	V Southern Pacific	Guerrero	5 016
70	096	Arroyozarco	IX Northern Gulf	State of Mexico and Hidalgo	18 866
71	097	Lazaro Cardenas	IV Balsas	Michoacán de Ocampo	71 593
72	098	Jose Maria Morelos	IV Balsas	Michoacán de Ocampo and Guerrero	5 083
73	099	Quitupan-Magdalena[c]	IV Balsas	Michoacán de Ocampo	5 120
74	100	Alfajayucan	XIII Waters of the Valley of Mexico	Hidalgo	40 473
75	101	Cuxtepeques	XI Southern Border	Chiapas	8 267
76	102	Hondo River	XII Yucatán Peninsula	Quintana Roo	27 182
77	103	Florido River	VI Rio Bravo	Chihuahua and Durango	8 964
78	104	Cuajinicuilapa (Ometepec)	V Southern Pacific	Guerrero	6 720
79	105	Nexpa	V Southern Pacific	Guerrero	14 549
80	107	San Gregorio	XI Southern Border	Chiapas	11 227
81	108	Elota-Piaxtla	III Northern Pacific	Sinaloa	27 104
82	109	San Lorenzo River	III Northern Pacific	Sinaloa	69 399
83	110	Verde-Progreso River	V Southern Pacific	Oaxaca	5 030
84	111	Presidio River	III Northern Pacific	Sinaloa	8 435
85	112	Ajacuba	XIII Waters of the Valley of Mexico	Hidalgo	8 500
		Irrigation Zone Fuerte-Mayo, Sinaloa[b]	VI Rio Bravo	Sinaloa	15 073
		Irrigation Zone Fuerte-Mayo, Sonora[b]	III Northern Pacific	Sonora	7 510
		Irrigation Zone Labores Viejas, Chihuahua[a]	III Northern Pacific	Chihuahua	3 712
		SUBTOTALS			3 498 164

NOTE: Since 2005, the Irrigation District 081 State of Campeche became a Coordination of Irrigation Units.
[a] The surface area of this irrigation zone depends operatively and administratively on Irrigation District 005 Delicias, Chihuahua.
[b] The surface area of this irrigation zone depends operatively and administratively on Irrigation District 076 Carrizo Valley, Sinaloa.
[c] The agricultural area of Quitupan is considered part of Irrigation District 013, State of Jalisco.
SOURCE: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

G4.3 Volume of water used in Irrigation Districts, agricultural years from 1989-90 to 2007-08 (billions of cubic meters)



NOTE: The agricultural year in Mexico includes the period from October to September of the following year.
1 km³ = 1 000 hm³ = one billion m³.
SOURCE: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

Photograph taken by N. Pastelin showing an aerial view of the Lomo de Toro diversion dam invaded by water hyacinth, except for the canals. Yuriria, Guanajuato, Lomo de Toro diversion dam, 1972

Water is employed in Irrigation Districts by gravity, by which means the distribution of water is made possible, or it may also be pumped, when electromechanical assistance is required as a result of the topographic layout of the source in question. In turn, the surface source may be a dam, diversion or pump directly to the current; whereas the groundwater source is inevitably used by pumping wells. The volume distributed by each type of use is shown in table T4.3.

T4.3 Number of users, physical surface irrigated, volume distributed and gross mean sheet by type of use. Agricultural year 2007-08

Type of use	Number of users	Physical surface irrigated (ha)			Volume distributed (thousands of m^3)	Mean gross sheet (cm)
		Single crop	Double crop	Total		
Gravity dams	298 107	1 630 388	152 156	1 782 544	20 451 760	115
Gravity diversion	117 279	440 040	17 014	457 054	6 987 889	153
Pumping wells	30 136	228 193	30 039	258 231	3 175 424	123
Pumping currents	8 127	41 779	7 775	49 554	437 299	88
TOTAL	453 649	2 340 400	206 984	2 547 384	31 052 373	122

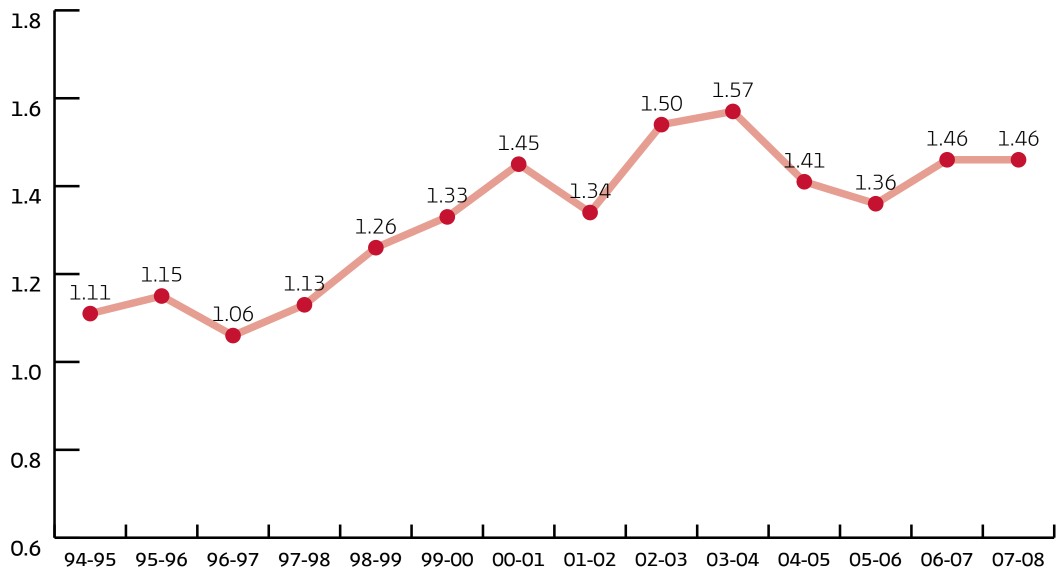
SOURCE: CONAGUA. Agricultural Statistics of the Irrigation Districts. Agricultural year 2007-2008. Deputy Director General's Office for Hydro-Agricultural Infrastructure. 2009.

The productivity of water in Irrigation Districts is a key indicator to evaluate the efficiency with which water is used for food production, and depends upon the efficiency with which water is piped from the supply sources to the plots and of application there. The evolution in efficiency is shown in graph G4.4.

In the current environment, in which a decrease in the availability is foreseen as a result of climate change, it is imperative to increase piping efficiencies. It should be mentioned that water productivity may fluctuate greatly according to the meteorological conditions, as well as the phenological characteristics of each crop. The main crops according to the area harvested are presented in table T4.4.

The transfer of Irrigation Districts to the users commenced with the creation of the CONAGUA in 1989 and the passing of the new National Water Law in 1992, and was supported by a program of partial rehabilitation of the infrastructure that was allocated via irrigation modules to user associations.

G4.4 Productivity of water in Irrigation Districts, series of agricultural years from 1994-95 to 2007-08 (kg/m³)



NOTE: The agricultural year in Mexico includes the period from October to September of the following year.
The calculation employs the gross volume used corresponding to the vegetative cycle, thus explaining why it does not match the annual volumes used.
SOURCE: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

T4.4 Main crops in Irrigation Districts. Agricultural year 2007-08

Crop	Surface harvested (ha)	Participation (%)	Yield (tonnes/ha)	Production (tonnes)	Value of production (thousands of Mexican pesos)
Corn	866 649	30%	8.5	7 327 132	19 722 293
Wheat	475 100	17%	6.2	2 937 725	11 187 461
Sorghum	361 676	13%	5.6	2 027 940	5 412 924
Sugar cane	125 833	4%	93.7	11 787 962	4 893 806
Beans	89 611	3%	1.9	166 530	1 582 570
Others	945 063	33%	22.4	21 166 097	37 705 401
TOTAL	2 863 931	100%		45 413 386	80 504 455

SOURCE: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

Up to December 2008, 99.18% of the total surface of the Irrigation Districts had been transferred to the users. Up to that time, only two Districts had not been totally transferred to the users, as shown in table T4.5.

We recommend consulting the annual publication "Agricultural Statistics of the Irrigation Districts", produced by the National Water Commission.

T4.5 Partially transferred Irrigation Districts, 2008 (situation as of December 31st)

No	Name	State	Percentage transferred	No. of users
003	Tula	Hidalgo	53.87	18 317
018	Colonias Yaquis	Sonora	83.39	1 710

SOURCE: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

Irrigation Units

The Irrigation Units (known as URDERALES in Spanish) are operated by members of cooperatives and small landholders, who in some cases are organized within the Units. As a result of their complexity, variety and generally reduced extension, no up-to-date and detailed information exists on the beneficiaries, surface areas and infrastructure. However, the volume used is estimated and Agricultural Statistics exist from the 2004-2005 cycle onwards in the Irrigation Units.

> We recommend consulting the annual publication "Agricultural Statistics of the Irrigation Units 2005-2006", produced by the National Water Commission.

T4.6 Surface harvested, production and yield of the Irrigation Units by Hydrological-Administrative Region

No	Hydrological-Administrative Region	Surface harvested (ha)	Production (tonnes)	Yield (tonnes/ha)
I	Baja California Peninsula	51 847	1 058 094	20.41
II	Northwest	128 671	1 733 460	13.47
III	Northern Pacific	147 791	2 384 148	16.13
IV	Balsas	500 393	12 285 530	24.88
V	Southern Pacific	102 139	1 735 278	16.99
VI	Rio Bravo	475 095	7 671 843	16.15
VII	Central Basins of the North	478 232	14 834 353	31.02
VIII	Lerma-Santiago-Pacific	648 032	12 220 005	18.89
IX	Northern Gulf	431 124	7 014 490	16.27
X	Central Gulf	78 683	3 309 154	42.13
XI	Southern Border	29 395	1 243 574	42.31
XII	Yucatán Peninsula	46 309	837 519	18.09
XIII	Waters of the Valley of Mexico	84 936	2 376 290	28.02
TOTAL		3 202 646	68 703 737	21.51

SOURCE: CONAGUA. Agricultural Statistics of the Irrigation Units 2005-2006. 2008.

Technified Rainfed Districts

In the tropical and subtropical plains of the country, which have an excess of humidity and constant floods, the federal government has established the Technified Rainfed Districts (TRDs), in which hydraulic works have been built to remove the excess water. Table T4.7 lists the main characteristics of the TRDs. Similarly to the Irrigation Districts, the Technified Rainfed Districts have gradually been transferred to organized users.

T4.7 Characteristics of the Technified Rainfed Districts, 2008 (situation as of December 31st)

No	Code	Technified Rainfed District	Hydrological-Administrative Region	State	Surface area (thousands of ha)	Users (number)
1	001	La Sierra	XI Southern Border	Tabasco	32.1	1 178
2	002	Zanapa-Tonalá	XI Southern Border	Tabasco	106.9	6 919
3	003	Tesechoacán	X Central Gulf	Veracruz de Ignacio de La Llave	18.0	1 139
4	005	Pujal Coy II	X Central Gulf	San Luis Potosí and Tamaulipas	220.0	9 987
5	006	Acapetahua	XI Southern Border	Chiapas	103.9	5 050
6	007	Center of Veracruz	X Central Gulf	Veracruz de Ignacio de La Llave	75.0	6 367
7	008	East of Yucatán	XII Yucatán Peninsula	Yucatán	667.0	25 021
8	009	El Bejuco	III Northern Pacific	Nayarit	25.4	2 261
9	010	San Fernando	IX Northern Gulf	Tamaulipas	505.0	13 975
10	011	Margaritas – Comitán	XI Southern Border	Chiapas	48.0	5 397
11	012	La Chontalpa	XI Southern Border	Tabasco	91.0	5 000
12	013	Balancan-Tenosique[a]	XI Southern Border	Tabasco	115.3	4 289
13	015	Edzná-Yohaltún[a]	XII Yucatán Peninsula	Campeche	85.1	1 120
14	016	Sanes Huasteca[a]	XI Southern Border	Tabasco	26.4	1 321
15	017	Tapachula	XI Southern Border	Chiapas	94.3	5 852
16	018	Huixtla	XI Southern Border	Chiapas	107.6	6 010
17	020	Margaritas-Pijijiapan	XI Southern Border	Chiapas	68.0	4 712
18	023	Isla Rodríguez Clara	X Central Gulf	Veracruz de Ignacio de La Llave	13.7	627
19	024	Southern zone of Yucatán	XII Yucatán Peninsula	Yucatán	67.3	880
20	025	Verde River	XII Yucatán Peninsula	Campeche	134.9	1 984
21	026	Ucum Valley[a]	XII Yucatán Peninsula	Quintana Roo	104.8	1 739
22	027	Frailesca[a]	XI Southern Border	Chiapas	56.8	3 083
23	035	Los Naranjos[a]	X Central Gulf	Veracruz de Ignacio de La Llave	92.6	6 045
NUMBER	23			TOTAL	2 859.1	119 956

NOTE: [a] Technified Rainfed Districts that have not yet been transferred to the users.
In the state of Tabasco, the TRD013 Balancá-Tenosique operates with a surface area of 115.7 thousand hectares.
SOURCE: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

4.4 Drinking water and sanitation infrastructure

Drinking water coverage

The CONAGUA considers that drinking water coverage includes those who have tap water in their household; outside of their household, but within the grounds; from a public tap or from another household. Inhabitants considered to be covered do not necessarily dispose of water of drinking quality.

Bearing in mind the aforementioned definition and the results of the Census on Population and Housing from 2005, up to October 17th that year, 89.2% of the population had drinking water coverage. The CONAGUA estimates that by the end of 2008, the drinking water coverage had risen to 90.3%, which breaks down as 94.3% in urban zones and 76.8% in rural areas. Table T4.8 indicates the evolution in the drinking water coverage to the population of Mexico.

The evolution of the population with coverage is differentiated according to the size of the population in the locality. The coverage for populations in large localities, of more than 100 000 inhabitants, increases proportionately more than in smaller localities, as can be observed in graph G4.5.

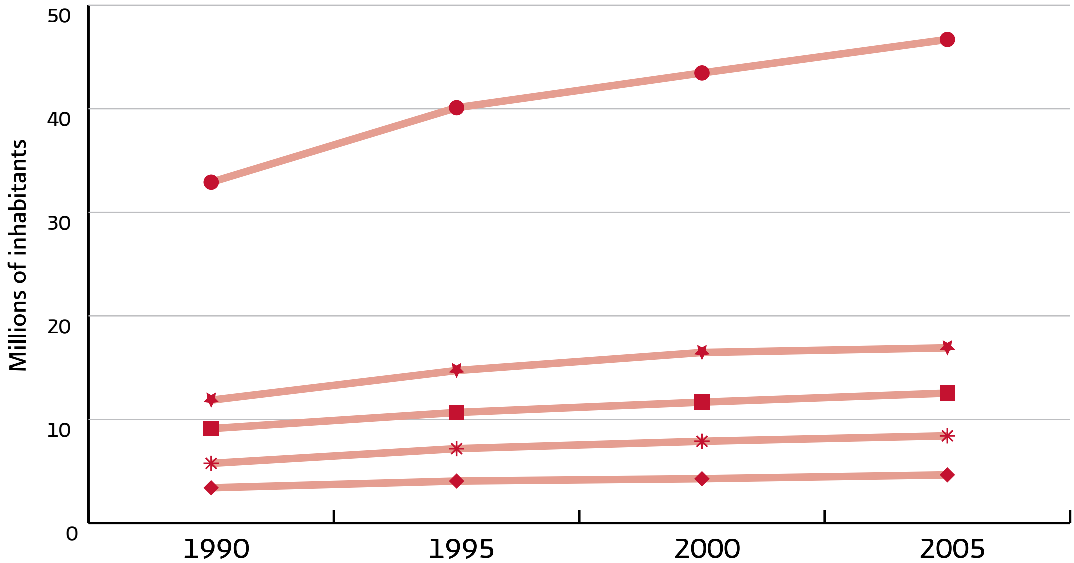
T4.8 Composition of the national drinking water coverage, series of Census years from 1990 to 2005 (percentage)

Date	With piped water within grounds [a] (%)	Other forms of supply [b] (%)	Total (%)
12/March/1990	75.4	3.0	78.4
5/November/1995	83.0	1.6	84.6
14/February/2000	83.3	4.5	87.8
17/October/2005	87.1	2.1	89.2

NOTES: [a] Refers to piped water within the household, and outside the household but within the grounds.
[b] Refers to water obtained by transport, from a public tap or from another household.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Portable Information Cubes. 2008, Population, Housing and Water, Uses of Water and Hypercube.
CONAGUA. Analysis of the Information on Water in the Censuses from 1990 to 2005. September 2007.
CONAGUA. National Water Resources Program 2007-2012. This is how we're doing... Progress in 2007 and Targets for 2008.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

However, it should be taken into account that the increase in the population is greater in urban localities, whereas in rural localities it decreases. Graph G4.6 illustrates the evolution in the population with drinking water coverage and the total population, considering in both cases both its rural and urban components.

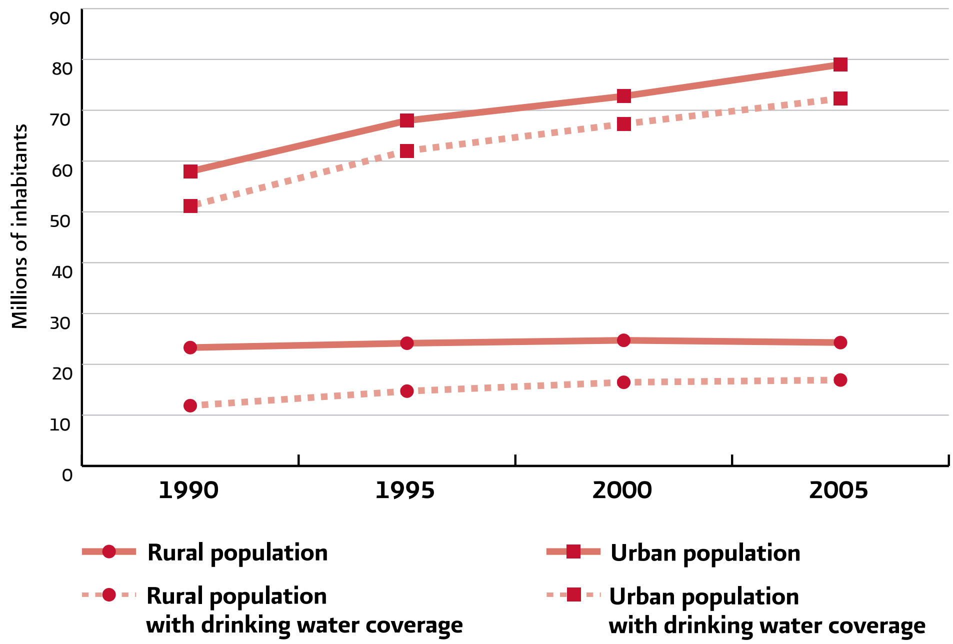
G4.5 Evolution in the population with drinking water coverage, by size of population (millions of inhabitants)



	1990	1995	2000	2005
1- 2 499	11 864 664	14 724 552	16 466 341	16 914 253
2 500-14 999	9 117 904	10 675 524	11 671 967	12 545 001
15 000-49 999	5 760 112	7 182 064	7 892 887	8 421 362
50 000-99 999	3 402 524	4 053 299	4 278 454	4 649 524
100 000 and above	32 910 338	40 103 489	43 459 153	46 693 611

NOTE: The populations are at the time of the Censuses.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Analysis of the Information on Water in the Censuses from 1990 to 2005. September 2007.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

G4.6 Evolution in the rural and urban populations with drinking water coverage 1990-2005 (millions of inhabitants)



NOTE: The populations are at the time of the Censuses.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Analysis of the Information on Water in the Censuses from 1990 to 2005. September 2007.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

Improved sanitation coverage

Additionally, the CONAGUA considers that improved sanitation coverage includes those citizens connected to the sanitation network or a septic tank, wastepipe, ravine, crevice, lake or sea.

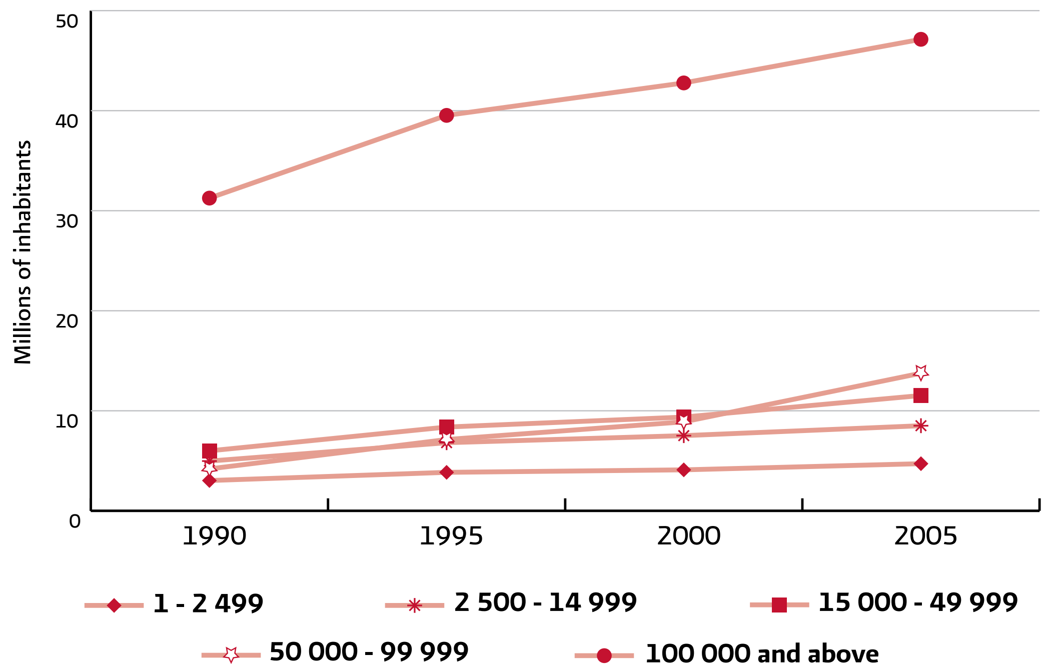
It should be added that for the purpose of this document, sanitation and sewerage are considered as synonyms. Bearing in mind that definition and the results of the 2005 Census on Population and Housing, up to October 17th of that year, 85.6% of the population had improved sanitation coverage. The CONAGUA estimates that at the end of 2008, the improved sanitation coverage was 86.4%, composed of 93.9% coverage in urban areas and 61.8% in rural zones. Table T4.9 shows the composition of the improved sanitation coverage nationwide.

T4.9 Composition of the national improved sanitation coverage, series of Census years from 1990 to 2005 (percentage)

Date	Connected to a public network (%)	Connected to a septic tank (%)	Others [a] (%)	Total (%)
12/March/1990	50.1	8.6	2.8	61.5
5/November/1995	57.5	11.7	3.2	72.4
14/February/2000	61.5	11.4	3.3	76.2
17/October/2005	67.6	15.9	2.1	85.6

NOTE: [a] Refers to a wastepipe, ravine, crevice, lake or sea.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Portable Information Cubes. 2008, Population, Housing and Water, Uses of Water and Hypercube.
CONAGUA. Analysis of the Information on Water in the Censuses from 1990 to 2005. September 2007.
CONAGUA. National Water Resources Program 2007-2012. This is how we're doing... Progress in 2007 and Targets for 2008.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

G4.7 Evolution in the population with improved sanitation coverage, by size of population 1990-2005 (millions of inhabitants)



	1990	1995	2000	2005
1- 2 499	4 192 850	7 128 147	8 895 698	13 758 528
2 500-14 999	5 997 188	8 375 040	9 372 637	11 528 523
15 000-49 999	4 976 324	6 810 300	7 516 231	8 508 107
50 000-99 999	3 028 547	3 846 956	4 097 097	4 713 634
100 000 and above	31 259 792	39 528 700	42 772 718	47 132 386

NOTE: The populations are at the time of the Censuses.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Portable Information Cubes. 2008, Population, Housing and Water, Uses of Water and Hypercube.
CONAGUA. Analysis of the Information on Water in the Censuses from 1990 to 2005. September 2007.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

As in the case of drinking water, the evolution in the population with improved sanitation coverage is also differentiated as regards the size of the population in the locality. In this case, the population in rural localities with sanitation coverage increased significantly in the period between 2000 and 2005, as can be appreciated in graph G4.7.

Graph G4.8 illustrates the evolution in the population with sanitation coverage and the total population, considering in both cases its rural and urban components.

The evolution in the coverage of both drinking water and sanitation is illustrated in table T4.10. In table T4.11, the drinking water and sanitation coverage is shown by Hydrological-Administrative Region. It can be observed that the greatest backlogs under both headings are in the regions V Pacific Sur, XI Southern Border and X Central Gulf.

The greatest backlogs in the drinking water coverage are in the states of Guerrero, Oaxaca and Chiapas, whereas in terms of improved sanitation, Oaxaca, Guerrero and Yucatán are the states with the lowest percentages of coverage, as can be appreciated in table T4.12.

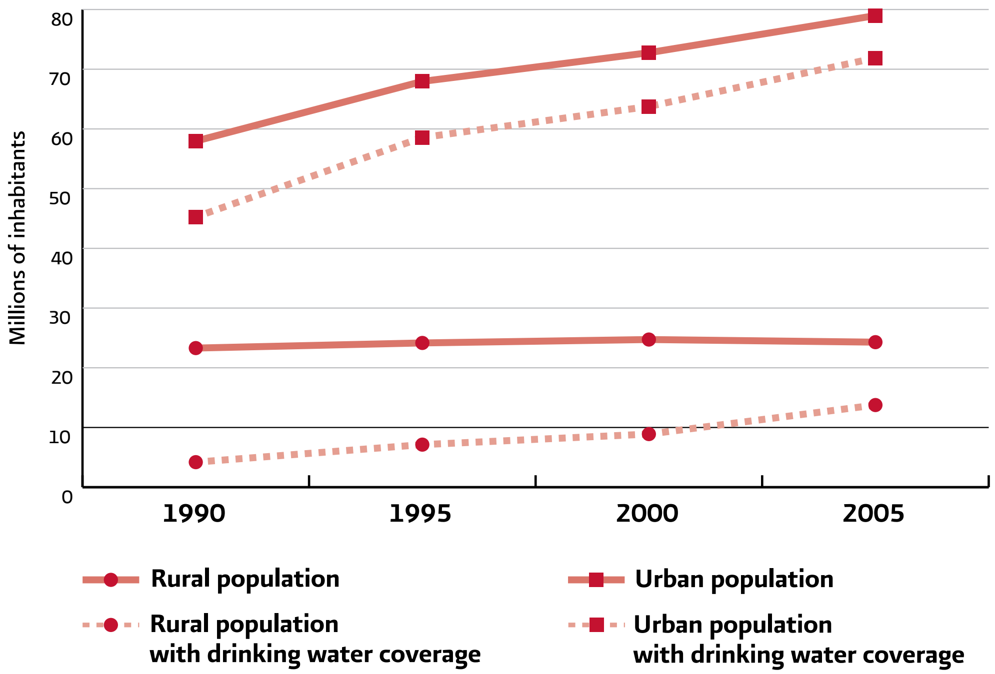
We recommend consulting the annual publication "Situation of the Drinking Water, Sanitation and Sewerage Subsector", produced by the National Water Commission.

T4.10 Coverage of the population with drinking water and improved sanitation (in Mexico), both rural and urban, series of Census years from 1990 to 2005

Population	Census 1990 (%)	Census 1995 (%)	Census 2000 (%)	Census 2005 (%)
	March 12th, 1990	November 5th, 1995	March 14th, 2000	October 17th, 2005
Drinking water				
Urban	89.4	93.0	94.6	95.0
Rural	51.2	61.2	68.0	70.7
Total	78.4	84.6	87.8	89.2
Improved sanitation				
Urban	79.0	87.8	89.6	94.5
Rural	18.1	29.6	36.7	57.5
Total	61.5	72.4	76.2	85.6

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Portable Information Cubes 2008. Population, Housing and Water; Uses and Hypercube.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

G4.8 Evolution in the rural and urban population with improved sanitation coverage (millions of inhabitants)



NOTE: The populations are at the time of the Censuses.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Portable Information Cubes. 2008, Population, Housing and Water, Uses of Water and Hypercube.
CONAGUA. Analysis of the Information on Water in the Censuses from 1990 to 2005. September 2007.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

T4.11 Coverage of the population with drinking water and improved sanitation services by Hydrological-Administrative Region, series of Census years from 1990 to 2005 (percentage)

No	Hydrological-Administrative Region	Drinking water				Improved sanitation			
		12/Mar/90	5/Nov/95	14/Feb/00	17/Oct/05	12/Mar/90	5/Nov/95	14/Feb/00	17/Oct/05
I	Baja California Peninsula	81.3	87.4	92.0	92.9	65.2	75.8	80.6	89.0
II	Northwest	89.7	93.2	95.2	94.8	62.6	71.5	76.5	84.1
III	Northern Pacific	78.7	85.6	88.8	89.0	51.7	63.9	69.9	82.6
IV	Balsas	72.8	81.1	83.2	84.4	48.8	63.0	67.5	81.4
V	Southern Pacific	59.2	69.0	73.2	73.5	33.3	46.5	47.4	63.3
VI	Rio Bravo	91.8	94.4	96.1	96.1	73.9	84.0	88.2	93.8
VII	Central Basins of the North	83.2	87.9	90.9	93.3	55.4	65.3	73.3	85.6
VIII	Lerma-Santiago-Pacific	84.2	90.3	92.2	93.4	68.0	79.8	82.5	90.1
IX	Northern Gulf	57.6	67.8	75.5	80.9	33.9	42.2	50.0	65.3
X	Central Gulf	58.8	64.6	71.9	77.2	45.9	55.9	60.1	74.8
XI	Southern Border	56.7	65.4	73.3	74.4	45.5	62.3	67.7	80.7
XII	Yucatán Peninsula	74.0	84.9	91.9	94.1	45.1	57.5	63.2	76.3
XIII	Waters of the Valley of Mexico	92.5	96.3	96.9	96.5	85.9	93.1	94.4	97.2
	NATIONAL	78.4	84.6	87.8	89.2	61.5	72.4	76.2	85.6

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Portable Information Cubes 2008. Population, Housing and Water; Uses and Hypercube.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

T4.12 Coverage of the population with drinking water and improved sanitation services by state, series of Census years from 1990 to 2005 (percentage)

No	State	Drinking water				Improved sanitation			
		12/Mar/90	5/Nov/95	14/Feb/00	17/Oct/05	12/Mar/90	5/Nov/95	14/Feb/00	17/Oct/05
1	Aguascalientes	95.5	98.0	97.9	97.8	85.2	93.7	94.5	96.9
2	Baja California	79.8	86.7	91.9	93.8	65.4	76.0	80.7	88.9
3	Baja California Sur	89.4	90.9	92.5	87.7	64.4	74.6	79.9	89.7
4	Campeche	69.8	78.3	84.7	88.4	44.2	58.5	60.8	78.4
5	Coahuila de Zaragoza	91.9	94.6	97.0	97.3	67.3	76.1	83.3	91.5
6	Colima	93.0	95.8	97.1	97.8	81.8	93.9	93.1	98.2
7	Chiapas	57.3	65.6	73.5	73.5	38.4	52.6	59.3	74.7
8	Chihuahua	87.6	91.8	93.1	92.9	65.8	79.0	84.3	89.8
9	Durango	84.6	89.6	91.6	90.9	52.5	64.7	71.8	82.6
10	Guanajuato	82.4	88.9	92.0	93.4	58.0	70.6	75.3	85.8
11	Guerrero	55.1	64.7	69.1	68.0	34.8	46.3	49.7	64.2
12	Hidalgo	69.4	79.5	83.9	87.2	41.6	56.2	64.0	79.1
13	Jalisco	85.7	91.3	92.4	93.3	80.3	89.5	91.2	95.8
14	Mexico City (Federal District)	96.1	97.7	97.9	97.6	93.3	97.7	98.1	98.6
15	Michoacán de Ocampo	78.2	86.4	88.2	89.4	55.5	69.3	72.9	84.2
16	Morelos	88.3	90.3	91.6	91.6	67.0	81.2	83.6	92.6
17	Nayarit	83.4	86.7	89.6	91.4	59.1	75.0	78.8	90.9
18	Nuevo León	92.9	94.5	95.6	95.6	80.8	88.6	91.1	95.3
19	Oaxaca	57.2	67.0	72.0	73.3	28.5	42.0	42.9	60.0
20	Puebla	70.2	78.6	82.8	85.4	45.3	56.5	62.8	79.0
21	Querétaro	82.8	89.2	92.3	93.7	54.0	67.2	73.7	85.6
22	Quintana Roo	88.7	89.1	93.8	94.5	54.3	76.1	81.3	89.5
23	San Luís Potosí	65.5	73.5	78.2	82.7	46.2	53.5	59.2	74.2
24	Sinaloa	79.8	88.0	91.8	93.1	53.5	67.3	73.1	86.4
25	Sonora	91.0	94.0	95.7	95.2	64.9	73.5	78.2	85.4
26	State of Mexico	84.6	91.5	92.8	93.2	72.5	83.4	84.9	91.2
27	Tabasco	55.4	65.1	72.8	76.4	60.6	82.0	84.4	93.4
28	Tamaulipas	80.9	88.9	94.1	94.7	57.8	65.6	73.4	82.4
29	Tlaxcala	90.9	95.6	96.3	97.3	57.1	75.5	81.9	90.6
30	Veracruz de Ignacio de la Llave	57.5	62.2	69.9	76.3	50.1	60.4	64.6	77.7
31	Yucatán	70.2	85.5	93.7	96.1	42.1	48.8	54.6	68.2
32	Zacatecas	74.8	82.7	88.0	92.8	45.0	58.0	69.3	84.2
	NATIONAL	78.4	84.6	87.8	89.2	61.5	72.4	76.2	85.6

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Portable Information Cubes 2008. Population, Housing and Water; Uses and Hypercube.
INEGI. General Censuses of Population and Housing. INEGI. Information published in various formats.

Aqueducts

There are more than 3 000 kilometers of aqueducts in Mexico that transport water to various cities and rural communities around the country, with a total capacity of more than 112 cubic meters per second. The main aqueducts, as regards their length and flow, are listed in table T4.13.

T4.13 Main aqueducts in Mexico by Hydrological-Administrative Region, 2008

No	Aqueduct	Hydrological-Administrative Region	Length (km)	Design flow (L/s)	Year of completion	Supplies	Operated by
1	Colorodo River – Tijuana	I Baja California Peninsula	130	4 000	1982	Cities of Tijuana and Tecate and the village of La Rumorosa in Baja California	Water Service Commission of the State of Baja California (COSAE)
2	Vizcaino – Northern Pacific	I Baja California Peninsula	206	62	1990	Localities of Bahía Asunción, Bahía Tortugas and the fishing villages of Punta Abreojos in Baja California	Water utility of the municipality of Mulege, Baja California
3	Cutzamala System	IV Balsas and XIII Waters of the Valley of Mexico	162	19 000	1993	The Metropolitan Zone of the Valley of Mexico with water from the Valle de Bravo, Villa Victoria and El Bosque dams, among others	CONAGUA
4	Linares Monterrey	VI Rio Bravo	133	5 000	1984	The Metropolitan Zone of the city of Monterrey, Nuevo Leon, with water from the Cerro Prieto dam	Water and Sanitation Services of Monterrey, I. P. D.
5	El Cuchillo-Monterrey	VI Rio Bravo	91	5 000	1994	The Metropolitan Zone of the city of Monterrey with water from the El Cuchillo dam	Water and Sanitation Services of Monterrey. I. P. D
6	Lerma	VII Central Basins of the North	60	14 000	1975	Mexico City with water from the aquifers located in the upper area of River Lerma	Mexico City Water System
7	Armería – Manzanillo	VIII Lerma-Santiago-Pacific and XIII Waters of the Valley of Mexico	50	250	1987	City of Manzanillo, Colima	Manzanillo Drinking Water, Drainage and Sanitation Commission, Colima
8	Chapala – Guadalajara	VIII Lerma-Santiago-Pacific	42	7 500	1991	The Metropolitan Zone of the city of Guadalajara with water from Lake Chapala	Inter-Municipal System for Drinking Water and Sanitation Services (SIAPA)
9	Vicente Guerrero Dam – Ciudad Victoria	VIII Lerma-Santiago-Pacific	54	1 000	1992	Ciudad Victoria, Tamaulipas, with water from the Vicente Guerrero dam	Municipal Drinking Water and Sanitation Commission (COMAPA Victoria)
10	Uxpanapa – La Cangrejera	IX Northern Gulf	40	20 000	1985	22 industries located in the southern part of the state of Veracruz	CONAGUA

T4.13 Main aqueducts in Mexico by Hydrological-Administrative Region, 2008

No	Aqueduct	Hydrological-Administrative Region	Length (km)	Design flow (L/s)	Year of completion	Supplies	Operated by
11	Yurivia – Coatzacoalcos and Minatitlán	X Central Gulf	64	2 000	1987	Cities of Coatzacoalcos and Minatitlan, Veracruz with water from the Ocotal and Tizizapa rivers	Coatzacoalcos Municipal Water and Sanitation Commission, Veracruz de Ignacio de la Llave (CMAPS Coatzacoalcos)
12	Huitzilapan River – Xalapa	X Central Gulf	55	1 000	2000	City of Xalapa de Enriquez, Veracruz de Ignacio de la Llave	Xalapa Municipal Water and Sanitation Commission (CMAS)
13	Chicbul – Ciudad del Carmen	XII Yucatán Peninsula	122	390	1975	Localities of Sabancuy, Isla Aguada and Ciudad del Carmen, Campeche	Municipal Drinking Water System Ciudad del Carmen, Campeche

SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

Cutzamala System

The Cutzamala System, which supplies 11 delegations of Mexico City (Federal District) and 11 municipalities of the State of Mexico, is one of the biggest drinking water supply systems in the world, not only for the quantity of water that it transports (approximately 485 million cubic meters every year), but also because of the difference in elevation (1 100 m) that it overcomes. It contributes 18% of the supply for all uses in the Valley of Mexico catch-

T4.14 Characteristics of the elements that make up the Cutzamala System

Element	Type	Capacity	Elevation (MASL)	Observations
Tuxpan	Diversion dam	5 hm^3	1 751.00	Surcharge pool elevation height 1 763.00
El Bosque	Storage reservoir	202 hm^3	1 741.40	Surcharge pool elevation height 1 743.00
Ixtapan del Oro	Diversion dam	0.5 hm^3	1 650.00	Surcharge pool elevation height 1 699.71
Colorines	Diversion dam	1.5 hm^3	1 629.00	Surcharge pool elevation height 1 677.50
Valle de Bravo	Storage reservoir	395 hm^3	1 768.00	Surcharge pool elevation height 1 833.00
Villa Victoria	Storage reservoir	186 hm^3	2 545.00	Surcharge pool elevation height 2 607.50
Chilesdo	Diversion dam	1.5 hm^3	2 396.00	Surcharge pool elevation height 2 359.05
Pumping plant 1	Pumps	20 m^3/s	1 600.18	
Pumping plant 2	Pumps	24 m^3/s	1 721.70	Operates in conjunction with pumping plants 3 and 4
Pumping plant 3	Pumps	24 m^3/s	1 832.90	Operates in conjunction with pumping plants 2 and 4
Pumping plant 4	Pumps	24 m^3/s	2 178.88	Operates in conjunction with pumping plants 2 and 3
Pumping plant 5	Pumps	24 m^3/s	2 497.00	
Pumping plant 6	Pumps	5 m^3/s	2 323.98	
Los Berros Treatment plant	Treatment plant	20 m^3/s	2 540.00	

NOTE: MASL: Meters Above Sea Level
SOURCE: CONAGUA. Waters of the Valley of Mexico River Basin Organization.

ment, calculated at 82 m^3/s, which is complemented by the Lerma System (6%), groundwater withdrawal (73%) and rivers and springs (3%)[3].

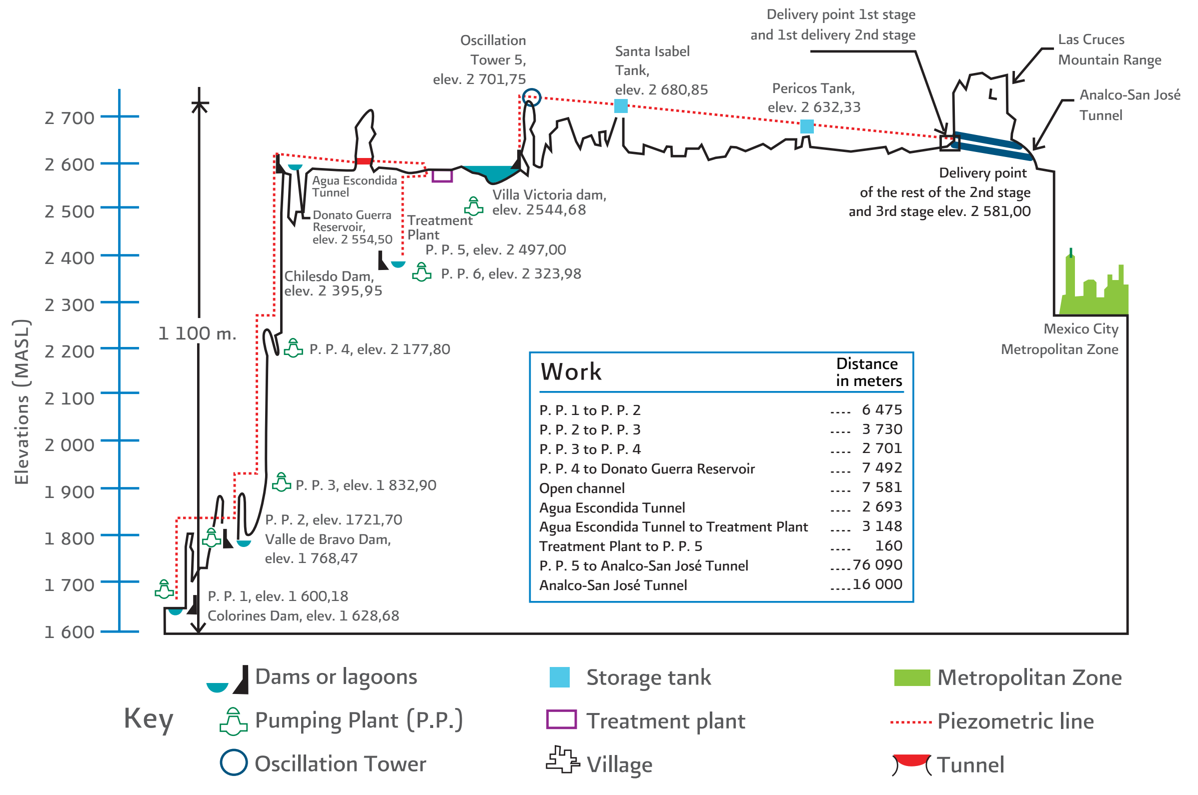
The system's pumping, necessary to overcome the difference in elevation, generates significant energy consumption. In 2008, the electricity used was 1.29 TWh, which represented 0.56% of the total generation of electricity in Mexico that year, and its cost was 1 844 million pesos. In comparison, the cost represented 6.4% of the CONAGUA's end-of-year expenses for that same year.

Cutzamala is made up of seven diversion and storage reservoirs, six pumping stations and one treatment plant with the characteristics indicated in table T4.14.

Graph G4.9 shows the difference in elevation that has to be overcome from the lowest point of Pumping Plant No. 1 to transport the water to Oscillation Tower No. 5 and subsequently by gravity to the Valley of Mexico Metropolitan Zone.

3 Luege T., J.L. 2008. Program for the Water Sustainability in the Valley of Mexico catchment. Presentation in the Water Tribune, Zaragoza Water Expo 2008, Spain, July 16th, 2008.

G4.9 Profile of the Cutzamala System



Work	Distance in meters
P. P. 1 to P. P. 2	6 475
P. P. 2 to P. P. 3	3 730
P. P. 3 to P. P. 4	2 701
P. P. 4 to Donato Guerra Reservoir	7 492
Open channel	7 581
Agua Escondida Tunnel	2 693
Agua Escondida Tunnel to Treatment Plant	3 148
Treatment Plant to P. P. 5	160
P. P. 5 to Analco-San José Tunnel	76 090
Analco-San José Tunnel	16 000

NOTE: P.P.: Pumping Plant.
SOURCE: CONAGUA Waters of the Valley of Mexico River Basin Organization. Statistics from Region XIII. 2007.

T4.15 Volumes and flows supplied by the Cutzamala System, annual series from 1991 to 2008

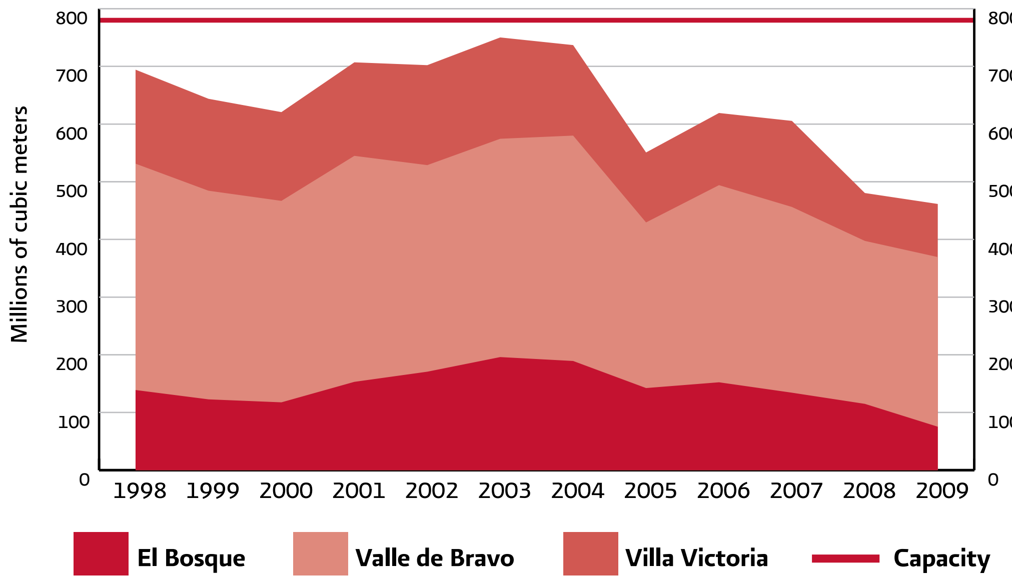
Year	Delivery to Mexico City		Delivery to the State of Mexico		TOTAL	
	Volume hm^3/year	Mean flow m^3/s	Volume hm^3/year	Mean flow m^3/s	Volume hm^3/year	Mean flow m^3/s
1991	238.92	7.59	78.11	2.49	317.03	10.08
1992	224.89	7.05	89.66	2.81	314.55	9.85
1993	251.79	8.10	90.44	2.91	342.23	11.02
1994	304.34	9.67	106.31	3.38	410.65	13.05
1995	309.12	9.80	121.39	3.85	430.51	13.65
1996	305.63	9.62	145.66	4.57	451.29	14.18
1997	320.71	10.16	159.17	5.05	479.88	15.21
1998	313.07	9.93	141.64	4.49	454.72	14.42
1999	319.30	10.21	159.45	5.10	478.75	15.30
2000	306.70	9.68	176.55	5.57	483.25	15.24
2001	303.14	9.64	173.35	5.51	476.49	15.15
2002	303.66	9.65	175.99	5.60	479.65	15.26
2003	310.70	9.77	185.23	5.83	495.93	15.59
2004	310.67	9.84	177.73	5.64	488.40	15.48
2005	310.39	9.84	182.80	5.64	493.19	15.48
2006	303.53	9.61	177.26	5.61	480.79	15.21
2007	303.90	9.72	174.56	5.58	478.46	15.30
2008	306.25	9.58	179.47	5.61	485.72	15.19

SOURCE: CONAGUA. Waters of the Valley of Mexico River Basin Organization.

The annual volumes supplied by the Cutzamala System can be appreciated in table T4.15.

It should be mentioned that the Cutzamala System is subject to variations in the hydrological regime of its elements. Recent years have witnessed a decreased volume in the System's storage reservoirs, as shown in graph G4.10.

G4.10 Evolution of the storage in the reservoirs of the Cutzamala System, December each year (millions of cubic meters)



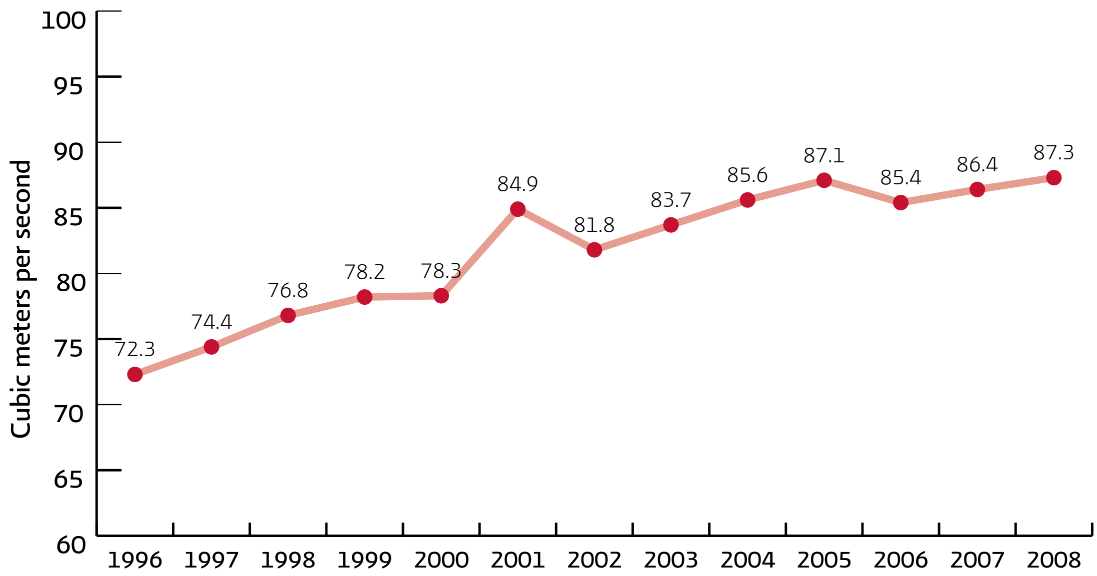
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from: CONAGUA. Waters of the Valley of Mexico River Basin Organization.

Treatment plants

Municipal treatment plants condition the quality of water in surface and/or groundwater sources for public urban use. In 2008, 87.3 m^3/s was treated in the 604 plants in operation in Mexico. The evolution in the flow treated annually is illustrated in graph G4.11.

The distribution of the treatment plants is listed in table T4.16 by Hydrological-Administrative Region, and in T4.17 by state.

G4.11 Flow of water treated, annual series from 1996 to 2008 (cubic meters per second)



SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

T4.16 Treatment plants in operation, by Hydrological-Administrative Region, 2008

No	Hydrological-Administrative Region	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
I	Baja California Peninsula	41	10.91	5.53
II	Northwest	24	4.13	2.10
III	Northern Pacific	151	9.08	7.23
IV	Balsas[a]	21	23.18	17.58
V	Southern Pacific	8	3.18	2.59
VI	Rio Bravo	57	26.09	15.70
VII	Central Basins of the North	60	0.55	0.39
VIII	Lerma-Santiago-Pacific	106	19.42	12.15
IX	Northern Gulf	43	6.66	5.89
X	Central Gulf	9	6.64	4.15
XI	Southern Border	42	14.93	9.12
XII	Yucatán Peninsula	1	0.01	0.01
XIII	Waters of the Valley of Mexico	41	6.10	4.88
TOTAL		604	130.88	87.31

NOTE: [a] Includes the Los Berros treatment plant, found in the locality of the same name in the municipality of Villa de Allende, State of Mexico; which is part of the Cutzamala System and is operated by the Waters of the Valley of Mexico River Basin Organization.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

T4.17 Treatment plants in operation by state, 2008

State	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
1. Aguascalientes	3	0.04	0.03
2. Baja California	26	10.70	5.31
3. Baja California Sur	15	0.22	0.22
4. Campeche	2	0.03	0.02
5. Coahuila de Zaragoza	18	2.13	1.71
6. Colima	33	0.01	0.00
7. Chiapas	4	4.50	2.51
8. Chihuahua	4	0.65	0.38
9. Durango	30	0.03	0.02
10. Guanajuato	27	0.37	0.31
11. Guerrero	11	3.28	2.97
12. Hidalgo	2	0.13	0.13
13. Jalisco	24	16.20	9.49
14. Mexico City (Federal District)	36	4.62	3.64
15. Michoacán de Ocampo	6	2.95	2.50
16. Morelos	0	0.00	0.00
17. Nayarit	0	0.00	0.00
18. Nuevo León	8	14.40	7.09

T4.17 Treatment plants in operation by state, 2008

State	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
19. Oaxaca	6	1.29	0.77
20. Puebla	4	0.72	0.55
21. Querétaro	6	0.27	0.21
22. Quintana Roo	0	0.00	0.00
23. San Luis Potosí	14	1.31	0.96
24. Sinaloa	142	9.07	7.22
25. Sonora	24	4.13	2.01
26. State of Mexico	11	22.16	16.74
27. Tabasco	37	10.41	6.60
28. Tamaulipas	54	14.35	11.44
29. Tlaxcala	0	0.00	0.00
30. Veracruz de Ignacio de la Llave	13	6.91	4.39
31. Yucatán	0	0.00	0.00
32. Zacatecas	44	0.007	0.007
NATIONAL	604	130.88	87.31

SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

T4.18 Main treatment processes applied, 2008

Main process	Purpose	Plants		Flow treated	
		No	%	m^3/s	%
Softening	Elimination of hardness	21	3.5	0.88	1.0
Adsorption	Elimination of organic traces	14	2.3	1.29	1.5
Conventional treatment	Elimination of suspended solids	187	31.0	58.93	67.5
Patented treatment	Elimination of suspended solids	140	23.2	6.64	7.6
Reversible electrodialysis	Elimination of dissolved solids	2	0.3	0.12	0.1
Direct filtration	Elimination of suspended solids	63	10.4	14.67	16.8
Slow filters	Elimination of suspended solids	6	1.0	0.04	0.1
Reverse osmosis	Elimination of dissolved solids	155	25.7	1.29	1.5
Removal of iron and manganese		16	2.6	3.45	4.0
TOTAL		604	100	87.31	100

SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

We recommend consulting the annual publication "National Inventory of Municipal Treatment Plants and Wastewater Treatment Plants in Operation", produced by the National Water Commission.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Plantas_potabilizadoras).

4.5 Water treatment and reuse

Wastewater discharge

Wastewater discharges are classified as either municipal or industrial. The former correspond to those which are managed in the municipal urban and rural sanitation systems, whereas the latter are those that are discharged directly to national receiving water bodies, as is the case for self-supplying industry.

As can be appreciated in table T4.19, 35% of the total of municipal wastewater is treated, whereas the percentage of treatment of industrial wastewater is 18%.

T4.19 Municipal and non-municipal wastewater discharges, 2008

Urban centers (municipal discharges):		
Total wastewater generated	7.44	km^3/year (235.8 m^3/s)
Wastewater collected in sanitation	6.56	km^3/year (208 m^3/s)
Pollutants treated	2.64	km^3/year (83.64 m^3/s)
Pollutants generated	2.01	million tonnes of BOD_5 per year
Pollutants collected in sanitation	1.77	million tonnes of BOD_5 per year
Pollutants removed by treatment systems	0.58	million tonnes of BOD_5 per year
Non-municipal uses, including industry:		
Wastewater	6.01	km^3/year (190.4 m^3/s)
Pollutants treated	1.07	km^3/year (33.7 m^3/s)
Pollutants generated	7.00	million tonnes of BOD_5 per year
Pollutants removed by treatment systems	1.15	million tonnes of BOD_5 per year

NOTE: BOD_5 = 5-day Biochemical Oxygen Demand.
1 km^3 = 1 000 hm^3 = one billion m^3.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.
CONAGUA. Deputy Director General's Office for Technical Affairs.

In the DVD you will find the data related to this issue in the spreadsheet:
• TM(Plantas_tratamiento).

We recommend consulting the annual publication "National Inventory of Municipal Treatment Plants and Wastewater Treatment Plants in Operation", produced by the National Water Commission.

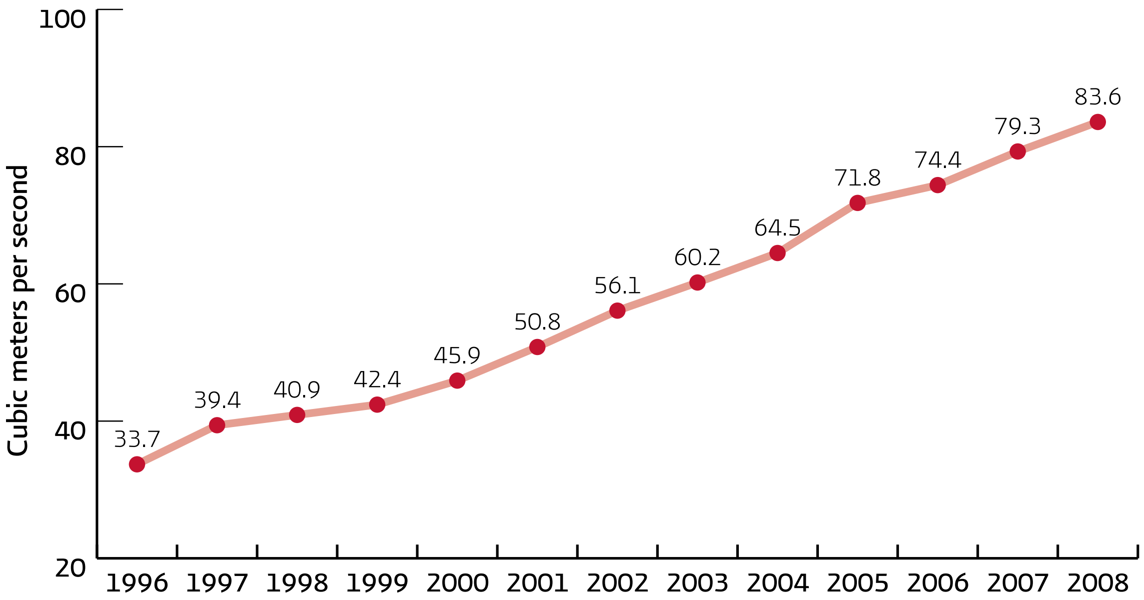
Wastewater treatment

Municipal wastewater treatment plants

In 2008, the 1 833 plants in operation in Mexico treated 83.6 m^3/s, or 40% of the 208 m^3/s collected in the sanitation systems. The evolution of the flow treated per year is shown in graph G4.12.

In table T4.20, the wastewater treatment plants in operation are shown by Hydrological-Administrative Region, and in table T4.21, they are shown by state.

G4.12 Flow of municipal wastewater treated, annual series from 1996 to 2008 (cubic meters per second, m^3/s)



SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

T4.20 Municipal wastewater treatment plants in operation, by Hydrological-Administrative Region, 2008

No	Hydrological-Administrative Region	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
I	Baja California Peninsula	45	8.19	6.11
II	Northwest	90	4.54	3.18
III	Northern Pacific	249	8.38	6.60
IV	Balsas	147	7.60	5.50
V	Southern Pacific	83	3.17	1.98
VI	Rio Bravo	188	28.32	22.23
VII	Central Basins of the North	113	5.19	4.03
VIII	Lerma-Santiago-Pacific	465	23.17	18.02
IX	Northern Gulf	91	2.91	2.31
X	Central Gulf	127	5.35	3.14
XI	Southern Border	97	3.36	2.67
XII	Yucatán Peninsula	55	2.26	1.73
XIII	Waters of the Valley of Mexico	83	10.60	6.14
TOTAL		1 833	113.02	83.64

SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

T4.21 Municipal wastewater treatment plants in operation, by state, 2008

State	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
1. Aguascalientes	115	4.23	3.47
2. Baja California	27	6.99	5.26
3. Baja California Sur	18	1.20	0.84
4. Campeche	13	0.10	0.06
5. Coahuila de Zaragoza	21	4.97	3.87
6. Colima	57	1.54	1.00
7. Chiapas	24	1.51	1.36
8. Chihuahua	119	8.72	5.93
9. Durango	167	3.55	2.67
10. Guanajuato	60	5.79	4.31
11. Guerrero	40	2.00	1.22
12. Hidalgo	13	0.33	0.28
13. Jalisco	96	3.77	3.49
14. Mexico City (Federal District)	27	6.48	3.12
15. Michoacán de Ocampo	25	3.56	2.47
16. Morelos	32	1.60	1.21
17. Nayarit	63	2.03	1.23
18. Nuevo León	61	13.24	11.65
19. Oaxaca	66	1.51	0.99

T4.21 Municipal wastewater treatment plants in operation, by state, 2008

State	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
20. Puebla	69	3.02	2.43
21. Querétaro	67	1.12	0.72
22. Quintana Roo	29	2.08	1.60
23. San Luis Potosí	21	2.12	1.74
24. Sinaloa	136	5.28	4.51
25. Sonora	76	4.45	3.09
26. State of Mexico	78	7.09	5.19
27. Tabasco	72	1.85	1.31
28. Tamaulipas	39	5.61	4.05
29. Tlaxcala	52	1.23	0.87
30. Veracruz de Ignacio de la Llave	92	5.43	3.17
31. Yucatán	13	0.08	0.07
32. Zacatecas	45	0.55	0.46
NATIONAL	1 833	113.02	83.64

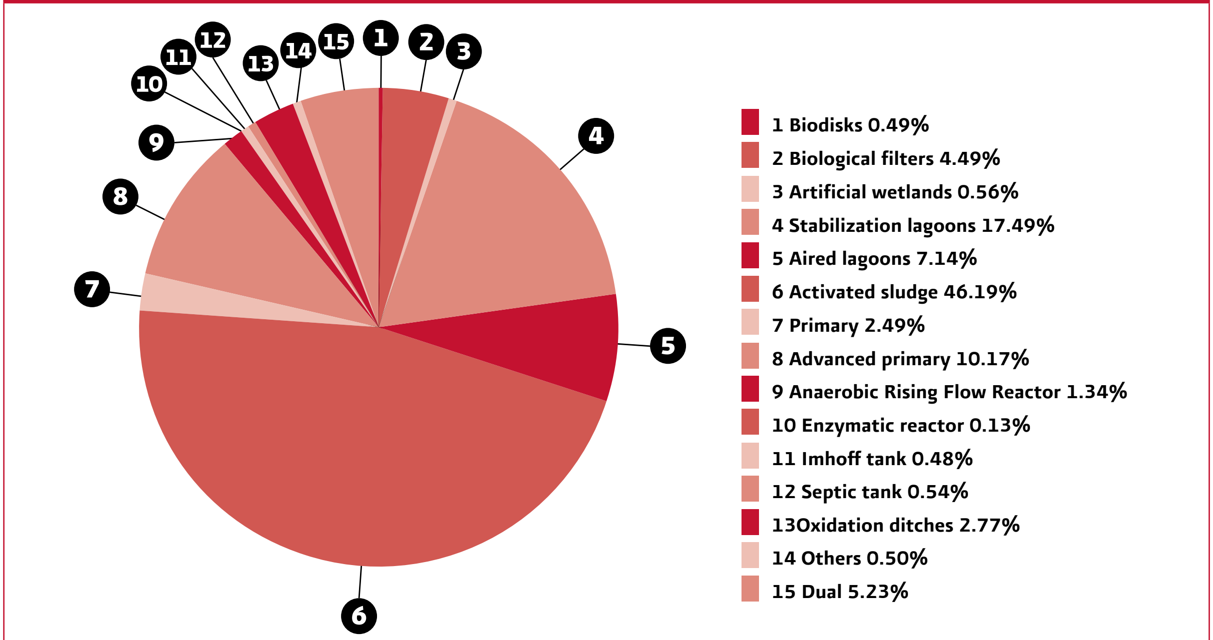
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

The distribution of the wastewater treatment plants is shown in map M4.3, and their main treatment processes are illustrated in graph G4.13.

M4.3 Municipal wastewater treatment plants as of December 2008

SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

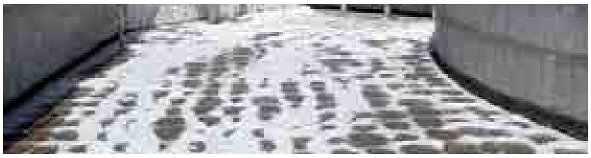
G4.13 Main municipal wastewater treatment processes, by flow treated, 2008



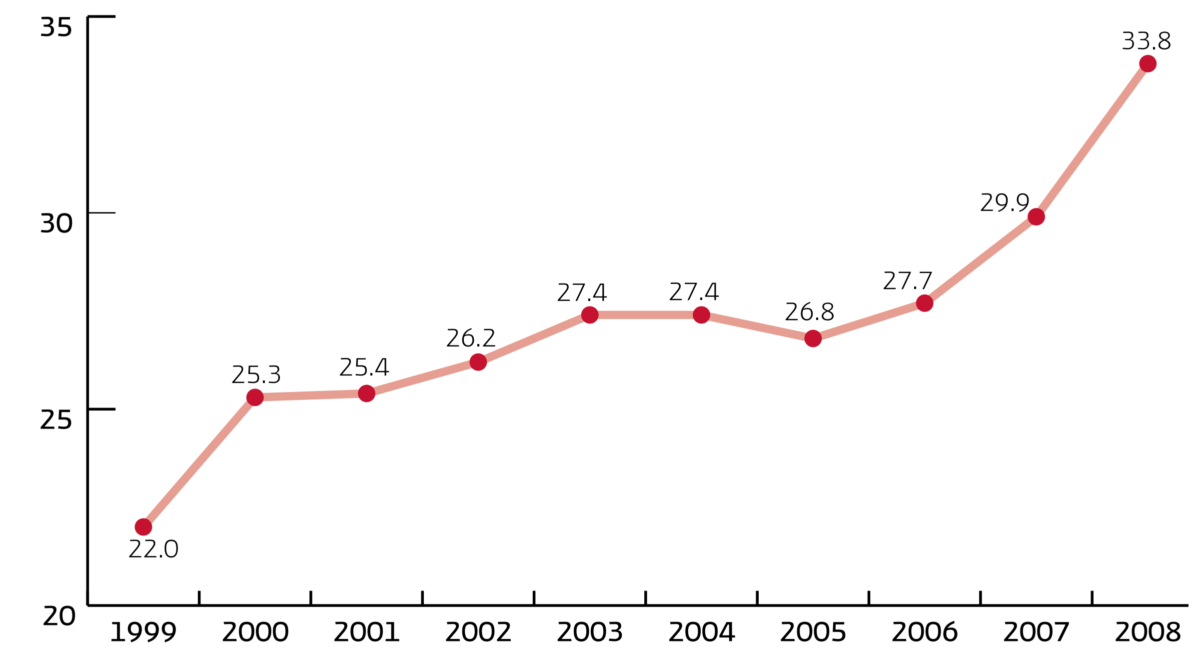
NOTE: For 2008, the total flow treated was 83.6 m^3/s.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

Industrial wastewater treatment plants

In 2008, industry treated 33.8 m^3/s of wastewater, in 2 082 plants in operation nationwide. The evolution from 1996 to 2008 is shown in graph G4.14.



G4.14 Flow of industrial wastewater treated, annual series from 1999 to 2008 (cubic meters per second, m^3/s)



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.

T4.22 Industrial wastewater treatment plants in operation by state, 2008

State	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
Aguascalientes	53	0.26	0.13
Baja California	179	0.67	0.15
Baja California Sur	7	0.01	0.01
Campeche	49	0.50	0.16
Coahuila	66	0.88	0.61
Colima	8	0.47	0.31
Chiapas	34	7.37	0.72
Chihuahua	20	0.66	0.29
Durango	31	0.68	0.34
Guanajuato	45	0.40	0.18
Guerrero	8	0.06	0.04
Hidalgo	43	2.42	1.29
Jalisco	34	1.51	1.51
Mexico City (Federal District)	120	0.40	0.39
Michoacán	50	3.81	2.70
Morelos	83	2.75	2.64
Nayarit	5	0.16	0.16
Nuevo León	91	4.13	3.00
Oaxaca	15	1.22	0.90
Puebla	96	2.87	2.62
Querétaro	107	1.10	0.51
Quintana Roo	2	0.01	0.01
San Luis Potosí	74	1.27	0.63
Sinaloa	47	3.16	0.85
Sonora	23	0.36	0.16
State of Mexico	319	4.57	3.21
Tabasco	115	1.28	0.15
Tamaulipas	46	1.64	1.12
Tlaxcala	106	0.25	0.22
Veracruz	161	11.62	8.65
Yucatán	36	0.11	0.07
Zacatecas	9	0.16	0.04
TOTAL	2 082	56.75	33.78

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

T4.23 Types of industrial wastewater treatment, 2008

Type of treatment	Purpose	Number of plants	Operating flow (m^3/s)	Percentage
PRIMARY	To adjust the pH and remove organic and/or inorganic materials in suspension, with a size equal to or greater than 0.1 mm.	648	12.25	36.26
SECONDARY	To remove colloidal and dissolved organic materials	1 185	17.62	52.16
TERTIARY	To remove dissolved materials, including gases, natural and synthetic organic substances, ions, bacteria and viruses.	66	0.83	2.46
UNSPECIFIED		183	3.08	9.12
TOTAL		2 082	33.78	100.00

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

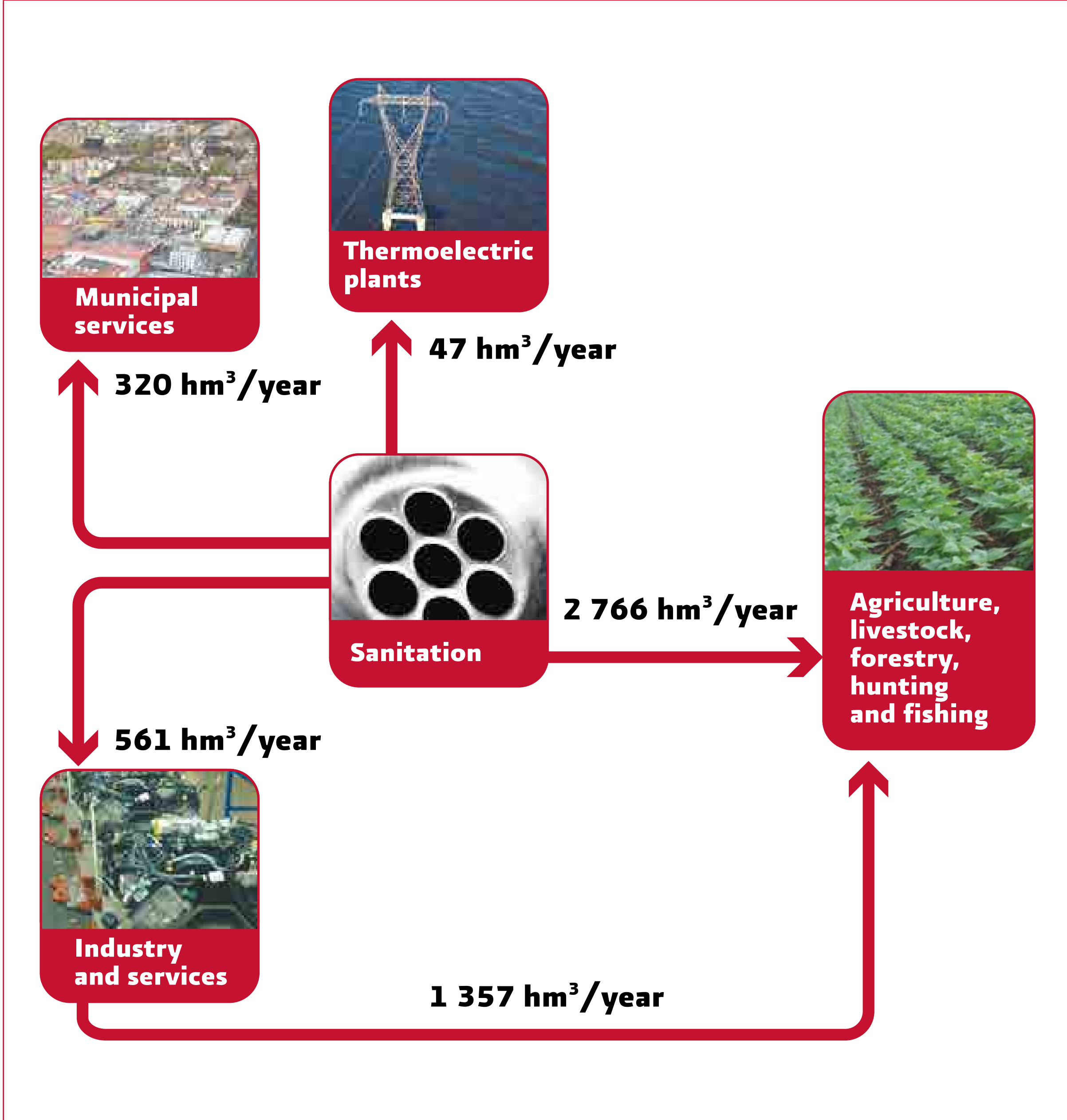
Reuse of wastewater

It is estimated that in 2008 in Mexico, 5 051 million cubic meters of water were reused, the equivalent of a flow of 160 m^3/s. In the reuse of water of municipal origin, the transfer of wastewater collected in sewerage networks for agricultural crops stands out. To a lesser degree, this wastewater is also reused in industry, as well as in thermoelectric stations, as is the case in the Villa de Reyes thermoelectric station in San Luis Potosí.

In the reuse of industrial wastewater (non-municipal), the wastewater used by the sugar industry in growing sugar cane in the state of Veracruz stands out.

In graph G4.15, the different transfers of water between uses can be identified.

G4.15 Reuse of municipal and non-municipal wastewater, 2008



NOTE: hm^3/year = 1 million cubic meters per year.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Water Accounts.

4.6 Emergency attention

The CONAGUA has set up 15 Regional Emergency Attention Centers (CRAEs in Spanish) in various areas of the country, with the aim of supporting the states and municipalities in the supply of drinking water and sanitation in situations of risk. In June 2009, the first State Emergency Attention Center was established in Campeche. Map M4.4 shows the location of the Centers.

Among the equipment at the disposal of the CRAEs are mobile treatment plants, pumping equipment, plants for independent electricity generation, pipe trucks and transport equipment for the machinery. This emergency attention is carried out by the CONAGUA in coordination with the states, municipalities and federal dependences.

M4.4 Location of the Emergency Attention Centers, 2008

NOTE: By December 2009, the centers shown in Ciudad Lerdo and Piedras Negras (under construction) had been added.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Coordination for Emergency Attention and River Basin Councils

Chapter 5. Water management tools

The information in this section corresponds to all the efforts undertaken to ensure a sustainable use of water. There are various water-related legal and normative arrangements that apply in Mexico, such as the obligation to have a concession deed in order to use the nation's water resources and the standards for the determination of water available in catchments and aquifers.

Other mechanisms include economic and financial tools, such as duties that should be paid for the use of the nation's water, or for discharging wastewater to Mexico's water bodies.

Finally, this chapter introduces the issue of the mechanisms aimed at reaching consensus between the users and local authorities, with the aim of preserving Mexico's water resources, as is the case of the River Basin Councils and the Technical Groundwater Committees (known as COTAS in Spanish).

5.1 Water-related institutions in Mexico

The National Water Commission of Mexico (CONAGUA), an administrative, normative, technical, consultative and decentralized agency of the Ministry of the Environment and Natural Resources (SEMARNAT), has the following mission and vision:

Mission

To manage and preserve the nation's water and its inherent public goods to achieve a sustainable use of these resources, with the co-responsibility of the three tiers of government and society-at-large.

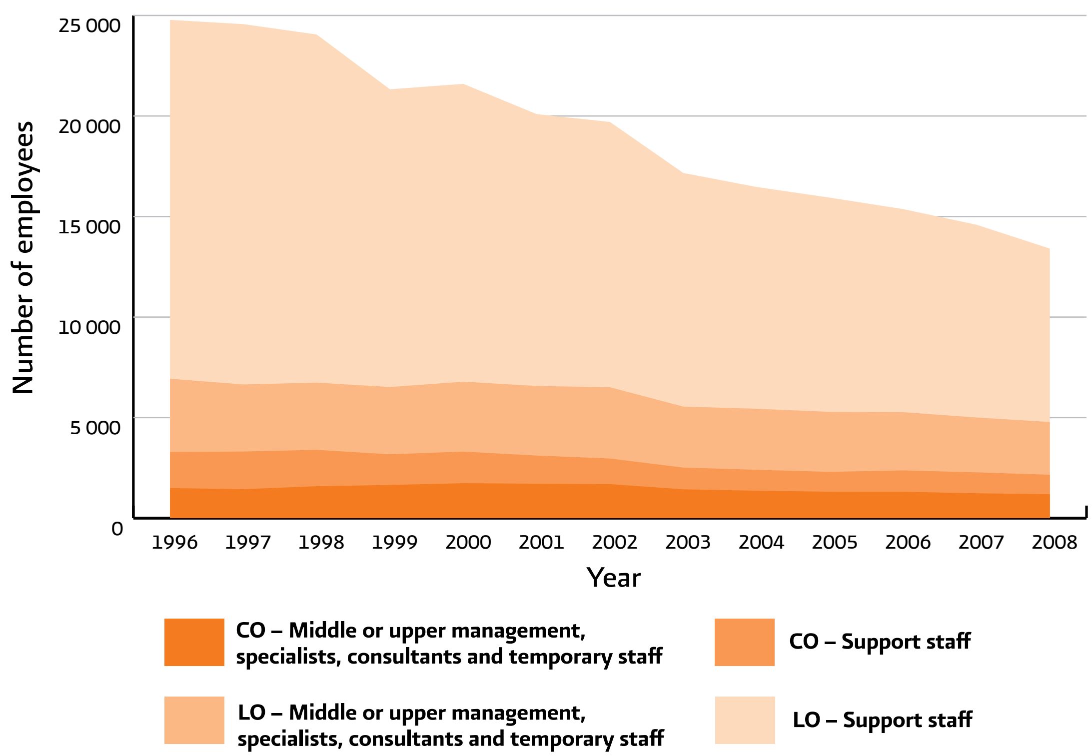
Vision

To be a technical authority and a promoter of the participation of society and governmental bodies in Integrated Water Resources Management and its inherent public goods.

Up to December 2008, the CONAGUA had 13 406 employees, of which 3 817 occupied middle and upper management positions and 9 589 corresponded to staff of the basic and mid-level payroll. 84% of the staff was assigned to the River Basin Organizations and Local Offices and the remaining 16% to the central offices. In 1989, the year of creation of the CONAGUA, it had 38 188 employees, which in recent years has reduced significantly, as can be observed in graph G5.1.

In order to carry out the functions assigned to it, the CONAGUA works in conjunction with various federal, state and municipal bodies, as well as water user associations and companies and private sector and civil society institutions. Table T5.1 shows the main institutions with which the CONAGUA coordinates for the achievement of the goals of the National Water Resources Program 2007-2012.

G5.1 Evolution in the CONAGUA staff roster, annual series from 1996 to 2008



NOTE: CO: Central Offices.
LO: Local Offices.
SOURCE: CONAGUA. Deputy Director General's Office for Administration.

T5.1 Institutions and organizations with which the National Water Commission coordinates

Institution	Example of the coordination carried out
Ministry of Finance and Public Credit	Defining the annual budget assigned to the institutions related to the water sector and the corresponding calendar of payments, contributing to favoring a flexible and appropriate use of the assigned resources; if applicable, authorizing multi-annual investment programs.
Congress of the Union	Agreeing on the policies and budget required for water resources, as well as evaluating and if appropriate approving the requests for modification of the National Water Law and its By-Laws.
States and municipalities	Programs and actions to restore the country's watersheds, support the supply of drinking water and sanitation services to the population, stimulate the efficient use of water in productive activities, such as irrigation and industry, and actions for the attention of meteorological events.
Ministry of Health	Support the municipalities so that their inhabitants receive water suitable for human consumption and foster among the population the habits and customs associated with hygiene that will afford them a better standard of living.
Ministry of Public Education	Actions aimed at school children to promote the efficient use and preservation of water, including specific sections in text books on the conservation of water and the environment.
Ministry of Agriculture, Livestock, Rural Development, Fishing and Food	Actions to promote a more efficient use of water in agriculture and to increase agricultural productivity, based on the country's food requirements, the type of soil and the availability of water.
Ministry of the Interior	Programs and actions necessary for the prevention and attention of droughts and floods.
Federal Commission for Electricity	Build and operate the dams which are used to generate electricity, for water supply to cities, irrigation or flood protection.
Ministry of Foreign Affairs	Promote technical and financial coordination with agencies and institutions of the United States of America to carry out programs associated with the management and preservation of water in the transboundary catchments and aquifers.
Ministry of Tourism	Actions to achieve a better use and preservation of water in tourist sites and recreational areas.
Ministry of the Economy	Take part in the formulation of the official standards for the water sector.
National Forestry Commission	Soil and water conservation actions in the upstream parts of catchments, with the aim of decreasing the entrainment of solids to riverbeds and dams.
Attorney General's Office for Environmental Protection	Actions to monitor water quality in the country's rivers and lakes and to apply the corresponding sanctions.
Mexican Institute for Water Technology	Develop research and technology for water resources.
Ministry of Civil Service	Promote actions in favor of good governance and institutional development and coordinate the actions associated with the certification of capacities in the federal civil service.
River Basin Councils and their auxiliary bodies	Take part in the Integrated Water Resources Management of watersheds and aquifers, so as to favor social wellbeing, economic development and the preservation of the environment.
Water Advisory Council	Strategies for a better use and preservation of water.
Research and Technology Institutes	Research and technological development for the preservation of water.
Ministry of Social Development	Support rural communities for the development of drinking water, sewerage and sanitation infrastructure.

SOURCE: CONAGUA. National Water Resources Program 2007-2012. Mexico, 2007.

According to article 115 of the Constitution of Mexico, municipalities are responsible for providing drinking water, sewerage and sanitation services, subject to the compliance with both federal and state laws. The number of employees for the provision of drinking water, sewerage and sanitation services was 94 225 in 2004, according to the Census of Capture, Treatment and Water Supply from that year.

5.2 Legal framework for the use of water in Mexico

The National Water Law (*Ley de Aguas Nacionales* or LAN in Spanish) establishes that the use of the nation's waters will be carried out through the allocation of concession deeds by the Federal Executive Branch, through the CONAGUA, by means of the River Basin Councils, or directly by the CONAGUA when appropriate, according to the rules and conditions laid down within the National Water Law and its By-Laws. Similarly, for wastewater discharges, it is necessary to have a discharge permit issued by the CONAGUA.

Since the issuing of the National Water Law in 1992, the concession and discharge permit deeds are recorded in the Public Registry of Water Duties (REPDA).

Deeds registered in the Public Registry of Water Duties

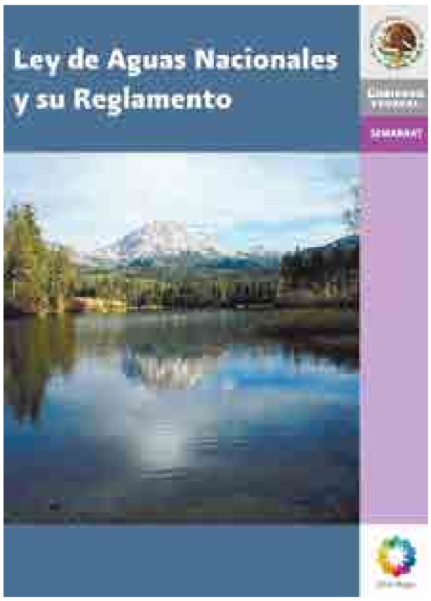
Up to December 2008, 360 301 concession deeds for the use of the nation's water had been registered in the REPDA, which corresponds to a volume of 79 752 million cubic meters (hm^3) allocated for offstream uses[1] and 165 368 hm^3 for instream uses (in hydropower plants).

The distribution of these deeds is shown in table T5.2, whereas table T5.3 illustrates the distribution of deeds throughout the Hydrological-Administrative Regions, considering additionally the concepts of discharge permits, federal zone permits and permits for material extraction. The regions VI Rio Bravo and VIII Lerma-Santiago-Pacific concentrate 30% of the total number of concession deeds.

T5.2 Concession deeds registered in the REPDA, 2008

Use	Deeds registered in the REPDA	
	Number	Percentage
Agriculture[a]	213 708	59.31
Public water supply[b]	136 278	37.82
Self-supplying industry[c]	10 168	2.82
Thermoelectric plants	44	0.01
Subtotal offstream uses	360 198	99.97
Instream use (hydropower plants)	103	0.03
TOTAL	360 301	100.00

NOTE: One concession deed may cover one or more uses or permits.
[a] Includes the agricultural, livestock, aquaculture, multiple and "others" headings of the REPDA classification.
[b] Includes the public urban and domestic headings of the REPDA classification.
[c] Includes the industrial, agro-industrial, services and trade headings of the REPDA classification.
There may be slight variations in the figures owing to the dates in which the REPDA was consulted, as a result of the projects awaiting registration.
SOURCE: CONAGUA. Deputy Director General's Office for Water Management.



[1] Including 1 296 hm^3 of volumes of water that are awaiting registration.

T5.3 Deeds registered in the REPDA, by Hydrological-Administrative Region, 2008 (number of deeds)

Hydrological-Administrative Region		Concessions [a]		Discharge permits	Federal zone permits	Material extraction permits
		Surface water	Groundwater			
I	Baja California Peninsula	2 382	9 650	658	1 525	385
II	Northwest	4 599	19 004	640	2 949	85
III	Northern Pacific	12 417	12 678	609	9 273	339
IV	Balsas	15 229	12 500	1 602	8 036	302
V	Southern Pacific	8 509	16 509	346	8 044	247
VI	Rio Bravo	6 484	36 488	595	5 901	52
VII	Central Basins of the North	3 561	26 772	925	3 351	49
VIII	Lerma-Santiago-Pacific	18 605	47 251	2 266	19 573	606
IX	Northern Gulf	7 606	12 917	744	10 699	192
X	Central Gulf	12 250	16 728	1 539	17 940	594
XI	Southern Border	24 434	7 700	662	11 623	187
XII	Yucatán Peninsula	174	22 568	2 721	74	3
XIII	Waters of the Valley of Mexico	1 098	2 188	606	1 715	0
	TOTAL	117 348	242 953	13 913	100 703	3 041

NOTE: [a] One concession deed may cover one or more uses or permits.
SOURCE: CONAGUA. Deputy Director General's Office for Water Management.

With the aim of making the transfer of rights more efficient and transparent, Water Banks have been created, as regulated management operation bodies, to act as facilitators, inform on the applicable legislation, provide advice and guidance to users, verify that the duties to be transferred comply with legislation; with the purpose of avoiding speculation, hoarding of the water resources and the existence of informal water markets.

At the end of 2009, a total of six Water Banks had been established in Mexico, which are currently being operated by the following River Basin Organizations: Central Basins of the North, Lerma-Santiago-Pacific, Rio Bravo, Northern Pacific, Balsas, and Baja California Peninsula, exceeding the goal established by the National Water Resources Program 2007-2012.

We recommend consulting the annual publication "Statistical Compendium of Water Management", produced by the National Water Commission (the figures may vary as a result of the updates to the REPDA database).

Prohibition zones

With the aim of reversing the trend towards the over-exploitation of the county's aquifers and watersheds, the federal government has issued prohibitions to restrict water withdrawals in various areas.

In the case of groundwater, up to December 2009, 145 prohibition zones were in force. In map M5.1, the areas of the country with some type of prohibition to restrict groundwater withdrawal are shown.

In the case of surface water, the existing prohibitions were decreed between 1929 and 1975. The suspension of the state of prohibition in the catchments of the Salado, Grande, Trinidad, Valle Nacional, Playa Vicente, Santo Domingo, Tonto, Blanco, San Juan, Tesechoacán, Papaloapan and Llanuras de Papaloapan Rivers and their tributaries and sub-tributaries was decreed in the Official Government Gazette in 2006.

Papaloapan River, Pier, State of Veracruz, Laguna de Alvarado

M5.1 Prohibition zones for groundwater extraction, by Hydrological-Administrative Region, 2009

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.

Publication of the mean annual availability of water

The National Water Law establishes that in order to allocate concession deeds, the mean annual availability of water in the watershed or aquifer in which the use is to be made should be taken into account. The CONAGUA is thus bound to publish the availabilities, for which the standard NOM-011-CONAGUA-2000 has been created, "Conservation of Water Resources– which establishes the specifications and the method to determine the mean annual availability of the nation's waters", in which the methodology to do so is indicated.

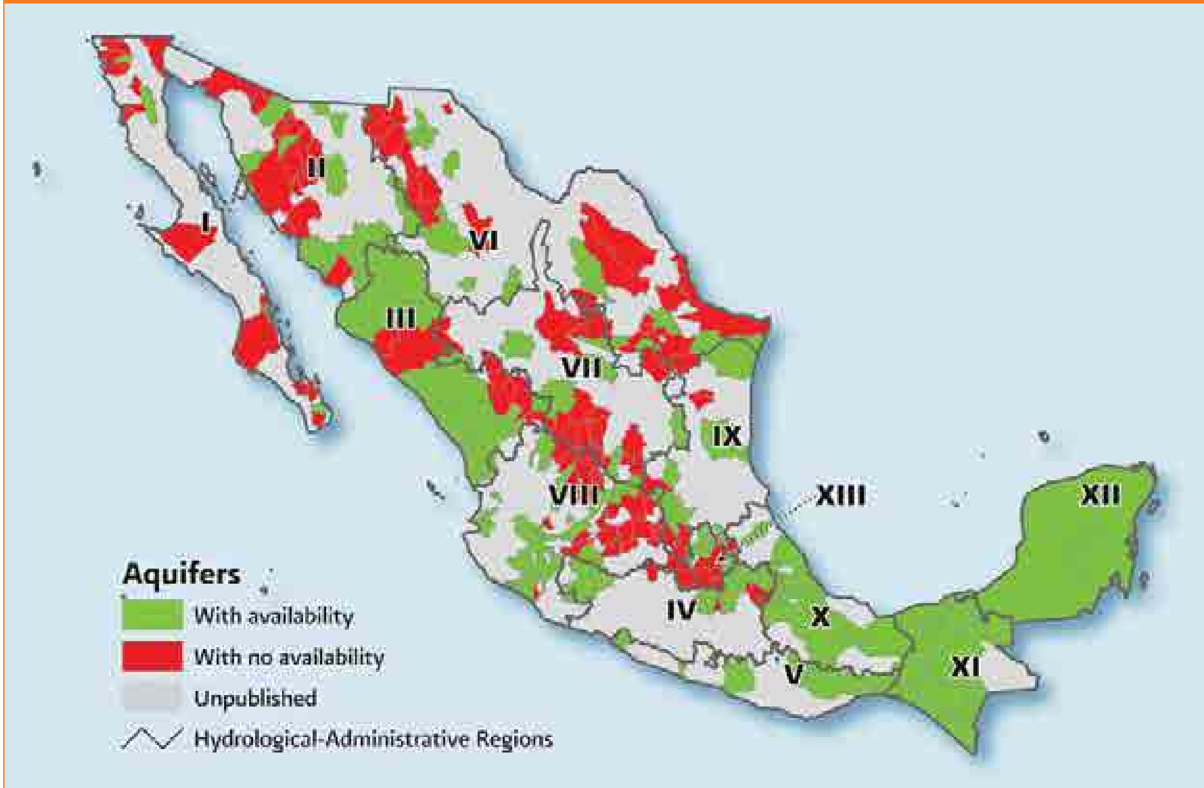
Up to December 31st, 2009, the availability of 282 hydrogeological units or aquifers, from which 84% of the country's groundwater is withdrawn, had been published in the Official Government Gazette, as well as that of 722 watersheds.

Maps M5.2 and M5.3 show the location of Mexico's watersheds and aquifers whose availability had been published in the Official Government Gazette up to December 31st, 2009.

M5.2 Watersheds with published availability up to 2009

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs.

M5.3 Aquifers with published availability up to 2009



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs.

In the DVD you will find the data related to this issue in the spreadsheets:

- TM(Cuencas_Hidrologicas) and,
- TM(Acuiferos).

Classification Declarations of national water bodies

The National Water Law (LAN) establishes that in order to grant wastewater discharge permits, the Classification Declarations of the national water bodies should be taken into account. The CONAGUA has the responsibility of drawing up and publishing the Classification Declarations in the Official Government Gazette (known as the DOF in Spanish).

According to Article 87 of the National Water Law, the Classification Declarations contain the limits of the water bodies studied in which the assimilation and dilution capacity is determined, referring to their capacity to self-purify; as well as the quality parameters that wastewater should comply with and the maximum discharge limits of these parameters in the classified areas, which are the basis to establish the particular discharge conditions. They also include quality targets in the receiving water bodies as regards the pollutants, as well as the periods to achieve these targets.

R5.1 Classification Declarations of the Coatzacoalcos River

On February 6th, 2008, the Classification Declaration was published in the Official Goverment Gazette for the Coatzacoalcos River and its tributaries (Calzadas River, Gopalapa stream and Teapa stream) as well as the Pajaritos lagoon, in the State of Veracruz. The Declaration of the Coatzacoalcos River divided the system into six areas and 33 parameters were included to be regulated in the wastewater discharges, among which were the organic compounds, the color, the Chemical Oxygen Demand, detergents, acute toxicity and those related to the NOM-001-SEMARNAT-1996.

Three steps were established for the removal of pollutants and three periods to comply with the water quality targets. The final stage corresponds to the period 2018-2020. The final target is proposed so that the water can have multiple uses such as the protection of aquatic life forms, agricultural irrigation and as a source of water supply for human consumption.

The overall benefits expected from the restoration of the water quality in this river and its tributaries are up to 2 300 million pesos for the next 20 years, through the provision of drinking water, tourism, health, biodiversity and fishing.

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

5.3 Water economy and finances

Duties for the use of the nation's water

Both corporations and individuals that use Mexico's water resources are bound to pay the corresponding water duties, with or without the benefit of concession deeds, authorizations or permits allocated by the Federal Government, as are those who discharge wastewater or any other deposit into rivers, catchments, reservoirs, seawater or water currents, be it permanently, intermittently or on a one-off basis, as well as those who discharge wastewater into the soil or filter it into grounds which are public property or which could pollute the subsoil or aquifers; and those who use public goods which belong to the nation in ports, terminals and port installations, the federal sea zone, dikes, channels, reservoirs, areas with currents and tanks, which are the property of the nation.

In order to charge duties for the use of water, the Mexican Republic has been divided into nine availability zones.

The list of the municipalities that belong to each availability zone may be found in article 231 of the 2008 Federal Duties Law, which is updated annually, and is reflected in map M5.4. In general the cost per cubic meter is higher in the zones of lesser availability, as can be observed in table T5.4.

For the setting of duties for wastewater discharges, the receiving bodies (rivers, lakes and lagoons, among others) are classified into three types: A, B or C, according to the effects caused by the pollution, the C-type receiving bodies being those in which the pollution has the strongest effects. The list of the receiving bodies that belong to each category can be found in the Federal Duties Law.

The cost for wastewater discharges is related to the volume of the discharge and the load of the pollutants, and may be consulted in article 278-C of the Federal Duties Law.

In the DVD you will find the data related to this issue in the spreadsheets:
- TM(Zonas_Disponibilidad) and,
- TM(Derechos_aguas_nacionales).

M5.4 Availability zones for the setting of duties by municipalities, 2009

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: Federal Duties Law 2009

T5.4 Duties for the use of the nation's water, according to availability zones, 2010 (Mexican cents per cubic meter)

Use	Zone								
	1	2	3	4	5	6	7	8	9
General Regime [a]	1 828.94	1 463.10	1 219.24	1 005.89	792.48	716.23	539.09	191.53	143.54
Drinking water, consumption more than 300 l/inhabitant/day	72.46	72.46	72.46	72.46	72.46	72.46	33.74	16.85	8.39
Drinking water, consumption equal to or less than 300 l/inhabitant/day	36.23	36.23	36.23	36.23	36.23	36.23	16.87	8.43	4.19
Agricultural, without exceeding the assigned volume	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agricultural, for every m^3 that it exceeds the assigned volume	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95
Spas and recreational centers	1.04	1.04	1.04	1.04	1.04	1.04	0.51	0.24	0.11
Hydropower generation	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Aquaculture	0.30	0.30	0.30	0.30	0.30	0.30	0.15	0.07	0.03

NOTE: No payment is made for the withdrawal of seawater, or for brackish water with concentrations of more than 2500 mg/L of total dissolved solids (certified by the CONAGUA).
[a] Refers to any use other than those mentioned.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: Federal Duties Law. Mexico, 2010.

The CONAGUA's duty collection

The CONAGUA is a fiscal authority, and intervenes in the charging of duties for the use of Mexico's water and its inherent public goods. In tables T5.5 and T5.6, the CONAGUA's collection of duties may be observed, which includes the concepts of the use of the nation's water, use of receiving bodies, material extraction, bulk water supply to urban and industrial centers; irrigation services; use of federal zones; and various, such as transaction services, VAT and fines, among others.

Periodically, the Ministry of Finance and Public Credit authorizes the CONAGUA to apply charges for services, for example bulk water supply to the Cutzamala System or to the Irrigation District modules.

It should be noted that the payment for wastewater discharges (use of receiving bodies) corresponds to 0.6% of the total revenue, even when the level of treatment is much lower. Similarly, the collection of duties for the concept of bulk water supply is worth mentioning, made up of 1 330.6 million pesos from the Cutzamala System, 661.9 from the Immediate Action Plan Well System (both for the supply of the Valley of Mexico Metropolitan Zone), and 47.9 from the Uxpanapa-Cangrejera Aqueduct, for the supply of industries in the south of the state of Veracruz.

T5.5 The CONAGUA's collection of duties by concept, annual series from 2000 to 2008 (millions of pesos at constant 2008 prices)

Concept	2000	2001	2002	2003	2004	2005	2006	2007	2008
Use of the nation's waters	6 974.4	6 764.0	7 261.1	7 817.4	7 404.2	7 421.3	7 015.2	7 478.9	7 601.1
Bulk water supply to urban and industrial centers	1 245.7	1 265.8	1 227.8	1 399.7	1 314.3	1 552.3	1 440.1	1 520.9	2 040.4
Irrigation services	159.6	182.8	183.5	167.4	170.6	175.0	167.6	199.7	194.5
Material extraction	44.0	47.6	36.8	33.1	42.1	38.6	57.1	38.1	42.6
Use of receiving bodies	48.5	86.6	67.4	77.9	76.7	58.3	52.9	60.2	58.1
Use of federal zones	27.9	26.9	26.9	28.7	36.7	30.8	29.1	36.1	31.3
Various (transaction services, VAT and fines, among others)	313.7	261.7	254.1	126.3	85.3	85.3	127.3	98.6	331.1
TOTAL	8 813.8	8 635.5	9 057.7	9 650.5	9 129.9	9 361.8	8 889.2	9 432.5	10 299.1

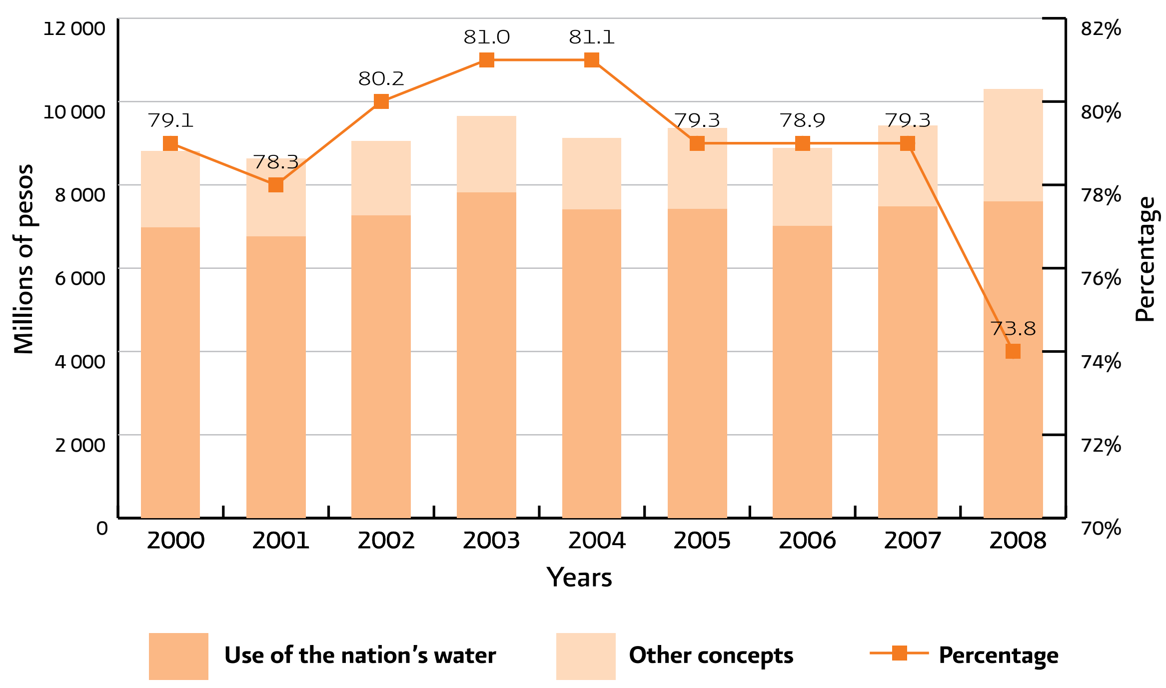
NOTE: The sums may not add up perfectly due to the rounding up or down of the figures.
The conversion of pesos at current prices to constant 2008 prices was carried out based on the average National Consumer Price Index for each year.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Coordination of Fiscal Revision and Payments.

In the period from 2000 to 2007, the concept of extraction or use of the nation's water varied between 78 and 81% of the CONAGUA's collected duties. It should be mentioned that this was an increase of 9.2%, going from 9 432 to 10 299 million pesos at constant 2008 prices. As can be observed in graph G5.2, even though the concept of extraction or use increased slightly in its total amount, its participation in the total revenues went down to 74%, whereas the concept of bulk water supply to urban and industrial centers presented a sharp increase.

From the creation of the CONAGUA in 1989 onwards, the revenues collected from the charging of duties increased noticeably compared to the previous period. From 1995 onwards, it has varied between 8 000 and 10 000 million pesos at constant 2008 prices, with a slight growth trend, as can be appreciated in graph G5.3.

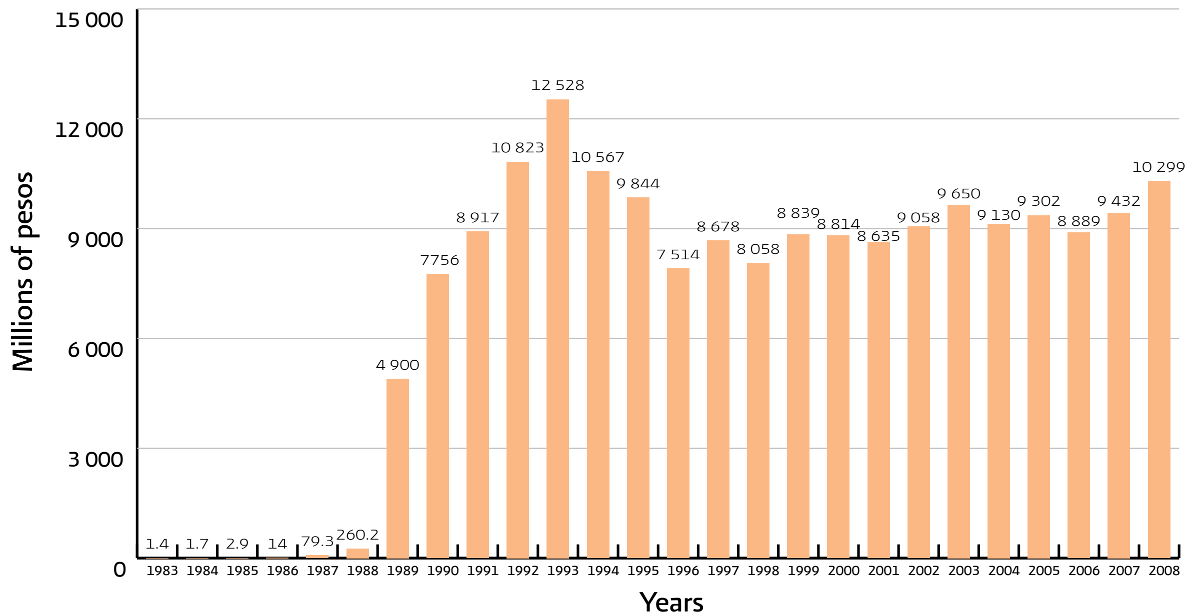
The duties collected in 2008 by Hydrological-Administrative Region are illustrated in table T5.6.

G5.2 Evolution in the duties collected for the extraction or use of the nation's water compared to the total revenues, period 2000-2008 (millions of pesos at constant 2008 prices)



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Coordination of Fiscal Revision and Payments.

G5.3 The CONAGUA's revenues collected for the billing of duties, annual series from 1983 to 2008 (millions of pesos at constant 2008 prices)



CONAGUA. Coordination of Fiscal Revision and Payments.

T5.6 The CONAGUA's revenues collected from the billing of duties and uses, by Hydrological-Administrative Region, 2008 (millions of pesos)

No	Hydrological-Administrative Region	CONCEPT							
		Use of the nation's water	Bulk water supply to urban and industrial centers	Irrigation	Material extraction	Wastewater discharges	Use of federal zones	Various (transaction services, regularization and fines, among others)	Total
I	Baja California Peninsula	105.7	0.0	71.7	7.7	0.9	3.4	3.4	192.8
II	Northwest	324.4	0.0	18.4	1.2	2.5	0.5	2.4	349.3
III	Northern Pacific	212.0	0.0	37.0	10.2	0.9	1.9	1.5	263.6
IV	Balsas	478.4	0.0	3.7	0.4	12.0	2.4	28.7	525.6
V	Southern Pacific	152.1	0.0	1.0	1.8	0.1	0.6	5.5	161.1
VI	Rio Bravo	1 094.1	0.0	18.7	0.6	1.4	4.4	11.4	1 130.6
VII	Central Basins of the North	451.3	0.0	13.1	1.3	3.2	1.0	4.7	474.5
VIII	Lerma-Santiago-Pacific	1 707.7	24.3	8.2	12.1	19.2	4.8	34.8	1 811.2
IX	Northern Gulf	346.8	0.0	8.6	0.6	5.4	4.1	5.1	370.6
X	Central Gulf	587.8	47.9	2.9	0.5	4.8	0.5	56.7	701.1
XI	Southern Border	455.7	0.0	0.2	6.2	4.0	1.0	113.2	580.4
XII	Yucatán Peninsula	127.9	0.0	0.3	0.0	3.2	0.0	5.8	137.2
XIII	Waters of the Valley of Mexico	1 557.1	1 968.2	10.7	0.0	0.6	6.7	57.9	3 601.1
	TOTAL	7 601.1	2 040.4	194.5	42.6	58.1	31.3	331.1	10 299.1

NOTE: The sums may not add up perfectly due to the rounding up or down of the figures.
CONAGUA. Coordination of Fiscal Revision and Payments.

It is worth mentioning that the regions VI Rio Bravo, VIII Lerma-Santiago-Pacific and XIII Waters of the Valley of Mexico contribute 64% of the duties collected.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Recaudacion_concepto).

Table T5.7 indicates the duties collected for each of the uses mentioned in article 223 of the water-related Federal Duties Law. Correspondingly, table T5.9 shows the values by Hydrological-Administrative Region.

The volumes declared, which refers to those that the users of the nation's water reported for the period 2000–2008 in their declarations for the payment of duties, are shown in table T5.8, classified by uses, as in table T5.10 by Hydrological-Administrative Regions.

T5.7 Revenues collected for the extraction or use of the nation's water, annual series from 2000 to 2008 (millions of pesos at constant 2008 prices)

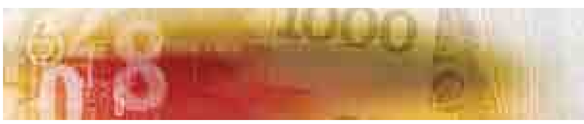
Use	2000	2001	2002	2003	2004	2005	2006	2007	2008
General Regime[a]	5 850.2	5 779.6	5 531.4	5 637.3	5 206.2	5 095.9	4 845.3	5 202.5	5 203.9
Urban public	511.2	482.9	1 267.7	1 810.4	1 770.1	1 895.0	1 671.3	1 797.9	1 844.3
Hydropower plants	586.9	474.2	436.2	367.5	406.5	408.4	476.9	457.5	524.7
Spas and recreational centers	25.8	26.8	25.3	1.2	20.8	21.5	21.4	20.5	27.5
Aquaculture	0.2	0.6	0.4	1.0	0.6	0.5	0.4	0.6	0.7
TOTAL	6 974.4	6 764.0	7 261.1	7 817.4	7 404.2	7 421.3	7 015.2	7 478.9	7 601.1

NOTE: The sums may not add up perfectly due to the rounding up or down of the figures.
[a] Refers to any use other than those mentioned.
SOURCE: CONAGUA. Coordination of Fiscal Revision and Payments.

T5.8 Volumes declared for the payment of duties, annual series from 2000 to 2008 (millions of cubic meters, hm³)

Use	2000	2001	2002	2003	2004	2005	2006	2007	2008
General Regime[a]	1 392.2	1 079.1	1 117.7	1 222.6	1 369.3	1 265.2	1 306.3	1 763.9	1 796.2
Urban public	661.5	1 682.1	4 182.5	6 549.6	6 397.5	7 082.6	8 240.1	7 584.4	7 639.3
Hydropower plants	165 842.5	128 848.9	120 982.1	96 163.5	110 581.1	115 385.8	140 294.9	122 831.6	150 669.4
Spas and recreational centers	164.4	128.1	115.5	32.0	80.5	93.8	115.0	83.5	85.7
Aquaculture	92.2	192.0	176.5	211.0	285.0	397.1	159.0	307.9	308.6
TOTAL	168 152.7	131 930.3	126 574.2	104 178.5	118 713.3	124 224.6	150 115.3	132 571.3	160 499.2

NOTE: The sums may not add up perfectly due to the rounding up or down of the figures.
[a] Refers to any use other than those mentioned.
SOURCE: CONAGUA. Coordination of Fiscal Revision and Payments.



In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Recaudacion_uso).

T5.9 Revenues collected for the extraction or use of the nation's water, by Hydrological-Administrative Region, 2008 (millions of pesos)

No	Hydrological-Administrative Region	General regime[a]	Public urban	Hydropower plants	Spas and recreational centers	Aquaculture	Total
I	Baja California Peninsula	7.4	98.2	0.0	0.0	0.0	105.7
II	Northwest	248.3	64.2	11.9	0.0	0.0	324.4
III	Northern Pacific	99.5	66.5	46.0	0.0	0.0	212.0
IV	Balsas	215.4	153.8	106.5	2.4	0.4	478.4
V	Southern Pacific	123.0	21.3	7.8	0.0	0.0	152.1
VI	Rio Bravo	775.1	311.6	6.9	0.6	0.0	1 094.1
VII	Central Basins of the North	376.2	75.0	0.0	0.1	0.0	451.3
VIII	Lerma-Santiago-Pacific	1 288.6	360.6	47.1	11.4	0.1	1 707.7
IX	Northern Gulf	283.7	52.8	10.1	0.1	0.1	346.8
X	Central Gulf	483.1	55.7	48.9	0.1	0.0	587.8
XI	Southern Border	206.4	9.8	239.6	0.0	0.0	455.7
XII	Yucatán Peninsula	93.7	34.2	0.0	0.0	0.0	127.9
XIII	Waters of the Valley of Mexico	1 003.6	540.6	0.0	12.9	0.1	1 557.1
	TOTAL	5 203.9	1 844.3	524.7	27.5	0.7	7 601.1

NOTES: The sums may not add up perfectly due to the rounding up or down of the figures.
[a] Refers to any use other than those mentioned.
SOURCE: CONAGUA. Coordination of Fiscal Revision and Payments.

T5.10 Volumes declared for the payment of duties for extraction or use of the nation's water, by Hydrological-Administrative Region, 2008 (millions of cubic meters, hm³)

No	Hydrological-Administrative Region	USE					
		General regime[a]	Public urban	Hydropower plants	Spas and recreational centers	Aquaculture	Total
I	Baja California Peninsula	7.9	1 061.2	0.0	1.5	0.0	1 070.6
II	Northwest	71.3	80.6	3 404.7	0.4	0.5	3 557.4
III	Northern Pacific	105.3	563.2	13 216.7	6.1	22.6	13 913.9
IV	Balsas	296.9	398.1	30 572.8	29.0	170.1	31 466.9
V	Southern Pacific	51.8	30.8	2 244.7	0.0	0.0	2 327.4
VI	Rio Bravo	143.4	742.5	1 967.7	2.4	1.9	2 857.9
VII	Central Basins of the North	80.2	232.4	0.0	0.6	1.3	314.5
VIII	Lerma-Santiago-Pacific	354.7	2 814.9	13 516.9	26.0	49.9	16 762.5
IX	Northern Gulf	125.3	73.1	2 912.1	7.0	21.4	3 138.9
X	Central Gulf	302.2	346.5	14 040.5	3.8	30.9	14 723.9
XI	Southern Border	92.3	209.4	68 793.3	0.1	2.6	69 097.7
XII	Yucatán Peninsula	37.6	267.2	0.0	1.0	0.1	305.9
XIII	Waters of the Valley of Mexico	127.4	819.4	0.0	7.7	7.3	961.7
	TOTAL	1 796.2	7 639.3	150 669.4	85.7	308.6	160 499.2

NOTES: The sums may not add up perfectly due to the rounding up or down of the figures.
[a] Refers to any use other than those mentioned.
SOURCE: CONAGUA. Coordination of Fiscal Revision and Payments.

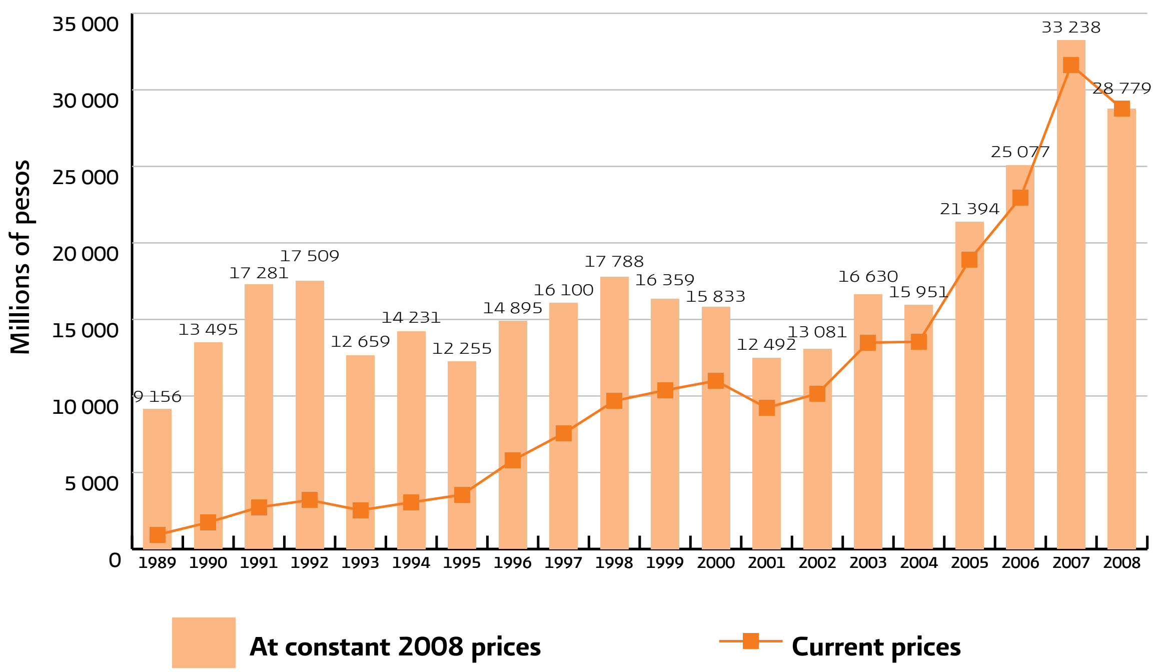
The CONAGUA's budget

The CONAGUA's budget as authorized by the Chamber of Deputies for 2010 was 34 499 million Mexican pesos, of which 3 546 million pesos corresponds to staff services and 30 953 million pesos to the concepts of material and supplies, general services, subsidies and transfers, real estate and furniture, public works and financial investment. Throughout the year there are budgetary adjustments, as a result of which the end-of-year revenues vary from the budget originally authorized.

The evolution in the CONAGUA's end-of-year revenues is shown in graph G5.4. It should be mentioned that 2007 was a non-typical year, since the original budget was 20 577 million pesos, whereas the end-of-year revenues were 62% more, reaching a total amount of 33 238 million pesos.

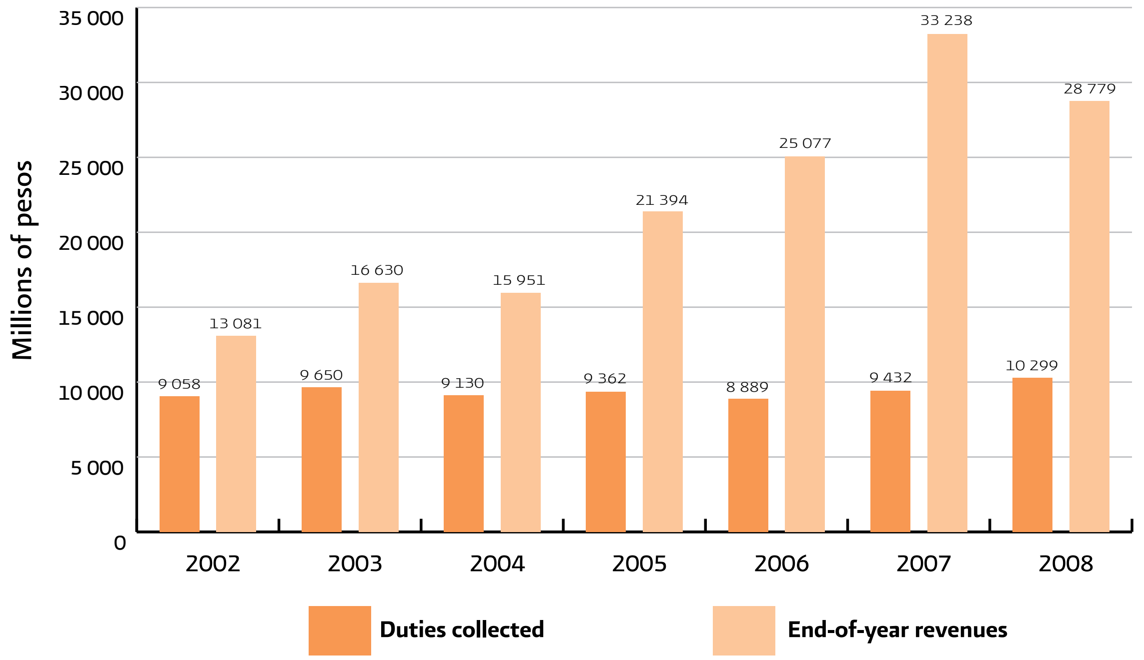
It is interesting to compare the end-of-year revenues against the duties collected, which can be viewed in graph G5.5. As can be observed, the CONAGUA man-

G5.4 Evolution in the CONAGUA's end-of-year revenues, annual series from 1989 to 2008 (millions of pesos)



NOTE: The conversion of pesos at current prices to constant 2008 prices was carried out based on the average National Consumer Price Index from January to December of each year.
SOURCE: CONAGUA. Deputy Director General's Office for Administration.

G5.5 Duties collected and end-of-year revenues of the CONAGUA (millions of pesos at constant 2008 prices)



SOURCE: CONAGUA. Deputy Director General's Office for Administration.
CONAGUA. Coordination of Fiscal Revision and Payments.

ages a greater budget than the sum of its collected duties, which in 2008 was the equivalent of 36% of the end-of-year revenues.

The evolution in the investment in the drinking water, sewerage and sanitation subsector is shown in table T5.11. It should be mentioned that the investment has

T5.11 Investments under the drinking water, sewerage and sanitation subsector (millions of pesos at constant 2008 prices)

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

NOTE: [a] Includes: Storms drains, operating expenses and supervision.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

T5.12 Investments reported by program and agency, according to the sector of origin of the resources, 2008 (millions of pesos)

Concept	Federal	State	Municipal	Credit/Private/others	Total
CONAGUA investments	**12 288.2**	**6 886.9**	**3 212.1**	**1 121.2**	**23 508.4**
Drinking water and improved sanitation in urban zones	6 924.7	5 203.8	1 270.9	830.4	14 229.9
Valley of Mexico[a]	797.0	0.0	0.0	0.0	797.0
Duty Returns	1 941.2	0.0	1 941.2	NA	3 882.3
Clean Water	33.7	37.1	0.0	0.0	70.8
PROSSAPYS[b]	2 174.7	804.6	0.0	0.0	2 979.3
PROMAGUA[b]	416.9	841.3	0.0	290.8	1 549.1
Other agencies	**1 600.1**	**399.9**	**337.8**	**3 689.8**	**6 027.6**
SEDESOL	1 082.6	179.4	241.5	37.8	1 541.3
CONAVI	0.0	0.0	0.0	3 652.0	3 652.0
CDI	517.6	220.5	96.2	0.0	834.3
TOTALES	13 888.3	7 286.8	3 549.8	4 811.1	29 536.0

[a] Resources from the 1928 Trust Fund, with contributions from the Government of Mexico City (Federal District) and on behalf of the state of Mexico.
[b] The state investment includes the municipal resources.
NA: Not applicable.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation, SEDESOL, BANOBRAS, CONAVI, CDI and service providers.

different origins. For 2008, as can be observed in table T5.12, 47% of the investment was of federal origin, whereas the states contributed 24.7%, the municipalities 12% and other sources, including state commissions, housing developers, credits, contributions from the US Environmental Protection Agency and private initiatives, accounted for the remaining 16.3%.

Water tariffs

Drinking water tariffs are set independently for each municipality, depending on the provisions of each state's legislation. In some states, the tariffs are approved by the local State Congress, whereas in others they are approved by the governing body or Board of Governors of the municipality's or locality's drinking water utility or the State Water Commission.

Table T5.13 is a comparative sample of the legal framework of the states as regards drinking water, sewerage and sanitation service provision, indicating the authority that approves the tariffs and the cost components considered in the legislation for their calculation.

In principle, tariffs have the objective of completely recovering the costs incurred by the service provider. There is a Mexican Standard on the evaluation of tariffs (NMX- AA-147-SCFI-2008), published in April 2009, which contains a definition of these costs.

The level of the tariffs, or the payment due, is expressed in a price structure, more often than not differentiated according to the type of user (domestic, commercial and industrial, among others), as well as by a cost redistribution mechanism through cross subsidies, in which marginalized users are offered lower tariffs than those users considered as non-marginalized.

In general the price structures are based on progressive tariff blocks, meaning that the price per cubic meter is higher for greater water consumption. It should be added that there are a great variety of mechanisms, including the fixed quota, which implies the user paying a certain amount independently of the amount that he or she has consumed.

T5.13 Comparison of the legal frameworks in Mexico's states

States	Publication of the law	Body that approves the tariffs	Aspects considered in tariffs			
			Are costs covered?	Depreciation?	Sewerage cost included?	Sanitation cost included?
Aguascalientes	2005	Board of Governors	Yes	Yes	Yes	Yes
Baja California	1969	State Congress	Yes	N/A	N/A	N/A
Baja California Sur	2001	Board of Governors	Yes	N/A	Yes	N/A
Campeche	1992	Board of Governors	Yes	Yes	Yes	Yes
Coahuila	2006	Board of Governors	Yes	Yes	N/A	N/A
Colima	2000	Board of Governors	Yes	Yes	Yes	Yes
Chiapas	2000	Board of Governors	Yes	Yes	Yes	Yes
Chihuahua	2004	State Council	Yes	N/A	Yes	Yes
Durango	2005	City Council	Yes	Yes	Yes	Yes
Guanajuato	2000	City Council	Yes	Yes	Yes	Yes
Guerrero	2002	City Council	Yes	Yes	Yes	Yes
Hidalgo	1999	State Congress	Yes	N/A	Yes	Yes
Jalisco	2007	State Congress	Yes	Yes	Yes	Yes
Mexico City (Federal District)	2003	Legislative Assembly	Yes	N/A	N/A	N/A
Michoacán de Ocampo	2004	City Council	Yes	Yes	N/A	N/A
Morelos	2002	State Congress	Yes	Yes	Yes	Yes
Nayarit	1995	Board of Governors	Yes	Yes	Yes	Yes
Nuevo León	1997	State Executive	Yes	Yes	Yes	Yes
Oaxaca	1993	Board of Governors	Yes	Yes	Yes	Yes
Puebla	1994	State Congress	Yes	N/A	N/A	N/A
Querétaro	1992	Board of Governors	Yes	Yes	Yes	Yes
Quintana Roo	1996	Board of Governors	Yes	N/A	N/A	N/A
San Luis Potosí	2001	State Congress	Yes	Yes	Yes	Yes
Sinaloa	2002	Board of Governors	Yes	N/A	Yes	Yes
Sonora	2006	State Congress	Yes	Yes	Yes	Yes
State of Mexico	1999	Board of Governors	Yes	Yes	Yes	Yes
Tabasco	2005	State Congress	Yes	Yes	Yes	Yes
Tamaulipas	2006	State Executive	Yes	Yes	Yes	Yes
Tlaxcala	2001	City Council	N/A	N/A	N/A	N/A
Veracruz	2001	Board of Governors	Yes	Yes	Yes	Yes
Yucatán	1982	State Congress	Yes	N/A	N/A	N/A
Zacatecas	1994	Board of Governors	Yes	Yes	Yes	Yes

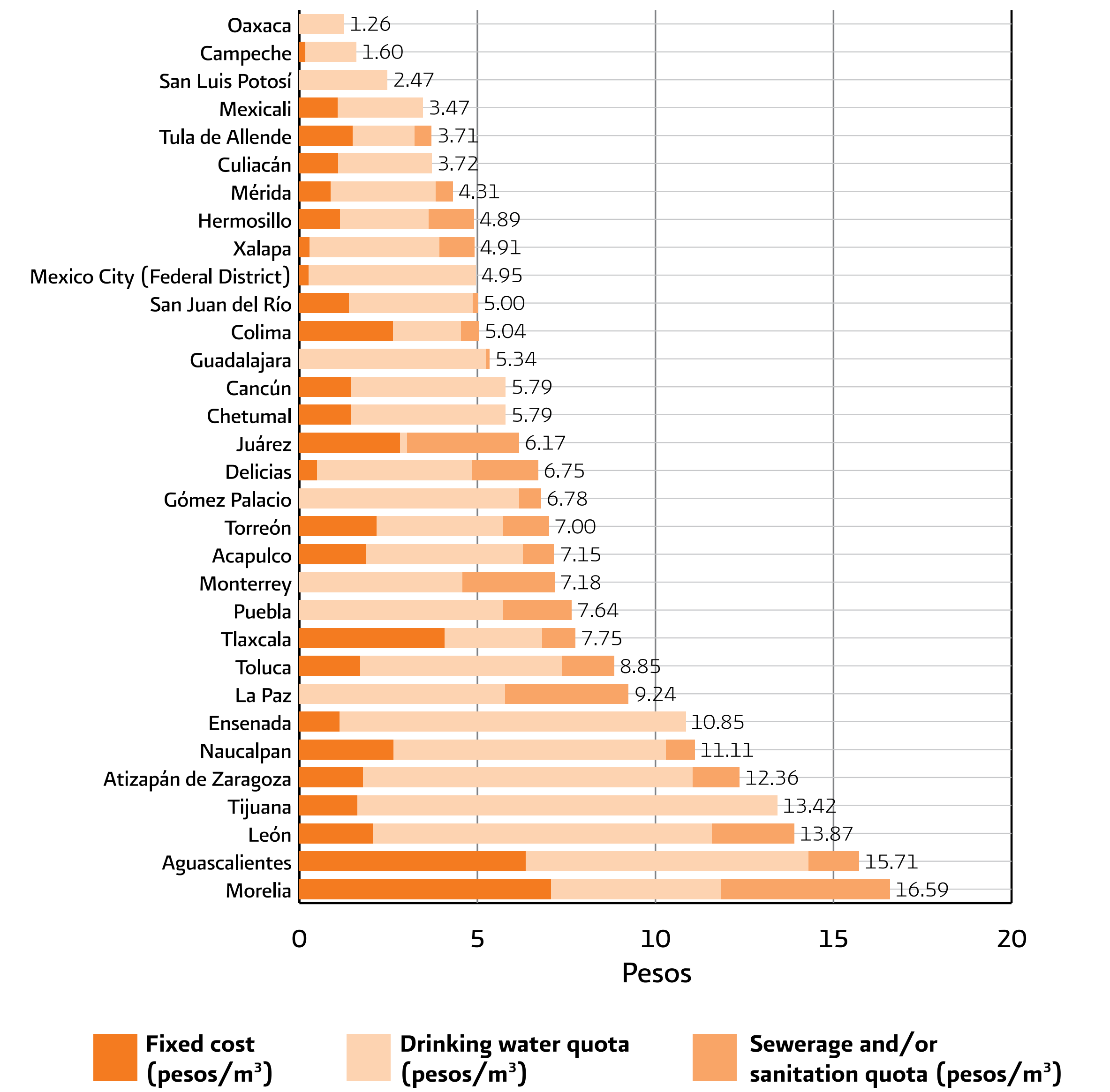
NOTE: Updated in June 2009.
Yes = The state constitution contains the condition. N/A = The condition is unspecified.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

Water tariffs generally include:

- Fixed costs, independent from the volume used,
- Variable costs for the water supplied, associated with the volume used,
- Variable costs for sewerage and wastewater treatment, generally applied as a percentage of the costs for water supply,
- Taxes.

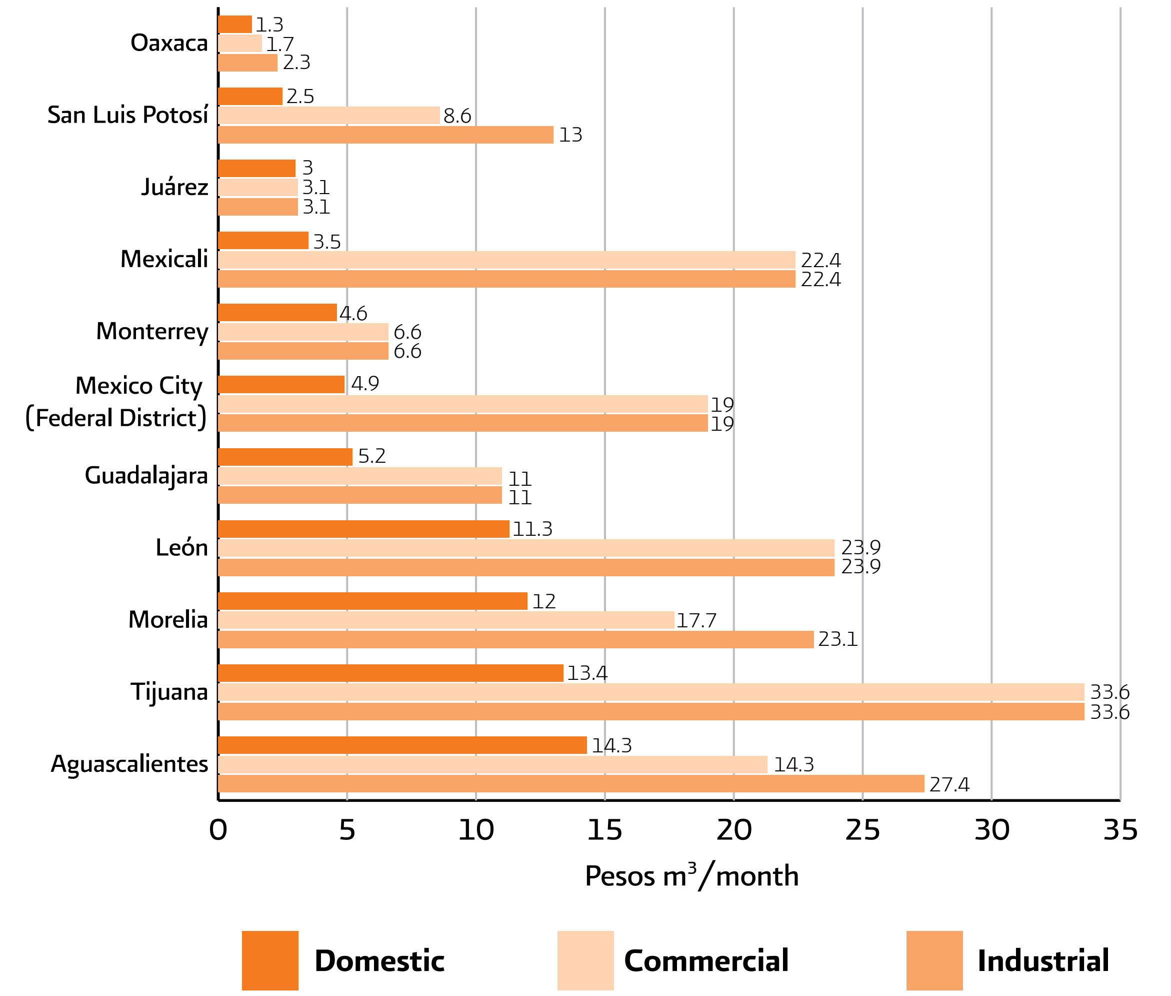
Graph G5.6 indicates the drinking water, sewerage and/or sanitation tariffs for selected cities in Mexico, for a consumption of 30 m³ per month for domestic use, as well as the highest applicable tariff.

G5.6 Domestic drinking water, sewerage and/or sanitation tariffs in selected cities, 2008 (pesos/m³)



NOTE: The highest applicable tariff for a consumption of 30 m³ per month.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

G5.7 Comparison of tariffs for domestic, industrial and commercial uses in selected cities, 2008 (pesos/m³)



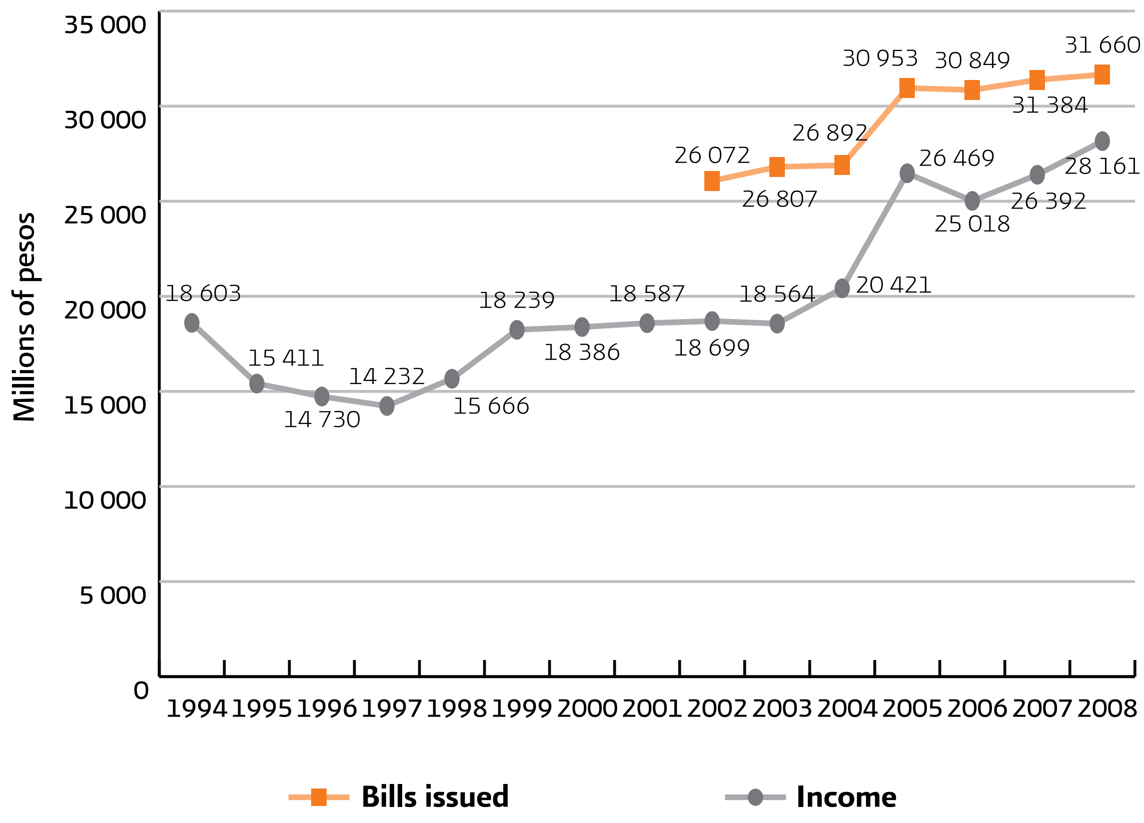
NOTE: The highest applicable tariff for a consumption of 30 m³ per month.
SOURCE: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation

In graph G5.7, the tariffs for domestic, industrial and commercial uses are shown for several localities in Mexico, assuming a consumption of 30 m³ per month.

It is worth mentioning that, with the level of the tariff established, the service provider carries out the billing to users as a necessary step to charge for the service. The payment of these bills represents the revenues collected by the service provider. There are payments that are carried out in the same billing period, whereas others are late payments, fines or surcharges.

The relationship between the bills issued and the duties collected by the service providers, as reported by them, can be viewed in graph G5.8.

G5.8 Total amount of bills issued and income annually by water utilities (millions of pesos at constant 2008 prices)



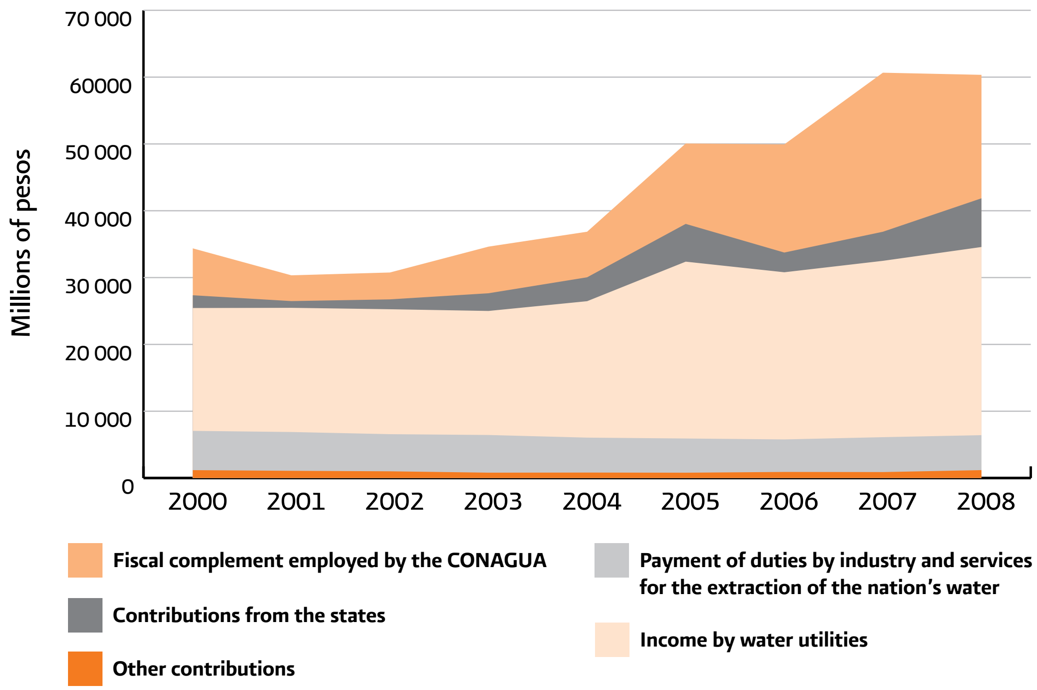
NOTE: Some states collect more duties than those billed, due to the value billed corresponding to each financial year whereas the amount collected does not always adhere to the same period, since it may include payments corresponding to previous periods, fines and/or surcharges.
Produced based on data estimated from a sample of water utilities from all around Mexico.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

The sector's revenues

It is interesting to consider the growing evolution in the main resources destined to the water sector, illustrated in graph G5.9 as the sum of duties collected by the CONAGUA and by service providers, the contributions from the states for investment in the drinking water, sewerage and sanitation subsector, and the fiscal contribution that makes up the difference between the CONAGUA's budget and the duties it collects.

We recommend consulting the annual publication "Situation of the Drinking Water, Sewerage and Sanitation Subsector", produced by the National Water Commission.

G5.9 Main economic resources destined to the water sector (millions of pesos at constant 2008 prices)



NOTE: The conversion of pesos at current prices to constant 2008 prices was carried out based on the average National Consumer Price Index for each year.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
CONAGUA. Deputy Director General's Office for Administration.
CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.
CONAGUA. Coordination of Fiscal Revision and Payments.

5.4 Participation mechanisms

River Basin Councils and their auxiliary bodies

The National Water Law establishes that the River Basin Councils are collegiate entities of mixed membership, which are coordination and consensus-reaching bodies providing support, consultation and advice, between the CONAGUA, including the corresponding River Basin Organization, the dependencies and entities of the federal, state or municipal governments and the representatives of water users and of civil society organizations, from the respective watershed or hydrological region.

Up to December 31st, 2009, 26 River Basin Councils had been established, with the Council referred to as Central Pacific Coast established that year. The location of these River Basin Councils is shown in map M.5.5.

In the process of consolidation of the River Basin Councils, it was necessary to attend very specific problems in more localized geographic zones, as a result of which River Basin Commissions were created to attend sub-catchments, River Basin Committees for micro-catchments, Technical Groundwater Committees for aquifers and Clean Beach Committees in the country's coastal zones.

The Clean Beach Committees are worthy of special mention. They promote the cleaning up of beaches and the watersheds and aquifers associated with them, as well as preventing and rectifying pollution to protect and preserve Mexico's beaches, respecting the native ecology and raising the quality and the standard of living of the local population, of tourism and the competitivity of the beaches.

As regards the auxiliary bodies, in 2009 three new River Basin Commissions were created, two River Basin Committees, two Technical Groundwater Committees and one Clean Beach Committee, as a result of which there is a total of 176 auxiliary bodies of the River Basin Councils, with 30 Commissions, 29 Committees, 81 Technical Groundwater Committees and 36 Clean Beach Committees, as shown in table T5.14.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Mecanismos_participacion).

M5.5 Location of the River Basin Councils, 2009

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Coordination of Emergency Attention and River Basin Councils.

T5.14 Participation mechanisms by Hydrological-Administrative Region, 2009 (situation up to December 31st)

No	Hydrological-Administrative Region	River Basin Councils	River Basin Commissions	River Basin Committees	Technical Groundwater Committees	Clean Beach Committees
I	Baja California Peninsula	1. Baja California	0	0	7	2
		2. Baja California Sur	1	0	12	4
II	Northwest	3. Upper Northwest	3	0	3	2
		4. Yaqui and Matape Rivers	1	0	2	0
		5. Mayo River	0	0	0	1
III	Northern Pacific	6. Fuerte and Sinaloa Rivers	0	0	0	0
		7. Mocorito to Quelita Rivers	0	0	0	1
		8. Presidio to San Pedro Rivers	0	0	5	1
IV	Balsas	9. Balsas River	3	1	3	1
V	Southern Pacific	10. Guerrero Coast	0	3	0	2
		11. Oaxaca Coast	0	7	1	4
VI	Rio Bravo	12. Rio Bravo	1	1	12	0
VII	Central Basins of the North	13. Nazas-Aguanaval	1	1	3	0
		14. Altiplano	0	0	6	0
VIII	Lerma-Santiago-Pacific	15. Lerma-Chapala	6	0	15	0
		16. Santiago River	3	0	2	0
		17. Central Pacific Coast	2	0	0	3
IX	Northern Gulf	18. San Fernando-Soto La Marina Rivers	0	0	0	1
		19. Panuco River	2	1	6	1
X	Central Gulf	20. Tuxpan to Jamapa Rivers	0	1	0	1
		21. Papaloapan River	0	1	3	0
		22. Coatzacoalcos River	0	0	0	1
XI	Southern Border	23. Chiapas Coast	0	5	0	2
		24. Yucatán Peninsula	2	6	0	3
XII	Yucatán Peninsula	25. Grijalva and Usumacinta Rivers	1	0	0	6
XIII	Waters of the Valley of Mexico	26. Valley of Mexico	4	2	1	0
	TOTAL	26	30	29	81	36

CONAGUA. Coordination of Emergency Attention and River Basin Councils.

Water Advisory Council

The Water Advisory Council is a civil-society, multi-stakeholder, independent, non-profit organization, created as an association under Mexican law in March 2000. The Council brings together individuals or institutions of an altruistic vocation, recognized for their activities in the academic, civil society and economic sectors, and aware of water-related problems and the need to solve them.

The Council's main objective is to promote and support the necessary strategic shift for the rational use and sustainable management of water in Mexico, advising with this aim the public and private sectors and civil society.

The Council has two types of advisors, namely personal and institutional, according to whether they are individuals or organizations. It currently has 29 advisors, of which 22 are personal and 7 are institutional.

The institutional advisors are:

- National Association of Water and Sanitation Utilities of Mexico;
- National Association of Irrigation Users;
- Communication Council;
- National Polytechnic Institute;
- Monterrey Technological and Higher Studies Institute;
- National Autonomous University of Mexico; and
- Mexican Chamber of the Construction Industry.

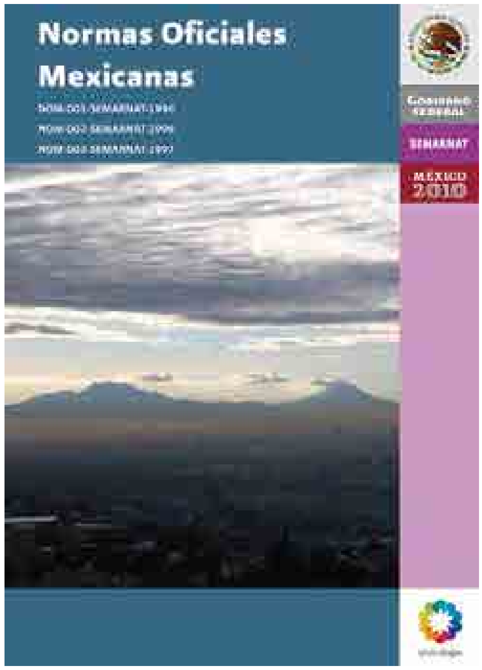
It should be mentioned that the National Water Commission is not a member of the Council, but is invited as a permanent guest.

5.5 Water-related standards

Official Mexican Ecological Standards and those of the water sector

In the following, the Mexican environmental standards related to the theme of water are presented.

NOM-001-SEMARNAT-1996
Maximum permissible limits of pollutants in wastewater discharges in the nation's waters and goods.



Compliance dates with NOM-001-SEMARNAT-1996		
Municipal discharges		
Modified compliance dates from:	**Population range (according to 1990 Census)**	**Number of localities (according to 1990 Census)**
January 1st, 2000	More than 50 000 inhabitants	139
January 1st, 2005	From 20 001 to 50 000 inhabitants	181
January 1st, 2010	From 2 501 to 20 000 inhabitants	2 266
Non-municipal discharges		
Modified compliance dates from:	**Biochemical Oxygen Demand per day (t/day)**	**Total Suspended Solids (t/day)**
January 1st, 2000	More than 3.0	More than 3.0
January 1st, 2005	From 1.20 to 3.0	From 1.20 to 3.0
January 1st, 2010	Less than 1.2	Less than 1.2

NOM-002-SEMARNAT-1996

Maximum permissible limits of pollutants in wastewater discharges to urban and municipal sewerage systems.

NOM-003-SEMARNAT-1997

Maximum permissible limits of pollutants for treated wastewater that is reused in services to the public.

NOM-004-SEMARNAT-2002

Specifications and maximum permissible limits of pollutants for their use and final disposal.

NOM-083-SEMARNAT-2003

Environmental protection for the sites of final disposal of solid urban and special requirement waste.

NOM-022-SEMARNAT-2003

Preservation, conservation, sustainable use and restoration of coastal wetlands in areas of mangrove swamps.

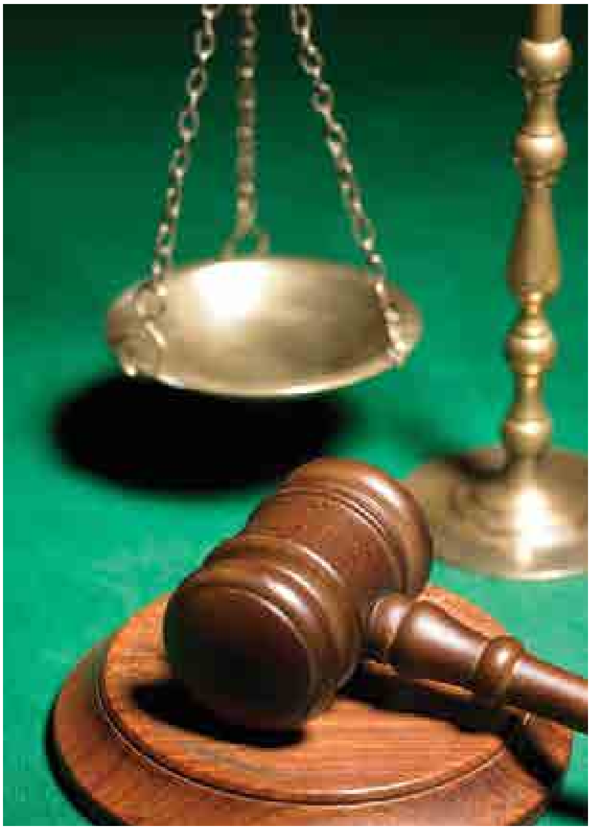
NOM-141-SEMARNAT-2003

Characterization of mine tailings and mine tailing dams.

With the aim of complying with its obligation to publish the availability of water and of the country's catchments and aquifers, the CONAGUA has issued the NOM-011-CONAGUA-2000.

NOM-011-CONAGUA-2000

Conservation of water resources. Establishes the specifications and the method to determine the mean annual availability of the nation's waters. It was published in the Official Government Gazette on April 17th, 2002, and came into effect on June 17th, 2002.



Additionally, the CONAGUA has issued standards that establish the dispositions, specifications and test methods that guarantee that the products and services tendered to drinking water, sewerage and sanitation system water utilities comply with the objective of using and preserving water in quantity and quality. The Official Mexican Standards (NOM in Spanish) in effect are the following:

NOM-001-CONAGUA-1995
Specifications for airtightness in sanitary sewerage systems.
NOM-002-CONAGUA-1995
Specifications and testing methods for home drinking water outlets.
NOM-003-CONAGUA-1996
Requirements for the construction of wells.
NOM-004-CONAGUA-1996
Requirements for the protection of aquifers during maintenance and rehabilitation of wells, and the closing of wells.
NOM-005-CONAGUA-1996
Specifications and testing methods for flux meters.
NOM-006-CONAGUA-1997
Specifications and testing methods for pre-manufactured septic tanks.
NOM-007-CONAGUA-1997
Security requirements for the construction and operation of water tanks.
NOM-008-CONAGUA-1998
Specifications and testing methods for showers.
NOM-009-CONAGUA-1998
Specifications and testing methods for lavatories.
NOM-010-CONAGUA-1999
Specifications and testing methods for inlet and discharge valves for lavatory tanks.
NOM-013-CONAGUA-2000
Specifications for airtightness and testing methods for drinking water distribution networks.
NOM-014-CONAGUA-2003
Requirements for artificial aquifer recharge with treated wastewater.
NOM-015-CONAGUA-2007
Characteristics and specifications of works and of water for its artificial infiltration into aquifers.

Official Mexican Standards of the Ministry of Health

Water supply for human use and consumption with appropriate quality is fundamental, among other aspects, to prevent and avoid the transmission of gastrointestinal and other diseases. It was thus necessary to establish permissible limits as regards their microbiological, physical, sensory, chemical and radioactive characteristics.

NOM-127-SSA1-1994
Environmental health. Water for human use and consumption. Permissible limits of quality and treatment to which water should be submitted for its purification. It was published in the Official Government Gazette on January 18th, 1996, and came into effect the following day. On November 22nd, 2000, a modification was published in the Official Government Gazette that came into effect ninety calendar days following its publication.

This standard establishes:

- Permissible limits of bacteriological characteristics (fecal coliforms and total coliforms);
- Permissible limits of physical and sensory characteristics (color, smell, taste, and cloudiness);
- Permissible limits of chemical characteristics (which include 34 parameters, such as aluminum, arsenic, barium, etc);
- Treatment methods which should be applied according to the pollutants encountered.

In the following, some other standards of importance for the health sector are indicated:

NOM-013-SSA1-1993
Health requirements for the tanks of vehicles used to transport drinking water.
NOM-014-SSA1-1993
Health procedures for drinking water samples in networks.
NOM-179-SSA1-1998
Monitoring and evaluation of the control of drinking water quality in networks.
NOM-230-SSA1-2002
Health requirements for drinking water networks.

Other standards

The Mexican Standards (NMX) constitute a regulatory set of voluntary application. Among the standards of interest for the water sector are:

NMX-AA-120-SCFI-2006
Requirements and specifications for the sustainability of beach quality.
NMX-AA-147-SCFI-2008
Methodology for the evaluation of drinking water, sewerage and sanitation tariffs.
NMX-AA-148-SCFI-2008
Methodology to evaluate the quality of drinking water, sewerage and sanitation services. Part 1, guidelines for the evaluation and improvement of services to users.
NMX-AA-149/1-SCFI-2008
Methodology to evaluate the efficiency of drinking water, sewerage and sanitation service providers. Part 1, guidelines for the provision and evaluation of wastewater services.
NMX-AA-149/2-SCFI-2008
Methodology to evaluate the efficiency of drinking water, sewerage and sanitation service providers. Part 2, guidelines for the provision and evaluation of drinking water services.

In the DVD you will find the files of the standards related to this issue.

Alternatively, we recommend consulting the CONAGUA's website (http://www.conagua.gob.mx) in order to study the full texts of the Standards, in Spanish only.

Chapter 6. Water, health and the environment

Water management cannot be dealt with in an isolated manner, and the interactions between very diverse issues should be contemplated, such as health, vegetation and ecosystems.

The information in this chapter highlights, among other things, the close links that exist between access to water and mortality, particularly among young children.

The data related to the changes in soil use and vegetation are also relevant, since they have direct repercussions on the way in which water is available and can be used. Finally, wetlands are an issue directly linked to water management, but with a specific treatment given their particular characteristics.

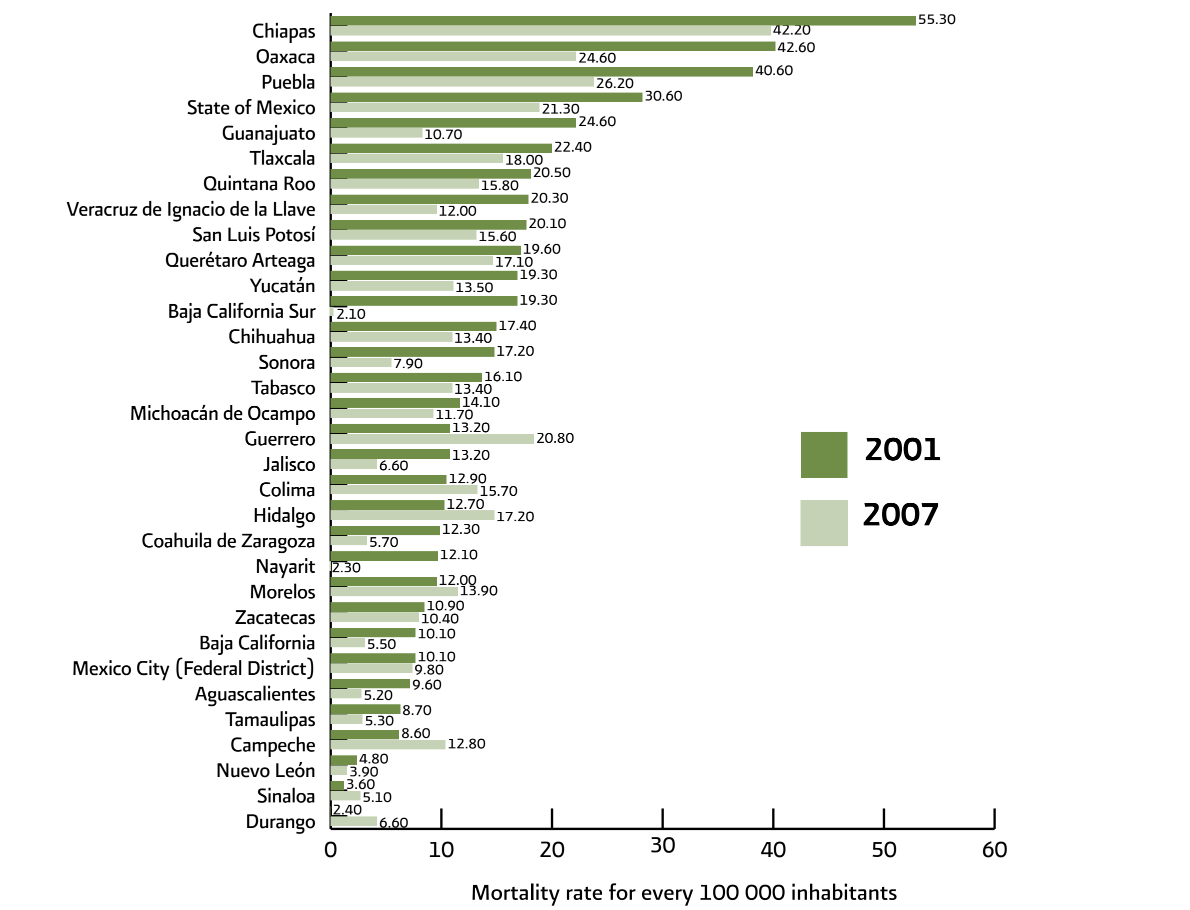
6.1 Water and health

The supply of drinking water and improved sanitation services is a significant factor in the health of the population, especially among young children. Access to appropriate sources of drinking water and improved sanitation is fundamental for the reduction of mortality and illness among the population under the age of five, through the decrease both in the impact of water-borne diseases, like viral hepatitis, typhoid fever, cholera, dysentery and other causes of diarrhea, as well as possible infections resulting from the consumption of water with pathogenic chemical components, such as arsenic, nitrates or fluoride.

In Mexico, in the case of diarrheal diseases as shown in graph G6.1, child mortality has been reduced as a result of several public health-related actions and interventions[1], including the distribution of oral serum (from 1984 onwards), vaccination campaigns (from 1986 onwards), the Clean Water Program (from 1991 onwards), and the increase in the drinking water, sewerage and sanitation coverage, which reduce the exposure to pathogenic agents. In addition to these factors, those related to hygiene, education, access to health services and socio-economic and environmental conditions should be mentioned.

[1] Sepúlveda; Jaime *et al*. Increase in the survival rate of children under the age of five in Mexico: the diagonal strategy. Public Health in Mexico. Vol. 49, Supplement 1 from 2007.

G6.1 Mortality through diarrheal diseases in children under the age of five, by State, 2001 and 2007 (mortality rate for every 100 000 inhabitants)



NOTE: The rate observed is the mortality for every 100 000 children under the age of five.
SOURCE: Ministry of Health. Indicators of results: Health Conditions by State 2001-2007

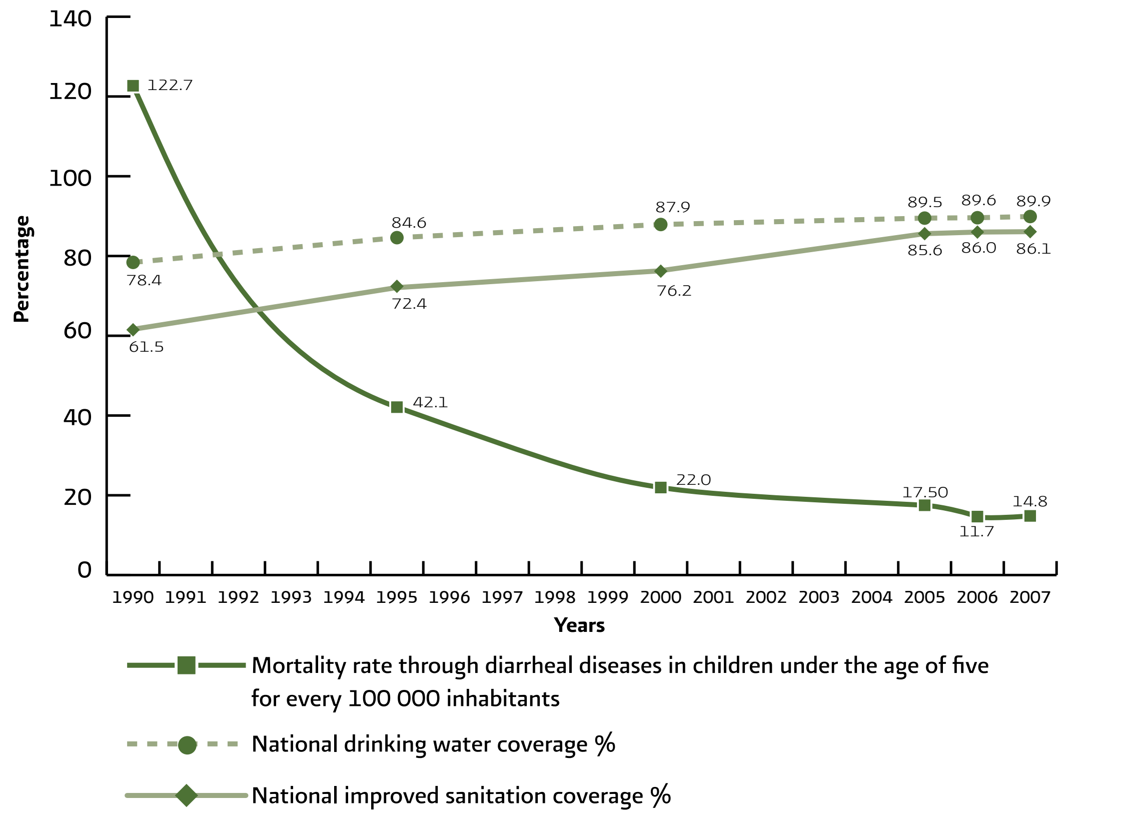
It is a worthwhile exercise to compare the increase in drinking water and improved sanitation coverage against the reduction in the mortality rate through diarrheal diseases in children under the age of five, which can be observed in graph G6.2.

The disinfection of water aims to destroy or inactivate pathogenic agents and other microorganisms, with the purpose of ensuring that the population receives water suitable for human consumption.

The efficiency of the disinfection process of the water that is supplied to the population is evaluated through the determination of free chlorine residual, a fundamental indicator, the presence of which in the domestic outlet signals the efficiency of the disinfection process.

The municipal situation as of 2008 is shown in map M6.1. It should be noted that for 2008, according to data from the Federal Commission for Protection against Health Risks (COFEPRIS), the national average for chlorination efficiency was 86.6%.

G6.2 Percentage of drinking water and improved sanitation coverage and mortality rate through diarrheal diseases in children under the age of five, annual series from 1990 to 2007



SOURCE: For the data from 1990 to 2006: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from the Ministry of Health. General Office for Performance Evaluation.
For the update to 2007: Ministry of Health. Indicators of results: Health Conditions by State 2001-2007.

M6.1 Chlorination efficiency by municipality, 2008

SOURCE: COFEPRIS. Chlorination efficiency 2006, 2007 and 2008. June 2008.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Cloracion).

6.2 Vegetation

According to data from INEGI's "Charter for Use of Soil and Vegetation", Mexico is classified into 12 groups of vegetation compatible with the Rzedowski classification system (1978). The occurrence of these types of vegetation in Mexico is shown in graph G6.3 according to the classification of series I, II, III and IV.

Series I has its roots in 1978, when work began on the "Charter for Use of Soil and Vegetation", scale 1:250 000, for which more than ten years were needed to cover the entire national territory on the issue, in part due to the extensive field work carried out. In this cartography, the current state of vegetation is considered in its primary and secondary

states. Furthermore, agricultural and livestock uses were considered. To achieve this, aerial photographs were taken from high altitude for the photographic interpretation and field work.

The information was updated from 1996 to 1999 and is known as "Series II of Use of Soils and Vegetation", scale 1:250 000, in which printed space maps (generated with LANDSAT images in 1993), were used as input, as well as field work from 1996 to 1999.

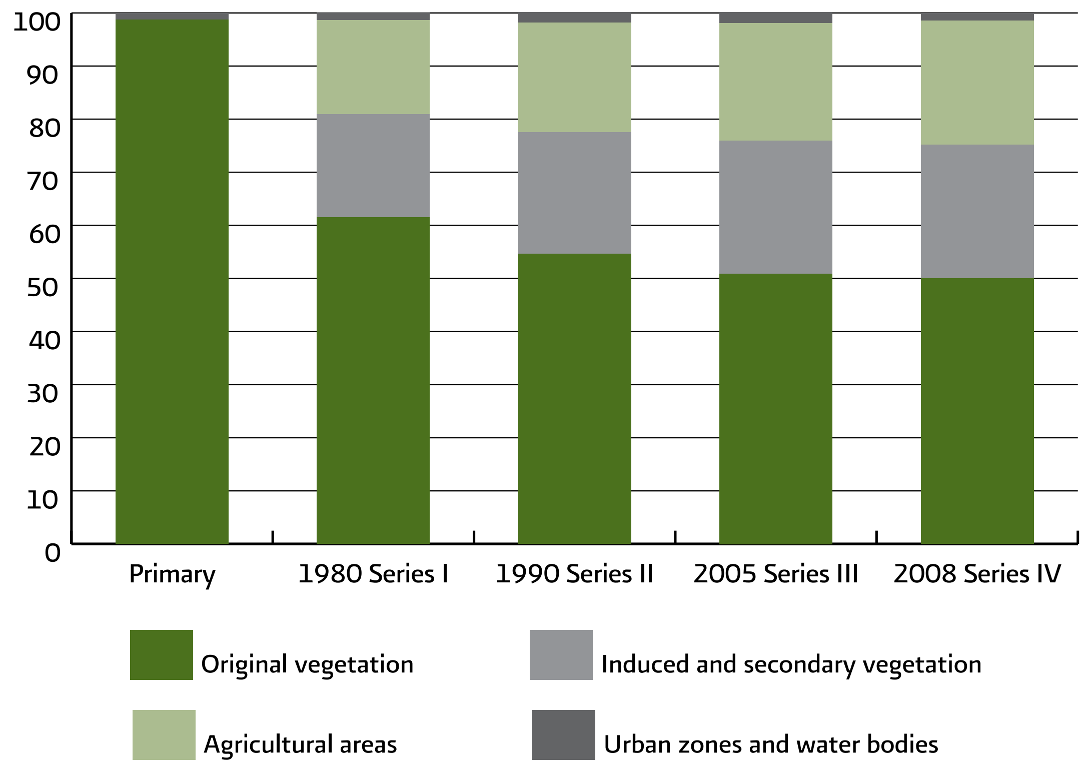
Series III, carried out using digital processes and methods, was prepared between 2002 and 2005. Images from the LANDSAT ETM satellite from 2002 were used as input. A visual analysis and field work were carried out. This information is structured digitally to be used and applied in a Geographic Information System (GIS) environment. Organized into 14 layers, the information considers both polygons and dots and lines to visualize the information on ground coverage. Additionally, some conceptual adjustments were made to facilitate its interpretation and digital structuring, as well as considering the conceptual generalization for its representation at scales of 1:1 000 000 and 1:4 000 000.

Series IV was developed under the same conceptual framework as Series III, with multi-spectrum SPOT satellite images corresponding to February, March and June 2007. Series IV (2009) can be appreciated in map M6.2.

Changing soil uses, reflected in the vegetation, have an impact on the phenomena of erosion, which may be due to the action of both water and air. Erosion in Mexico was evaluated by the Ministry of the Environment and Natural Resources (SEMARNAT) in 2002[2], which evaluated that 42% of the territory of

[2] SEMARNAT-UACh. Evaluation of the loss of soil through water and air erosion in the Mexican Republic, scale 1: 1 000 000. Mexico 2002.

G6.3 Evolution in the use of soil and vegetation, based on INEGI's Charters (percentage)



NOTE: Primary refers to the vegetation that develops naturally according to the site's environmental factors, and which has not been significantly modified by human activity.
SOURCE: INEGI. Basic information for the construction of the rate of deforestation. Mexico, 2009.

M6.2 Vegetation in Mexico, Series IV, Mexico, 2009

SOURCE: INEGI. Current Charter for Use of Soil and Vegetation. Series IV. Mexico, 2009.

Mexico was at risk from water erosion, whereas 89% was at risk from air erosion, as shown in table T6.1.

The change in soil uses is highlighted by the increase in secondary and induced vegetation, as well as in growing urban and agricultural areas. It should be mentioned that the erosion process increase the gradual degradation in the capacity of water channels and bodies, inducing effects through intense or sustained rainfall, situations which are not alien to Mexico, due to its precipitation regime (see 2.2.2 Precipitation).

T6.1 Potential soil erosion by degree, 2002 (percentage of the national territory)

	With no apparent erosion	With potential erosion				Total
		Light	Moderate	Severe	Very severe	
Water erosion	58.0	10.9	20.5	7.8	2.8	100.0
Air erosion	11.0	6.5	30.7	33.6	18.2	100.0

NOTE: The loss of soil through erosion is expressed in metric tonnes of soil per surface unit (ha) in a given timeframe (normally one year).
With no apparent degradation: 0 - 5 tonnes/ha/year, Light: 5 - 10 tonnes/ha/year, Moderate: 10 - 50 tonnes/ha/year, Severe: 50 -200 tonnes/ha/year, Very severe: > 200 tonnes/ha/year.
SOURCE: SEMARNAT-UACh. 2002. Evaluation of the loss of soil through water and air erosion in the Mexican Republic, scale 1: 1 000 000. Mexico 2002.

6.3 Biodiversity

With the aim of conserving the status of protected areas, as well as ensuring that they retain their function as areas of groundwater recharge, the necessary decrees are established for the protection of ground-based ecosystems and wetlands in particular, both in Mexico and worldwide.

In Mexico, the number of protected areas increased to 171 in August 2009, covering a total surface area of 23.9 million hectares, as shown in table T6.2. Since the information given in the previous edition of Statistics, there has been an increase of 669 000 hectares and seven protected areas. It should be mentioned that the "Pico de Tacíntaro" protected area, formerly classified as a national park, was re-classified in August 2009 as an area of flora and fauna protection[3]. Map M6.3 shows the national territory covered by protected areas.

6.4 Wetlands

Wetlands constitute a basic and irreplaceable link of the water cycle. Their conservation and sustainable management may ensure the biological richness and environmental services that they perform, such as water storage, the conservation of aquifers, water purification through retention of nutrients, sediments and pollut-

[3] CONANP. Press releases on August 21st, 2009. Consulted on: http://www.conanp.gob.mx/pdf_comunicados/21agosto2009.pdf (25/08/2009).

M6.3 Protected areas in Mexico, by Hydrological-Administrative Region, 2009

SOURCE: CONANP. Consultation on the Geographical Information System. Mexico, 2009.

T6.2 Protected areas in Mexico, 2009

No	Category	Surface area (ha) 2009
39	Biosphere Reserves	11 992 450
67	National Parks	1 482 489
4	Natural Monuments	14 093
7	Natural Resources Protection Areas	3 467 386
35	Flora and Fauna Protection Areas	6 588 822
18	Sanctuaries	146 254
1	Other categories	186 734
	TOTAL	23 878 228

SOURCE: CONANP. Director's Office for Evaluation and Follow-up. Protected Areas. Consulted on: http://www.conanp.gob.mx/q_anp.html. (15/07/2009).

ants, protection against storms and flood mitigation, the stabilization of coasts and erosion control.

These ecosystems have endured transformation processes with various purposes, and the lack of knowledge on wetlands and their inappropriate management constitute some of the main problems that adversely affect their conservation in Mexico. For all of the above, in order to conserve them, they are currently the subject of standardization and protection efforts.

Nationally, as stipulated in the 1992 National Water Law, it is the CONAGUA's responsibility to carry out and update the National Inventory of Wetlands, as well as to define their contours, classify them and propose standards for their protection, restoration and use.

For this purpose, an inter-institutional group was created, which brings together the different agencies of the federal government whose work touches upon wetlands. Among other institutions, the members of this group include the CONAGUA, the National Commission for the Knowledge and Use of Biodiversity (CONABIO), the National Commission for Protected Areas (CONANP), the National Institute of Ecology (INE), the National Institute for Statistics and Geography (INEGI), and, on behalf of the Ministry of the Environment and Natural Resources (SEMARNAT), the General Director's Office of Federal Maritime Ground and Environmental Coastal Zones (ZOFEMATAC).

For 2008, the cartography of potential wetlands was generated by the National Institute for Statistics and Geography, as an input to the National Inventory of Wetlands, based on the analysis and interpretation of digital information on natural resources, such as types of vegetation, soils, ground characteristics (toposhapes: mountains, plains), slopes, water bodies and currents, among others, which has allowed the contours of potential wetlands to be defined.

Internationally, an intergovernmental Convention was signed in the city of Ramsar (Iran, 1971), known as the Ramsar Convention. This Convention "provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources".

At the time of going to press, 123 Mexican wetlands had been registered in the Ramsar Convention, taking the total surface area of the country registered to 8.87 million hectares, with an increase of 37 wetlands and almost 3 million hectares compared to the figures given in the previous edition. Map M6.4 shows the wetlands registered in the Ramsar Convention, as well as the potential wetlands that have been identified.

In the DVD you will find the data related to this issue in the spreadsheet:

- RAMSAR.

M6.4 Potential and current RAMSAR wetlands in Mexico, 2009

SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

Chapter 7. Future Scenarios

It is a highly relevant exercise to establish future water-related scenarios for Mexico, with the aim of choosing a desirable situation and focusing the efforts of Mexican society-at-large on achieving this situation, as has been proposed in the 2030 Water Agenda developed by the CONAGUA.

In this chapter, information is presented on the scenario proposed for the year 2030, as well as the different trends that will shape Mexico's water future, such as the nation's population growth.

The progress that has been made towards the goals, strategies and targets laid out in the National Water Resources Program 2007-2012 is also presented in this chapter.

7.1 Consolidation of sustainable water policies

In the history of Mexico's water policy, three clear phases can be discerned. At the beginning of the 20th century, the focus was placed on the supply side, which explains why a large number of storage reservoirs, irrigation districts, aqueducts and water supply systems were built.

From the 1980s onwards, policy was more demand-oriented and based on the principle of decentralization. The responsibility for providing drinking water, sewerage and sanitation services was transferred to the municipalities, and the CONAGUA was created as an institution that concentrated the task of managing the nation's water resources. Among the actions which aimed to meet this objective was the creation of the Public Registry of Water Duties, as a mechanism to provide order to the use of water resources.

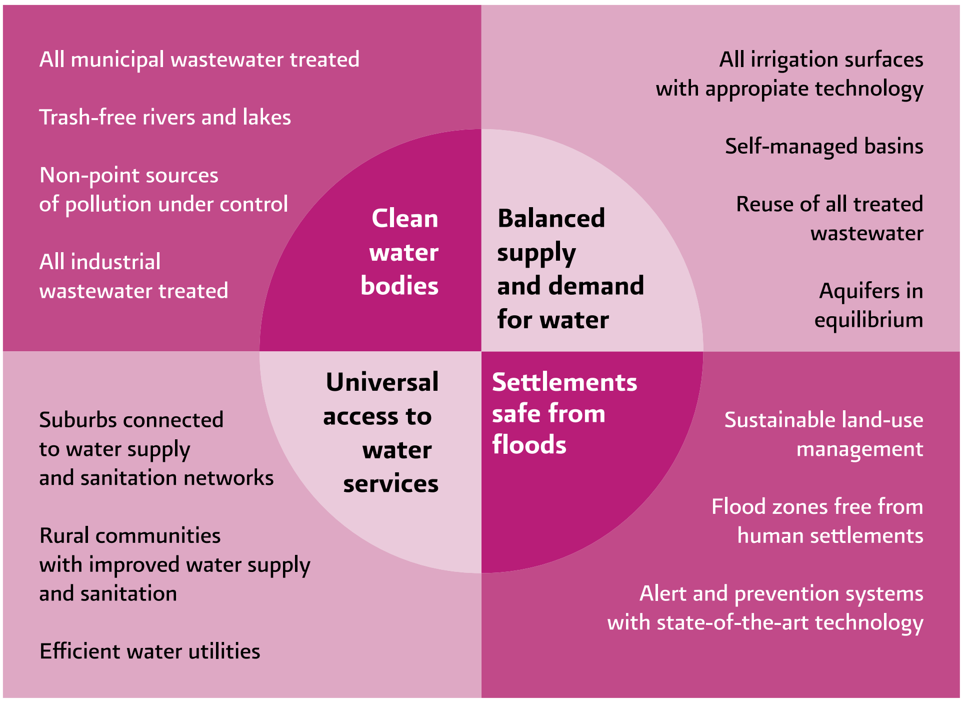
At the dawn of the 21st century, a new phase is being defined, that of water sustainability, in which the treatment of wastewater is being significantly increased, the reuse of water is being promoted and Water Banks are being created to manage the transfer of water duties between users.

A vision that looks to put forward an institutional coalition in order to overcome the sector's challenges is the 2030 Water Agenda, developed by the CONAGUA (2008). The Agenda's objectives may be visualized in graph G7.1.

7.2 Trends

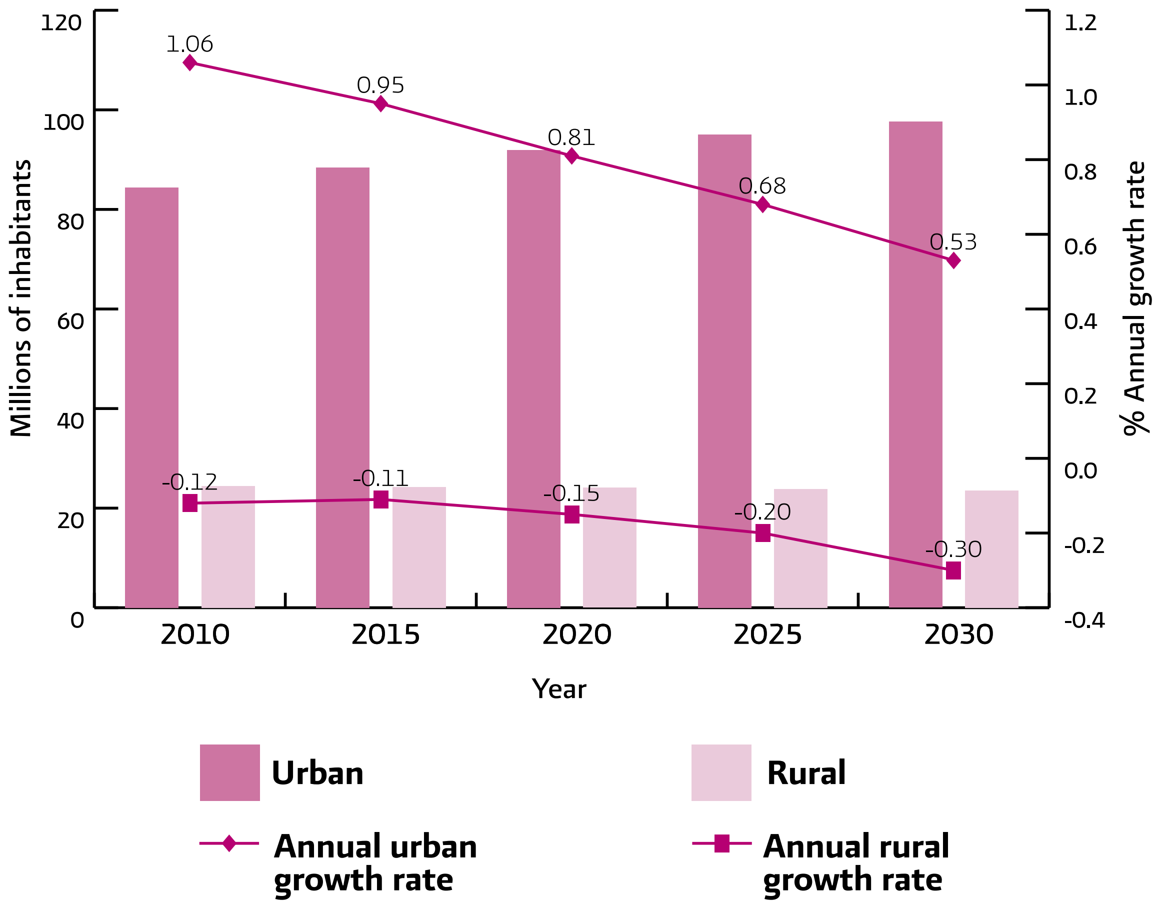
One very important aspect to be considered in Mexico's future scenarios is the population growth and the concentration of the population in urban areas. According to estimates by the National Population Council (CONAPO), between 2010 and 2030, the population of Mexico will increase by almost 12.3 million people, although the growth trend will drop slightly. Furthermore, for 2030 approximately 81% of the total population will be based in urban localities, as can be observed in graph G7.2.

G7.1 Visualization of the goals of the Water Agenda 2030



SOURCE: CONAGUA. Deputy Director General's Office for Planning.

G7.2 Projected growth in the urban and rural population, 2010 to 2030



Population up to December 31st of each year (millions of inhabitants)

Population	2010	2015	2020	2025	2030
Rural	24.42	24.28	24.10	23.86	23.50
Urban	84.38	88.40	91.98	95.09	97.61
TOTAL	108.80	112.68	116.08	118.95	121.10

NOTE: Data interpolated on December 31st of each year.
The rural population is considered as that which lives in localities of less than 2 500 inhabitants, whereas the urban population refers to that of 2 500 inhabitants or more.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAPO. Population Projections in Mexico 2005-2050. Mexico, 2007.

It is estimated that 70% of the population growth for 2030 will occur in the Hydrological-Administrative Regions VIII Lerma-Santiago-Pacific, XIII Waters of the Valley of Mexico, VI Rio Bravo and I Baja California Peninsula. On the other hand, the regions III Northern Pacific and V Southern Pacific will experience a decrease in their population, as can be viewed in table T7.1.

It should be noted that some of the regions in which the highest population growth is expected are at the same time those where there is already a high water stress (see 3.8, Water Stress), which can be appreciated in graph G7.3. By contrast, in some regions with a lower water stress (Southern Pacific, Northern Gulf and Central Gulf) a lower population growth is expected.

T7.1 Population in 2010 and 2030, by Hydrological-Administrative Region (thousands of inhabitants)

No	Hydrological-Administrative Region	Population 2010	Population 2030	Expected population growth
I	Baja California Peninsula	3 882	5 915	2 033
II	Northwest	2 635	2 910	275
III	Northern Pacific	3 959	3 795	- 164
IV	Balsas	10 666	11 127	461
V	Southern Pacific	4 131	4 022	- 110
VI	Rio Bravo	11 117	13 252	2 135
VII	Central Basins of the North	4 217	4 568	351
VIII	Lerma-Santiago-Pacific	21 141	23 512	2 371
IX	Northern Gulf	4 981	5 099	118
X	Central Gulf	9 677	9 925	248
XI	Southern Border	6 674	7 498	823
XII	Yucatán Peninsula	4 145	5 807	1 662
XIII	Waters of the Valley of Mexico	21 582	23 673	2 091
	TOTAL	108 808	121 104	12 295

NOTE: Data interpolated on December 31st of each year.
SOURCE: CONAPO. Population Projections in Mexico 2005-2050. Mexico, 2007.

G7.3 Qualitative comparison between the current water stress for the Hydrological-Administrative Regions, with the expected population growth rate for the period 2010-2030

	Lower expected growth rate	Higher expected growth rate
Higher annual water stress	Waters of the Valley of Mexico Northwest Northern Pacific Balsas Central Basins of the North Lerma-Santiago-Pacific	Baja California Peninsula Rio Bravo
Lower annual water stress	Southern Pacific Northern Gulf Central Gulf	Southern Border Yucatán Peninsula

NOTE: The division between the higher and lower growth rate is the national rate (11.3%) for the period 2010-2030. The division between the higher and lower water stress is 40%, which is the level at which water stress is considered high.
SOURCE: Tables T3.7 and T7.1.

In the DVD you will find the data related to this issue in the spreadsheet:
- TM(Proyeccion_final_año) and,
- TM(Proyeccion_mitad_año).

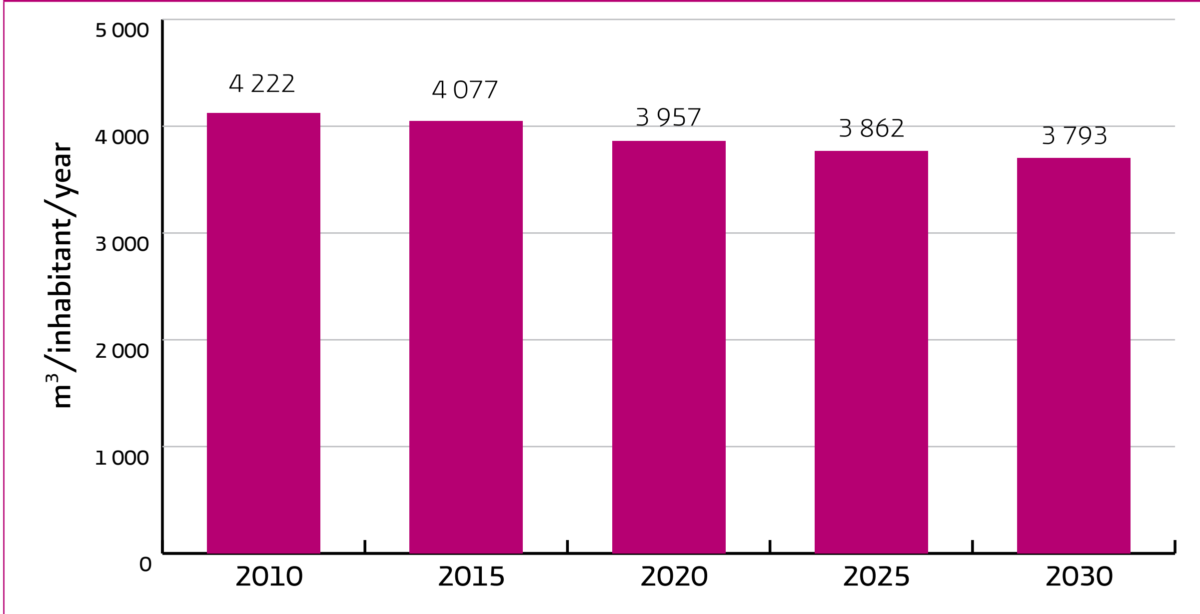
In 2030, it is expected that 57% of the population of Mexico will be living in 36 population centers with more than 500 000 inhabitants. In map M7.1 all the population centers which in 2030 will have more than 500 000 inhabitants are shown.

The increasing population will bring about a reduction in the per capita renewable water resources nationwide. The foreseen decrease is shown in graph G7.4, from 4 222 m^3/inhabitant/year in 2010 to 3 793 in 2030.

M7.1 Population of more than 500 000 inhabitants, projection to 2030

NOTE: Includes metropolitan zones and isolated municipalities.
MZ = Metropolitan Zone.
SOURCE: CONAGUA. Deputy Director General's Office for Planning.
Produced based on data from: SEDESOL, INEGI and CONAPO. Limits of the metropolitan zones in Mexico. Mexico, 2004.
INEGI. II Census on Population and Housing 2005. Mexico, 2007.

G7.4 Projections of the per capita renewable water resources in Mexico, selected years from 2010 to 2030 (m^3/inhabitant/year)



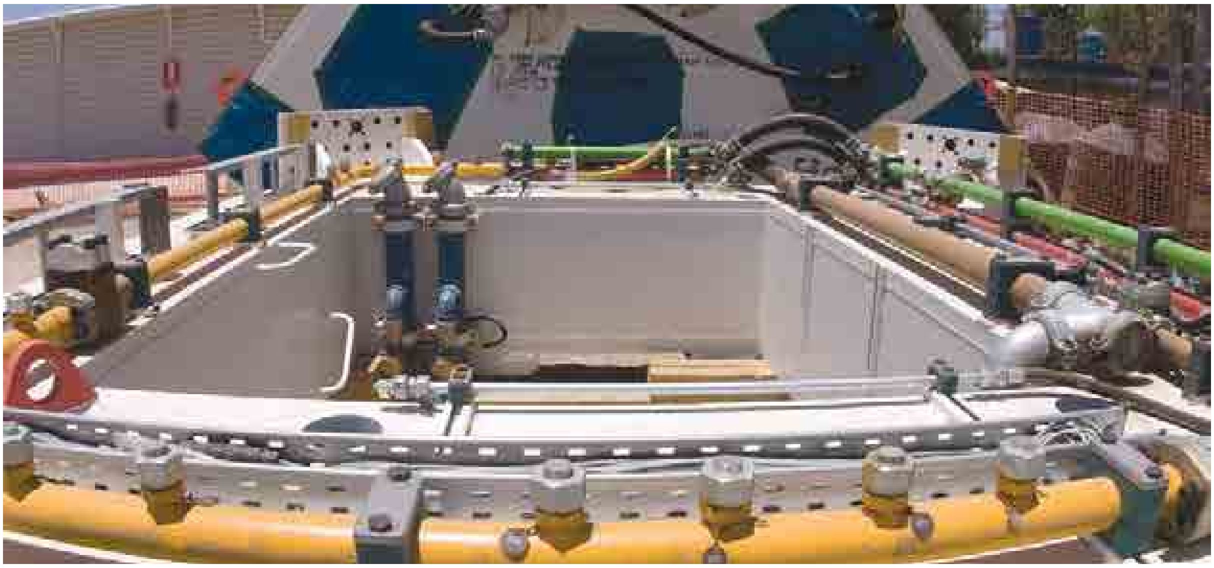
NOTE: Data interpolated on December 31st of each year.

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from: CONAPO. Population Projections in Mexico 2005-2050. Mexico, 2007.

CONAGUA. Deputy Director General's Office for Technical Affairs.

By 2030, in some of the country's Hydrological-Administrative Regions, the per capita renewable water resources will reach levels close to or even less than 1 000 m^3/inhabitant/year, a condition classified as severe scarcity.

As shown in table T7.2 and map M7.2, the Hydrological-Administrative Regions I Baja California Peninsula, VI Rio Bravo and XIII Waters of the Valley of Mexico will require a highly efficient water management in order to meet the growing demand for water.



T7.2 Per capita renewable water resources by Hydrological-Administrative Region, 2010 and 2030

No	Hydrological-Administrative Region	Mean renewable water resources (millions of m³/year)	Per capita renewable water resources in 2010 (m³/inhab/year)	Per capita renewable water resources in 2030
I	Baja California Peninsula	4 626	1 191	782
II	Northwest	8 323	3 158	2 860
III	Northern Pacific	25 627	6 474	6 753
IV	Balsas	21 680	2 033	1 948
V	Southern Pacific	32 794	7 938	8 154
VI	Rio Bravo	11 937	1 074	901
VII	Central Basins of the North	7 884	1 870	1 726
VIII	Lerma-Santiago-Pacific	34 160	1 616	1 453
IX	Northern Gulf	25 543	5 128	5 009
X	Central Gulf	95 866	9 907	9 659
XI	Southern Border	157 754	23 637	21 041
XII	Yucatán Peninsula	29 645	7 151	5 105
XIII	Waters of the Valley of Mexico	3 514	163	148
	TOTAL	459 351	4 222	3 793

NOTE: The calculation of the per capita renewable water resources is based on data on the population interpolated on December 31st of each year.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from:
CONAPO. Population Projections in Mexico 2005-2050. Mexico, 2007.
CONAGUA. Deputy Director General's Office for Technical Affairs.

Special attention will have to be paid to groundwater, the overexploitation of which leads to the subsidence of phreatic levels and the consequent subsidence of ground levels, as well as causing wells to have to be dug deeper and deeper to withdraw water. It is worth mentioning that the majority of the rural population, especially in arid areas, depends almost exclusively on groundwater.

M7.2 Per capita renewable water resources by Hydrological-Administrative Region, 2030

SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAPO. Population Projections in Mexico 2005-2050. Mexico, 2007. CONAGUA. Deputy Director General's Office for Technical Affairs.

With the aim of facing the decrease in the availability of water in the coming years, it will be necessary to carry out actions to reduce the demand, by increasing the efficiency in the use of water for crop irrigation and in water distribution systems in cities. Furthermore, the volume of wastewater that is treated and reused must increase significantly, with the aim of enhancing the availability of water of appropriate quality for the uses for which it is destined.

In addition, in order to continue guaranteeing social development, it will be necessary to significantly increase the coverage of drinking water and improved sanitation.

7.3 National Development Plan 2007-2012

The National Development Plan 2007-2012 (NDP) takes as its central premise the concept of sustainable human development, with the finality of establishing national goals, strategies and priorities so that, during the current administration, progress can be made towards the achievement of the vision that we have proposed for the nation for the coming years.

From the NDP, sector-wide, special, institutional and regional programs have been derived, among which feature the National Water Resources Program 2007-2012.

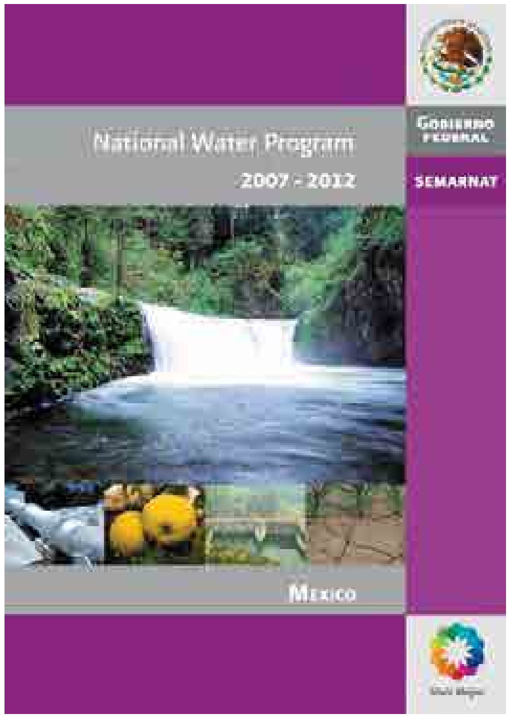
7.4 National Water Resources Program (NWRP) 2007-2012

The NWRP incorporates the goals and strategies associated with the management and preservation of water. It was formulated in a participatory manner based on the following elements:

- National Development Plan 2007-2012.
- National Program for the Environment and Natural Resources 2007-2012.
- National Water Programs followed in previous government administrations.
- Regional water programs.
- Public participation through workshops and Internet consultations.

The goals established in the NWRP are the following:

1. To improve water productivity in the agricultural sector.
2. To increase access to and quality of drinking water, sewerage and sanitation services.
3. To promote integrated, sustainable water management in river basins and aquifers.
4. To enhance the technical, administrative and financial development of the water sector.
5. To consolidate the participation of users and organized society in water management and to promote a culture for the proper use of this resource.
6. To prevent risks from meteorological and hydrometeorological events and attend to their effects.
7. To assess the effects of climate change on the hydrologic cycle.
8. To create a culture of administrative contribution and compliance with the National Water Law.



In order to attain the goals of the NWRP, 65 strategies and 115 targets have been established (one target for each indicator). Additionally, in the NWRP the organizations and institutions most related to the achievement of each goal have been included, as well as the challenges to be overcome to reach the foreseen targets.

In the DVD you will find the data related to this issue in the spreadsheet:
- TM(Metas_PNH).

In table T7.3 the situation up to 2008 and the preliminary figures for 2009 as regards the main targets in the medium (2012) and long term (2030) are presented.

We recommend consulting the publication "National Water Resources Program 2007-2012", produced by the National Water Commission.

T7.3 Main water-related targets for 2012 and 2030

Goal	Strategy	Indicator	Situation 2008	Situation 2009[a]	Target for 2012	Ideal target 2030
1	Modernize hydro-agricultural infrastructure and technify agricultural surfaces in coordination with users and local authorities.	Hectares modernized (accumulated)	2.48 million	2.68 million	3.28 million	5.95 million
1	Modernize hydro-agricultural infrastructure and technify agricultural surfaces in coordination with users and local authorities.	Rehabilitated technified rainfed surface (ha) (accumulated)	430.3 thousand	463.7 thousand	487.5 thousand	511.5 thousand
1	Extend the agricultural border of irrigation and technified rainfed in zones with availability of water subject to land planning.	Hectares under irrigation (accumulated)	6 528 thousand	6 549 thousand	6 603 thousand	Not Applicable
1	Extend the agricultural border of irrigation and technified rainfed in zones with availability of water subject to land planning.	Hectares with technified rainfed infrastructure (accumulated)	2 746 thousand	2 748 thousand	2 803 thousand	7 500 thousand
1	Maintain the dams managed by the CONAGUA in appropriate working conditions.	Rehabilitated dams (accumulated)	345	420	499	750
2	Treat the wastewater generated and promote the reuse and exchange of this wastewater.	Treatment of wastewater collected (%)	40.2	40.6	60.0	100
2	Increase the coverage of drinking water and improved sanitation services in Mexico, leading to the sustainability of the services.	Drinking water coverage (%)	90.3	90.7	92.0	100
2	Increase the coverage of drinking water and improved sanitation services in Mexico, leading to the sustainability of the services.	Improved sanitation coverage (%)	86.4	86.8	88.0	100
2	Improve the quality of the water supplied to the population.	Volume of water disinfected (%)	96.7	97.1	98.0	100
3	Publish the availability of water in the country's aquifers and watersheds.	Aquifers with published availability (accumulated)	282	282	653	653
3	Publish the availability of water in the country's aquifers and watersheds.	Watersheds with published water availability (accumulated)	677	722	728	728
8	Review the fundraising schemes from the nation's water and in particular wastewater discharges, in order to contribute to the cleaning of the watersheds and aquifers.	Amount raised through the payment of duties (millions of 2006 Mexican pesos) (annual)	9 479	9 311	Not Applicable	Not Applicable
8	Strengthen the application of the control mechanisms foreseen by law and monitor the appropriate use of the concessions of the nation's water and discharge permits to bring about an appropriate management and preservation of water resources.	Inspection visits to users of the nation's water and their inherent goods (annual)	3 957	4 557	Not Applicable	Not Applicable

NOTE: [a] Preliminary figures. The total number of watersheds has been modified in recent studies. The inspection visits to the users of the nation's water and their inherent goods include citizen reports.
SOURCE: CONAGUA. National Water Resources Program 2007-2012.

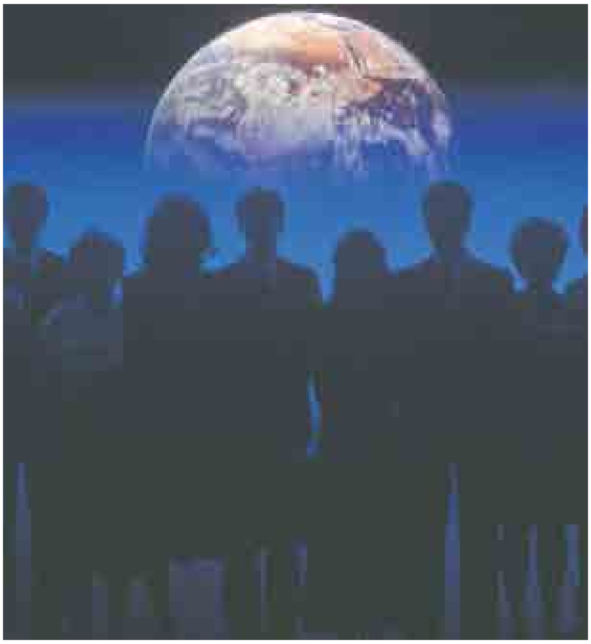
Chapter 8. Water in the World

The information captured in the preceding chapters takes on greater significance when it is compared to the situation in other countries. This section thus includes tables with data on the precipitation, quantity of renewable water resources, population, Gross Domestic Product, surface areas under irrigation, and the quantity of water used for different purposes, among other issues, in various countries in the world. Under these headings, Mexico's ranking as compared to other countries is shown in the country tables.

Information is also provided on the drinking water and improved sanitation coverage in the different countries of the world, which is part of the Millennium Development Goal targets, and as regards the tariffs for these services in various cities.

Additionally, some particular concepts are analyzed, such as the water footprint, virtual water and climate change.

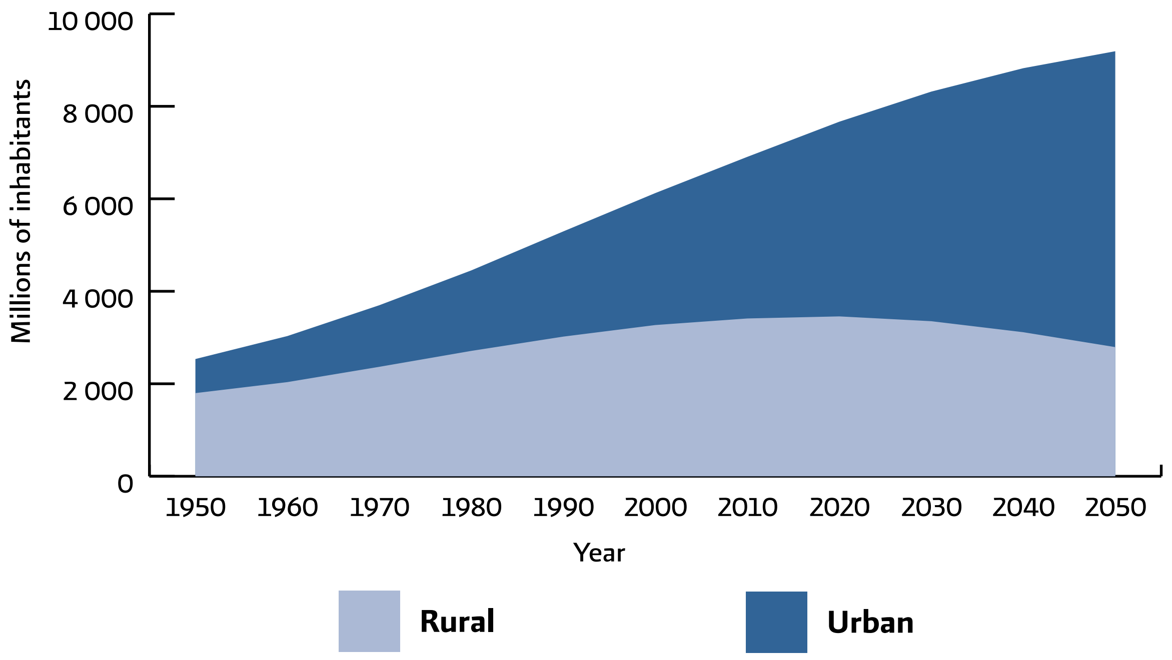
8.1 Socio-economic and demographic aspects



In 1950, the world population was 2.54 billion, whereas for 2005, that number had risen to 6.52 billion. It is estimated that for 2010, the world population will be 6.91 billion, and that this future growth will be mainly concentrated in the least developed countries, where the population is growing at a rate five times higher than in developed countries (see graph G8.1).

One characteristic of the world demography is the trend towards a concentration of populations in urban centers. This trend is even more pronounced in the least developed countries of the world. As a consequence, it may be observed that an ever-increasing percentage of the world's population now lives in mega-cities.

G8.1 Evolution in the world urban and rural population, from 1950 to 2050 (millions of inhabitants)



Year	1950	1960	1970	1980	1990	2000	2010	2020	2030	2040	2050
Urban	737	996	1 332	1 741	2 275	2 854	3 495	4 210	4 965	5 709	6 398
Rural	1 798	2 036	2 367	2 711	3 020	3 270	3 412	3 457	3 353	3 115	2 793
TOTAL	2 535	3 032	3 699	4 451	5 295	6 124	6 907	7 667	8 318	8 824	9 191

SOURCE: UNDESA. World Urbanization Prospects: The 2007 Revision Population Database. Consulted on: http://esa.un.org/unup (15/07/2009).

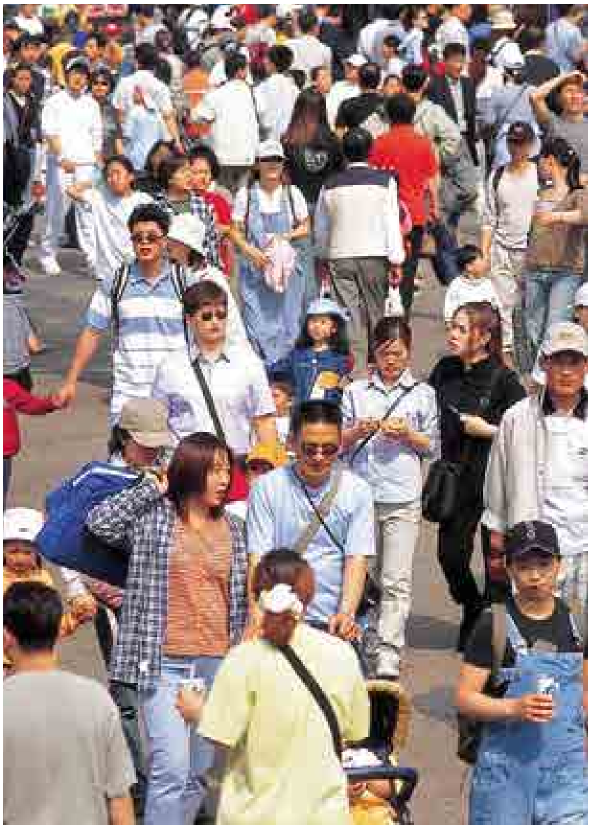
One example of this is presented in table T8.1, which counts the cities with a population of more than five million inhabitants. This list keeps on growing, which in turn represents greater proportions of the world's urban and total population.

T8.1 World population centers with more than five million inhabitants

	1975	2007	2025
Number of population centers	18	49	75
Population (millions of inhabitants)	170.3	500.2	783.5
% World urban population	11.2%	15.2%	17.1%
% Total world population	4.2%	7.5%	9.8%

SOURCE: UNDESA. World Urbanization Prospects: The 2007 Revision Population Database. Consulted on: http://esa.un.unup (15/07/2009).

In table T8.2, the countries with the highest populations are presented, among which Mexico is in eleventh place out of a total of 222. It is worth mentioning that there are five countries, in addition to Mexico, which appear in each table of this chapter as references (Brazil, United States of America, France, South Africa and Turkey) so as to be able to compare the situation of these countries in the international context.



T8.2 Most populated countries, 2006

No	Country	Population (millions of inhabitants)	Population density (inhab./km^2)
1	China	1 337.41	139.36
2	India	1 181.41	359.39
3	United States of America	311.67	32.37
4	Indonesia	227.35	119.37
5	Brazil	191.97	22.55
6	Pakistan	176.95	222.28
7	Bangladesh	160.00	1 111.13
8	Nigeria	151.21	163.69
9	Russia	141.39	8.28
10	Japan	127.29	336.87
11	**Mexico**	**107.12**	**54.53**
12	Philippines	90.35	301.16
13	Vietnam	87.10	262.58
14	Germany	82.26	230.42
15	Egypt	81.53	81.41
16	Ethiopia	80.71	73.09
17	Turkey	73.91	94.33
18	Iran	73.31	44.48
19	Thailand	67.39	131.33
20	Democratic Republic of Congo	64.26	27.40
21	France	62.04	112.49
22	United Kingdom	61.23	252.08
23	Italy	59.60	197.81
24	South Africa	49.67	40.68

NOTE: The population is estimated up to July 1st, 2008, except for the case of Mexico, which is estimated up to December 2008.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on: UNDESA. World Population Prospects: The 2008 Revision. Consulted on: http://esa.un.org/unup (15/7/2008).
For Mexico: CONAGUA. Statistics on Water in Mexico 2008. Master population projection table as of the end of 2008.
INEGI. Yearbook of Statistics by State 2008. Mexico, 2008.
INEGI. General Censuses on Population and Housing.

In table T8.3, information is presented on the countries with the highest per capita Gross Domestic Product. It is worth mentioning that Mexico is in 57th position worldwide out of 181 countries evaluated. In terms of the total GDP, Mexico is ranked 14th worldwide.

T8.3 Countries with the highest Gross Domestic Product, 2008

GDP per capita				Total GDP			
No	Country	GDP per capita (US dollars)	Estimated from	No	Country	GDP (billions of USD)	Estimated from
1	Luxembourg	117 231.4	2006	1	United States of America	14 195.0	2007
2	Norway	97 808.3	2006	2	Japan	4 866.2	2007
3	Qatar	95 167.3	2006	3	China	3 941.5	2006
4	Ireland	66 814.8	2006	4	Germany	3 653.4	2007
5	Switzerland	64 635.9	2006	5	France	2 843.1	2007
6	Denmark	63 898.1	2006	6	United Kingdom	2 833.2	2007
7	Iceland	62 152.7	2007	7	Italy	2 330.0	2007
8	Sweden	54 499.9	2006	8	Russia	1 698.6	2007
9	Finland	51 806.7	2006	9	Spain	1 622.5	2007
10	Netherlands	51 657.4	2006	10	Brazil	1 621.3	2007
11	Austria	50 510.4	2006	11	Canada	1 571.1	2007
12	United Arab Emirates	50 383.0	2006	12	India	1 232.9	2007
13	Australia	49 271.4	2006	13	Australia	1 046.8	2007
14	Belgium	47 244.0	2007	**14**	**Mexico**	**1 088.1**	**2008**
15	Canada	47 066.5	2007	15	South Korea	999.4	2006
16	United States of America	46 541.2	2007	16	Netherlands	862.9	2006
17	United Kingdom	46 432.4	2006	17	Turkey	748.3	2007
18	France	45 858.4	2006	18	Belgium	507.1	2007
19	Germany	44 488.1	2007	19	Sweden	502.5	2007
20	Kuwait	42 159.1	2005	20	Indonesia	488.1	2006
55	Turkey	10 737.7	2007	21	Switzerland	472.5	2007
57	**Mexico**	**10 235.0**	**2008**	22	Saudi Arabia	464.4	2006
64	Brazil	8 449.9	2005	23	Norway	459.0	2007
75	South Africa	6 116.3	2007	32	South Africa	295.60	2007

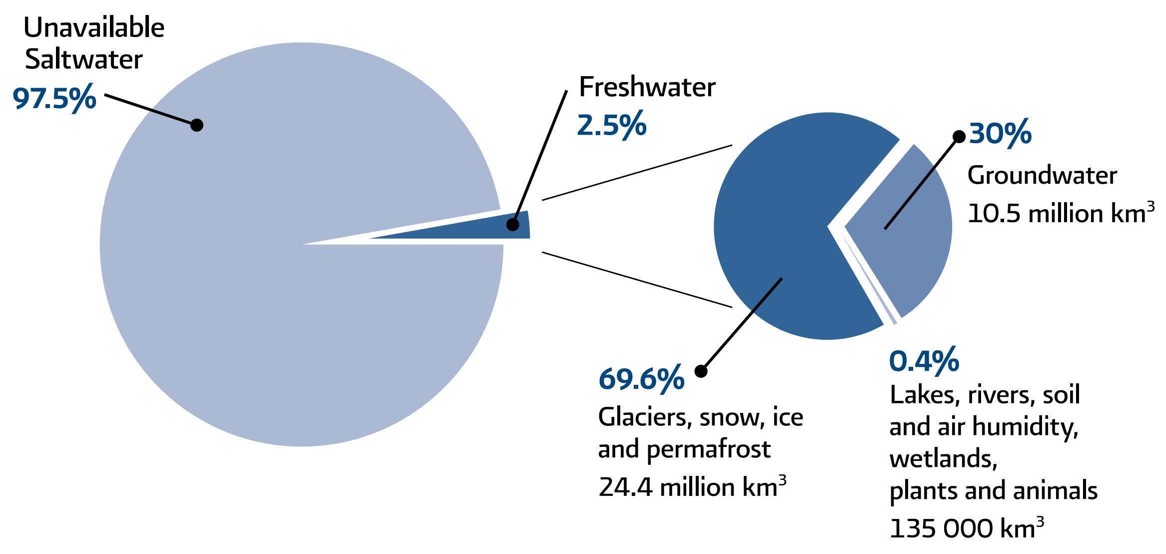
NOTE: Current prices.
SOURCE: For the values on Mexico: Bank of Mexico. Annual Report 2008. Mexico, 2009.
Other countries: International Monetary Fund, World Economic Outlook Database, April 2008.

8.2 Components of the hydrologic cycle in the world

The average annual availability of water in the world is approximately 1.39 billion km^3, of which 97.5% is saltwater and only 2.5%, or 35 million km^3, is freshwater. Of that amount, almost 70% is unavailable for human consumption since it is locked up in glaciers, in snow and ice (see graph G8.2).

Of the water that is technically available for human consumption, only a small percentage is found in lakes, rivers, soil humidity and relatively shallow groundwater deposits, the renovation of which is the result of infiltration. Much of this theoretically usable water is far from populated areas, making it difficult or impossible to effectively use it.

G8.2 Global distribution of water in the world



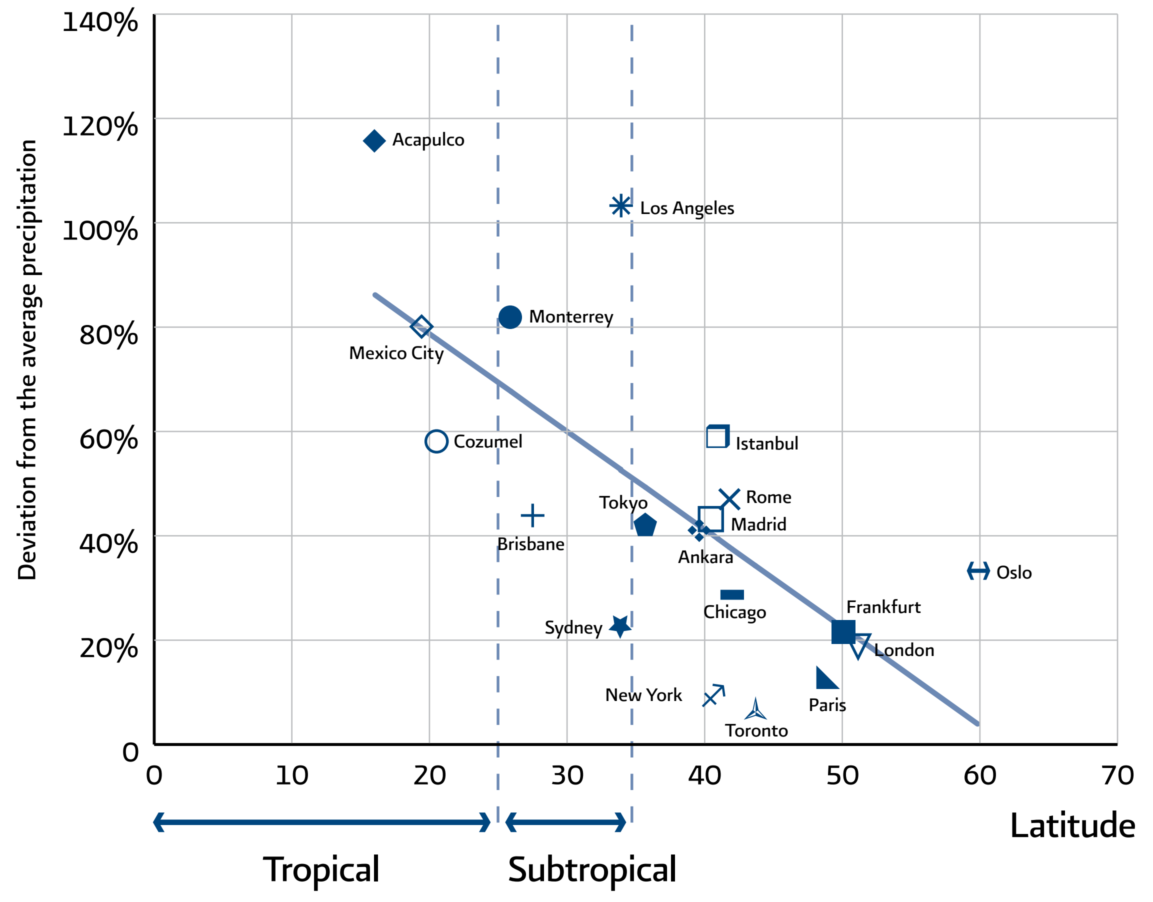
SOURCE: Clarke, R. and J. King. The Water Atlas. New York, 2004.

Precipitation

Precipitation constitutes an important part of the hydrologic cycle, since it produces the planet's renewable water resources. However, precipitation varies from country to country and from region to region, depending on the climate and the geographical location.

In graph G8.3, the correlation that exists between precipitation patterns, measured by their coefficient of variation, and the latitude in various cities in the world can be observed. The coefficient of variation gives an approximation of the variability of annual precipitation. The higher the coefficient is, the greater the variability will be throughout the year. In general, cities at higher latitudes are characterized by a uniform precipitation throughout the year, whereas cities closer to the equator have a more accentuated precipitation in the summer months.

G8.3 Correlation between precipitation and latitude in various cities in the world

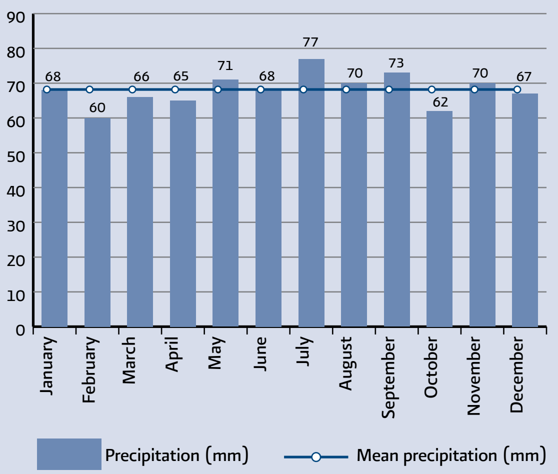


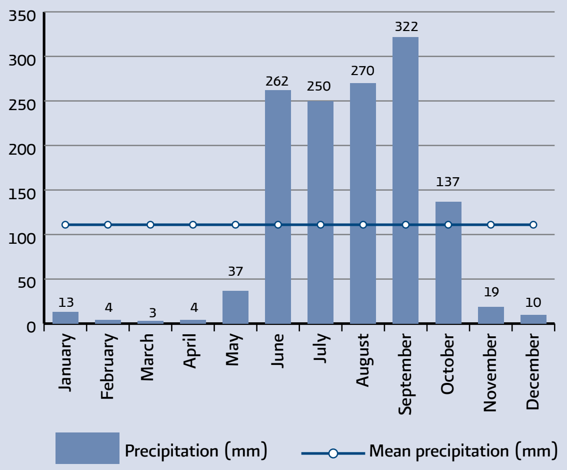
NOTE: The normal periods considered are variable for each city, which is why the years in question have not been specified.
For illustrative purposes, the representation of the latitudes was simplified.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
World Climate. Consulted on: http://www.worldclimate.com. (15/07/2009).
CONAGUA. Deputy Director General's Office for Technical Affairs.

R8.1 Variability in precipitation

The coefficient of variation is calculated as $C_v = \frac{\sigma}{\mu}$, where σ is the standard deviation, and μ the mean of the monthly precipitation for the indicated cities. For each city, a representative climate period was contemplated.

A city with a low C_v, such as Toronto in Canada, contrasts strongly with cities with a high C_v, such as Acapulco. In Mexico, the regime is variable with summer rain and torrential precipitation.





Aerial view of the city of Toronto, Canada

Acapulco, Mexico

Renewable water resources

A country's per capita renewable water resources may be calculated by dividing its renewable resources by the number of inhabitants. According to this criterion, Mexico is in 88th place worldwide out of 177 countries on which data is available, as shown in table T8.4. It should be mentioned that in the case of Mexico, the national availability hides a strong regional variation.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Datos_mundiales).

T8.4 Countries with the highest per capita renewable water resources, 2008

No	Country	Mean precipitation (millimeters)	Renewable water resources (billions of m³)	Per capita renewable water resources (m³/inhabitant/year)
1	Greenland	350	603	10 432 526
2	French Guiana	2 895	134	680 203
3	Iceland	1 940	170	570 470
4	Guyana	2 387	241	326 116
5	Surinam	2 331	122	268 132
6	Congo	1 646	832	225 535
7	Bhutan	2 200	95	149 137
8	Papua New Guinea	3 142	801	129 152
9	Gabon	1 831	164	125 095
10	Solomon Islands	3 028	45	92 355
11	Canada	537	2 902	89 926
12	Norway	1 414	382	81 816
13	New Zealand	1 732	327	78 986
14	Peru	1 738	1 913	69 339
15	Bolivia	1 146	623	67 799
16	Belize	1 705	19	67 473
17	Liberia	2 391	232	64 823
18	Laos	434	334	57 918
19	Chile	1 522	922	55 998
20	Paraguay	1 130	336	55 851
25	Brazil	1 783	8 233	44 067
61	United States of America	715	3 051	10 175
88	**Mexico**	**760**	**459**	**4 288**
100	France	867	204	3 321
108	Turkey	643	214	2 889
147	South Africa	495	50	1 036

NOTE: 1 km³ = 1 000 hm³ = 1 billion m³.
SOURCE: FAO. Information System on Water and Agriculture, Aquastat.
Consulted on: http://www.fao.org/AG/AGL/aglw/aquastat/main/index.stml. (15/07/2009).
CONAGUA. Deputy Director General's Office for Technical Affairs. Year 2009.

Climate change

Among the scenarios produced by the Intergovernmental Panel on Climate Change (IPCC), it is expected that climate change will intensify the current stress placed on water resources, as a consequence of the population growth, economic activities, uses of soil and in particular urbanization processes. In some regions, mountain snowcaps, glaciers and small icecaps perform a crucial function as regards freshwater availability.

According to projections from the IPCC, the generalized loss of landmass of the glaciers and the shrinking of the snow cover in recent decades will accelerate in the 21st century, thus reducing the availability of water and the hydropower potential, and altering the seasonality of the flows in the regions supplied with snow water from the main mountain ranges, currently home to one sixth of the world's population.

In the case of Mexico, climate change is an ongoing process which will have important consequences on the availability of its water resources. Different estimations agree upon the forecasted increase in the world temperature, at the end of the current century, of between three and four degrees centigrade.

R8.2 Climate change and water

The changes in precipitation and temperature will produce changes in runoff and water availability. It is expected with high confidence that runoff will increase by 10 to 40% by the halfway point of the 21st century, at high latitudes and in some wet tropical areas, and that it will be reduced by 10 to 30% in arid and semi-arid regions, in medium latitudes and in the dry tropics. In areas affected by droughts, it is projected that they will increase in scale. Regionally, great increases are expected in the demand on water for irrigation as a result of climate change.

Available research suggests a significant future increase in the occurrence of torrential rains, even in those areas in which a decrease is predicted in the mean precipitation. The resulting risk of flooding presents challenges to society, physical infrastructure and water quality and it is predicted that it will adversely affect sustainable development. The temperature increase will affect the physical, chemical and biological properties of freshwater in lakes and rivers, with predominantly adverse impacts on freshwater species, on their ecosystems and on water quality.

In coastal areas, the increase in the sea level will exacerbate the restrictions on water resources due to the increase in the salinization of groundwater.

SOURCE: IPCC. Synthesis Report on Climate Change 2007.

Extreme hydrometeorological phenomena

Extreme hydrometeorological phenomena, such as droughts, floods and hurricanes, are natural events which frequently result in disasters with human and material losses. These losses can set developing countries back years in their socio-economic development, which is often earned with great difficulty.

In the analysis of disasters, it has been found that more than 60% of the total damage reported occurs in developed countries. Furthermore, the damage estimated as a percentage of the GDP is significantly higher in underdeveloped, generally smaller countries. In the period from 1970 to 2006, 95% of all deaths caused by disasters occurred in low and medium-low income countries. Taking into account the size of the population, this situation would imply that those living in low income countries are twenty times more likely to die from natural risks than those living in high-income countries.

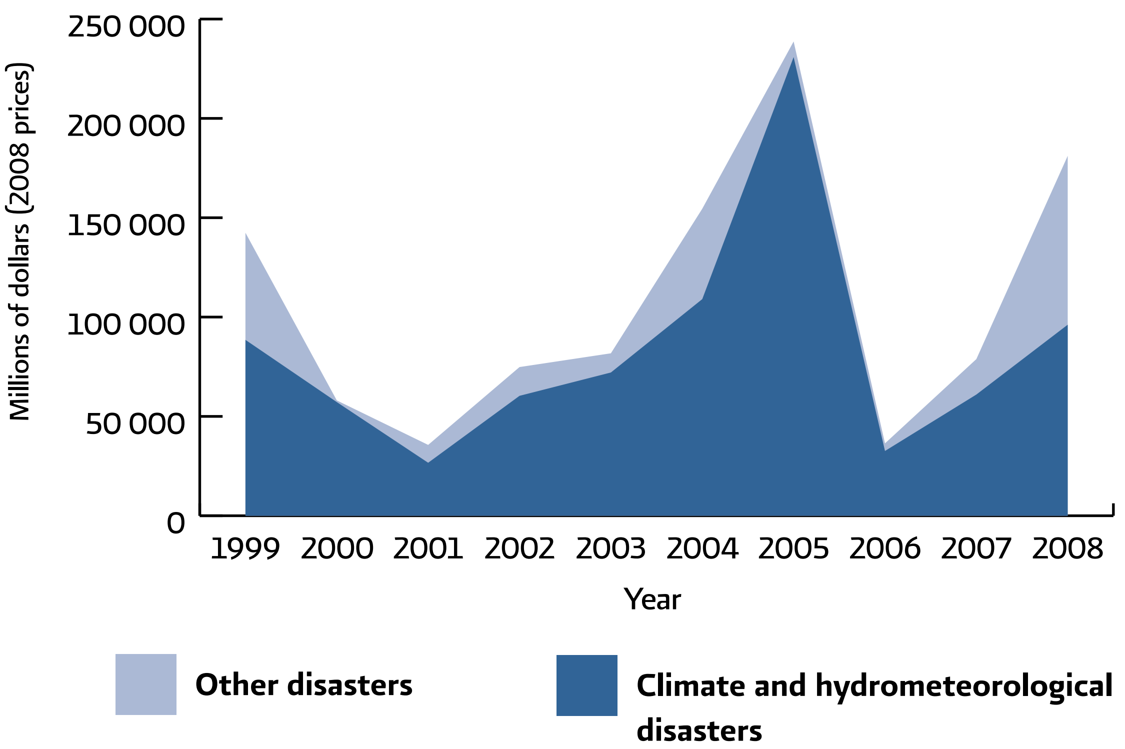
The world reference on this subject is the International Disaster Database EM-DAT, of the Centre

R8.3 Definition of disasters

According to the definition of the UN International Strategy for Disaster Reduction (UNISDR), a disaster is "a serious disruption of the functioning of a community or a society causing widespread human, material, economic or environmental losses which exceed the ability of the affected community or society to cope using its own resources".

SOURCE: UNISDR. International Strategy for Disaster Reduction. Definitions. Consulted on: http://www.unisdr.org/eng/library/lib-terminology-eng%20home.htm (15/07/2009).

G8.4 Estimated damage caused by disasters, distinguishing between the contribution of climatic and hydrometeorological disasters



SOURCE: International Federation of the Red Cross and Red Crescent Societies. World Disasters Report 2009. Consulted on http://www.ifrc.org/Docs/pubs/disasters/wdr2009/WDR2009-full.pdf (15/07/2009).

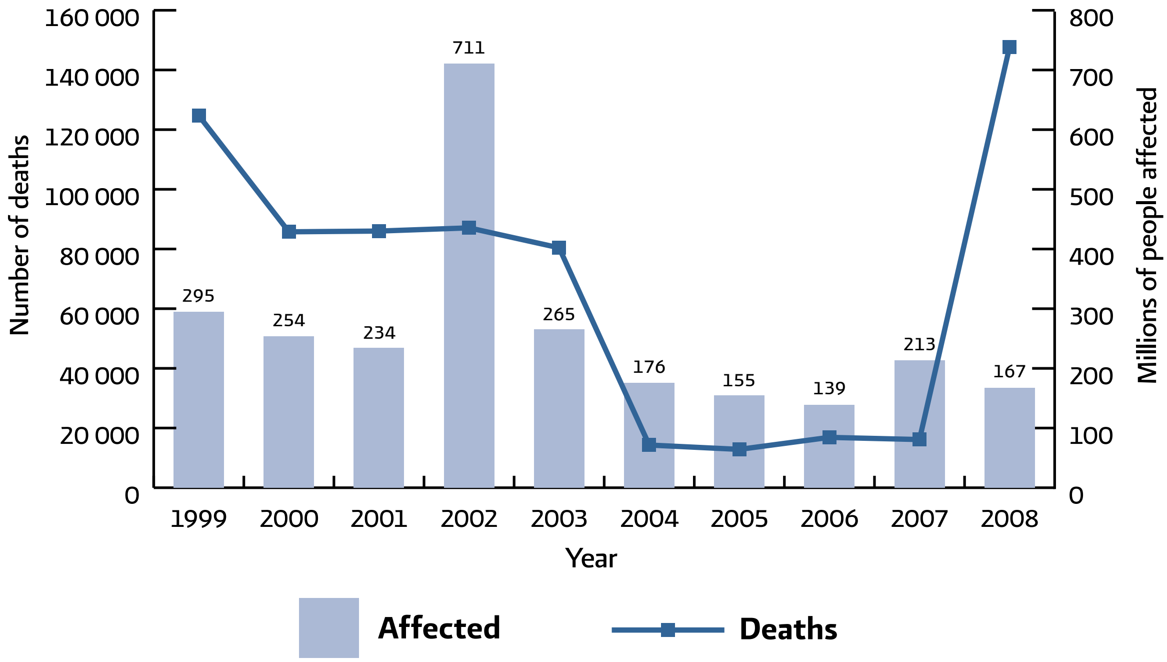
for Research on the Epidemiology of Disasters (CRED), hosted at the Université Catholique de Louvain, with the collaboration and participation of several national and international agencies, among them the United Nations and the International Federation of the Red Cross and Red Crescent Societies.

The EM-DAT allows disasters of climatic and hydrometeorological origin to be distinguished, among them droughts, food insecurity, extreme temperatures, floods, forest fires, insect infestations, water-related landslides and windstorms. This type of disasters represents a significant proportion of the estimated damage caused by disasters, which represented in 2008 96.15 billion dollars, or 53% of the total damage caused by all types of disasters, as shown in figure G8.4.

The number of deaths and those affected by climatic and hydrometeorological disasters in the period between 1999 and 2008 is shown in graph G8.5. These figures include a percentage of 61% and 78% respectively of the total damage caused by all types of disasters. Graph G8.4 and G8.5 both reveal the annual variability in the occurrence of large disasters due to hydrometeorological phenomena.

It should be noted that disasters are expected to increase, both in number and as regards their effects, as a result of climate change.

G8.5 Number of deaths and people affected by climatic and hydrometeorological disasters



SOURCE: International Federation of the Red Cross and Red Crescent Societies. World Disasters Report 2009. Consulted on http://www.ifrc.org/Docs/pubs/disasters/wdr2009/WDR2009-full.pdf (15/07/2009).

8.3 Uses of water and infrastructure

In the last century, the world population tripled, whereas water withdrawals multiplied six-fold. This situation has contributed to the increase in water stress around the world. In table T8.5, the countries with the highest per capita water withdrawals are shown, in which it can be observed that Mexico is ranked in tenth place.

The main use of water resources worldwide, according to estimations from the FAO, is agriculture, with 72% of the total withdrawal for main uses, which are agriculture, industry and public water supply.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Datos_Mundiales).

T8.5 Countries with the largest withdrawals of water and percentage of main uses

No	Country	Total water withdrawal (km³/year)	% Agricultural use	% Use for public water supply	% Industrial use
1	India	645.8	86.5	8.1	5.5
2	China	630.3	67.7	6.6	25.7
3	United States of America	479.3	41.3	12.7	46.0
4	Pakistan	169.4	96.0	1.9	2.0
5	Japan	88.4	62.5	19.7	17.9
6	Thailand	87.1	95.0	2.5	2.5
7	Indonesia	82.8	91.3	8.0	0.7
8	**Mexico**	**79.8**	**76.8**	**14.0**	**9.2**
9	Bangladesh	79.4	96.2	3.2	0.7
10	Russia	76.7	17.8	18.8	63.5
11	Iran	72.9	90.9	6.8	2.3
12	Vietnam	71.4	68.1	7.8	24.1
13	Egypt	68.3	86.4	7.8	5.9
14	Brazil	59.3	61.8	20.3	18.0
15	Uzbekistan	58.3	93.2	4.7	2.1
16	Germany	47.1	19.8	12.3	67.9
17	Canada	46.0	11.8	19.6	68.7
18	Italy	44.4	45.1	18.2	36.7
19	Iraq	42.7	92.2	3.2	4.6
20	France	40.0	9.8	15.7	74.5
21	Turkey	37.5	74.3	14.8	11.0
22	Ukraine	37.5	52.5	12.2	35.4
23	Sudan	37.3	96.7	2.7	0.7
44	South Africa	12.5	62.7	31.2	6.0

NOTE: The main uses consider agriculture, industry, including power plant cooling, and public water supply.
The sums may not add up perfectly, due to the rounding up or down of figures.
The values for Mexico are up to 2008.
1 km³ = 1 000 hm³ = 1 billion m³.
SOURCE: FAO. Information System on Water and Agriculture, Aquastat. 2007.

Industrial use

Industry is one of the main motors of growth and economic development. In the East Asia and Pacific region, industry currently generates 48% of the total GDP, and this proportion is increasing. On the other hand, in developing countries, the proportion of GDP represented by industry grew from 22 to 26% between 1998 and 2002.

Around 20% of water is employed in industry, this quantity being the equivalent of a consumption of 130 m³ per person per year. Of this quantity, more than half is used in thermoelectric stations in their cooling processes. Among the greatest consumers of water are oil stations, the metal, paper and wood industries, food processing and the manufacturing industry.

Agricultural use

Irrigation is fundamental to meet the world's food requirements. Only 17% of the area with irrigation is watered, but produces more than a third of the world's food. Additionally, it should be added that in recent years, agriculture has used greater quantities of fertilizers, resulting in chemicals used in irrigation polluting soils.

Mexico is in 6th place worldwide in terms of the surface area with irrigation infrastructure, the first places being occupied by India, China and the United States of America, as shown in table T8.6.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Datos_mundiales).

T8.6 Countries with the largest surface area with irrigation infrastructure

No	Country	Cultivatable surface		Surface with irrigation infrastructure		Irrigation infrastructure as a percentage of the cultivatable surface (%)
		Thousands of ha	Year	Thousands of ha	Year	
1	India	169 500	2007	57 286	2000(F)	33.8%
2	China	152 831	2007	53 820	2000	35.2%
3	United States of America	173 158	2007	25 023	2000(F)	14.5%
4	Pakistan	22 300	2007	17 820	2001	79.9%
5	Iran	18 549	2007	8 132	2003(F)	43.8%
6	**Mexico**	**26 900**	**2007**	**6 460**	**2008**	**24.0%**
7	Russia	123 368	2007	5 158	1994	4.2%
8	Thailand	18 950	2007	5 004	1995	26.4%
9	Turkey	24 837	2007	4 983	2006(F)	20.1%
10	Indonesia	37 500	2007	4 428	1996	11.8%
11	Uzbekistan	4 640	2007	4 223	1996(F)	91.0%
12	Italy	9 702	2007	3 973	2005	40.9%
13	Spain	17 560	2007	3 765	2005	21.4%
14	Bangladesh	8 450	2007	3 751	1995	44.4%
15	Kazakhstan	22 800	2007	3 556	1993	15.6%
16	Iraq	5 450	2007	3 525	1990	64.7%
17	Egypt	3 538	2007	3 422	2002	96.7%
18	Afghanistan	8 661	2007	3 199	1993(F)	36.9%
19	Japan	4 650	2007	3 128	1993	67.3%
20	Vietnam	9 430	2007	3 000	1994	31.8%
21	Brazil	66 500	2007	2 870	1998	4.3%
22	France	19 519	2007	2 706	2005	13.9%
23	Ukraine	33 333	2007	2 605	1994	7.8%
33	South Africa	15 450	2007	1 498	2000(F)	9.7%

NOTE: The data is from the year indicated in the table.
(F) refers to estimations from the FAO.
SOURCE: FAO. Information System on Water and Agriculture, Aquastat. Consulted on: http://www.fao.org/AG/AGL/aglw/aquastat/main/index.stml (15/07/2009).
For Mexico: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure.

Hydropower generation

Energy performs a key function in poverty reduction, the promotion of economic activities and the improvement of the quality of life, health and education opportunities, especially for women and children.

The International Energy Agency (IEA) considers that the generation of energy practically doubled in the period from 1973 to 2007, going from 6.12 to 12.03 billion metric tonnes of oil equivalent. Water is used in electricity generation processes in two main ways: in cooling thermoelectric plants and turning the turbines in hydropower plants. In 2007, of the total primary energy supply, 2.2% was generated by hydropower, as can be observed in table T8.7.

Energy generation should be considered from the perspective of greenhouse gas emissions, which affect climate change. Hydropower is considered as a source of renewable energy, together with geothermal, solar and wind energy.

T8.7 Total primary energy supply by source, 2007 (percentage)

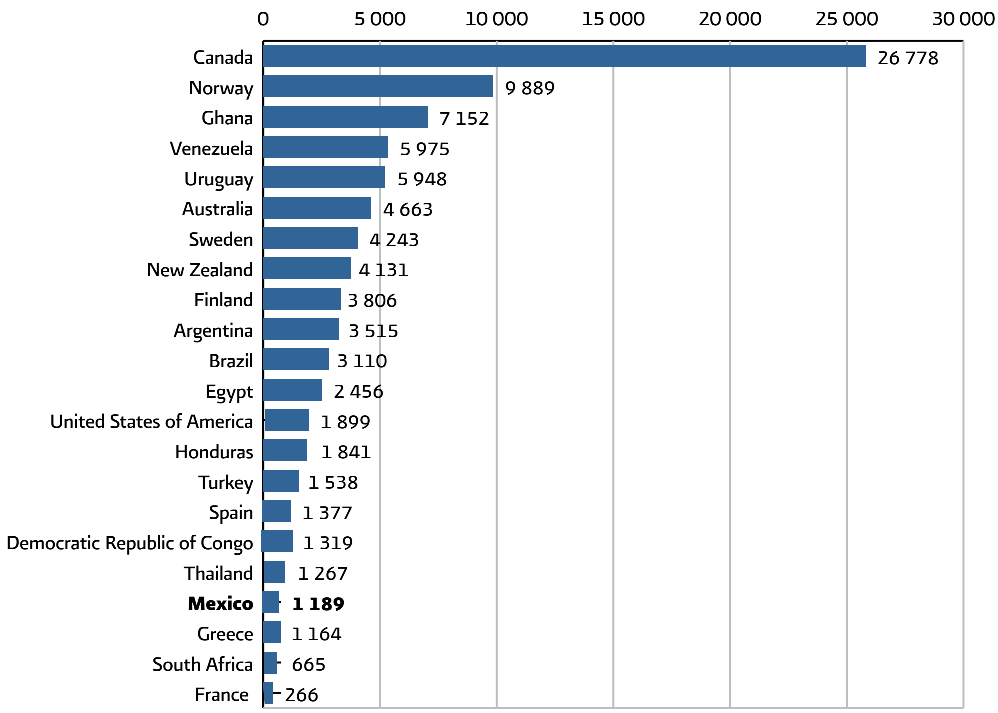
Fuente de energía	%
Oil	34.0
Coal/peat	26.5
Gas	20.9
Combustible renewables and waste[a]	9.8
Nuclear	5.9
Hydro	2.2
Geothermal/solar/wind	0.7

NOTE: [a] Solid and liquid biomass, biogas, industrial and municipal residues.
SOURCE: IEA. International Energy Agency Key World Energy Statistics 2009. Consulted on: http://www.iea.org/Textbase/publications/free_new_Desc.asp?PUBS_ID=1199 (15/07/2009).

Artificial reservoirs in the world

The water storage capacity for various uses and for flood control is directly proportional to the degree of hydraulic development of countries. An indicator that allows this degree to be appreciated is the per capita storage capacity. It is worth mentioning that Mexico has the 19th highest storage capacity in the world, as shown in graph G8.6.

G8.6 Per capita storage capacity in selected countries (m³/inhabitant)



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from:
ICOLD. World Register of Dams. 2003.
World Commission of Dams. Dams and Development: A New Framework for Decision-making, Annex V, South Africa, 2000.

Water footprint

One way of measuring the impact of human activities on water resources is the so-called water footprint, which can be calculated by adding up the water used by each person for his or her activities and which is needed to produce the goods and services that he or she consumes.

The four main factors that determine a country's water footprint are: the level of consumption, the type of consumption (for example the amount of meat consumed by each person), the climate and the efficiency with which water is used. According to this concept, each human being on average uses 1 240 m^3 of water per year; however the differences between countries are significant. For example, in Mexico the water footprint is 1 441 m^3 of water per person per year, whereas in the United States of America (the country with the largest water footprint), 2 483 m^3 is required, and in China (one of the countries with the smallest water footprints), the figure is 702 m^3.

In these calculations, both the water withdrawn from aquifers, lakes, rivers and streams (known as blue water), and the rainwater that feeds rainfed crops (known as green water) are included.

Virtual water

A concept that is closely linked to the water footprint is that of virtual water. The virtual water content of a product is the quantity of water that was employed in its productive process. Trade between countries implies an implicit flow of virtual water between them, which corresponds to the water that was used for the generation of the products or services imported or exported. The total volume of virtual water exchanged between the countries of the world is 1 625 km^3 per year, of which approximately 80% corresponds to agricultural products, the remainder corresponding to industrial products.

Growing one kilogram of corn requires on average in the world 900 liters of water, whereas growing one kilogram of white rice requires 3 400 liters. However, the production of one kilogram of beef requires on average 15 500 liters, which includes the water drunk by the animal throughout its lifetime and the water required to grow the grain that serves as its food. Table T8.9 shows the average virtual water content of various products. The values are different in each country, depending on the climatic conditions and the efficiency in the use of water.

T8.8 Water footprint of selected countries, 1997-2001 (m^3/ person/year)

Country	Water footprint (m^3/person/year)
United States of America	2 483
Spain	2 325
Canada	2 049
France	1 875
Turkey	1 615
Mexico	**1 441**
Australia	1 393
Brazil	1 381
India	980
South Africa	931
China	702

NOTE: Water footprint: the domestic consumption of water resources minus the virtual water exports plus the virtual water imports.
SOURCE: Hoekstra, A.Y. and A.K. Chapagain. Globalization of Water: Sharing the Planet's Freshwater Resources. Blackwell, 2008.

T8.9 Average volume of water used to produce selected foodstuffs (liters/kg)

Product	Liters of water required per kilo of foodstuff
Beef	15 500
Cheese	4 900
Pork	4 850
Chicken	3 900
Rice (white)	3 400
Egg	3 300
Sorghum	2 850
Wheat	1 300
Milk	1 000
Corn	900

SOURCE: Hoekstra, A.Y. and A.K. Chapagain. Globalization of Water: Sharing the Planet's Freshwater Resources. Blackwell, 2008

Virtual water imports may be an option to reduce the problems of water scarcity in some countries. Countries that export virtual water should evaluate the impact of this activity on the availability of their water resources and the possible distortions derived from subsidies applied to agricultural production.

Water stress index

In the following table, the countries with the highest water stress are shown, this calculation being the result of dividing their withdrawal by their renewable water resources. Due to their low availability, the Middle East countries suffer from a high water stress, whereas Mexico is in 58th place out of 151 evaluated according to this indicator.

In the DVD you will find the data related to this issue in the spreadsheet:

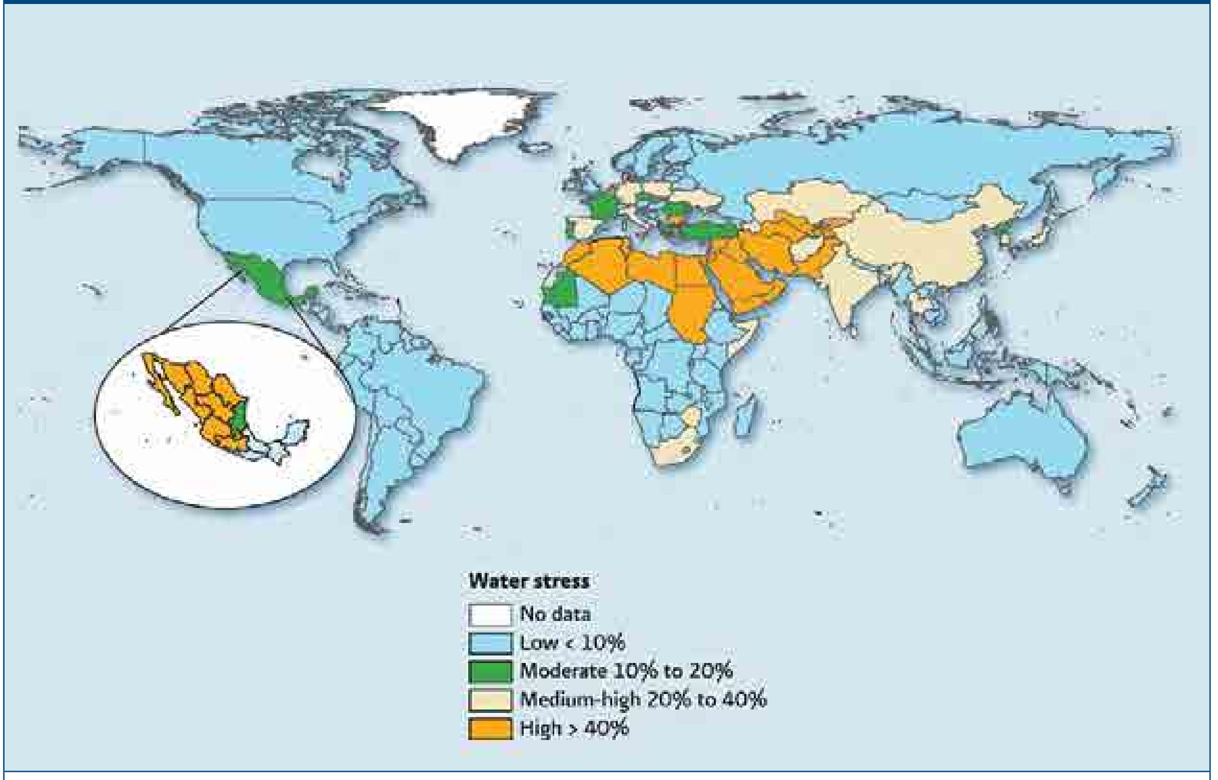
- TM(Datos_mundiales).

T8.10 Countries with the highest water stress, 2008

No	Country	Renewable water resources		Total withdrawal		Water stress	
		(km³)	Year	(km³)	Year	(%)	Year
1	Kuwait	0.02	2008	0.42	2002	2 075.00	2002
2	United Arab Emirates	0.15	2008	2.80	2005(F)	1 866.66	2007(F)
3	Saudi Arabia	2.40	2008(F)	22.47	2006(F)	936.13	2007(F)
4	Libya	0.60	2008(F)	4.27	2000(F)	711.33	2002(F)
5	Qatar	0.06	2008	0.22	2005	381.03	2007
6	Bahrain	0.12	2008	0.24	2005	205.78	2007
7	Yemen	2.10	2008(F)	3.38	2000(F)	161.14	2002(F)
8	Uzbekistan	50.41	2008(F)	58.34	2000(F)	115.73	2002(F)
9	Barbados	0.08	2008(F)	0.09	2000(F)	112.50	2002(F)
10	Turkmenistan	24.72	2008(F)	24.63	2000(F)	99.62	2002(F)
11	Egypt	57.30	2008	54.26	2000(F)	94.70	2002(F)
12	Jordan	0.94	2008(F)	0.85	2005	90.46	2007(F)
13	Israel	1.78	2008(F)	1.55	2007(F)	87.20	2007(F)
14	Iraq	75.61	2008(F)	64.49	2000(F)	85.30	2002(F)
15	Oman	1.40	2008(F)	1.18	2006	83.93	2007(F)
16	Syria	16.80	2008	13.89	2003(F)	82.72	2007(F)
17	Pakistan	225.27	2008(F)	169.39	2000(F)	75.19	2002(F)
18	Tajikistan	15.98	2008(F)	11.96	2000(F)	74.84	2002(F)
19	Iran	137.52	2008	93.10	2004(F)	67.70	2007(F)
44	South Africa	50.00	2008(F)	12.48	2000(F)	24.96	2002(F)
56	France	203.70	2008(F)	39.95	2000(F)	19.61	2002(F)
57	Turkey	213.56	2008	39.10	2006(F)	18.31	2007(F)
58	**Mexico**	**459.35**	**2008(C)**	**79.75**	**2008(C)**	**17.36**	**2008(C)**
66	United States of America	3 051.00	2008	283.94	2000(F)	9.31	2002(F)

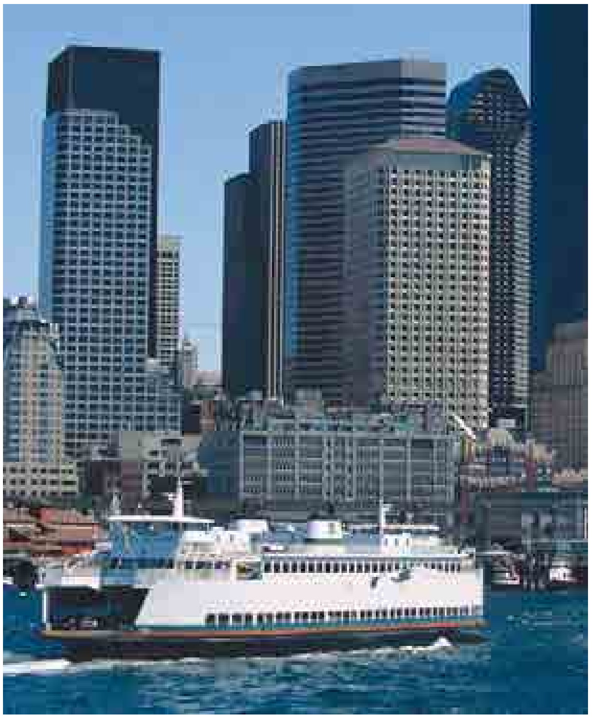
NOTE: 1 km³ = 1 000 hm³ = 1 billion m³.
The year indicates the year in which the calculation of each variable in the table was made. (F) refers to estimations from the FAO and (C) means the CONAGUA.
SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on:
FAO. Information System on Water and Agriculture, Aquastat.
Consulted on http://www.fao.org/AG/AGL/aglw/aquastat/main/index.stml. (15/07/2009).
CONAGUA. Deputy Director General's Office for Technical Affairs. Deputy Director General's Office for Water Management.

M8.1 Water stress, 2008



SOURCE: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from:
FAO. Information System on Water and Agriculture, Aquastat.
Consulted on http://www.fao.org/AG/AGL/aglw/aquastat/main/index.stml. (15/07/2009).

Kuwait



Washington DC, capital of the United States of America

Drinking water, improved sanitation and wastewater treatment

In 2000, the United Nations established the Millennium Development Goals (MDGs), with the aim of reducing extreme poverty by 2015. Goal number seven, related with environmental sustainability, establishes the targets of reducing by half the proportion of people without sustainable access to safe drinking water and basic sanitation[1].

The UN estimates that since 1990, 1.6 billion people have gained access to safe drinking water, meaning that the MDG target related to drinking water is on track to be achieved. However, in 2006, 900 million people still lacked access to drinking water, whereas approximately 2.5 billion (38% of the world population) did not have access to basic sanitation services. This data, which can be viewed in tables T8.11 and T8.12, shows that the MDG target related to sanitation is in danger of not being achieved. Recognizing this fact, 2008 was named by the United Nations the "International Year of Sanitation".

The MDGs should be considered from two perspectives. The first is the close link between water and health, and the knowledge that the extension of drinking water and sanitation coverage would contribute to a reduction in mortality through water-related diseases. The second is the effect that climate change will have on water resources and, in particular, on the availability and quality of water.

According to the definitions of the MDGs, in 2006 Mexico had a drinking water coverage of 95% (98% urban and 85% rural), as well as 81% in improved sanitation (91% urban and 48% rural). The situation worldwide can be appreciated in maps M8.2 and M8.3.

[1] The follow-up on these MDG targets is through the UNICEF WHO Joint Monitoring Programme for Water Supply and Sanitation. The latest report is from 2008, with data up to 2006.

In the DVD you will find the data related to this issue in the spreadsheet:

- TM(Agua_y_saneamiento).

R8.4 Millennium Development Goals (MDGs)

Millennium Development Goal number seven considers the following monitoring indicators which allow the progress in drinking water and improved sanitation to be measured:

Proportion of the population with access to improved drinking water sources

Improved drinking water sources are those which are protected against outside pollution, especially fecal matter, either as a result of their construction or through an active intervention. These sources include water services which are piped to households, lots or yards, and other improved sources, such as taps or public fountains, piped or drilled wells, covered dug wells, protected sources and harvested rainwater.

Proportion of the population with access to and which makes use of improved sanitation

Improved sanitary installations are those which guarantee hygienic separation of human excreta from human contact. Among them are: lavatories or latrines with tanks or siphons connected to piped sewer systems, septic tanks, pit latrines, improved pit latrines with ventilation, pit latrines with slabs and composting toilets.

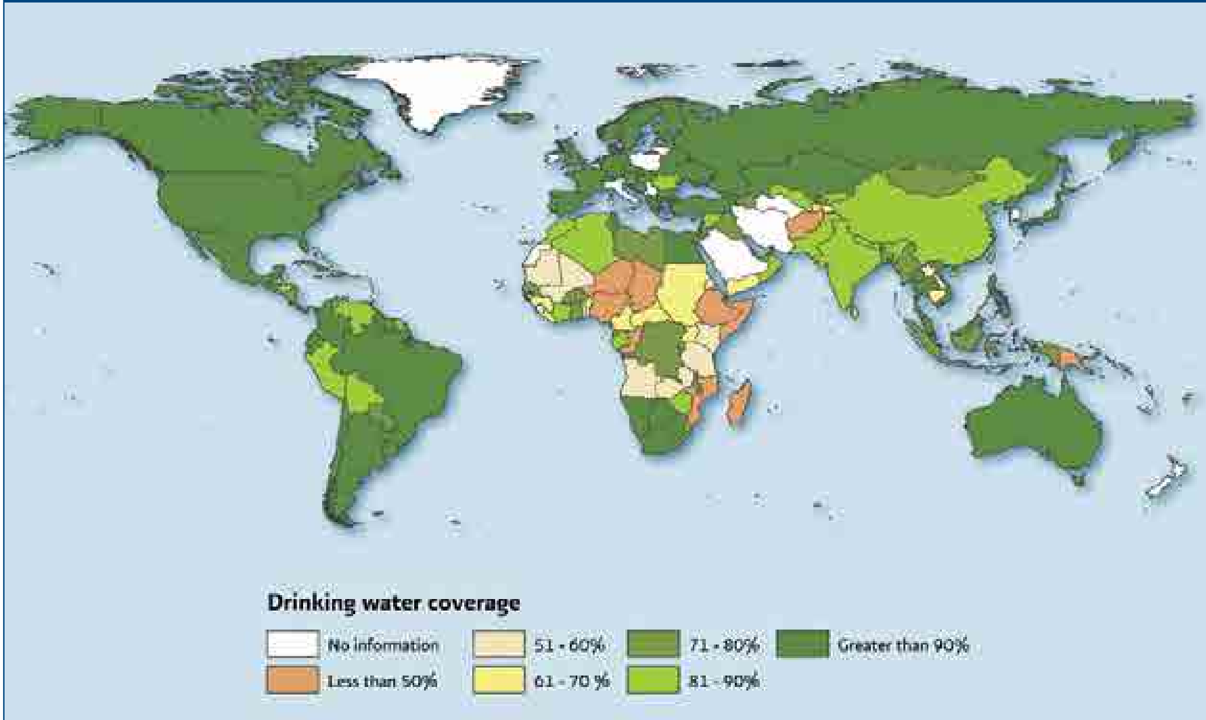
SOURCE: United Nations. UNICEF-WHO Joint Monitoring Programme for Water Supply and Sanitation. Progress on water and sanitation: Special focus on sanitation. UNICEF, New York and WHO, Geneva, 2008.

T8.11 Regional and worldwide progress towards the MDG drinking water target

Region	Drinking water coverage 1990 (%)	Drinking water coverage 2006 (%)	Drinking water coverage required in 2006 to achieve the MDGs (%)	MDG coverage target (%)	Progress
Commonwealth of Independent States	93	94	95	97	On track
Northern Africa	88	82	92	94	On track
Latin America & Caribbean	84	92	89	92	On track
Western Asia	86	90	90	93	On track
Eastern Asia	68	88	78	84	On track
Southern Asia	74	87	82	87	On track
South-East Asia	73	86	82	87	On track
Developing regions	**71**	**84**	**80**	**86**	**On track**
Developed regions	**98**	**99**	**99**	**99**	**On track**
World	**77**	**87**	**84**	**89**	**On track**
Sub-Saharan Africa	49	58	65	75	Behind schedule
Oceania	51	50	67	76	Behind schedule

SOURCE: United Nations. UNICEF-WHO Joint Monitoring Programme for Water Supply and Sanitation. Progress on water and sanitation: Special focus on sanitation. UNICEF, New York and WHO, Geneva, 2008.

M8.2 Drinking water coverage in the world, 2006



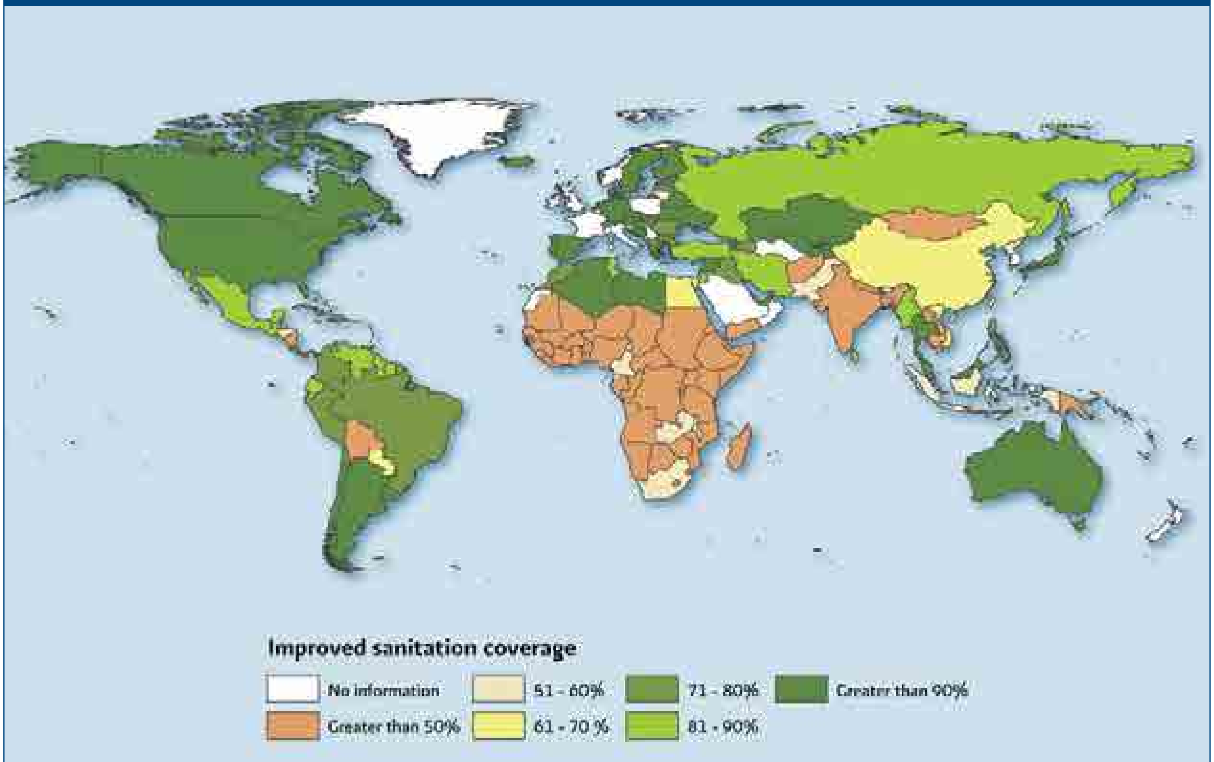
SOURCE: CONAGUA. Produced based on:
United Nations. UNICEF-WHO Joint Monitoring Programme for Water Supply and Sanitation. Progress on water and sanitation: Special focus on sanitation. UNICEF, New York and WHO, Geneva, 2008 (Data from 2006).

T8.12 Regional and worldwide progress towards the MDG sanitation target

Region	Sanitation coverage 1990 (%)	Improved sanitation coverage 2006 (%)	Improved sanitation coverage required in 2006 to achieve the MDGs (%)	MDG coverage target (%)	Progress
Western Asia	79	84	86	90	On track
Latin America & Caribbean	68	79	78	84	On track
Northern Africa	62	76	74	81	On track
South-East Asia	50	67	64	75	On track
Eastern Asia	48	65	65	74	On track
Developed regions	**99**	**99**	**99**	**100**	**On track**
Commonwealth of Independent States	90	89	93	95	Behind schedule
Oceania	52	52	69	76	Behind schedule
Southern Asia	21	33	46	61	Behind schedule
Sub-Saharan Africa	26	31	50	63	Behind schedule
Developing regions	**41**	**53**	**60**	**71**	Behind schedule
World	**54**	**62**	**69**	**77**	**Behind schedule**

SOURCE: United Nations. UNICEF-WHO Joint Monitoring Programme for Water Supply and Sanitation. Progress on water and sanitation: Special focus on sanitation. UNICEF, New York and WHO, Geneva, 2008.

M8.3 Improved sanitation coverage in the world, 2006



SOURCE: CONAGUA. Produced based on:
United Nations. UNICEF-WHO Joint Monitoring Programme for Water Supply and Sanitation. Progress on water and sanitation: Special focus on sanitation. UNICEF, New York and WHO, Geneva, 2008 (Data from 2006).

Drinking water and sanitation tariffs

It may be considered that drinking water, sewerage and sanitation services are funded through Tariffs, Transfers and Taxes (known collectively as the 3Ts).

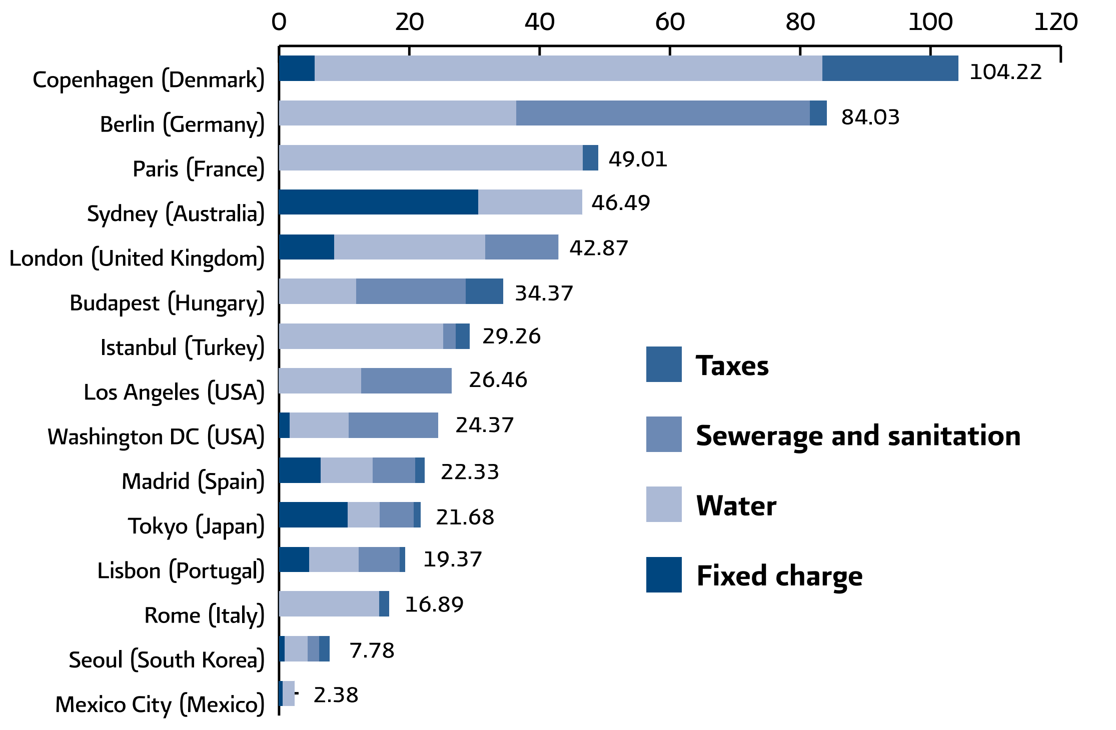
From the economic-financial perspective, it was initially considered desirable for tariffs to totally absorb the cost of providing the service, a concept known as Total Cost Recovery. It should be mentioned that the definition of this cost has not been universally agreed upon, since it is recommended that the capital costs of extending and replacing the infrastructure, in addition to the cost of its operation and maintenance, should be included in the calculation of costs, for the funding of new infrastructure, as well as environmental and external economic costs, concepts that traditionally, in Mexico at least, have not been considered.

It is worth mentioning the concept of Sustainable Cost Recovery[2], which is derived from the growing worldwide recognition that Total Cost Recovery based only on tariffs might not be feasible in some circumstances. Based on this recognition, Sustainable Cost Recovery proposes the use of resources from the Exchequer, and possibly from foreign aid, to recover costs. The crucial difference with the current situation is the distinction that tariffs must be affordable for every category of user, and transfers must be foreseen in order to allow the service providers to use them to fund investments.

In graph G8.7, the drinking water and sanitation tariffs are shown for selected cities in the world, for a domestic consumption of 15m³ per month, as well as the taxes associated with the service.

[2] OECD. 2009. Managing Water for All – An OECD perspective on pricing and financing.

G8.7 Domestic drinking water and sanitation tariffs and taxes associated with the service in selected cities of the world, 2008 (tariffs in Mexican pesos/m³, for a consumption of 15 m³ per month)



NOTE: Values in Mexican pesos. The exchange rate used to calculate the table: 12 pesos = 1 dollar.
SOURCE: GWI. Global Water Tariff Survey 2008.
For Mexico: CONAGUA, Deputy Director General's Office for Drinking Water, Sewerage and Sanitation.

Water and health

Estimations from the World Health Organization (WHO) indicate that every year in the world approximately 1.8 million people die from diarrheal diseases[3], of which the majority is children under the age of five, mainly in developing countries. Among these diarrheal diseases are cholera, typhoid fever and dysentery; all of them associated with the "fecal-oral" means of transmission. The majority of these deaths could be avoided through better access to drinking water, sewerage and sanitation services.

Other water-related diseases include helminthiases, malnutrition, and schistosomiasis; whereas other diseases are transmitted by insects, such as malaria, dengue fever and Japanese encephalitis, which are spread through the existence of stagnant water bodies, which constitute appropriate habitats for their vector transmission. There are further types of effects related with water security, such as drowning.

It is estimated that improving sewerage and sanitation reduces by 32% the frequency of diarrheal diseases, whereas improvements to water supply have an impact of 25%. Improvements to water quality reduce by 31% the incidence of diarrheal diseases. It is important to bear in mind that actions in the field of water, sanitation and hygiene are closely linked and produce a combined effect. The effect may vary according to local circumstances. The possible water-related impacts are summarized in table T8.13.

According to the WHO[4], investing in drinking water, sewerage and sanitation to reach the Millennium Development Goals would have economic benefits

[3] UN-WHO. Burden of disease and cost-effectiveness estimates. Consulted on: http://www.who.int/water_sanitation_health/diseases/burden/en/index.html (15/07/2009).

[4] WHO. Evaluation of the Costs and Benefits of Water and Sanitation Improvements at the Global Level. Consulted on: http://www.who.int/water_sanitation_health/wsh0404.pdf (15/07/2009).

T8.13 Worldwide deaths related to water, sanitation and hygiene in 2002 (thousands of people)

Disease or problem	Children 0-14 years of age	Developed countries	Developing countries	Total
Diarrhea	1 370	15	1 508	1 523
Helminthiases	8	0	12	12
Malnutrition (only related to proteins and energy)	71	0	71	71
Consequences of malnutrition	792	9	783	792
Schistosomiasis	0	0	15	15
Subtotal of diseases related to water, sanitation and hygiene	**2 241**	**24**	**2 389**	**2 413**
Malaria	482	0	526	526
Dengue fever	14	0	18	18
Japanese encephalitis	7	0	13	13
Subtotal of diseases through a lack of access to improved water resources	**503**	**0**	**557**	**557**
Drownings	106	33	244	277
Subtotal through lack of water security	**106**	**33**	**244**	**277**
Other types of infectious deaths	162	15	312	327
TOTAL DEATHS	3 012	72	3 502	3 574

SOURCE: WHO, UNICEF. Safer water, better health. Costs, benefits and sustainability of interventions to protect and promote health. 2008.

that have been estimated worldwide at 7 billion dollars per year in savings for health institutes and 340 million in individual costs. These benefits would translate into 320 million work days gained from fewer illnesses for those between the ages of 15 and 59, 272 million days in gained school attendance, 1.5 billion healthy days for children under the age of five; which adds up to a total of 9.9 billion dollars per year gained. As regards productive time from close access to water, an estimated 63 billion dollars would be gained per year. Finally, avoiding deaths would have an impact of 3.6 billion dollars per year due to the possibility of future income.

The sum of the aforementioned figures would give a total of 84 billion dollars in benefits, which compares favorably with the additional investment costs of 11.3 billion dollars on top of annual investments.

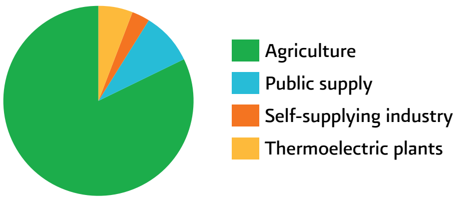
Annexes

Hydrological-Administrative Region: I Baja California Peninsula
River Basin Organization with its Headquarters in: Mexicali, Baja California

Contextual data

Number of municipalities	10
Total population 2008	3 681 032 inhabitants
Urban	3 391 622 inhabitants
Rural	289 410 inhabitants
Total population 2030	5 915 393 inhabitants

Offstream uses of water 2008



Agriculture	2 893 hm³/year (82.4%)
Public supply	327 hm³/year (9.3%)
Self-supplying industry	91 hm³/year (2.6%)
Thermoelectric plants	199 hm³/year (5.7%)
Total	3 510 hm³/year

Instream uses of water 2008

Hydroelectric plants (volume declared)	0 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	92.9 %
Urban	95.0 %
Rural	69.7 %

Improved sanitation coverage

Regional	89.0 %
Urban	92.2 %
Rural	55.3 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	41
Capacity installed	10.914 m³/s
Flow treated	5.526 m³/s

Municipal wastewater

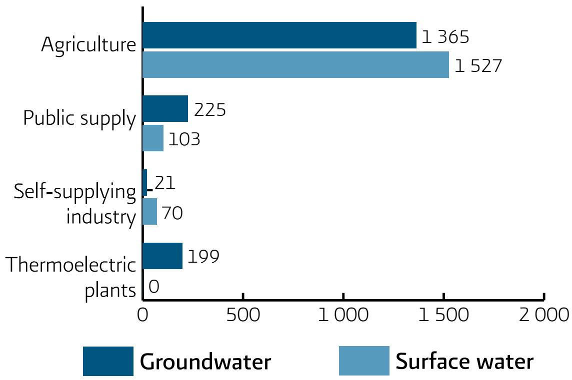
Number in operation	45
Capacity installed	8.188 m³/s
Flow treated	6.107 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	169 mm
Mean surface runoff	3 367 hm³/year
Number of aquifers	87
Mean aquifer recharge	1 259 hm³/year
Per capita renewable water resources, 2008	1 257 m³/inhab/year
Per capita renewable water resources, 2030	782 m³/inhab/year

Origin of the water used

Surface water	1 700 hm³/year	(48.4%)
Groundwater	1 811 hm³/year	(51.6%)

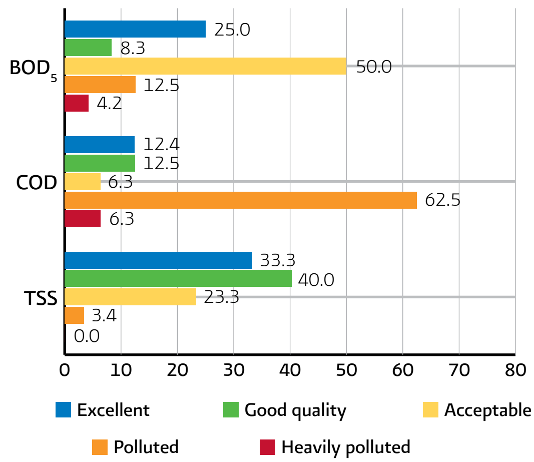


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	24
COD	16
TSS	30

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Tijuana River and Nuevo

Irrigation Districts (ID) 2008

Number of IDs	2
Total surface area of the IDs	246 906 hectares

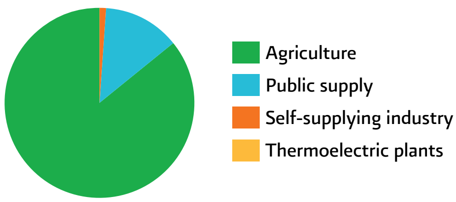
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: II Northwest
River Basin Organization with its Headquarters in: Hermosillo, Sonora

Contextual data

Number of municipalities	79
Total population 2008	2 594 182 inhabitants
Urban	2 192 529 inhabitants
Rural	401 653 inhabitants
Total population 2030	2 910 425 inhabitants

Offstream uses of water 2008



Agriculture	6 527 hm³/year (85.8%)
Public supply	984 hm³/year (12.9%)
Self-supplying industry	91 hm³/year (1.2%)
Thermoelectric plants	7 hm³/year (0.1%)
Total	7 609 hm³/year

Instream uses of water 2008

Hydroelectric plants (volume declared)	3 405 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	94.8 %
Urban	96.6 %
Rural	85.4 %

Improved sanitation coverage

Regional	84.1 %
Urban	92.0 %
Rural	43.7 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	24
Capacity installed	4.130 m³/s
Flow treated	2.098 m³/s

Municipal wastewater

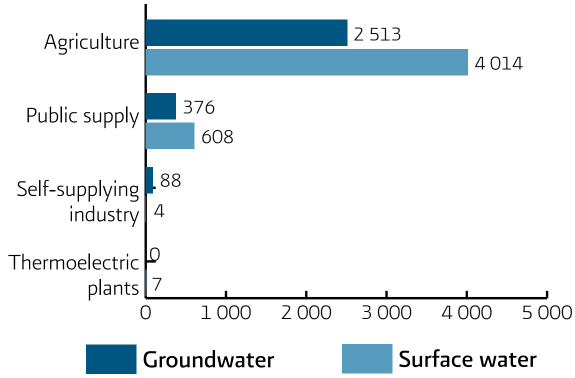
Number in operation	90
Capacity installed	4.538 m³/s
Flow treated	3.179 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	445 mm
Mean surface runoff	5 074 hm³/year
Number of aquifers	63
Mean aquifer recharge	3 250 hm³/year
Per capita renewable water resources, 2008	3 208 m³/inhab/year
Per capita renewable water resources, 2030	2 860 m³/inhab/year

Origin of the water used

Surface water	4 632 hm³/year	(60.9%)
Groundwater	2 977 hm³/year	(39.1%)



Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	20
COD	28
TSS	28

Percentage distribution of monitoring sites according to the indicator and water quality classification scale

Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Dren Las Ánimas

Irrigation Districts (ID) 2008

Number of IDs	7
Total surface area of the IDs	502 281 hectares

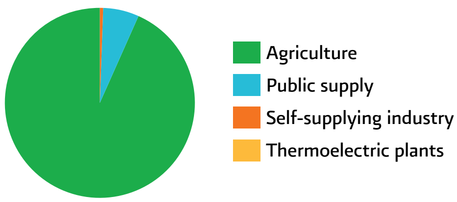
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: III Northern Pacific
River Basin Organization with its Headquarters in: Culiacán, Sinaloa

Contextual data

Number of municipalities	51
Total population 2008	3 960 006 inhabitants
Urban	2 643 900 inhabitants
Rural	1 316 106 inhabitants
Total population 2030	3 794 715 inhabitants

Offstream uses of water 2008



Agriculture	9 742 hm³/year	(93.3%)
Public supply	639 hm³/year	(6.1%)
Self-supplying industry	58 hm³/year	(0.6%)
Thermoelectric plants	0 hm³/year	(0.0%)
Total	10 439 hm³/year	

Instream uses of water 2008

Hydroelectric plants (volume declared)	13 217 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	89.0 %
Urban	97.9 %
Rural	71.9 %

Improved sanitation coverage

Regional	82.6 %
Urban	95.0 %
Rural	58.9 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	151
Capacity installed	9.081 m³/s
Flow treated	7.234 m³/s

Municipal wastewater

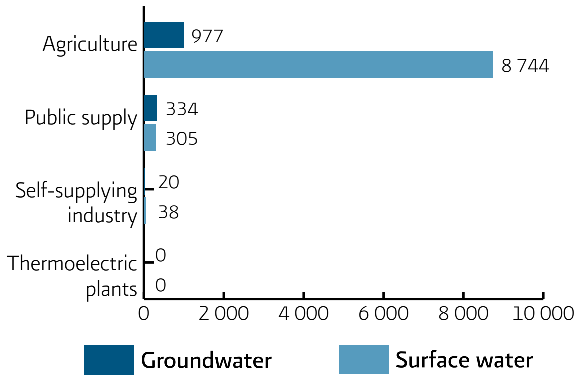
Number in operation	249
Capacity installed	8.383 m³/s
Flow treated	6.598 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	747 mm
Mean surface runoff	22 364 hm³/year
Number of aquifers	24
Mean aquifer recharge	3 263 hm³/year
Per capita renewable water resources, 2008	6 471 m³/inhab/year
Per capita renewable water resources, 2030	6 753 m³/inhab/year

Origin of the water used

Surface water	9 088 hm³/year	(87.1%)
Groundwater	1 351 hm³/year	(12.9%)

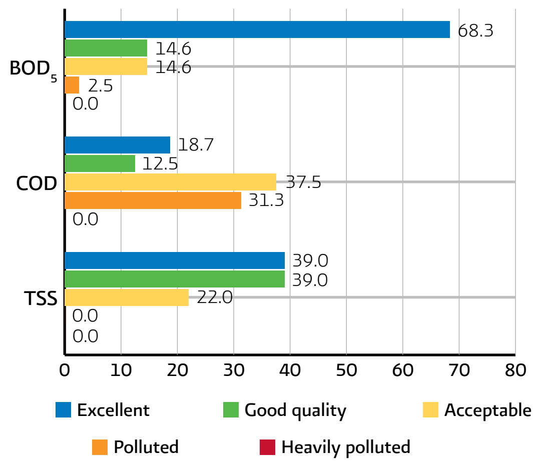


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	41
COD	16
TSS	41

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: 0

Irrigation Districts (ID) 2008

Number of IDs	9
Total surface area of the IDs	789 034 hectares

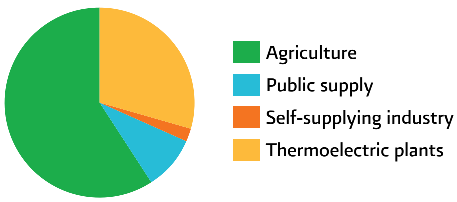
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: IV Balsas
River Basin Organization with its Headquarters in: Cuernavaca, Morelos

Contextual data

Number of municipalities	422
Total population 2008	10 581 511 inhabitants
Urban	7 481 624 inhabitants
Rural	3 099 888 inhabitants
Total population 2030	11 127 421 inhabitants

Offstream uses of water 2008



Agriculture	6 308 hm³/year (58.9%)
Public supply	998 hm³/year (9.3%)
Self-supplying industry	227 hm³/year (2.1%)
Thermoelectric plants	3 170 hm³/year (29.6%)
Total	10 703 hm³/year

Instream uses of water 2008

Hydroelectric plants (volume declared)	30 573 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	84.4 %
Urban	91.2 %
Rural	69.2 %

Improved sanitation coverage

Regional	81.4 %
Urban	91.7 %
Rural	57.9 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	21
Capacity installed	23.182 m³/s
Flow treated	17.575 m³/s

Municipal wastewater

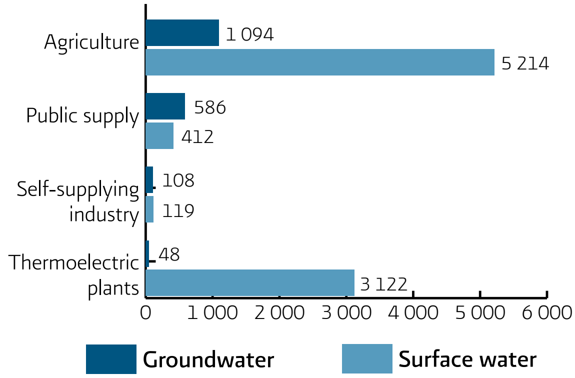
Number in operation	147
Capacity installed	7.598 m³/s
Flow treated	5.497 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	963 mm
Mean surface runoff	17 057 hm³/year
Number of aquifers	46
Mean aquifer recharge	4 623 hm³/year
Per capita renewable water resources, 2008	2 049 m³/inhab/year
Per capita renewable water resources, 2030	1 948 m³/inhab/year

Origin of the water used

Surface water	8 866 hm³/year	(82.8%)
Groundwater	1 836 hm³/year	(17.2%)

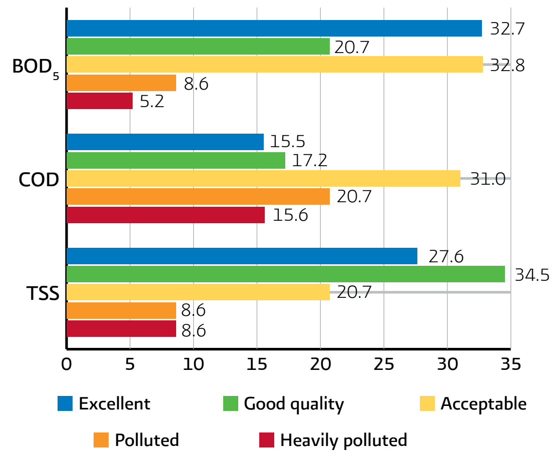


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	58
COD	58
TSS	58

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Salado Stream, Balsas River estuary; Alseseca, Atoyac, Balsas-Mezcala, Cuautla, Iguala and Zahuapan rivers

Irrigation Districts (ID) 2008

Number of IDs	9
Total surface area of the IDs	225 511 hectares

NOTE: The projection considers the population interpolated as of December 31st of the year in question.

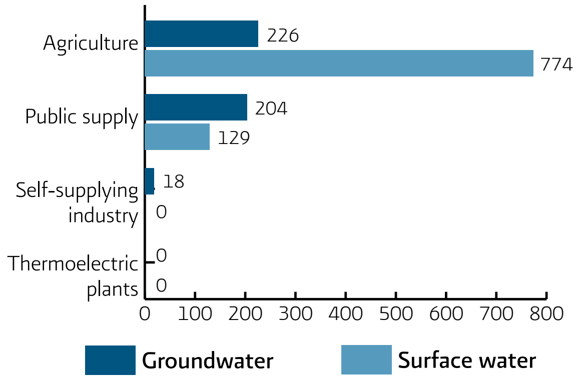
Hydrological-Administrative Region: V Southern Pacific
River Basin Organization with its Headquarters in: Oaxaca, Oaxaca

Renewable water resources 2008

Normal annual precipitation 1971-2000	1 187 mm
Mean surface runoff	30 800 hm^3/year
Number of aquifers	35
Mean aquifer recharge	1 994 hm^3/year
Per capita renewable water resources, 2008	7 955 m^3/inhab/year
Per capita renewable water resources, 2030	8 154 m^3/inhab/year

Origin of the water used

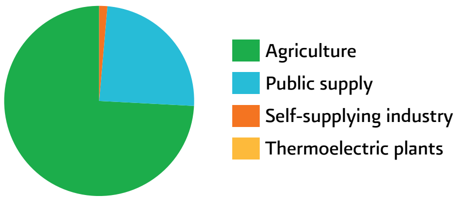
Surface water	903 hm^3/year	(66.8%)
Groundwater	448 hm^3/year	(33.2%)



Contextual data

Number of municipalities	363
Total population 2008	4 122 518 inhabitants
Urban	2 413 131 inhabitants
Rural	1 709 387 inhabitants
Total population 2030	4 021 577 inhabitants

Offstream uses of water 2008



Agriculture	1 000 hm^3/year (74%)
Public supply	333 hm^3/year (24.6%)
Self-supplying industry	18 hm^3/year (1.4%)
Thermoelectric plants	0 hm^3/year (0%)
Total	1 351 hm^3/year

Instream uses of water 2008

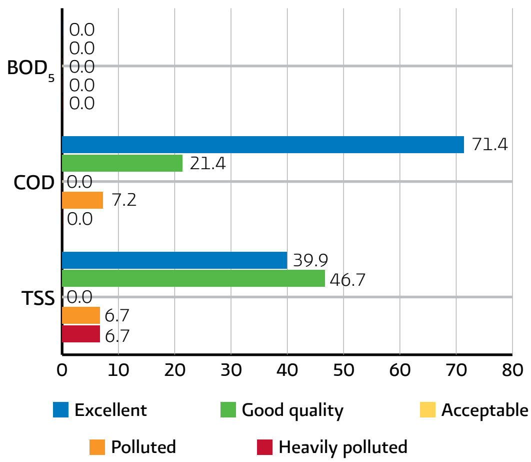
Hydroelectric plants (volume declared)	2 245 hm^3/year

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	
COD	14
TSS	15

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Verde River

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	73.5 %
Urban	83.6 %
Rural	59.6 %

Improved sanitation coverage

Regional	63.3 %
Urban	83.5 %
Rural	35.5 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	8
Capacity installed	3.181 m^3/s
Flow treated	2.586 m^3/s

Municipal wastewater

Number in operation	83
Capacity installed	3.166 m^3/s
Flow treated	1.983 m^3/s

Irrigation Districts (ID) 2008

Number of IDs	5
Total surface area of the IDs	75 389 hectares

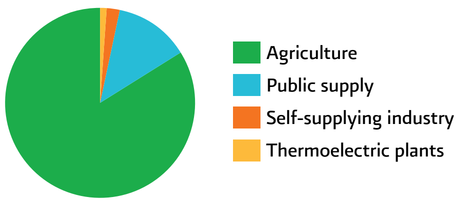
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: VI Rio Bravo
River Basin Organization with its Headquarters in: Monterrey, Nuevo León

Contextual data

Number of municipalities	141
Total population 2008	10 844 542 inhabitants
Urban	10 158 412 inhabitants
Rural	686 130 inhabitants
Total population 2030	13 251 755 inhabitants

Offstream uses of water 2008



Agriculture	7 735 hm³/year (83.8%)
Public supply	1 183 hm³/year (12.8%)
Self-supplying industry	205 hm³/year (2.2%)
Thermoelectric plants	112 hm³/year (1.2%)
Total	9 234 hm³/year

Instream uses of water 2008

Hydroelectric plants (volume declared)	1 968 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	96.1 %
Urban	97.9 %
Rural	71.6 %

Improved sanitation coverage

Regional	93.8 %
Urban	95.8 %
Rural	65.0 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	57
Capacity installed	26.087 m³/s
Flow treated	15.701 m³/s

Municipal wastewater

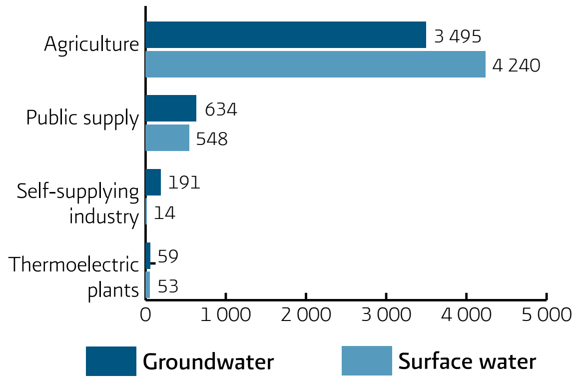
Number in operation	188
Capacity installed	28.316 m³/s
Flow treated	22.229 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	438 mm
Mean surface runoff	6 857 hm³/year
Number of aquifers	100
Mean aquifer recharge	5 080 hm³/year
Per capita renewable water resources, 2008	1 101 m³/inhab/year
Per capita renewable water resources, 2030	901 m³/inhab/year

Origin of the water used

Surface water	4 855 hm³/year	(52.6%)
Groundwater	4 379 hm³/year	(47.4%)

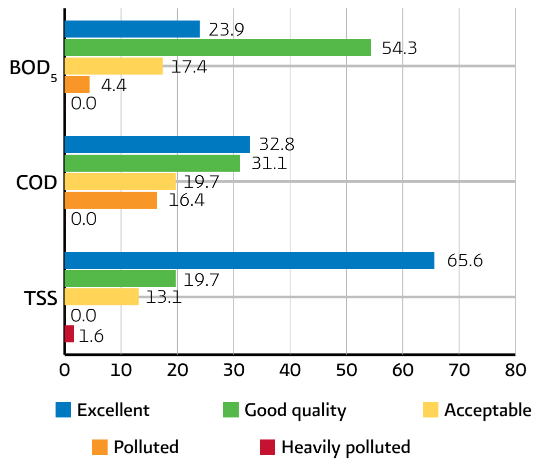


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	46
COD	61
TSS	61

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Brave River

Irrigation Districts (ID) 2008

Number of IDs	12
Total surface area of the IDs	554 597 hectares

NOTE: The projection considers the population interpolated as of December 31st of the year in question.

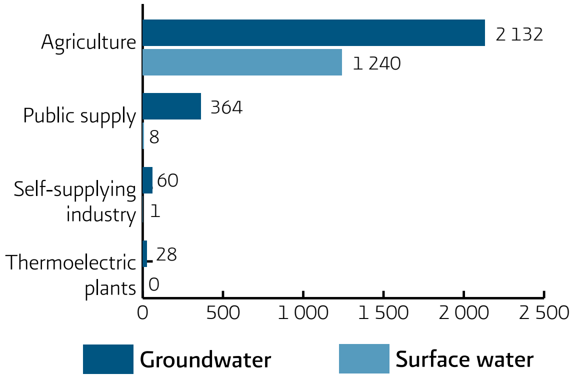
Hydrological-Administrative Region: VII Central Basins of the North
River Basin Organization with its Headquarters in: Torreón, Coahuila de Zaragoza

Renewable water resources 2008

Normal annual precipitation 1971-2000	430 mm
Mean surface runoff	5 506 hm³/year
Number of aquifers	68
Mean aquifer recharge	2 378 hm³/year
Per capita renewable water resources, 2008	1 898 m³/inhab/year
Per capita renewable water resources, 2030	1 726 m³/inhab/year

Origin of the water used

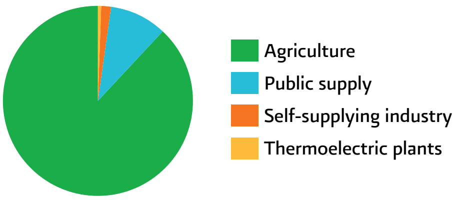
Surface water	1 248 hm³/year	(32.6%)
Groundwater	2 584 hm³/year	(67.4%)



Contextual data

Number of municipalities	83
Total population 2008	4 154 483 inhabitants
Urban	3 038 956 inhabitants
Rural	1 115 527 inhabitants
Total population 2030	4 568 007 inhabitants

Offstream uses of water 2008



Agriculture	3 372 hm³/year (88%)
Public supply	371 hm³/year (9.7%)
Self-supplying industry	61 hm³/year (1.6%)
Thermoelectric plants	28 hm³/year (0.7%)
Total	3 833 hm³/year

Instream uses of water 2008

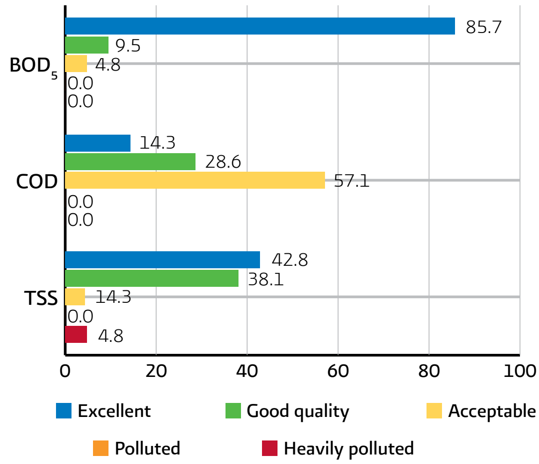
Hydroelectric plants (volume declared)	0 hm³/year

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	21
COD	21
TSS	21

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Aguanaval River

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	93.3 %
Urban	98.8 %
Rural	79.1 %

Improved sanitation coverage

Regional	85.6 %
Urban	95.6 %
Rural	59.9 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	60
Capacity installed	0.546 m³/s
Flow treated	0.390 m³/s

Municipal wastewater

Number in operation	113
Capacity installed	5.186 m³/s
Flow treated	4.031 m³/s

Irrigation Districts (ID) 2008

Number of IDs	1
Total surface area of the IDs	116 577 hectares

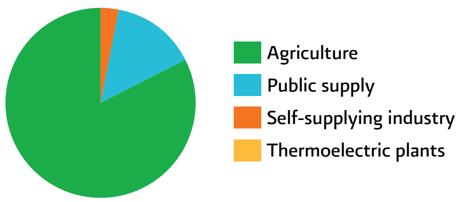
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: VIII Lerma-Santiago-Pacific
River Basin Organization with its Headquarters in: Guadalajara, Jalisco

Contextual data

Number of municipalities	329
Total population 2008	20 802 160 inhabitants
Urban	16 268 500 inhabitants
Rural	4 533 660 inhabitants
Total population 2030	23 511 810 inhabitants

Offstream uses of water 2008



Agriculture	11 669 hm³/year	(82.4%)
Public supply	2 058 hm³/year	(14.5%)
Self-supplying industry	411 hm³/year	(2.9%)
Thermoelectric plants	24 hm³/year	(0.2%)
Total	14 162 hm³/year	

Instream uses of water 2008

Hydroelectric plants (volume declared)	13 517 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	93.4 %
Urban	96.1 %
Rural	84.3 %

Improved sanitation coverage

Regional	90.1 %
Urban	96.2 %
Rural	69.3 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	106
Capacity installed	19.420 m³/s
Flow treated	12.153 m³/s

Municipal wastewater

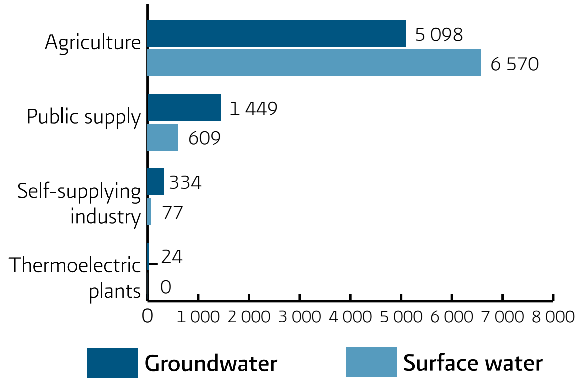
Number in operation	465
Capacity installed	23.175 m³/s
Flow treated	18.023 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	816 mm
Mean surface runoff	26 431 hm³/year
Number of aquifers	127
Mean aquifer recharge	7 728 hm³/year
Per capita renewable water resources, 2008	1 642 m³/inhab/year
Per capita renewable water resources, 2030	1 453 m³/inhab/year

Origin of the water used

Surface water	7 256 hm³/year	(51.2%)
Groundwater	6 906 hm³/year	(48.8%)

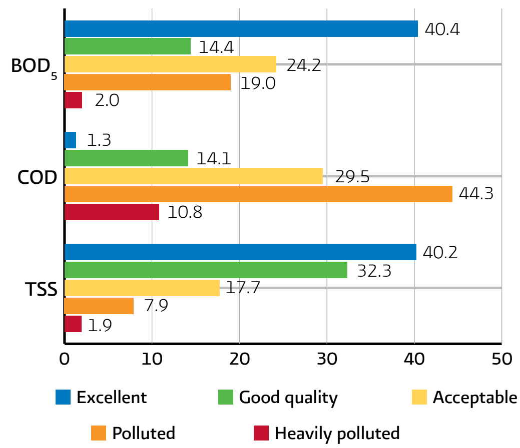


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	153
COD	149
TSS	164

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Mezapa Stream, Lake Cuitzeo, Almoloya del Río Lagoon; Aguascalientes, Laja, Lerma, San Juan de los Lagos, Tamazula, Turbio, Tuxcacuesco and Verde rivers

Irrigation Districts (ID) 2008

Number of IDs	14
Total surface area of the IDs	499 237 hectares

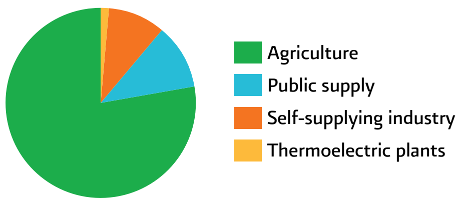
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: IX Northern Gulf
River Basin Organization with its Headquarters in: Ciudad Victoria, Tamaulipas

Contextual data

Number of municipalities	154
Total population 2008	4 955 427 inhabitants
Urban	2 512 205 inhabitants
Rural	2 443 222 inhabitants
Total population 2030	5 099 143 inhabitants

Offstream uses of water 2008



Agriculture	3 688 hm³/year (77.7%)
Public supply	527 hm³/year (11.1%)
Self-supplying industry	467 hm³/year (9.8%)
Thermoelectric plants	66 hm³/year (1.4%)
Total	4 747 hm³/year

Instream uses of water 2008

Hydroelectric plants (volume declared)	2 912 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	80.9 %
Urban	96.6 %
Rural	65.3 %

Improved sanitation coverage

Regional	65.3 %
Urban	88.2 %
Rural	42.5 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	43
Capacity installed	6.664 m³/s
Flow treated	5.887 m³/s

Municipal wastewater

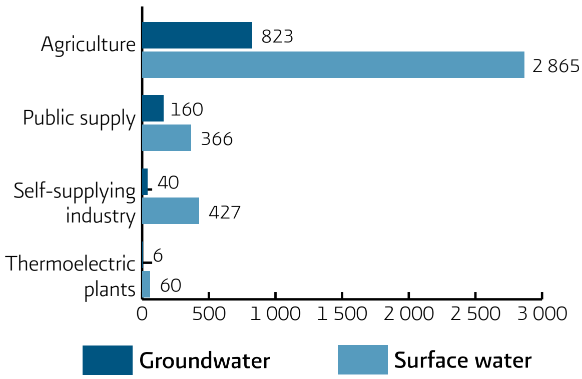
Number in operation	91
Capacity installed	2.911 m³/s
Flow treated	2.313 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	914 mm
Mean surface runoff	24 227 hm³/year
Number of aquifers	40
Mean aquifer recharge	1 316 hm³/year
Per capita renewable water resources, 2008	5 155 m³/inhab/year
Per capita renewable water resources, 2030	5 009 m³/inhab/year

Origin of the water used

Surface water	3 718 hm³/year	(78.3%)
Groundwater	1 029 hm³/year	(21.7%)

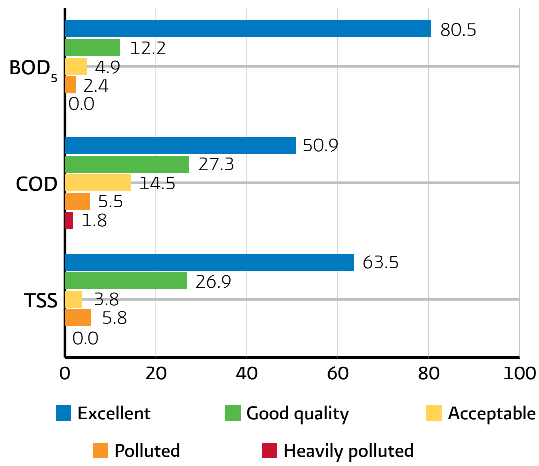


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	41
COD	55
TSS	52

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: San Juan del Río River

Irrigation Districts (ID) 2008

Number of IDs	13
Total surface area of the IDs	265 594 hectares

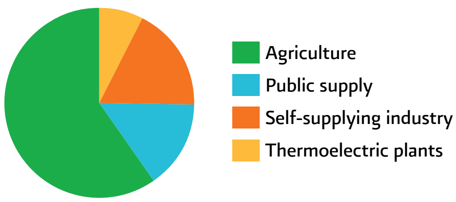
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: X Central Gulf
River Basin Organization with its Headquarters in: Xalapa, Veracruz

Contextual data

Number of municipalities	445
Total population 2008	9 616 781 inhabitants
Urban	5 516 607 inhabitants
Rural	4 100 175 inhabitants
Total population 2030	9 925 044 inhabitants

Offstream uses of water 2008



Agriculture	2 960 hm³/year (59.7%)
Public supply	744 hm³/year (15%)
Self-supplying industry	876 hm³/year (17.7%)
Thermoelectric plants	377 hm³/year (7.6%)
Total	4 957 hm³/year

Instream uses of water 2008

Hydroelectric plants (volume declared)	14 040 hm³/year

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	77.2 %
Urban	89.7 %
Rural	61.2 %

Improved sanitation coverage

Regional	74.8 %
Urban	92.1 %
Rural	52.7 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	9
Capacity installed	6.640 m³/s
Flow treated	4.150 m³/s

Municipal wastewater

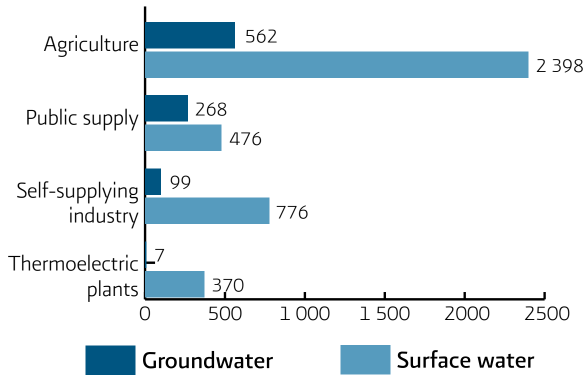
Number in operation	127
Capacity installed	5.350 m³/s
Flow treated	3.140 m³/s

Renewable water resources 2008

Normal annual precipitation 1971-2000	1 558 mm
Mean surface runoff	91 606 hm³/year
Number of aquifers	22
Mean aquifer recharge	4 260 hm³/year
Per capita renewable water resources, 2008	9 969 m³/inhab/year
Per capita renewable water resources, 2030	9 659 m³/inhab/year

Origin of the water used

Surface water	4 020 hm³/year	(81.1%)
Groundwater	936 hm³/year	(18.9%)

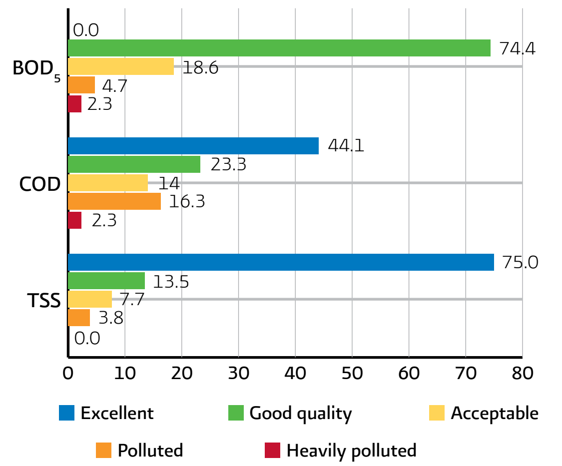


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	43
COD	43
TSS	52

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: El Diamante Stream

Irrigation Districts (ID) 2008

Number of IDs	2
Total surface area of the IDs	43 508 hectares

NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Hydrological-Administrative Region: XI Southern Border
River Basin Organization with its Headquarters in: Tuxtla Gutiérrez, Chiapas

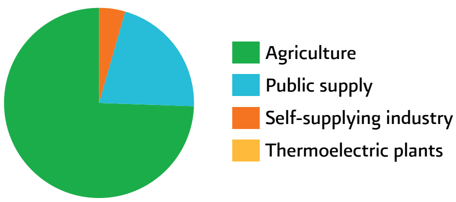
Renewable water resources 2008

Normal annual precipitation 1971-2000	1 846 mm
Mean surface runoff	139 739 hm³/year
Number of aquifers	23
Mean aquifer recharge	18 015 hm³/year
Per capita renewable water resources, 2008	24 043 m³/inhab/year
Per capita renewable water resources, 2030	21 041 m³/inhab/year

Contextual data

Number of municipalities	138
Total population 2008	6 561 406 inhabitants
Urban	3 322 559 inhabitants
Rural	3 238 847 inhabitants
Total population 2030	7 497 619 inhabitants

Offstream uses of water 2008



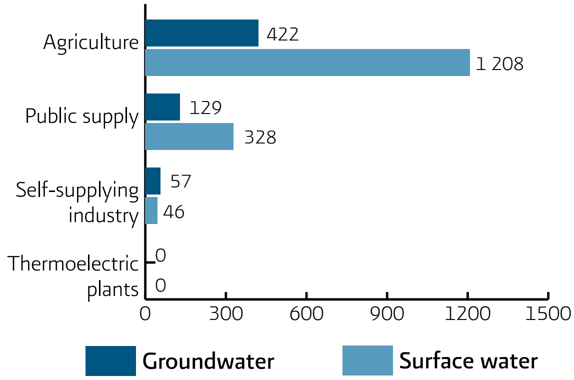
Agriculture	1 631 hm³/year	(74.5%)
Public supply	457 hm³/year	(20.9%)
Self-supplying industry	103 hm³/year	(4.7%)
Thermoelectric plants	0 hm³/year	(0%)
Total	2 190 hm³/year	

Instream uses of water 2008

Hydroelectric plants (volume declared)	68 793 hm³/year

Origin of the water used

Surface water	1 582 hm³/year	(72.2%)
Groundwater	608 hm³/year	(27.8%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	74.4 %
Urban	87.0 %
Rural	61.8 %

Improved sanitation coverage

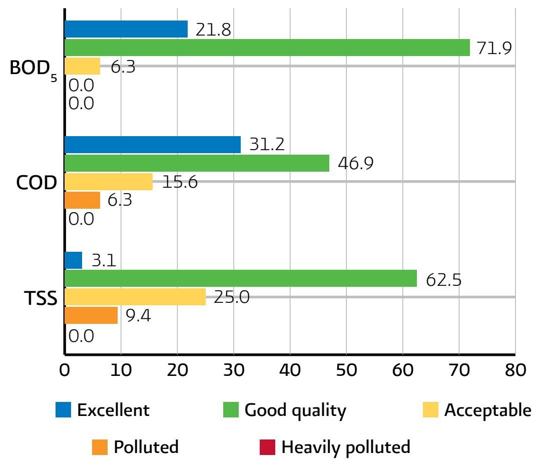
Regional	80.7 %
Urban	95.4 %
Rural	66.1 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	32
COD	32
TSS	32

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: 0

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	42
Capacity installed	14.931 m³/s
Flow treated	9.124 m³/s

Municipal wastewater

Number in operation	97
Capacity installed	3.359 m³/s
Flow treated	2.666 m³/s

Irrigation Districts (ID) 2008

Number of IDs	4
Total surface area of the IDs	36 399 hectares

NOTE: The projection considers the population interpolated as of December 31st of the year in question.

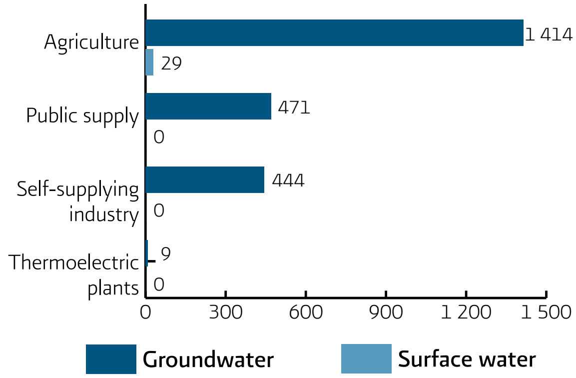
Hydrological-Administrative Region: XII Yucatán Peninsula
River Basin Organization with its Headquarters in: Mérida, Yucatán

Renewable water resources 2008

Normal annual precipitation 1971-2000	1 218 mm
Mean surface runoff	4 329 hm³/year
Number of aquifers	4
Mean aquifer recharge	25 316 hm³/year
Per capita renewable water resources, 2008	7 442 m³/hab/year
Per capita renewable water resources, 2030	5 105 m³/hab/year

Origin of the water used

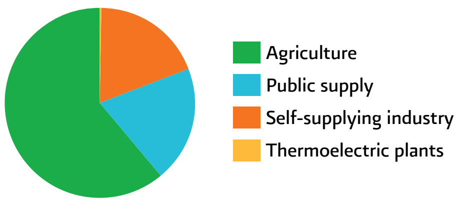
Surface water	30 hm³/year	(1.2%)
Groundwater	2 339 hm³/year	(98.8%)



Contextual data

Number of municipalities	125
Total population 2008	3 983 652 inhabitants
Urban	3 296 400 inhabitants
Rural	687 252 inhabitants
Total population 2030	5 807 391 inhabitants

Offstream uses of water 2008



Agriculture	1 443 hm³/year	(82%)
Public supply	471 hm³/year	(09%)
Self-supplying industry	444 hm³/year	(03%)
Thermoelectric plants	9 hm³/year	(06%)
Total	2 368 hm³/year	

Instream uses of water 2008

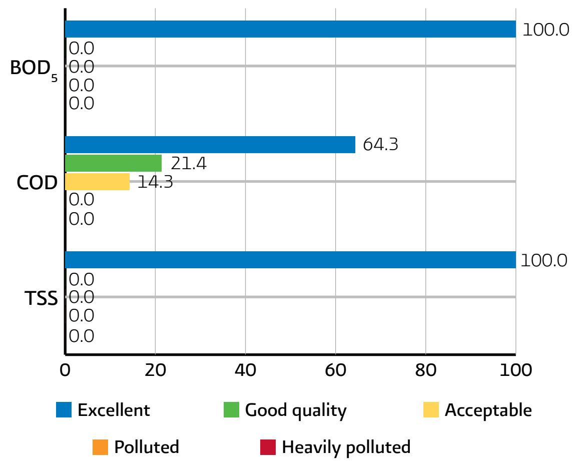
Hydroelectric plants (volume declared)	0 hm³/year

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	14
COD	14
TSS	7

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: 0

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	94.1 %
Urban	95.4 %
Rural	88.5 %

Improved sanitation coverage

Regional	76.3 %
Urban	83.8 %
Rural	43.7 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	1
Capacity installed	0.005 m³/s
Flow treated	0.005 m³/s

Municipal wastewater

Number in operation	55
Capacity installed	2.257 m³/s
Flow treated	1.731 m³/s

Irrigation Districts (ID) 2008

Number of IDs	2
Total surface area of the IDs	36 871 hectares

NOTE: The projection considers the population interpolated as of December 31st of the year in question.

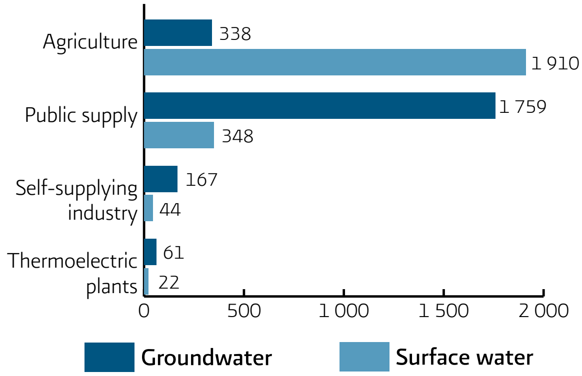
Hydrological-Administrative Region: XIII Waters of the Valley of Mexico
River Basin Organization with its Headquarters in: Mexico City (Federal District)

Renewable water resources 2008

Normal annual precipitation 1971-2000	606 mm
Mean surface runoff	1 174 hm³/year
Number of aquifers	14
Mean aquifer recharge	2 340 hm³/year
Per capita renewable water resources, 2008	165 m³/inhab/year
Per capita renewable water resources, 2030	148 m³/inhab/year

Origin of the water used

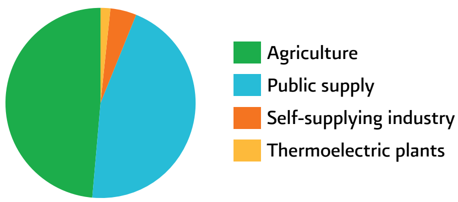
Surface water	2 325 hm³/year	(50%)
Groundwater	2 325 hm³/year	(50%)



Contextual data

Number of municipalities	116
Total population 2008	21 258 911 inhabitants
Urban	20 397 943 inhabitants
Rural	860 969 inhabitants
Total population 2030	23 673 230 inhabitants

Offstream uses of water 2008



Agriculture	2 249 hm³/year	(48.4%)
Public supply	2 107 hm³/year	(45.3%)
Self-supplying industry	211 hm³/year	(4.5%)
Thermoelectric plants	83 hm³/year	(1.8%)
Total	4 650 hm³/year	

Instream uses of water 2008

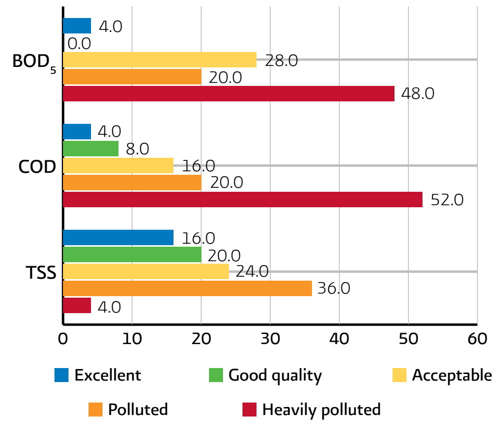
Hydroelectric plants (volume declared)	0 hm³/year

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	25
COD	25
TSS	25

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Western Outlet, Dendhó and Santo Tomás; Central Outlet Discharge, Grand Canal, Tlamaco-Juando weir; Churubusco, de la Compañía, de las Avenidas, de los Remedios, San Buenaventura and San Juan Teotihuacán rivers

Drinking water and improved sanitation coverage 2005

Drinking water coverage

Regional	96.5 %
Urban	97.0 %
Rural	85.4 %

Improved sanitation coverage

Regional	97.2 %
Urban	98.1 %
Rural	78.0 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	41
Capacity installed	6.097 m³/s
Flow treated	4.881 m³/s

Municipal wastewater

Number in operation	83
Capacity installed	10.597 m³/s
Flow treated	6.140 m³/s

Irrigation Districts (ID) 2008

Number of IDs	5
Total surface area of the IDs	106 260 hectares

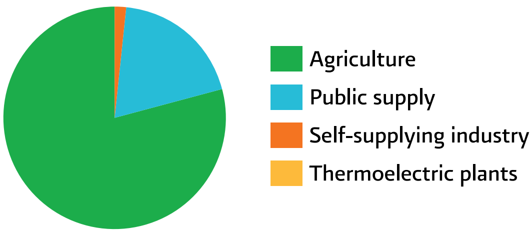
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

1. Aguascalientes

General data

Number of municipalities	11	
Total population 2008	1 133 117	inhabitants
Urban	921 500	inhabitants
Rural	211 617	inhabitants
Total population 2030	1 460 232	inhabitants
Normal annual precipitation 1971-2000	508	mm

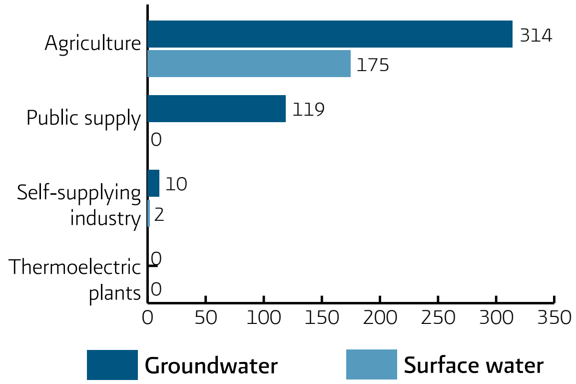
Offstream uses of water 2008



Agriculture	489	hm³/year	(78.4%)
Public supply	119	hm³/year	(19.2%)
Self-supplying industry	12	hm³/year	(1.9%)
Thermoelectric plants	0	hm³/year	(0.0%)
Total	619	hm³/year	

Origin of the water used

Surface water	177 hm³/year	(28.6%)
Groundwater	442 hm³/year	(71.4%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	97.8 %
Urban	99.2 %
Rural	92.0 %

Improved sanitation coverage

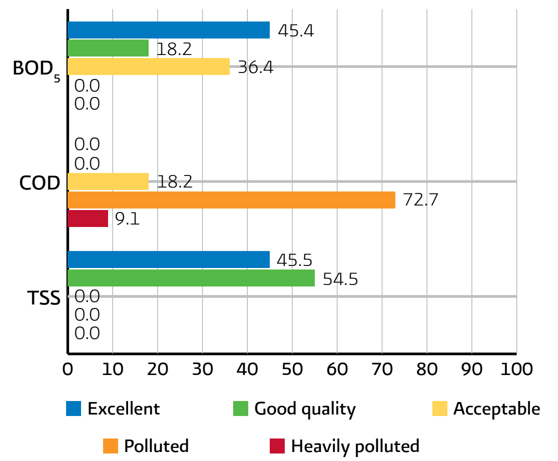
State-wide	96.9 %
Urban	98.8 %
Rural	88.4 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	11
COD	11
TSS	11

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	3
Capacity installed	0.044 m³/s
Flow treated	0.026 m³/s

Municipal wastewater

Number in operation	115
Capacity installed	4.232 m³/s
Flow treated	3.470 m³/s

Industrial wastewater

Number in operation	53
Capacity installed	0.261 m³/s
Flow treated	0.128 m³/s

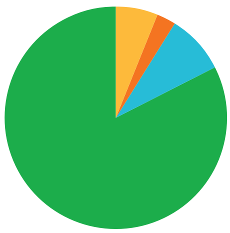
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

2. Baja California

General data

Number of municipalities	5	
Total population 2008	3 122 570	inhabitants
Urban	2 914 528	inhabitants
Rural	208 042	inhabitants
Total population 2030	5 082 349	inhabitants
Normal annual precipitation 1971-2000	177	mm

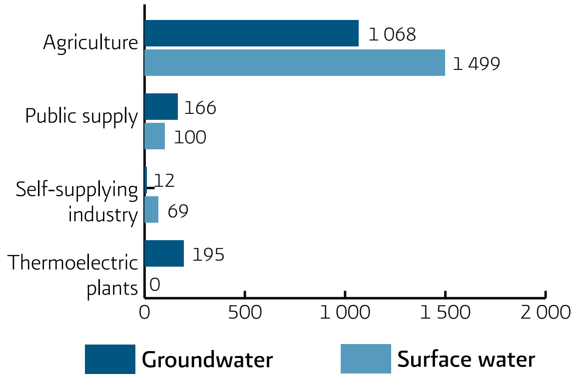
Offstream uses of water 2008



Agriculture	2 566	hm^3/year	(82.5%)
Public supply	266	hm^3/year	(8.6%)
Self-supplying industry	82	hm^3/year	(2.6%)
Thermoelectric plants	195	hm^3/year	(6.3%)
Total	3 109	hm^3/year	

Origin of the water used

Surface water	1 668 hm^3/year	(53.6%)
Groundwater	1 442 hm^3/year	(46.4%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	93.8 %
Urban	95.9 %
Rural	67.5 %

Improved sanitation coverage

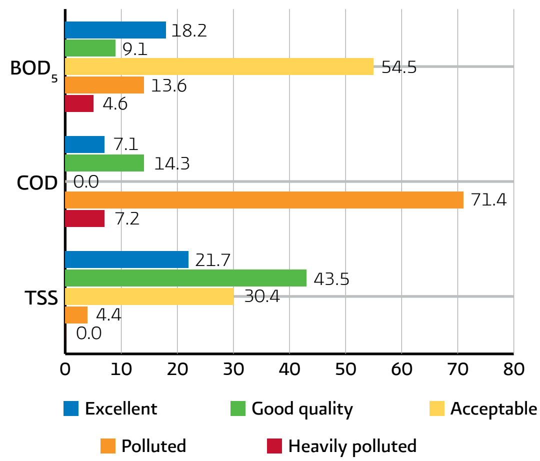
State-wide	88.9 %
Urban	91.8 %
Rural	51.7 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	22
COD	14
TSS	23

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	26
Capacity installed	10.699 m^3/s
Flow treated	5.311 m^3/s

Municipal wastewater

Number in operation	27
Capacity installed	6.985 m^3/s
Flow treated	5.262 m^3/s

Industrial wastewater

Number in operation	179
Capacity installed	0.673 m^3/s
Flow treated	0.151 m^3/s

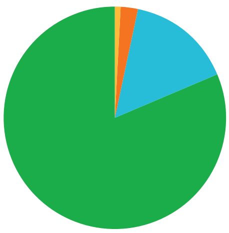
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

3. Baja California Sur

General data

Number of municipalities	5	
Total population 2008	558 463	inhabitants
Urban	477 094	inhabitants
Rural	81 369	inhabitants
Total population 2030	833 044	inhabitants
Normal annual precipitation 1971-2000	160	mm

Offstream uses of water 2008

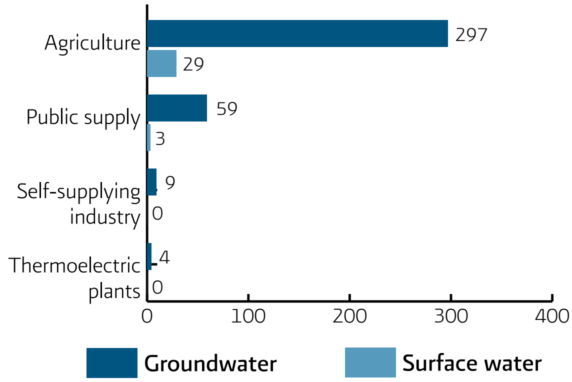


Agriculture
Public supply
Self-supplying industry
Thermoelectric plants

Agriculture	326	hm³/year	(81.3%)
Public supply	61	hm³/year	(15.3%)
Self-supplying industry	10	hm³/year	(2.4%)
Thermoelectric plants	4	hm³/year	(1.0%)
Total	401	hm³/year	

Origin of the water used

Surface water	32 hm³/year	(8.0%)
Groundwater	369 hm³/year	(92.0%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	87.7 %
Urban	89.9 %
Rural	75.3 %

Improved sanitation coverage

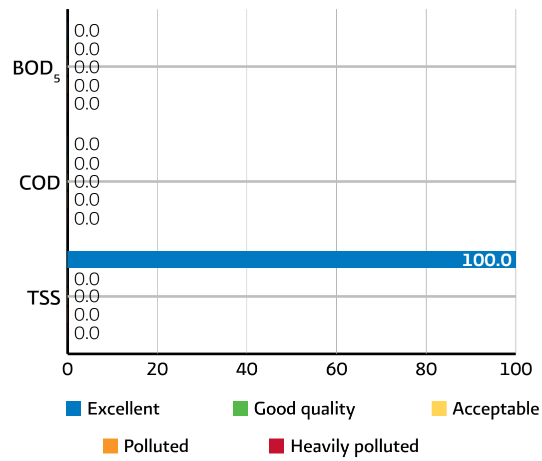
State-wide	89.7 %
Urban	94.3 %
Rural	64.6 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	0
COD	0
TSS	5

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	15
Capacity installed	0.215 m³/s
Flow treated	0.215 m³/s

Municipal wastewater

Number in operation	18
Capacity installed	1.202 m³/s
Flow treated	0.845 m³/s

Industrial wastewater

Number in operation	7
Capacity installed	0.008 m³/s
Flow treated	0.008 m³/s

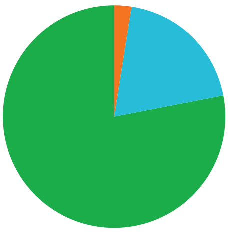
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

4. Campeche

General data

Number of municipalities	11	
Total population 2008	791 368	inhabitants
Urban	591 533	inhabitants
Rural	199 835	inhabitants
Total population 2030	968 665	inhabitants
Normal annual precipitation 1971-2000	1 337	mm

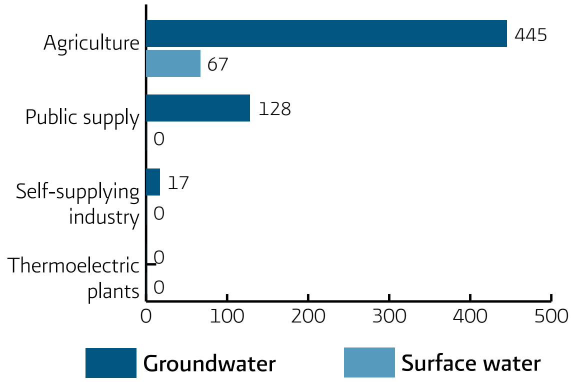
Offstream uses of water 2008



Agriculture	512	hm^3/year	(77.9%)
Public supply	128	hm^3/year	(19.4%)
Self-supplying industry	18	hm^3/year	(2.7%)
Thermoelectric plants	0	hm^3/year	(0.0%)
Total	657	hm^3/year	

Origin of the water used

Surface water	68 hm^3/year	(10.3%)
Groundwater	590 hm^3/year	(89.7%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	88.4 %
Urban	90.9 %
Rural	81.1 %

Improved sanitation coverage

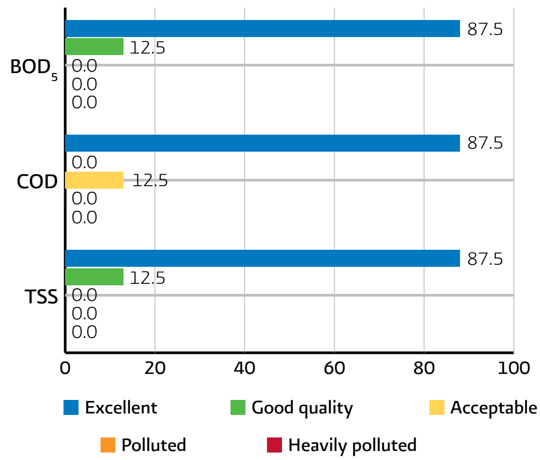
State-wide	78.4 %
Urban	89.1 %
Rural	48.1 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	8
COD	8
TSS	8

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	2
Capacity installed	0.025 m^3/s
Flow treated	0.023 m^3/s

Municipal wastewater

Number in operation	13
Capacity installed	0.102 m^3/s
Flow treated	0.061 m^3/s

Industrial wastewater

Number in operation	49
Capacity installed	0.498 m^3/s
Flow treated	0.158 m^3/s

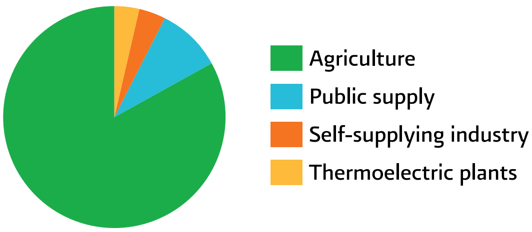
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

5. Coahuila de Zaragoza

General data

Number of municipalities	38	
Total population 2008	2 615 413	inhabitants
Urban	2 359 159	inhabitants
Rural	256 254	inhabitants
Total population 2030	3 059 206	inhabitants
Normal annual precipitation 1971-2000	386	mm

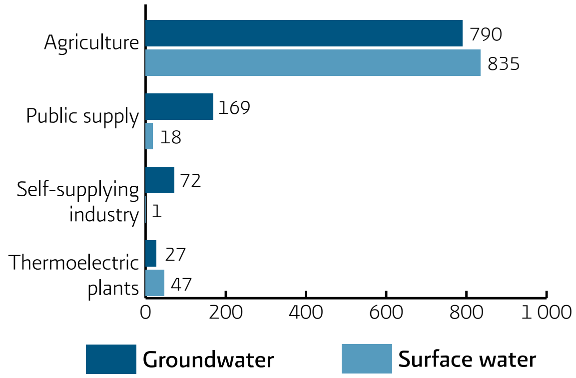
Offstream uses of water 2008



Agriculture	1 625	hm³/year	(82.9%)
Public supply	187	hm³/year	(9.5%)
Self-supplying industry	73	hm³/year	(3.7%)
Thermoelectric plants	75	hm³/year	(3.8%)
Total	1 959	hm³/year	

Origin of the water used

Surface water	901 hm³/year	(46.0%)
Groundwater	1 058 hm³/year	(54.0%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	97.3 %
Urban	98.7 %
Rural	84.8 %

Improved sanitation coverage

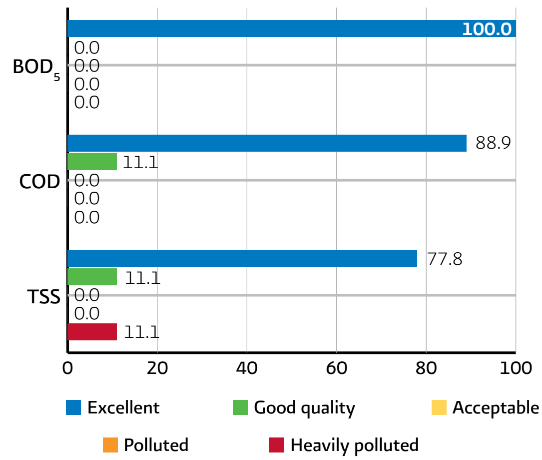
State-wide	91.5 %
Urban	94.7 %
Rural	62.7 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	1
COD	9
TSS	9

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	18
Capacity installed	2.132 m³/s
Flow treated	1.707 m³/s

Municipal wastewater

Number in operation	21
Capacity installed	4.967 m³/s
Flow treated	3.866 m³/s

Industrial wastewater

Number in operation	66
Capacity installed	0.881 m³/s
Flow treated	0.608 m³/s

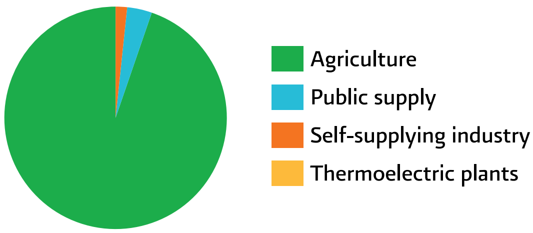
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

6. Colima

General data

Number of municipalities	10	
Total population 2008	597 074	inhabitants
Urban	525 013	inhabitants
Rural	72 062	inhabitants
Total population 2030	734 269	inhabitants
Normal annual precipitation 1971-2000	935	mm

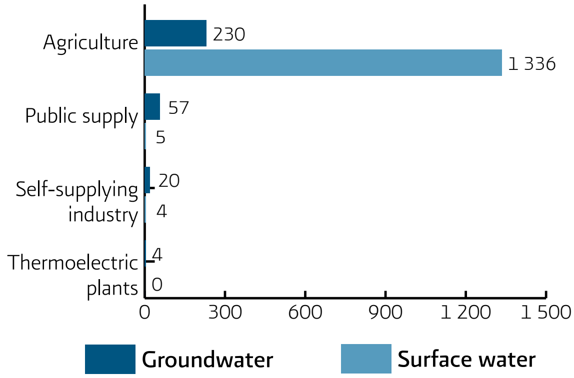
Offstream uses of water 2008



Agriculture	1 566	hm^3/year	(94.5%)
Public supply	62	hm^3/year	(3.8%)
Self-supplying industry	24	hm^3/year	(1.5%)
Thermoelectric plants	4	hm^3/year	(0.2%)
Total	1 656	hm^3/year	

Origin of the water used

Surface water	1 345	hm^3/year	(81.2%)
Groundwater	311	hm^3/year	(18.8%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	97.8 %
Urban	99.1 %
Rural	88.7 %

Improved sanitation coverage

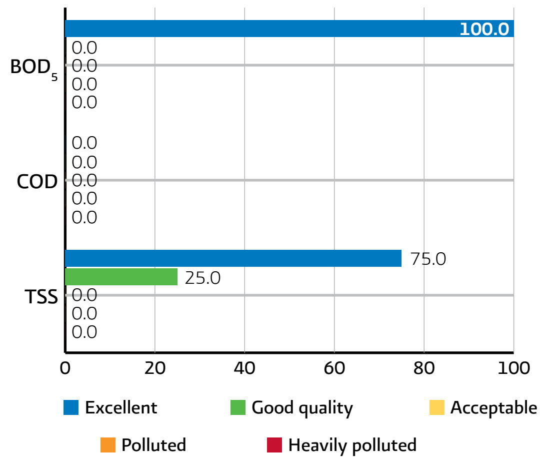
State-wide	98.2 %
Urban	98.8 %
Rural	94.2 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	12
COD	0
TSS	12

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	33
Capacity installed	0.011 m^3/s
Flow treated	0.005 m^3/s

Municipal wastewater

Number in operation	57
Capacity installed	1.541 m^3/s
Flow treated	1.002 m^3/s

Industrial wastewater

Number in operation	8
Capacity installed	0.467 m^3/s
Flow treated	0.311 m^3/s

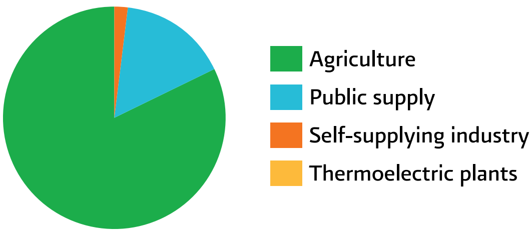
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

7. Chiapas

General data

Number of municipalities	118	
Total population 2008	4 483 595	inhabitants
Urban	2 177 773	inhabitants
Rural	2 305 823	inhabitants
Total population 2030	5 297 905	inhabitants
Normal annual precipitation 1971-2000	1 768	mm

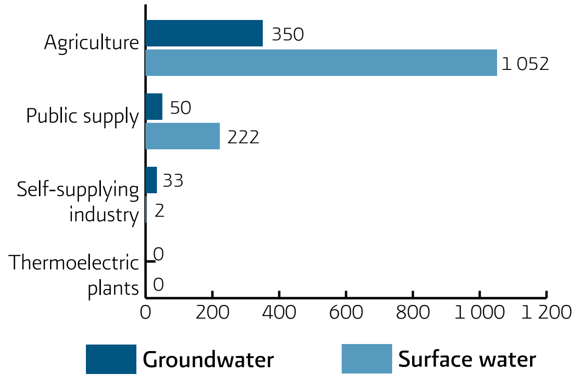
Offstream uses of water 2008



Agriculture	1 402	hm^3/year	(82.1%)
Public supply	272	hm^3/year	(15.9%)
Self-supplying industry	35	hm^3/year	(2.0%)
Thermoelectric plants	0	hm^3/year	(0.0%)
Total	1 709	hm^3/year	

Origin of the water used

Surface water	1 275	hm^3/year	(74.6%)
Groundwater	433	hm^3/year	(25.4%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	73.5 %
Urban	86.2 %
Rural	61.9 %

Improved sanitation coverage

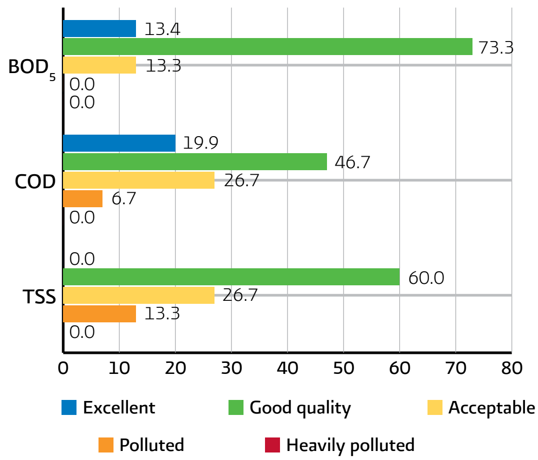
State-wide	74.7 %
Urban	94.1 %
Rural	57.0 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	15
COD	15
TSS	15

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	4
Capacity installed	4.500 m^3/s
Flow treated	2.510 m^3/s

Municipal wastewater

Number in operation	24
Capacity installed	1.509 m^3/s
Flow treated	1.357 m^3/s

Industrial wastewater

Number in operation	34
Capacity installed	7.366 m^3/s
Flow treated	0.718 m^3/s

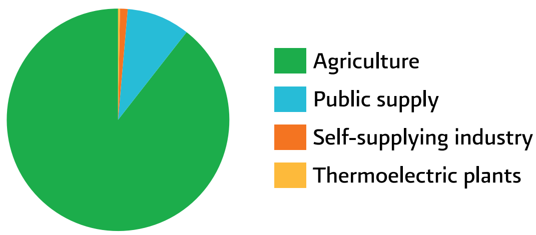
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

8. Chihuahua

General data

Number of municipalities	67	
Total population 2008	3 375 776	inhabitants
Urban	2 868 507	inhabitants
Rural	507 269	inhabitants
Total population 2030	3 843 745	inhabitants
Normal annual precipitation 1971-2000	459	mm

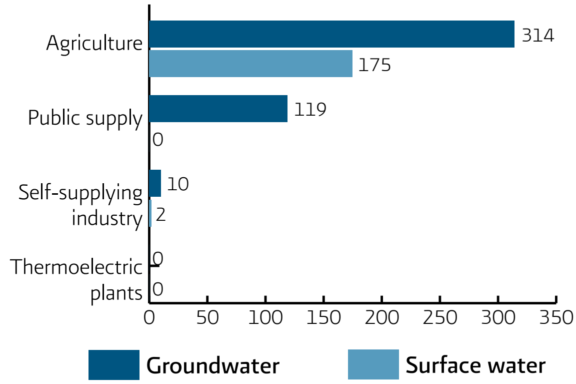
Offstream uses of water 2008



Agriculture	4 588	hm^3/year	(89.2%)
Public supply	476	hm^3/year	(9.3%)
Self-supplying industry	51	hm^3/year	(1.0%)
Thermoelectric plants	28	hm^3/year	(0.5%)
Total	5 143	hm^3/year	

Origin of the water used

Surface water	1 959	hm^3/year	(38.1%)
Groundwater	3 183	hm^3/year	(61.9%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	92.9 %
Urban	98.1 %
Rural	65.6 %

Improved sanitation coverage

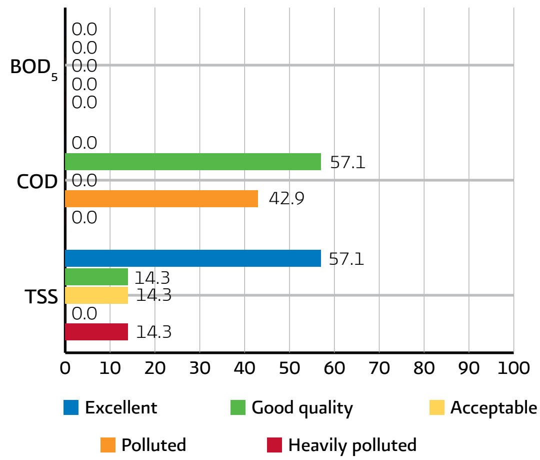
State-wide	89.8 %
Urban	96.5 %
Rural	54.4 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	0
COD	7
TSS	7

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	4
Capacity installed	0.650 m^3/s
Flow treated	0.380 m^3/s

Municipal wastewater

Number in operation	119
Capacity installed	8.718 m^3/s
Flow treated	5.928 m^3/s

Industrial wastewater

Number in operation	20
Capacity installed	0.663 m^3/s
Flow treated	0.287 m^3/s

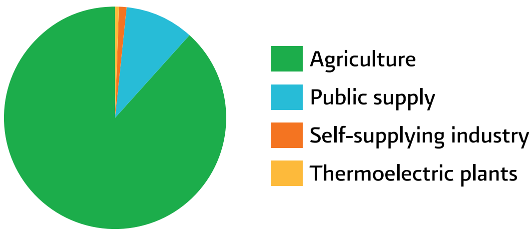
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

9. Durango

General data

Number of municipalities	39	
Total population 2008	1 547 516	inhabitants
Urban	1 060 513	inhabitants
Rural	487 003	inhabitants
Total population 2030	1 582 932	inhabitants
Normal annual precipitation 1971-2000	574	mm

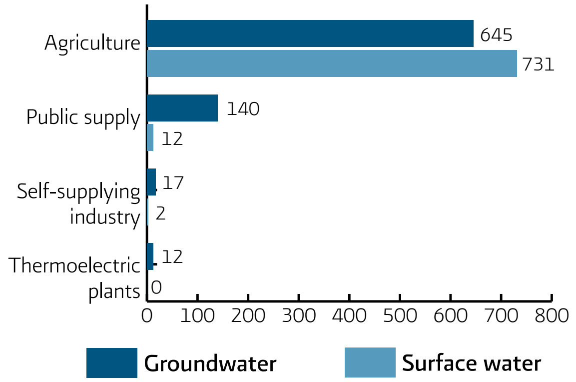
Offstream uses of water 2008



Agriculture	1 376	hm³/year	(88.2%)
Public supply	153	hm³/year	(9.8%)
Self-supplying industry	19	hm³/year	(1.2%)
Thermoelectric plants	12	hm³/year	(0.7%)
Total	1 560	hm³/year	

Origin of the water used

Surface water	746	hm³/year	(47.8%)
Groundwater	814	hm³/year	(52.2%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	90.9 %
Urban	98.9 %
Rural	74.8 %

Improved sanitation coverage

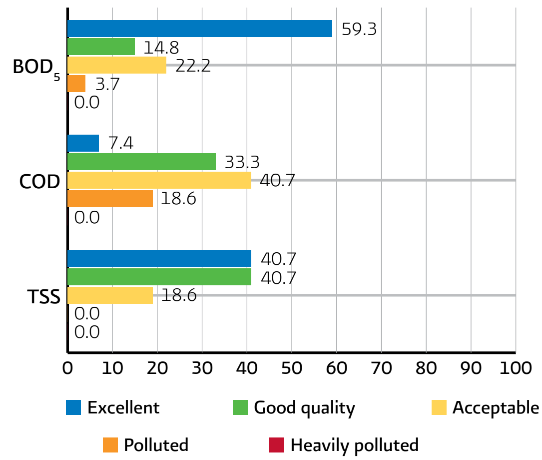
State-wide	82.6 %
Urban	95.4 %
Rural	56.9 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	27
COD	27
TSS	27

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	30
Capacity installed	0.030 m³/s
Flow treated	0.022 m³/s

Municipal wastewater

Number in operation	167
Capacity installed	3.551 m³/s
Flow treated	2.671 m³/s

Industrial wastewater

Number in operation	31
Capacity installed	0.677 m³/s
Flow treated	0.340 m³/s

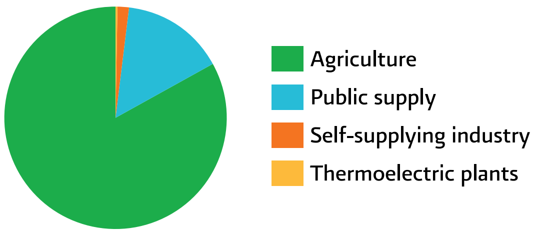
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

10. Guanajuato

General data

Number of municipalities	46	
Total population 2008	5 032 768	inhabitants
Urban	3 552 077	inhabitants
Rural	1 480 691	inhabitants
Total population 2030	5 278 030	inhabitants
Normal annual precipitation 1971-2000	595	mm

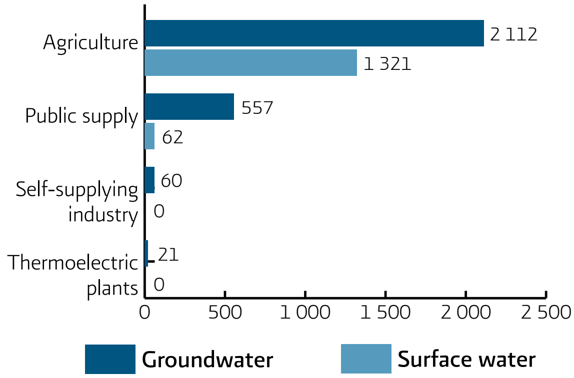
Offstream uses of water 2008



Agriculture	3 433	hm³/year	(83.1%)
Public supply	620	hm³/year	(15.0%)
Self-supplying industry	60	hm³/year	(1.5%)
Thermoelectric plants	21	hm³/year	(0.5%)
Total	4 134	hm³/year	

Origin of the water used

Surface water	1 383 hm³/year	(33.5%)
Groundwater	2 750 hm³/year	(66.5%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	93.4 %
Urban	96.8 %
Rural	85.7 %

Improved sanitation coverage

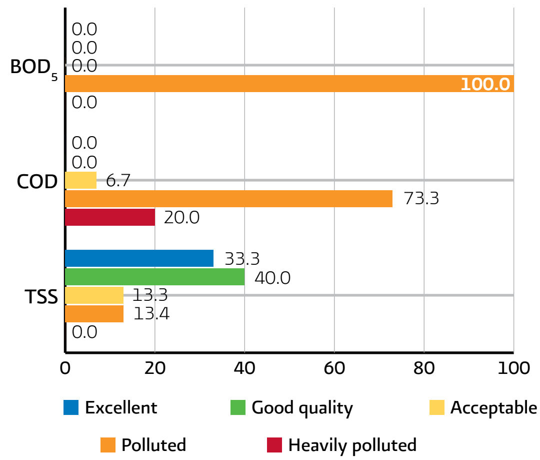
State-wide	85.8 %
Urban	96.6 %
Rural	61.1 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	1
COD	15
TSS	15

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	27
Capacity installed	0.375 m³/s
Flow treated	0.313 m³/s

Municipal wastewater

Number in operation	60
Capacity installed	5.790 m³/s
Flow treated	4.306 m³/s

Industrial wastewater

Number in operation	45
Capacity installed	0.398 m³/s
Flow treated	0.180 m³/s

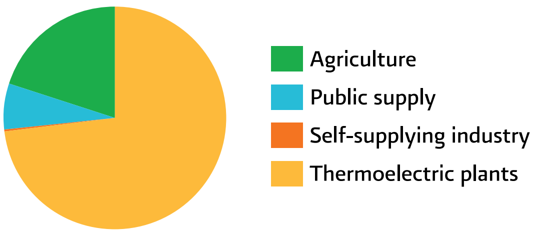
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

11. Guerrero

General data

Number of municipalities	81	
Total population 2008	3 143 093	inhabitants
Urban	1 801 117	inhabitants
Rural	1 341 976	inhabitants
Total population 2030	2 887 844	inhabitants
Normal annual precipitation 1971-2000	1 196	mm

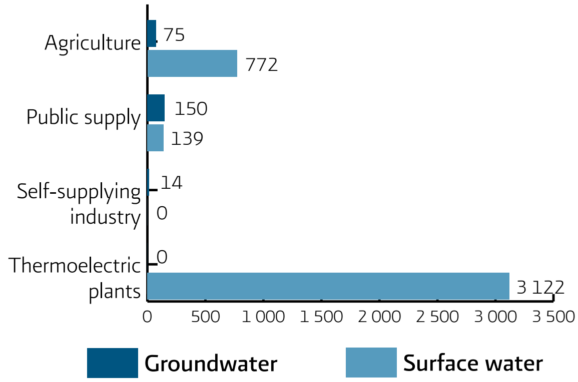
Offstream uses of water 2008



Agriculture	847	hm³/year	(19.8%)
Public supply	289	hm³/year	(6.8%)
Self-supplying industry	15	hm³/year	(0.3%)
Thermoelectric plants	3 122	hm³/year	(73.1%)
Total	4 272	hm³/year	

Origin of the water used

Surface water	4 033 hm³/year	(94.4%)
Groundwater	239 hm³/year	(5.6%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	68.0 %
Urban	81.3 %
Rural	50.4 %

Improved sanitation coverage

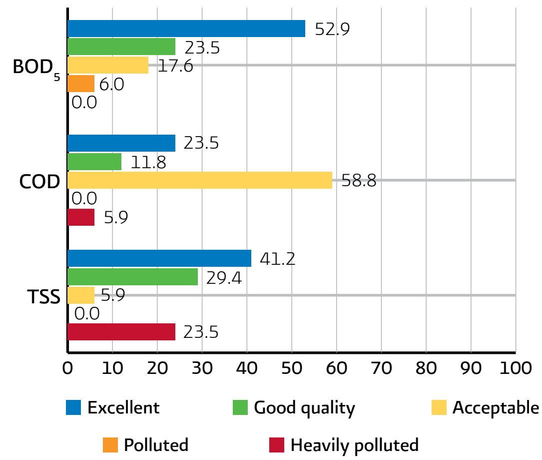
State-wide	64.2 %
Urban	85.0 %
Rural	36.6 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	17
COD	17
TSS	17

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	11
Capacity installed	3.278 m³/s
Flow treated	2.973 m³/s

Municipal wastewater

Number in operation	40
Capacity installed	2.001 m³/s
Flow treated	1.216 m³/s

Industrial wastewater

Number in operation	8
Capacity installed	0.055 m³/s
Flow treated	0.042 m³/s

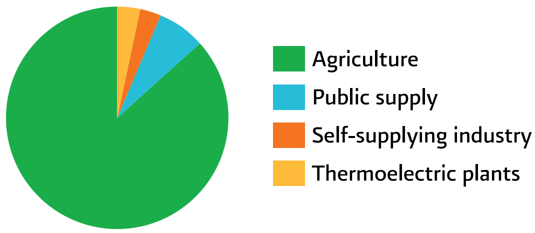
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

12. Hidalgo

General data

Number of municipalities	84	
Total population 2008	2 415 384	inhabitants
Urban	1 297 369	inhabitants
Rural	1 118 016	inhabitants
Total population 2030	2 573 581	inhabitants
Normal annual precipitation 1971-2000	829	mm

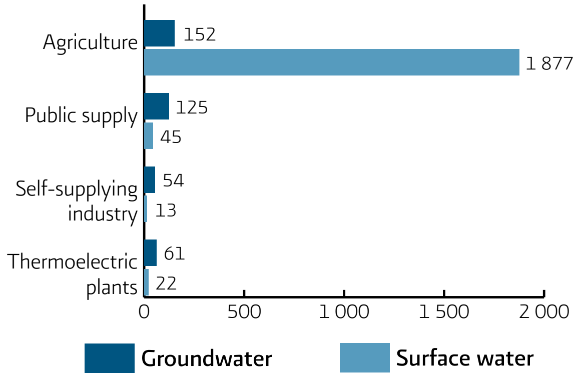
Offstream uses of water 2008



Agriculture	2 029	hm^3/year	(86.4%)
Public supply	170	hm^3/year	(7.2%)
Self-supplying industry	67	hm^3/year	(2.9%)
Thermoelectric plants	83	hm^3/year	(3.5%)
Total	2 348	hm^3/year	

Origin of the water used

Surface water	1 957	hm^3/year	(83.3%)
Groundwater	391	hm^3/year	(16.7%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	87.2 %
Urban	96.3 %
Rural	77.5 %

Improved sanitation coverage

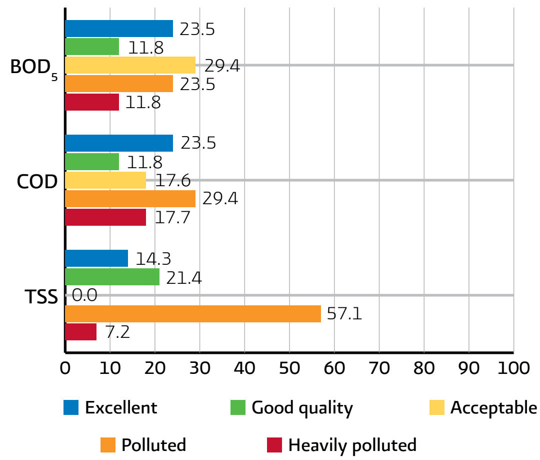
State-wide	79.1 %
Urban	94.8 %
Rural	62.1 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	17
COD	17
TSS	14

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	2
Capacity installed	0.130 m^3/s
Flow treated	0.130 m^3/s

Municipal wastewater

Number in operation	13
Capacity installed	0.326 m^3/s
Flow treated	0.282 m^3/s

Industrial wastewater

Number in operation	43
Capacity installed	2.415 m^3/s
Flow treated	1.295 m^3/s

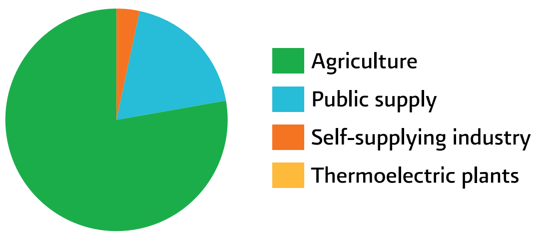
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

13. Jalisco

General data

Number of municipalities	125	
Total population 2008	6 988 697	inhabitants
Urban	6 069 338	inhabitants
Rural	919 359	inhabitants
Total population 2030	7 799 254	inhabitants
Normal annual precipitation 1971-2000	889	mm

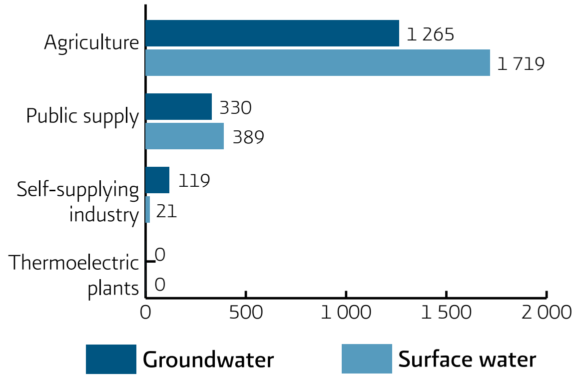
Offstream uses of water 2008



Agriculture	2 984	hm^3/year	(77.6%)
Public supply	719	hm^3/year	(18.7%)
Self-supplying industry	140	hm^3/year	(3.6%)
Thermoelectric plants	0	hm^3/year	(0.0%)
Total	3 843	hm^3/year	

Origin of the water used

Surface water	2 129 hm^3/year	(55.4%)
Groundwater	1 715 hm^3/year	(44.6%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	93.3 %
Urban	95.8 %
Rural	77.9 %

Improved sanitation coverage

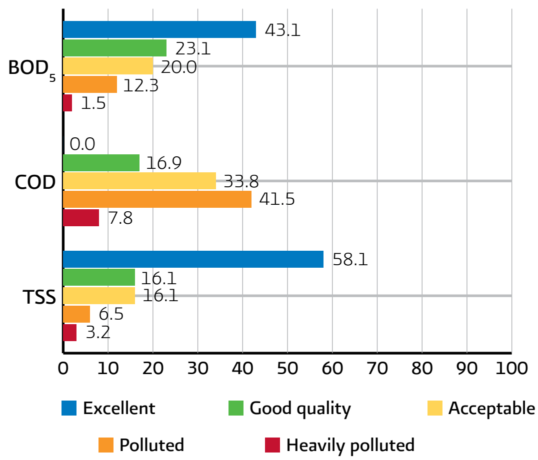
State-wide	95.8 %
Urban	98.2 %
Rural	81.0 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	65
COD	65
TSS	62

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	24
Capacity installed	16.197 m^3/s
Flow treated	9.490 m^3/s

Municipal wastewater

Number in operation	96
Capacity installed	3.767 m^3/s
Flow treated	3.494 m^3/s

Industrial wastewater

Number in operation	34
Capacity installed	1.511 m^3/s
Flow treated	1.511 m^3/s

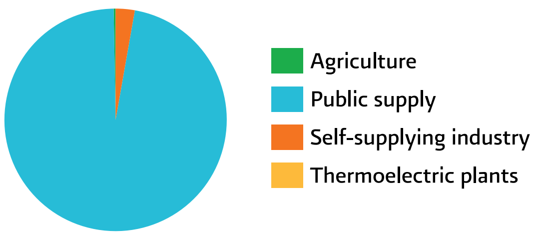
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

14. Mexico City (Federal District)

General data

Number of municipalities	16	
Total population 2008	8 838 981	inhabitants
Urban	8 806 675	inhabitants
Rural	32 306	inhabitants
Total population 2030	8 587 531	inhabitants
Normal annual precipitation 1971-2000	863	mm

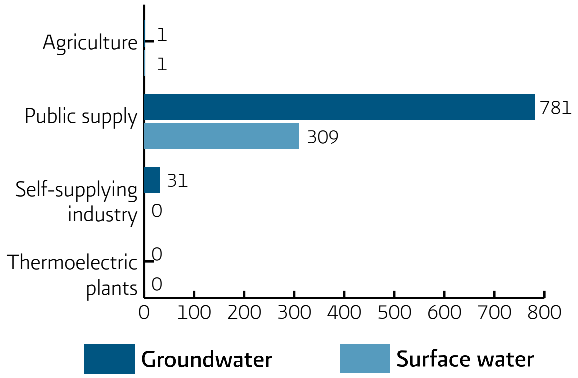
Offstream uses of water 2008



Agriculture	1	hm³/year	(0.1%)
Public supply	1 090	hm³/year	(97.1%)
Self-supplying industry	31	hm³/year	(2.8%)
Thermoelectric plants	0	hm³/year	(0.0%)
Total	1 122	hm³/year	

Origin of the water used

Surface water	310 hm³/year	(27.6%)
Groundwater	813 hm³/year	(72.4%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	97.6 %
Urban	97.8 %
Rural	41.7 %

Improved sanitation coverage

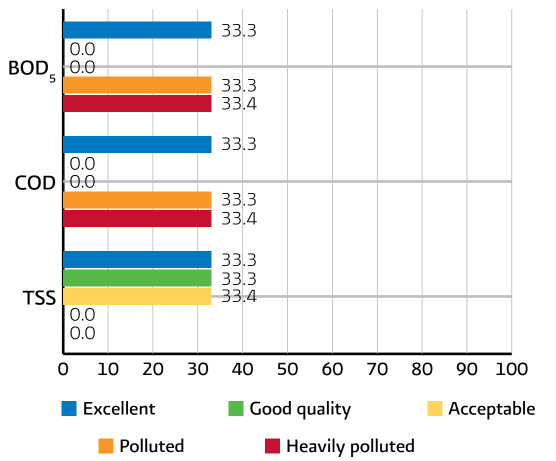
State-wide	98.6 %
Urban	98.6 %
Rural	86.6 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	3
COD	3
TSS	3

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	36
Capacity installed	4.617 m^3/s
Flow treated	3.644 m^3/s

Municipal wastewater

Number in operation	27
Capacity installed	6.481 m^3/s
Flow treated	3.123 m^3/s

Industrial wastewater

Number in operation	120
Capacity installed	0.397 m^3/s
Flow treated	0.391 m^3/s

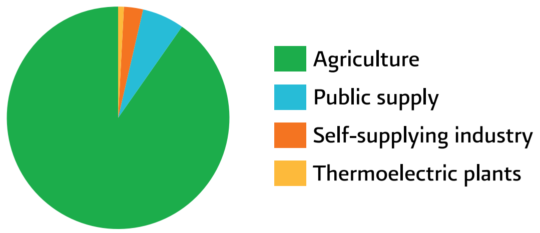
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

15. Michoacán de Ocampo

General data

Number of municipalities	113	
Total population 2008	3 970 987	inhabitants
Urban	2 707 717	inhabitants
Rural	1 263 270	inhabitants
Total population 2030	3 538 187	inhabitants
Normal annual precipitation 1971-2000	910	mm

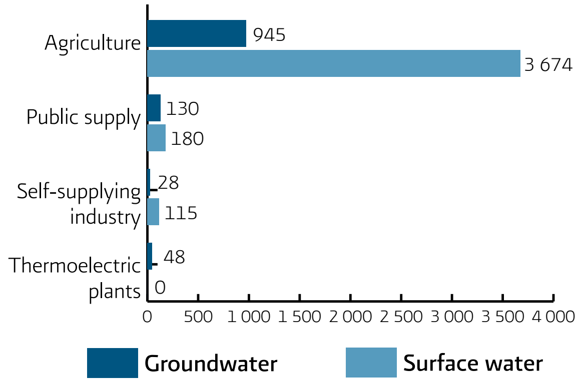
Offstream uses of water 2008



Agriculture	4 618	hm³/year	(90.2%)
Public supply	311	hm³/year	(6.1%)
Self-supplying industry	144	hm³/year	(2.8%)
Thermoelectric plants	48	hm³/year	(0.9%)
Total	5 121	hm³/year	

Origin of the water used

Surface water	3 969 hm³/year	(77.5%)
Groundwater	1 152 hm³/year	(22.5%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	89.4 %
Urban	95.1 %
Rural	77.7 %

Improved sanitation coverage

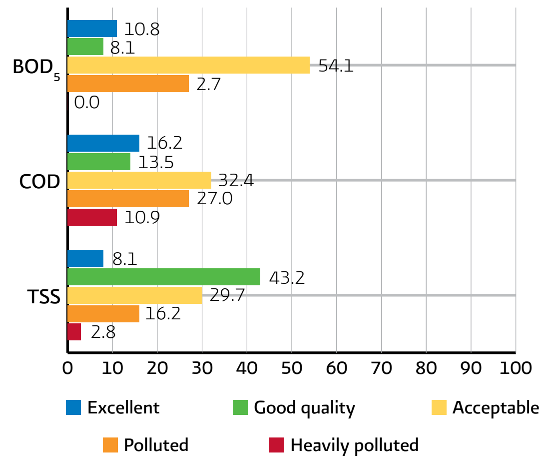
State-wide	84.2 %
Urban	93.0 %
Rural	66.1 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	37
COD	37
TSS	37

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	6
Capacity installed	2.945 m³/s
Flow treated	2.495 m³/s

Municipal wastewater

Number in operation	25
Capacity installed	3.557 m³/s
Flow treated	2.474 m³/s

Industrial wastewater

Number in operation	50
Capacity installed	3.810 m³/s
Flow treated	2.702 m³/s

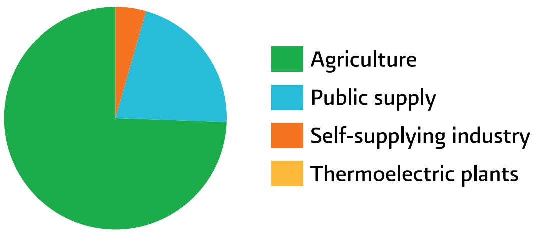
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

16. Morelos

General data

Number of municipalities	33	
Total population 2008	1 668 304	inhabitants
Urban	1 442 32	inhabitants
Rural	225 963	inhabitants
Total population 2030	1 858 697	inhabitants
Normal annual precipitation 1971-2000	976	mm

Offstream uses of water 2008



Agriculture	921	hm^3/year	(74.4%)
Public supply	261	hm^3/year	(21.0%)
Self-supplying industry	57	hm^3/year	(4.6%)
Thermoelectric plants	0	hm^3/year	(0.0%)
Total	1 239	hm^3/year	

Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	91.6 %
Urban	94.8 %
Rural	72.4 %

Improved sanitation coverage

State-wide	92.6 %
Urban	95.1 %
Rural	77.2 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	0
Capacity installed	0.000 m^3/s
Flow treated	0.000 m^3/s

Municipal wastewater

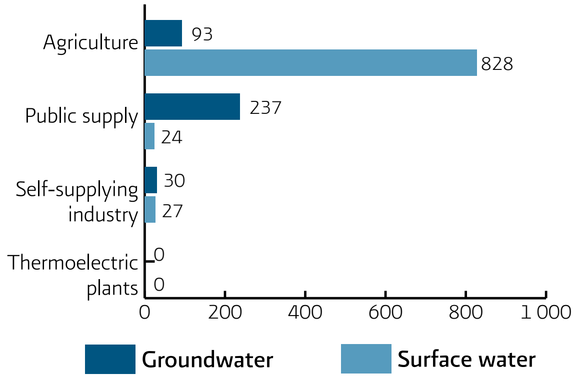
Number in operation	32
Capacity installed	1.603 m^3/s
Flow treated	1.214 m^3/s

Industrial wastewater

Number in operation	83
Capacity installed	2.751 m^3/s
Flow treated	2.645 m^3/s

Origin of the water used

Surface water	879	hm^3/year	(70.9%)
Groundwater	361	hm^3/year	(29.1%)

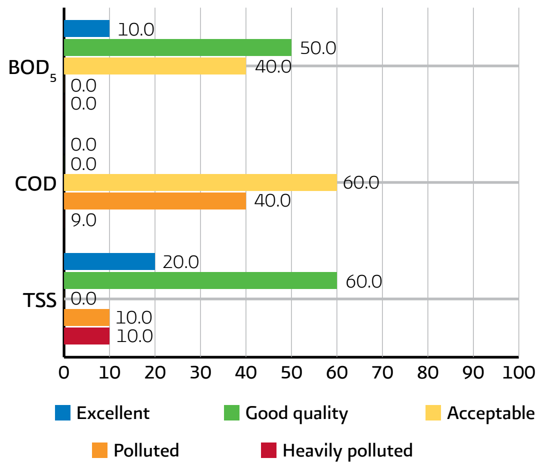


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	10
COD	10
TSS	10

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



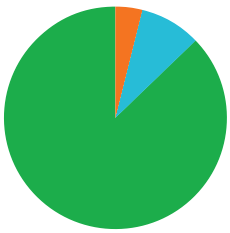
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

17. Nayarit

General data

Number of municipalities	20	
Total population 2008	968 268	inhabitants
Urban	656 264	inhabitants
Rural	312 005	inhabitants
Total population 2030	987 760	inhabitants
Normal annual precipitation 1971-2000	1 193	mm

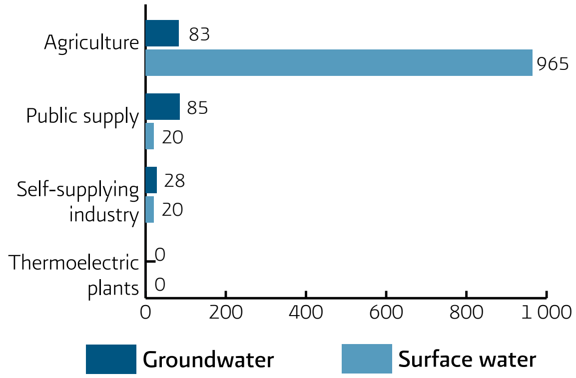
Offstream uses of water 2008



Agriculture	1 048	hm^3/year	(87.2%)
Public supply	106	hm^3/year	(8.8%)
Self-supplying industry	48	hm^3/year	(4.0%)
Thermoelectric plants	0	hm^3/year	(0.0%)
Total	1 202	hm^3/year	

Origin of the water used

Surface water	1 006 hm^3/year	(83.7%)
Groundwater	195 hm^3/year	(16.3%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	91.4 %
Urban	96.5 %
Rural	81.2 %

Improved sanitation coverage

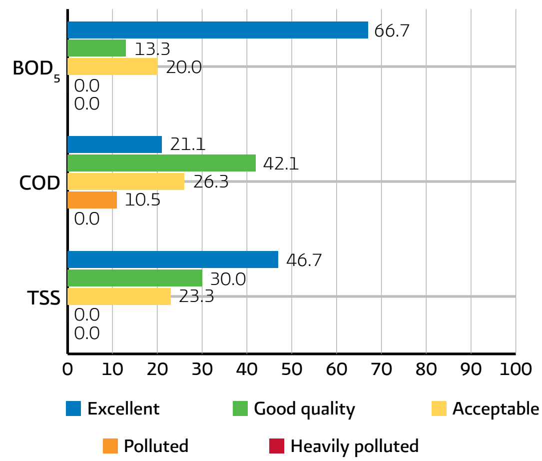
State-wide	90.9 %
Urban	97.7 %
Rural	77.6 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	30
COD	19
TSS	30

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	0
Capacity installed	0.000 m^3/s
Flow treated	0.000 m^3/s

Municipal wastewater

Number in operation	63
Capacity installed	2.029 m^3/s
Flow treated	1.228 m^3/s

Industrial wastewater

Number in operation	5
Capacity installed	0.164 m^3/s
Flow treated	0.164 m^3/s

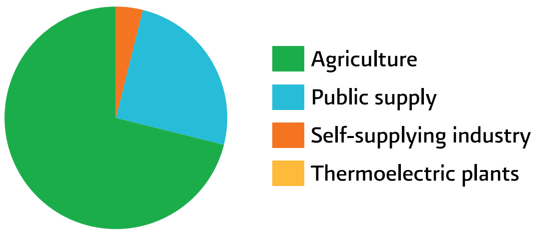
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

18. Nuevo León

General data

Number of municipalities	51	
Total population 2008	4 420 582	inhabitants
Urban	4 180 627	inhabitants
Rural	239 955	inhabitants
Total population 2030	5 406 220	inhabitants
Normal annual precipitation 1971-2000	589	mm

Offstream uses of water 2008



Agriculture	1 453	hm^3/year	(71.0%)
Public supply	512	hm^3/year	(25.0%)
Self-supplying industry	82	hm^3/year	(4.0%)
Thermoelectric plants	1	hm^3/year	(0.0%)
Total	2 047	hm^3/year	

Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	95.6 %
Urban	97.7 %
Rural	60.5 %

Improved sanitation coverage

State-wide	95.3 %
Urban	97.5 %
Rural	57.8 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	8
Capacity installed	14.404 m^3/s
Flow treated	7.085 m^3/s

Municipal wastewater

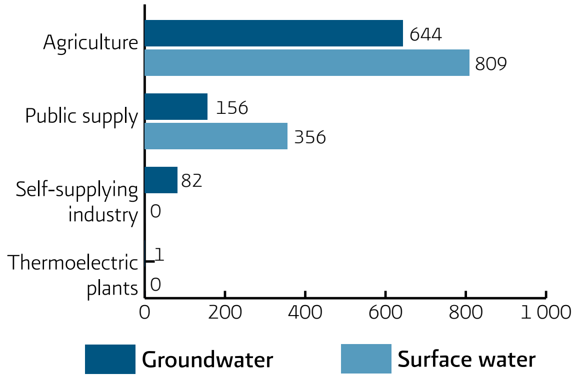
Number in operation	61
Capacity installed	13.244 m^3/s
Flow treated	11.646 m^3/s

Industrial wastewater

Number in operation	91
Capacity installed	4.131 m^3/s
Flow treated	3.000 m^3/s

Origin of the water used

Surface water	1 165 hm^3/year	(56.9%)
Groundwater	883 hm^3/year	(43.1%)

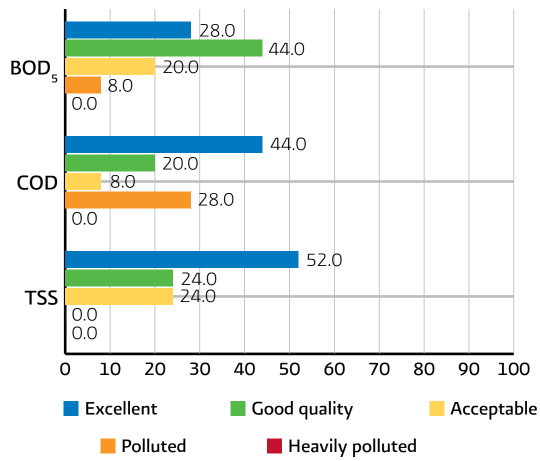


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	25
COD	25
TSS	25

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



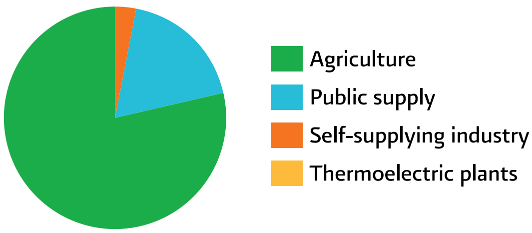
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

19. Oaxaca

General data

Number of municipalities	570	
Total population 2008	3 551 544	inhabitants
Urban	1 688 664	inhabitants
Rural	1 862 880	inhabitants
Total population 2030	3 402 505	inhabitants
Normal annual precipitation 1971-2000	1 183	mm

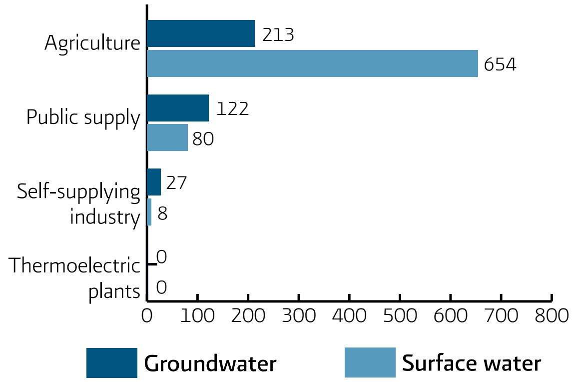
Offstream uses of water 2008



Agriculture	867	hm³/year	(78.6%)
Public supply	202	hm³/year	(18.3%)
Self-supplying industry	35	hm³/year	(3.2%)
Thermoelectric plants	0	hm³/year	(0.0%)
Total	1 103	hm³/year	

Origin of the water used

Surface water	741 hm³/year	(67.2%)
Groundwater	362 hm³/year	(32.8%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	73.3 %
Urban	84.7 %
Rural	63.4 %

Improved sanitation coverage

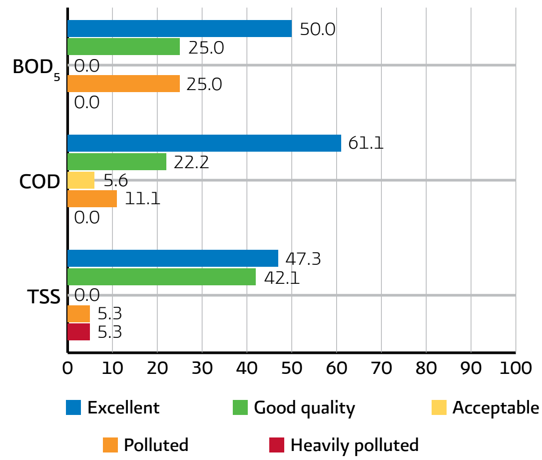
State-wide	60.0 %
Urban	84.0 %
Rural	39.2 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	4
COD	18
TSS	19

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	6
Capacity installed	1.291 m³/s
Flow treated	0.771 m³/s

Municipal wastewater

Number in operation	66
Capacity installed	1.510 m³/s
Flow treated	0.986 m³/s

Industrial wastewater

Number in operation	15
Capacity installed	1.221 m³/s
Flow treated	0.901 m³/s

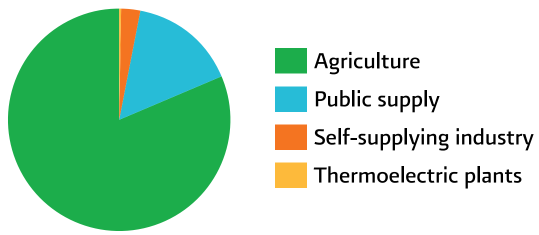
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

20. Puebla

General data

Number of municipalities	217	
Total population 2008	5 623 566	inhabitants
Urban	4 042 417	inhabitants
Rural	1 581 149	inhabitants
Total population 2030	6 536 966	inhabitants
Normal annual precipitation 1971-2000	1 040	mm

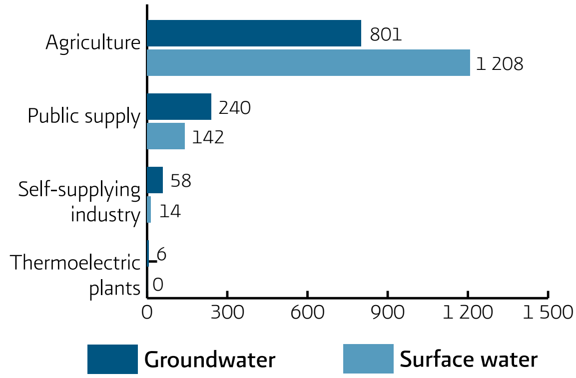
Offstream uses of water 2008



Agriculture	2 009	hm^3/year	(81.3%)
Public supply	382	hm^3/year	(15.5%)
Self-supplying industry	72	hm^3/year	(2.9%)
Thermoelectric plants	6	hm^3/year	(0.3%)
Total	2 469	hm^3/year	

Origin of the water used

Surface water	1 363 hm^3/year	(55.2%)
Groundwater	1 106 hm^3/year	(44.8%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	85.4 %
Urban	90.3 %
Rural	74.0 %

Improved sanitation coverage

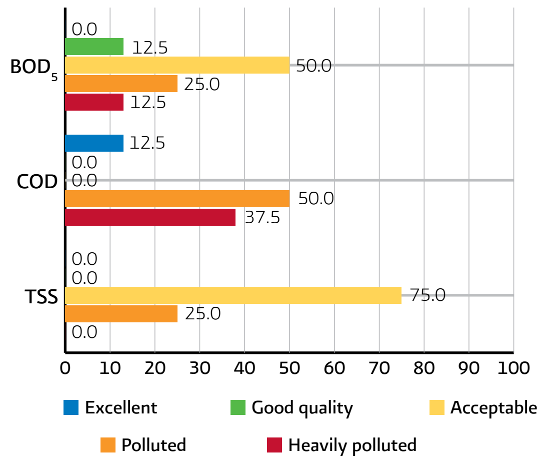
State-wide	79.0 %
Urban	89.9 %
Rural	53.6 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	8
COD	8
TSS	8

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	4
Capacity installed	0.715 m^3/s
Flow treated	0.545 m^3/s

Municipal wastewater

Number in operation	69
Capacity installed	3.023 m^3/s
Flow treated	2.426 m^3/s

Industrial wastewater

Number in operation	96
Capacity installed	2.874 m^3/s
Flow treated	2.624 m^3/s

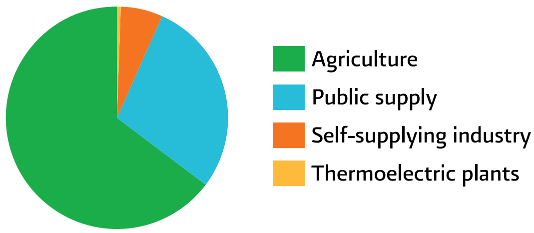
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

21. Querétaro

General data

Number of municipalities	18	
Total population 2008	1 705 299	inhabitants
Urban	1 214 337	inhabitants
Rural	490 962	inhabitants
Total population 2030	2 306 838	inhabitants
Normal annual precipitation 1971-2000	736	mm

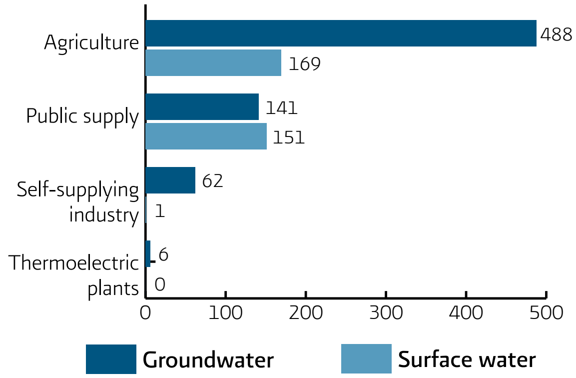
Offstream uses of water 2008



Agriculture	657	hm^3/year	(64.6%)
Public supply	292	hm^3/year	(28.7%)
Self-supplying industry	62	hm^3/year	(6.1%)
Thermoelectric plants	6	hm^3/year	(0.6%)
Total	1 018	hm^3/year	

Origin of the water used

Surface water	321 hm^3/year	(31.5%)
Groundwater	697 hm^3/year	(68.5%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	93.7 %
Urban	97.9 %
Rural	84.3 %

Improved sanitation coverage

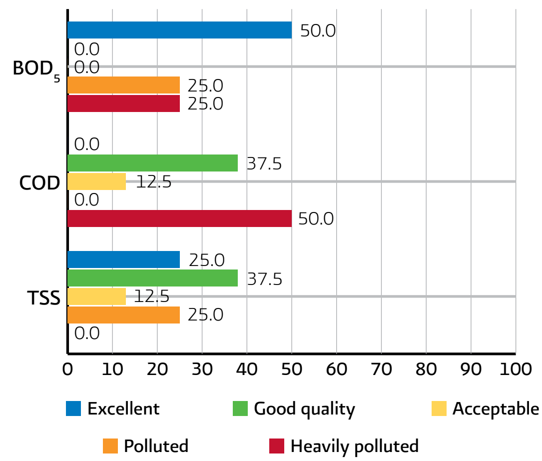
State-wide	85.6 %
Urban	95.1 %
Rural	64.1 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	8
COD	8
TSS	8

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	6
Capacity installed	0.269 m^3/s
Flow treated	0.212 m^3/s

Municipal wastewater

Number in operation	67
Capacity installed	1.120 m^3/s
Flow treated	0.716 m^3/s

Industrial wastewater

Number in operation	107
Capacity installed	1.104 m^3/s
Flow treated	0.507 m^3/s

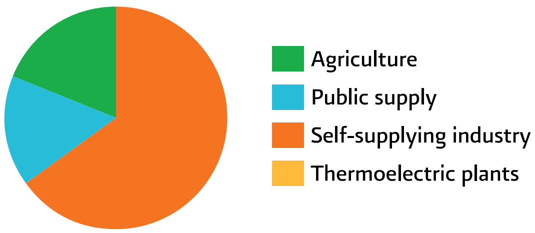
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

22. Quintana Roo

General data

Number of municipalities	9	
Total population 2008	1 290 575	inhabitants
Urban	1 119 745	inhabitants
Rural	170 830	inhabitants
Total population 2030	2 454 389	inhabitants
Normal annual precipitation 1971-2000	1 237	mm

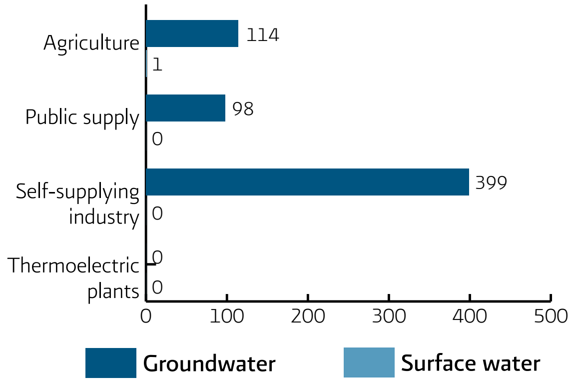
Offstream uses of water 2008



Agriculture	115	hm³/year	(18.7%)
Public supply	98	hm³/year	(16.1%)
Self-supplying industry	399	hm³/year	(65.2%)
Thermoelectric plants	0	hm³/year	(0.0%)
Total	612	hm³/year	

Origin of the water used

Surface water	1	hm³/year	(0.2%)
Groundwater	611	hm³/year	(99.8%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	94.5 %
Urban	96.1 %
Rural	85.8 %

Improved sanitation coverage

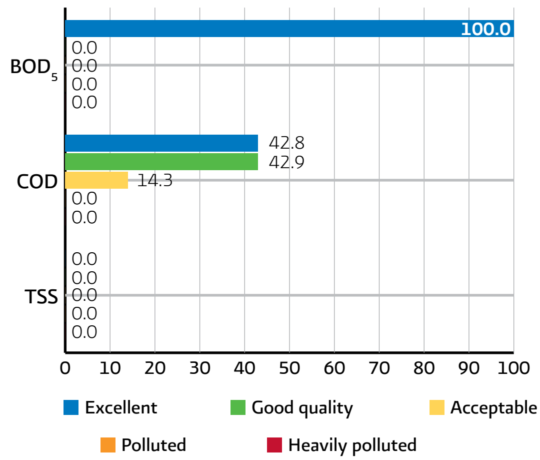
State-wide	89.5 %
Urban	95.9 %
Rural	53.9 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	7
COD	7
TSS	0

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	0
Capacity installed	0.000 m³/s
Flow treated	0.000 m³/s

Municipal wastewater

Number in operation	29
Capacity installed	2.077 m³/s
Flow treated	1.601 m³/s

Industrial wastewater

Number in operation	2
Capacity installed	0.011 m³/s
Flow treated	0.005 m³/s

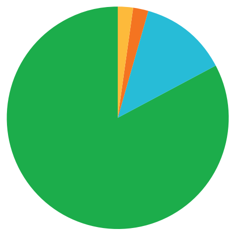
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

23. San Luis Potosí

General data

Number of municipalities	58	
Total population 2008	2 479 314	inhabitants
Urban	1 574 609	inhabitants
Rural	904 705	inhabitants
Total population 2030	2 598 934	inhabitants
Normal annual precipitation 1971-2000	699	mm

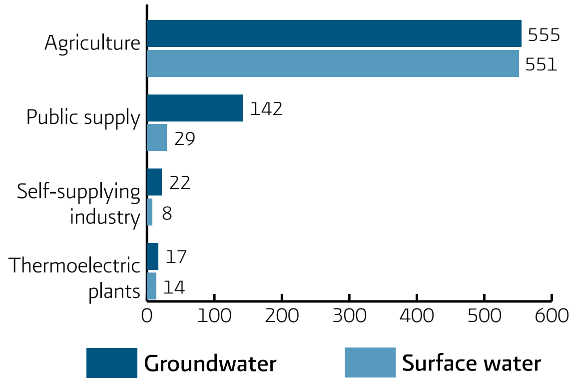
Offstream uses of water 2008



Agriculture	1 105	hm^3/year	(82.7%)
Public supply	171	hm^3/year	(12.8%)
Self-supplying industry	30	hm^3/year	(2.2%)
Thermoelectric plants	31	hm^3/year	(2.3%)
Total	1 337	hm^3/year	

Origin of the water used

Surface water	601	hm^3/year	(45.0%)
Groundwater	736	hm^3/year	(55.0%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	82.7 %
Urban	97.5 %
Rural	58.2 %

Improved sanitation coverage

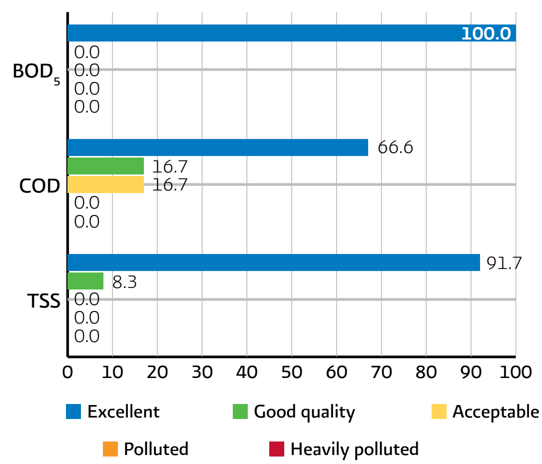
State-wide	74.2 %
Urban	93.2 %
Rural	42.8 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	12
COD	12
TSS	12

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	14
Capacity installed	1.315 m^3/s
Flow treated	0.957 m^3/s

Municipal wastewater

Number in operation	21
Capacity installed	2.125 m^3/s
Flow treated	1.740 m^3/s

Industrial wastewater

Number in operation	74
Capacity installed	1.266 m^3/s
Flow treated	0.632 m^3/s

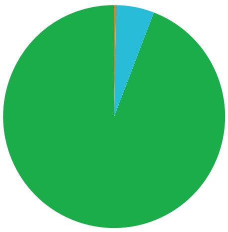
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

24. Sinaloa

General data

Number of municipalities	18	
Total population 2008	2 650 391	inhabitants
Urban	1 888 789	inhabitants
Rural	761 602	inhabitants
Total population 2030	2 612 436	inhabitants
Normal annual precipitation 1971-2000	730	mm

Offstream uses of water 2008



Agriculture	8 656	hm³/year	(94.0%)
Public supply	508	hm³/year	(5.5%)
Self-supplying industry	43	hm³/year	(0.5%)
Thermoelectric plants	0	hm³/year	(0.0%)
Total	9 207	hm³/year	

Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	93.1 %
Urban	98.3 %
Rural	80.6 %

Improved sanitation coverage

State-wide	86.4 %
Urban	94.8 %
Rural	66.3 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	142
Capacity installed	9.067 m³/s
Flow treated	7.224 m³/s

Municipal wastewater

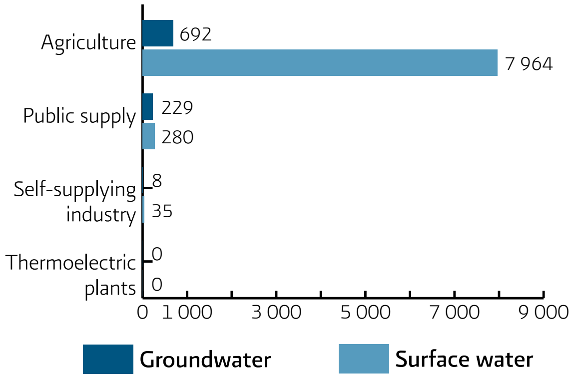
Number in operation	136
Capacity installed	5.281 m³/s
Flow treated	4.510 m³/s

Industrial wastewater

Number in operation	47
Capacity installed	3.157 m³/s
Flow treated	0.848 m³/s

Origin of the water used

Surface water	8 278	hm³/year	(89.9%)
Groundwater	928	hm³/year	(10.1%)

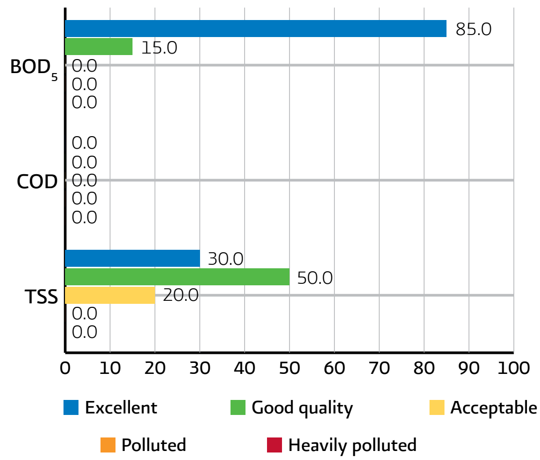


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	20
COD	0
TSS	20

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



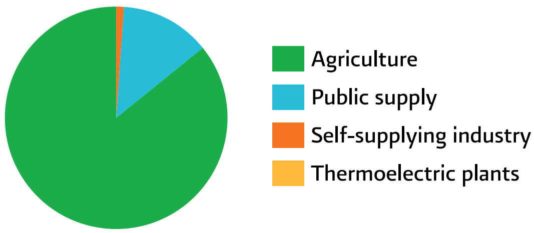
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

25. Sonora

General data

Number of municipalities	72	
Total population 2008	2 499 085	inhabitants
Urban	2 156 557	inhabitants
Rural	342 529	inhabitants
Total population 2030	2 845 433	inhabitants
Normal annual precipitation 1971-2000	419	mm

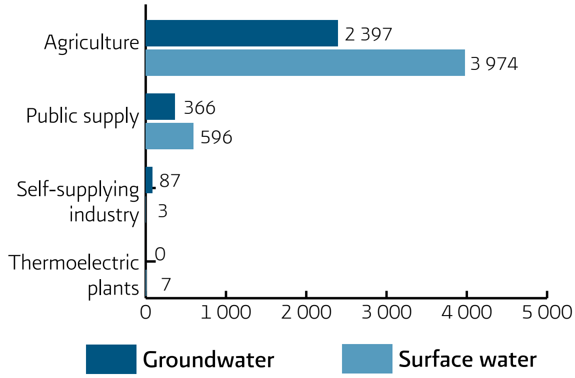
Offstream uses of water 2008



Agriculture	6 371	hm^3/year	(85.7%)
Public supply	962	hm^3/year	(12.9%)
Self-supplying industry	90	hm^3/year	(1.2%)
Thermoelectric plants	7	hm^3/year	(0.1%)
Total	7 430	hm^3/year	

Origin of the water used

Surface water	4 580 hm^3/year	(61.6%)
Groundwater	2 850 hm^3/year	(38.4%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	95.2 %
Urban	96.6 %
Rural	87.0 %

Improved sanitation coverage

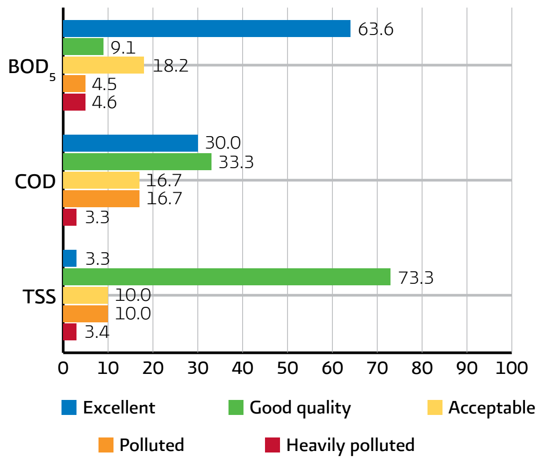
State-wide	85.4 %
Urban	92.3 %
Rural	44.3 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	22
COD	30
TSS	30

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	24
Capacity installed	4.130 m^3/s
Flow treated	2.098 m^3/s

Municipal wastewater

Number in operation	76
Capacity installed	4.447 m^3/s
Flow treated	3.093 m^3/s

Industrial wastewater

Number in operation	23
Capacity installed	0.359 m^3/s
Flow treated	0.159 m^3/s

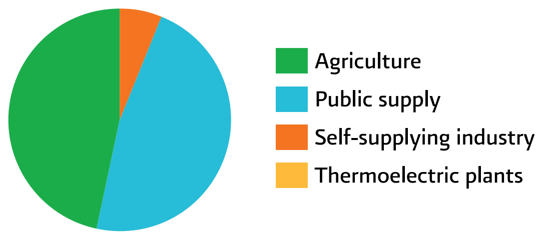
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

26. State of Mexico

General data

Number of municipalities	125	
Total population 2008	14 737 822	inhabitants
Urban	12 886 485	inhabitants
Rural	1 851 337	inhabitants
Total population 2030	18 114 304	inhabitants
Normal annual precipitation 1971-2000	847	mm

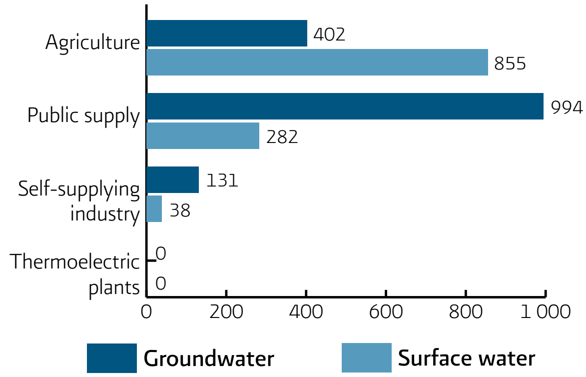
Offstream uses of water 2008



Agriculture	1 257	hm^3/year	(46.5%)
Public supply	1 276	hm^3/year	(47.2%)
Self-supplying industry	169	hm^3/year	(6.3%)
Thermoelectric plants	0	hm^3/year	(0.0%)
Total	2 702	hm^3/year	

Origin of the water used

Surface water	1 175	hm^3/year	(43.5%)
Groundwater	1 527	hm^3/year	(56.5%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	93.2 %
Urban	95.6 %
Rural	77.4 %

Improved sanitation coverage

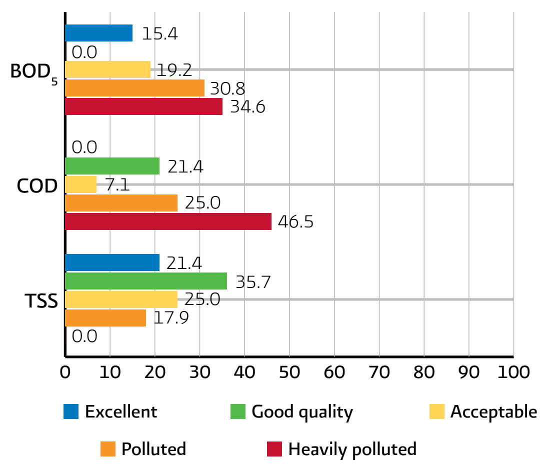
State-wide	91.2 %
Urban	96.0 %
Rural	59.9 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	26
COD	28
TSS	28

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	11
Capacity installed	22.164 m^3/s
Flow treated	16.739 m^3/s

Municipal wastewater

Number in operation	78
Capacity installed	7.090 m^3/s
Flow treated	5.190 m^3/s

Industrial wastewater

Number in operation	319
Capacity installed	4.568 m^3/s
Flow treated	3.211 m^3/s

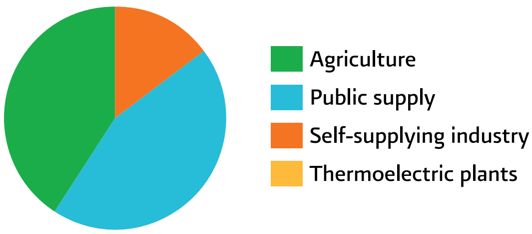
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

27. Tabasco

General data

Number of municipalities	17	
Total population 2008	2 045 247	inhabitants
Urban	1 124 351	inhabitants
Rural	920 896	inhabitants
Total population 2030	2 168 004	inhabitants
Normal annual precipitation 1971-2000	2 095	mm

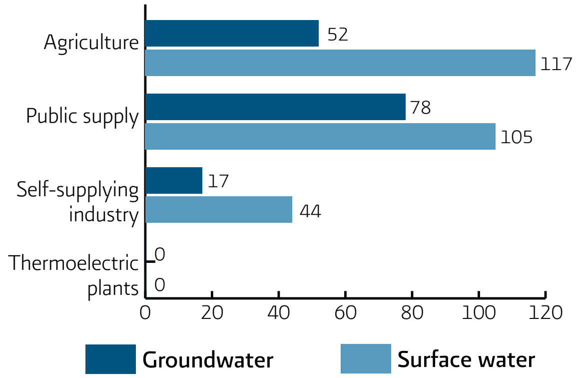
Offstream uses of water 2008



Agriculture	169 hm³/year	(40.8%)
Public supply	183 hm³/year	(44.3%)
Self-supplying industry	62 hm³/year	(14.9%)
Thermoelectric plants	0 hm³/year	(0.0%)
Total	414 hm³/year	

Origin of the water used

Surface water	267 hm³/year	(64.4%)
Groundwater	147 hm³/year	(35.6%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	76.4 %
Urban	88.7 %
Rural	61.5 %

Improved sanitation coverage

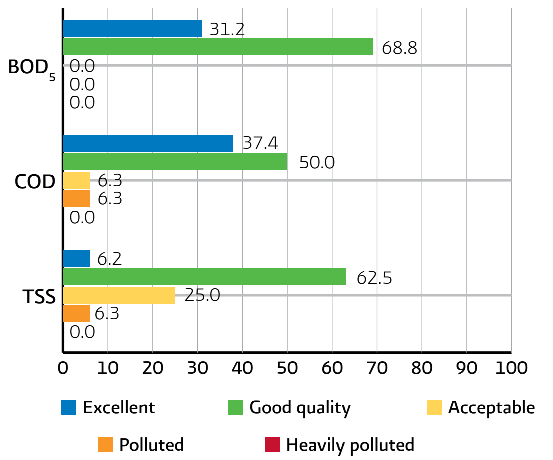
State-wide	93.4 %
Urban	97.8 %
Rural	88.1 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	16
COD	16
TSS	16

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	37
Capacity installed	10.411 m³/s
Flow treated	6.596 m³/s

Municipal wastewater

Number in operation	72
Capacity installed	1.850 m³/s
Flow treated	1.309 m³/s

Industrial wastewater

Number in operation	115
Capacity installed	1.276 m³/s
Flow treated	0.150 m³/s

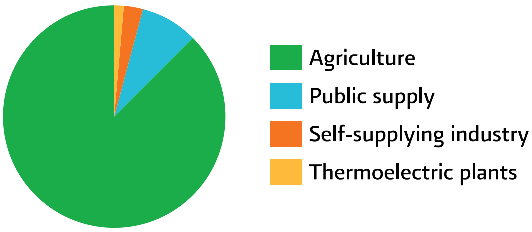
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

28. Tamaulipas

General data

Number of municipalities	43	
Total population 2008	3 173 982	inhabitants
Urban	2 788 280	inhabitants
Rural	385 703	inhabitants
Total population 2030	3 829 639	inhabitants
Normal annual precipitation 1971-2000	760	mm

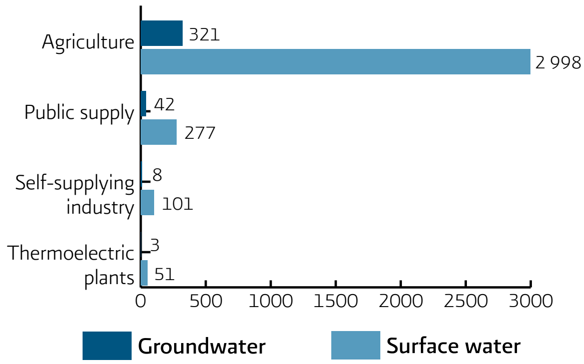
Offstream uses of water 2008



Agriculture	3 319	hm³/year	(87.3%)
Public supply	318	hm³/year	(8.4%)
Self-supplying industry	109	hm³/year	(2.9%)
Thermoelectric plants	54	hm³/year	(1.4%)
Total	3 800	hm³/year	

Origin of the water used

Surface water	3 427	hm³/year	(90.2%)
Groundwater	374	hm³/year	(9.8%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	94.7 %
Urban	97.8 %
Rural	74.3 %

Improved sanitation coverage

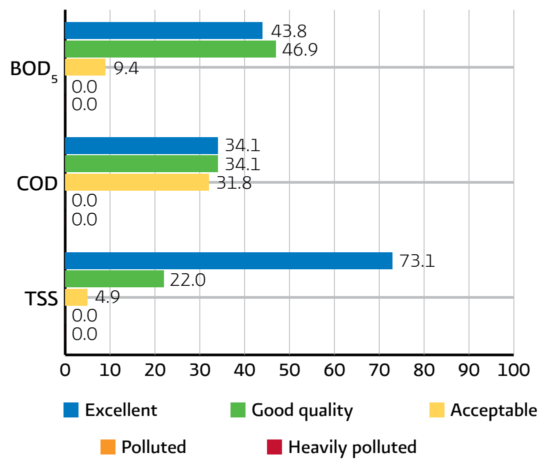
State-wide	82.4 %
Urban	90.5 %
Rural	27.7 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	32
COD	41
TSS	41

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	54
Capacity installed	14.345 m³/s
Flow treated	11.438 m³/s

Municipal wastewater

Number in operation	39
Capacity installed	5.614 m³/s
Flow treated	4.051 m³/s

Industrial wastewater

Number in operation	46
Capacity installed	1.643 m³/s
Flow treated	1.118 m³/s

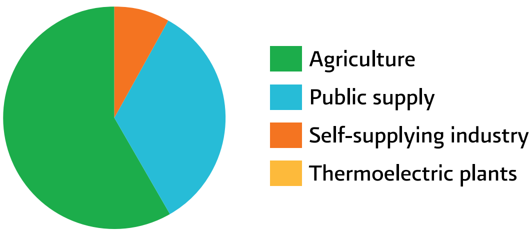
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

29. Tlaxcala

General data

Number of municipalities	60	
Total population 2008	1 127 332	inhabitants
Urban	893 619	inhabitants
Rural	233 713	inhabitants
Total population 2030	1 408 991	inhabitants
Normal annual precipitation 1971-2000	700	mm

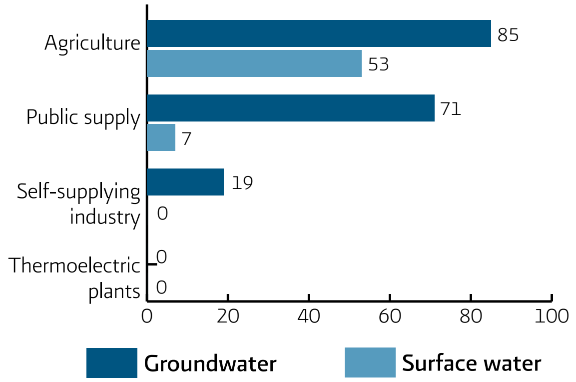
Offstream uses of water 2008



Agriculture	137	hm^3/year	(58.3%)
Public supply	79	hm^3/year	(33.4%)
Self-supplying industry	20	hm^3/year	(8.3%)
Thermoelectric plants	0	hm^3/year	(0.0%)
Total	236	hm^3/year	

Origin of the water used

Surface water	60 hm^3/year	(25.6%)
Groundwater	175 hm^3/year	(74.4%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	97.3 %
Urban	97.9 %
Rural	95.3 %

Improved sanitation coverage

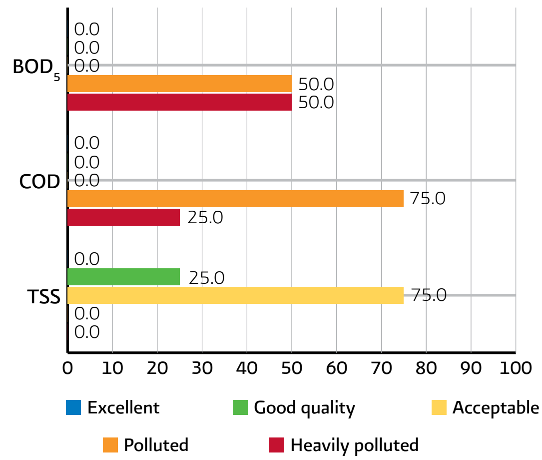
State-wide	90.6 %
Urban	92.8 %
Rural	82.8 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	4
COD	4
TSS	4

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	0
Capacity installed	0.000 m^3/s
Flow treated	0.000 m^3/s

Municipal wastewater

Number in operation	52
Capacity installed	1.232 m^3/s
Flow treated	0.872 m^3/s

Industrial wastewater

Number in operation	106
Capacity installed	0.249 m^3/s
Flow treated	0.218 m^3/s

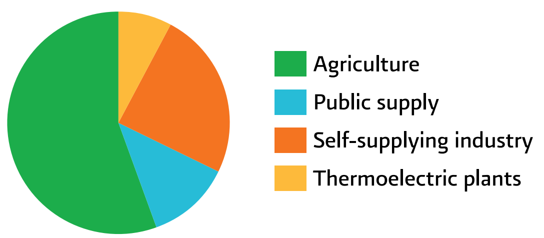
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

30. Veracruz de Ignacio de la Llave

General data

Number of municipalities	212	
Total population 2008	7 269 905	inhabitants
Urban	4 455 994	inhabitants
Rural	2 813 911	inhabitants
Total population 2030	7 373 459	inhabitants
Normal annual precipitation 1971-2000	1 617	mm

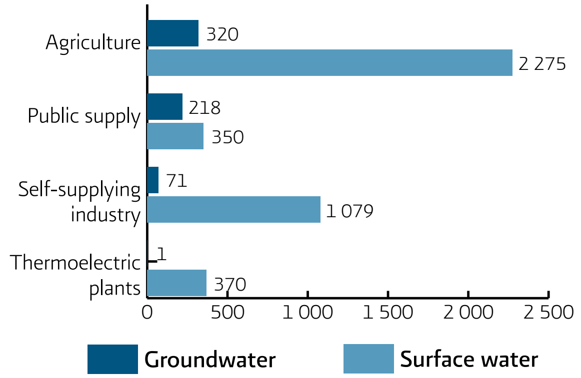
Offstream uses of water 2008



Agriculture	2 595	hm^3/year	(55.4%)
Public supply	569	hm^3/year	(12.1%)
Self-supplying industry	1 150	hm^3/year	(24.5%)
Thermoelectric plants	370	hm^3/year	(7.9%)
Total	4 684	hm^3/year	

Origin of the water used

Surface water	4 073	hm^3/year	(87.0%)
Groundwater	611	hm^3/year	(13.0%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	76.3 %
Urban	89.2 %
Rural	56.7 %

Improved sanitation coverage

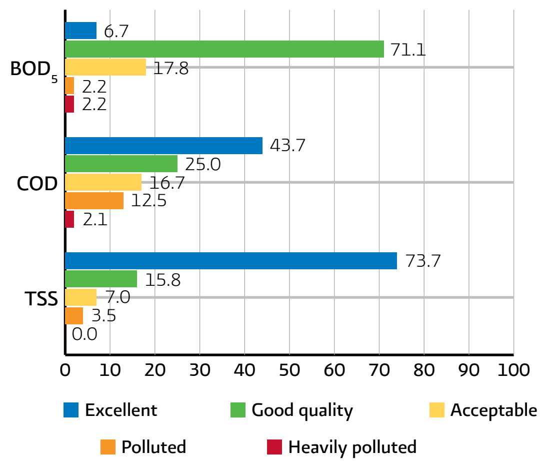
State-wide	77.7 %
Urban	93.3 %
Rural	54.0 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	45
COD	48
TSS	57

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	13
Capacity installed	6.912 m^3/s
Flow treated	4.394 m^3/s

Municipal wastewater

Number in operation	92
Capacity installed	5.428 m^3/s
Flow treated	3.171 m^3/s

Industrial wastewater

Number in operation	161
Capacity installed	11.623 m^3/s
Flow treated	8.649 m^3/s

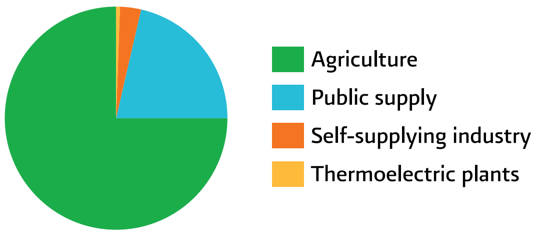
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

31. Yucatán

General data

Number of municipalities	106	
Total population 2008	1 910 023	inhabitants
Urban	1 588 194	inhabitants
Rural	321 829	inhabitants
Total population 2030	2 391 751	inhabitants
Normal annual precipitation 1971-2000	1 062	mm

Offstream uses of water 2008



Agriculture	867	hm³/year	(75.0%)
Public supply	245	hm³/year	(21.2%)
Self-supplying industry	34	hm³/year	(3.0%)
Thermoelectric plants	9	hm³/year	(0.8%)
Total	1 156	hm³/year	

Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	96.1 %
Urban	96.7 %
Rural	93.7 %

Improved sanitation coverage

State-wide	68.2 %
Urban	74.9 %
Rural	36.5 %

Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	0
Capacity installed	0.000 m³/s
Flow treated	0.000 m³/s

Municipal wastewater

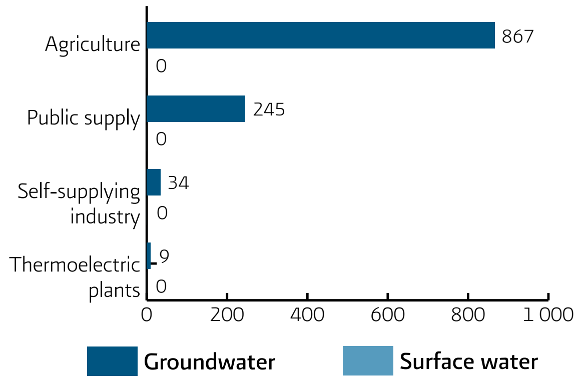
Number in operation	13
Capacity installed	0.079 m³/s
Flow treated	0.069 m³/s

Industrial wastewater

Number in operation	36
Capacity installed	0.114 m³/s
Flow treated	0.071 m³/s

Origin of the water used

Surface water	0 hm³/year	(0.0%)
Groundwater	1 156 hm³/year	(100.0%)

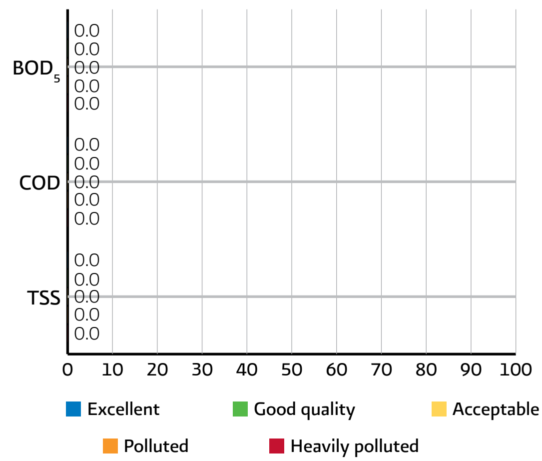


Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	0
COD	0
TSS	0

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



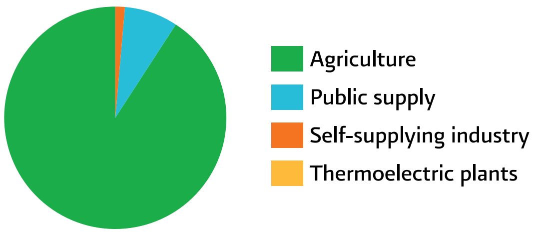
NOTE: The projection considers the population interpolated as of December 31st of the year in question.

32. Zacatecas

General data

Number of municipalities	58	
Total population 2008	1 380 576	inhabitants
Urban	803 204	inhabitants
Rural	577 372	inhabitants
Total population 2030	1 280 431	inhabitants
Normal annual precipitation 1971-2000	463	mm

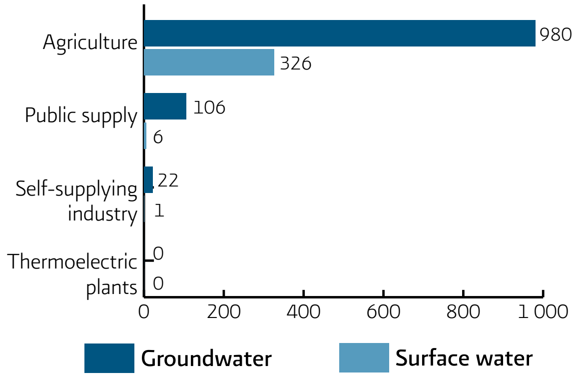
Offstream uses of water 2008



Agriculture	1 306	hm³/year	(90.6%)
Public supply	113	hm³/year	(7.8%)
Self-supplying industry	23	hm³/year	(1.6%)
Thermoelectric plants	0	hm³/year	(0.0%)
Total	1 441	hm³/year	

Origin of the water used

Surface water	333 hm³/year	(23.1%)
Groundwater	1 108 hm³/year	(76.9%)



Drinking water and improved sanitation coverage 2005

Drinking water coverage

State-wide	92.8 %
Urban	98.6 %
Rural	85.2 %

Improved sanitation coverage

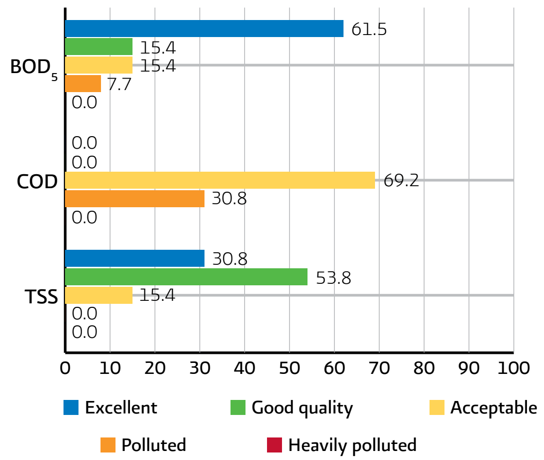
State-wide	84.2 %
Urban	96.1 %
Rural	68.4 %

Surface water quality 2008

Number of monitoring sites by water quality indicator

BOD_5	13
COD	13
TSS	13

Percentage distribution of monitoring sites according to the indicator and water quality classification scale



Treatment plants (as of December 2008)

Municipal treatment plants

Number in operation	44
Capacity installed	0.007 m³/s
Flow treated	0.007 m³/s

Municipal wastewater

Number in operation	45
Capacity installed	0.546 m³/s
Flow treated	0.461 m³/s

Industrial wastewater

Number in operation	9
Capacity installed	0.156 m³/s
Flow treated	0.044 m³/s

NOTE: The projection considers the population interpolated as of December 31st of the year in question.

Annex C. Characteristics of the hydrological regions

Hydrological region	Continental land extension (km²)	Normal annual precipitation 1971-2000 (mm)	Mean natural internal surface runoff (hm³/year)	Imports (+) or exports (-) from other countries (hm³/year)	Total mean natural surface runoff (hm³/year)	Number of watersheds
1. Baja California Northwest	28 492	249	359		359	16
2. Baja California Central-West	44 314	103	449		449	16
3. Baja California Southwest	29 722	184	318		318	15
4. Baja California Northeast	14 418	190	105		105	8
5. Baja California Central-East	13 626	101	54		54	15
6. Baja California Southeast	11 558	274	219		219	14
7. Colorado River	6 911	107	13	1 850	1 863	1
8. Sonora North	61 429	304	139		139	5
9. Sonora South	139 370	505	4 935		4 935	16
10. Sinaloa	103 483	713	14 408		14 408	23
11. Presidio-San Pedro	51 717	818	7 956		7 956	23
12. Lerma-Santiago	132 916	723	13 637		13 637	58
13. River Huicicila	5 225	1387	1 277		1 277	6
14. River Ameca	12 255	1020	2 236		2 236	9
15. Jalisco Coast	12 967	1175	3 684		3 684	11
16. Armería-Coahuayana	17 628	908	3 986		3 986	10
17. Michoacán Coast	9 205	888	1 612		1 612	6
18. Balsas	118 268	952	17 057		17 057	15
19. Greater Guerrero Coast	12 132	1234	6 091		6 091	28
20. Lower Guerrero Coast	39 936	1391	18 714		18 714	32
21. Oaxaca Coast	10 514	967	3 389		3 389	19
22. Tehuantepec	16 363	821	2 606		2 606	15
23. Chiapas Coast	12 293	2347	9 604	2 950	12 554	25
24. Bravo-Conchos	229 740	453	5 588	- 432	5 156	37
25. San Fernando-Soto La Marina	54 961	757	4 328		4 328	45
26. Panuco	96 989	892	20 330		20 330	77
27. North of Veracruz	26 592	1427	14 306		14 306	12
28. Papaloapan	57 355	1460	49 951		49 951	18
29. Coatzacoalcos	30 217	1946	39 482		39 482	15
30. Grijalva-Usumacinta	102 465	1709	73 466	44 080	117 546	83
31. Yucatán West	25 443	1229	591		591	2
32. Yucatán North	58 135	1091	0		0	0
33. Yucatán East	38 308	1243	1 125	864	1 989	1
34. Closed Catchments of the North	90 829	404	1 701		1 701	22
35. Mapimí	62 639	361	957		957	6
36. Nazas-Aguanaval	93 032	425	1 912		1 912	16
37. El Salado	87 801	431	2 637		2 637	8
TOTAL	1 959 248	760	329 218	49 312	378 530	728

NOTE: This information refers to the mean data determined through the latest studies carried out.
SOURCE: CONAGUA. Deputy Director General's Office for Technical Affairs.

Annex D. Bibliography

[Translator's note: When the original publications referred to in the various chapters of this English-language publication are in Spanish translations, the titles given are translations of the originals. In those cases, it is quoted below in Spanish, and the English-language translation is given in brackets and italics after the original]

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- CONEVAL. *Informe Ejecutivo de pobreza en México* (Executive Summary of Poverty in Mexico). Mexico, 2007.
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Chapter 6

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- CONAGUA. *Programa Nacional Hídrico 2007-2012* (National Water Resources Program 2007-2012). Mexico, 2008.
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- *Ley Federal de Derechos 2009 y 2010* (Federal Duties Law 2009 and 2010). Mexico, 2010.

Annex E. Glossary

Allocation. A deed granted by the Federal Executive Branch to municipalities or states in order to use the nation's waters, destined to public urban or domestic water services, in which case it is termed in Spanish an "asignación", or for the use of the nation's waters and public inherent goods to individuals or companies, be they private or public, in which case they are termed a "concesión".[a]

Aquifer. Any geological formation or group of geological formations connected by water, through which subsoil water flows or is stored that may be withdrawn for use and whose lateral and vertical limits are conventionally defined for the purpose of the evaluation, management and administration of the nation's subsoil water.[a]

Artificial recharge. A set of hydrogeological techniques applied to introduce water to an aquifer, through purpose-built infrastructure.[h]

Availability zone. For the purpose of the payment of water duties, the municipalities in the Mexican Republic have been classified into nine availability zones. This classification is contained in the Federal Duties Law.

Blue water. The quantity of water withdrawn from the country's rivers, lakes, streams and aquifers for various uses, both offstream and instream.

Drinking water and sanitation system. A series of infrastructure and actions that allow public drinking water and sanitation services to be provided, including sewerage, which contemplates the piping, treatment, removal and discharge of wastewater.[a]

Drinking water coverage. Percentage of the population living in private homes with running water within the home or on the lot, or with access to a public water tap or hydrant. This information is determined by means of censuses carried out by the INEGI and estimates from the CONAGUA for intermediate years.

Duty collection. In terms of the water sector, the amount charged to taxpayers for the use of the nation's waters, as well as wastewater discharges and for the use of inherent goods associated with water.

Federal zone. Ten-meter strips adjacent to channels, currents or reservoirs which belong to the nation, measured horizontally from the normal pool elevation. The width of the bank or federal zone is five meters in channels with a width of less than five meters.[a]

Green water. The quantity of water that is part of the soil humidity and that is used for rainfed crops and general vegetation.

Gross Domestic Product. The total value of goods and services produced in the territory of a country in a given period, free from duplicity.[d]

Groundwater withdrawal. The volume of water that is artificially withdrawn from a hydrogeological unit for various uses.[b]

Hurricane. A tropical cyclone in which the maximum sustained wind reaches or surpasses 119 km/h.

Hydrological region. A territorial area shaped according to its morphological, orographical and hydrological features, in which the watershed is considered as the basic unit for water management.

Improved sanitation. The collection and transportation of wastewater and the treatment both of this wastewater and the by-products generated through these activities, in such a way that its discharge produces the minimal impact possible on the environment.[e]

Improved sanitation coverage. The percentage of the population living in private housing, with an overflow connected to the public sanitation network, a septic tank, river, lake, sea, ravine or crevice. This information is determined through the censuses carried out by INEGI and estimates from the CONAGUA for intermediate years.

Incidental recharge. A recharge that is the result of some sort of human activity and that does not have specific infrastructure for artificial recharge.[h]

Irrigation. Application of water to crops through infrastructure, in comparison with crops that only receive precipitation, which are known as rainfed crops.

Irrigation District. A geographical area where irrigation services are provided by means of hydro-agricultural infrastructure works.

Irrigation sheet. The quantity of water, measured in longitudinal units, which is applied to a crop so that it may meet its physiological needs during the entire growth cycle, in addition to soil evaporation.

Mean natural availability. The total volume of renewable surface water and groundwater that occurs naturally in a region.

Mean natural surface runoff. The part of mean historical precipitation that occurs in the form of flows into a watercourse.

Natural recharge. The recharge generated by direct infiltration from precipitation, from surface runoff into channels or from water stored in water bodies.[h]

Normal pool elevation (NPE). For reservoirs, this is the equivalent of the elevation of the weir crest in the case of a freely-flowing structure; if it has floodgates, this refers to the highest level of water.

Particular discharge conditions. The series of physical, chemical and biological parameters, and of their maximum permitted levels in wastewater discharges, determined by the CONAGUA or by the corresponding River Basin Organization, according to their respective areas of competence, for each user, for a specific use or user group of a specific receiver body, with the purpose of conserving and controlling the water quality, in accordance with the 2004 National Water Law and the By-Laws derived from that Law.[a]

Perennial crops. Crops whose maturation cycle is more than one year long.

Permits. Permits are granted by the Federal Executive Branch through the CONAGUA or by the corresponding River Basin Organization, for the use of the nation's waters, as well as for the construction of hydraulic works and others of diverse origins related with water and national goods referred to in Article 113 of the 2004 National Water Law.

Physically irrigated surface. An area that is watered at least once in a given period of time.

Precipitation. Water that falls from the atmosphere in liquid or solid form, onto the earth's surface; including dew, drizzle, rain, hail, sleet and snow.[c]

Productivity of water in Irrigation Districts. The quantity of agricultural produce from all crops in the Irrigation Districts to which irrigation has been applied, divided by the quantity of water applied to them. It is presented in kg/m^3.

Receiving body. The current or natural water tank, dam, channel, salt-water zone or national good into which wastewater is discharged, as well as the grounds into which this water is filtered or injected, when it can pollute the soil, subsoil or aquifers.[a]

Renewable water resources. The total amount of water that can feasibly be used every year. Renewable water resources are calculated as the annual unaltered surface runoff, plus the mean annual aquifer recharge, plus water imports from other regions or countries, minus the water exports to other regions or countries.

Reuse. The use of wastewater with or without prior treatment.[a]

Rural locality. A locality with a population of less than 2 500 inhabitants, which is not a municipal seat.

Saltwater intrusion. A phenomenon in which saltwater enters the subsoil towards the inner land mass, causing groundwater salinization.

Surface water withdrawal. The volume of water that is artificially withdrawn from channels and surface water reservoirs for different uses.[b]

Tariff. The unit price established by the competent authorities for the provision of public drinking water, sewerage and sanitation services.[f]

Technified Rainfed District. Also known as Drainage Districts, TDRs are geographical area intended for agricultural activities but which lacks irrigation infrastructure, in which, through the use of certain techniques and infrastructure, the damage to production caused by periods of strong rain through abundant, prolonged rainfall is mitigated, or in conditions of scarcity, rain and humidity are used with greater efficiency on agricultural grounds.[a]

The nation's water. Water resources that are the property of the nation, according to the terms of paragraph 5 of article 27 of the Political Constitution of the United Mexican States.[a]

Total capacity of a reservoir. The volume of water that a reservoir can store at the Normal Pool Elevation (NPE).

Total recharge. The volume of water that enters a hydrogeological unit, in a given time period.[h]

Urban locality. A locality with a population equal to or more than 2 500 inhabitants or a municipal seat, regardless of the number of inhabitants it has as of the previous census.

Use. The application of water in activities aimed at withdrawing chemical or organic elements dissolved in it, after which it is returned to its natural source without significant consumption.[a]

Virtual water. The sum of the quantity of water employed in the productive process for the elaboration of a product.

Wastewater. Water of varied composition coming from discharges from public urban, domestic, industrial, commercial, service, agricultural, livestock, from treatment plants and in general from any other use, as well as any combination of them.[a]

Water footprint. The sum of the quantity of water used by each person for his or her different activities and which is necessary to produce the goods and services that he or she consumes. This concept includes both blue and green water.

Water stress. A percentage indicator of the stress placed on water resources, calculated by the quotient between the total volume of water allocated and the natural mean availability of water.

Water utility. A body in charge of and responsible for drinking water supply in quantity and quality to the locality where the domestic taps are located.[g]

Wetlands. Transition zones between aquatic and terrestrial systems that constitute temporary or permanent flood areas, subject or not to the influence of tides, such as swamps, marshes and mudflats, the limits of which are made up by a type of moisture-absorbing vegetation, either permanent or seasonal; areas in which the soil is predominantly water-based; and lake areas or areas of permanently humid soils through natural aquifer discharge.[a]

NOTE: The glossary is a compilation of various sources, with the aim of illustrating the different concepts employed in this document. They do not therefore constitute legally binding definitions.

SOURCE :
[a] National Water Law. 2004.
[b] Official Mexican Standard NOM-011-CNA -2000, Conservation of water resources – which establishes the specifications and the method to determine the mean annual availability of the nation's waters. 2002.
[c] INEGI. Dictionary of surface hydrology data. Scales 1:250 000 and 1:1 000 000 (Alphanumeric). 2000.
[d] Centro de Estudios de las Finanzas Públicas (Center for Studies on Public Finances). Glosario de Términos más Usuales de las Finanzas Públicas (Glossary of the most common terms in Public Finances). 2006.
[e] Revista del Colegio de Ingenieros de Caminos, Canales y Puertos (Magazine of the College of Road, Canal and Port Engineers). El saneamiento. Historia reciente, estado actual y perspectivas de futuro (Sanitation. Recent history, current status and future perspectives). 1995.
[f] Mexican Standard NMX-AA-147-SCFI-2008, Drinking water, sewerage and sanitation services - Tariff – Methodology for Tariff Evaluation. 2008.
[g] Official Mexican Standard NOM-002-CNA-1995, Domestic outlets for public water supply -Specifications and testing methods. 1996.
[h] Official Mexican Standard NOM-014-CONAGUA-2003, Requirements for artificial aquifer recharge with treated wastewater. 2009.sea, ravine or crevice. This information is determined through the censuses carried out by INEGI and estimates from the CONAGUA for intermediate years.

Annex F. Abbreviations and acronyms

BANOBRAS	National Bank of Public Works and Services
BOD_5	Five-day Biochemical Oxygen Demand
CDI	National Commission for the Development of Indigenous Peoples
CEAS	State Water and Sanitation Commission
CFE	Federal Commission for Electricity
CIAT	International Centre for Tropical Agriculture
COD	Chemical Oxygen Demand
COFEPRIS	Federal Commission for Protection against Health Risks
CONABIO	National Commission for the Knowledge and Use of Biodiversity
CONAFOVI	National Commission for Housing Promotion
CONAGUA	National Water Commission
CONAPO	National Population Council
CONEVAL	National Council for Evaluation of the Social Development Policy
COTAS	Technical Groundwater Committee
CPL	Clean Beach Committee
CRAE	Regional Emergency Attention Centers
CRED	Centre for Research on the Epidemiology of Disasters
D.R.	Irrigation District
D.F.	Federal District (Mexico City)
DOF	Official Government Gazette
ENOE	National Inquiry of Occupation and Employment
ETM	Enhanced Thematic Mapper
FAO	Food and Agriculture Organization
FONDEN	National Fund for Natural Disasters
GDP	Gross Domestic Product
GWI	Global Water Intelligence
IAH	International Association of Hydrogeologists
IBWC	International Boundary and Water Commission
ICOLD	International Commission on Large Dams
IEA	International Energy Agency
INE	National Institute of Ecology
INEGI	National Institute for Statistics and Geography (formerly the National Institute for Statistics, Geography and Informatics)
INH	National Wetlands Inventory
IPCC	Intergovernmental Panel on Climate Change
ITAM	Autonomous Technological Institute of Mexico
LAN	National Water Law
LFD	Federal Duties Law
MDGs	Millennium Development Goals
MLN	Most Likely Number
MT	Master Table
NADM	North American Drought Monitor
NAICS	North American Industry Classification System

Annex F. Abbreviations and acronyms

NASA	National Aeronautics and Space Administration
NMX	Mexican Standard
NWRP	National Water Resources Program
NOM	Official Mexican Standard
NPE	Normal pool elevation
PI	Private Initiative
PND	National Development Plan
PNH	National Water Program
PROFEPA	Attorney General's Office for Environmental Protection
PROMAGUA	Program for the Modernization of Water Utilities
PROSSAPYS	Program for the Construction and Rehabilitation of Drinking Water and Sanitation Systems in Rural Areas
REPDA	Public Registry of Water Duties
SAGARPA	Ministry of Agriculture, Livestock, Rural Development, Fisheries and Food
SCFI	Ministry of Trade and Industrial Promotion (obsolete, employed in the names of NOMs)
SECTUR	Ministry of Tourism
SEDESOL	Ministry of Social Development
SEEAW	System of Environmental- Economic Accounting for Water
SEGOB	Ministry of the Interior
SEMAR	Ministry of the Navy
SEMARNAT	Ministry of the Environment and Natural Resources
SHCP	Ministry of Finance and Public Credit
SIAP	Agro-Food and Fishing Information Service
SIG	Geographical Information System
SPE	Surcharge Pool Elevation
SPOT	Satellite for the Observation of the Earth
SRTM	Shuttle Radar Topography Model
SS	Ministry of Health
SSA	Ministry of Healthiness and Assistance (obsolete, employed in the names of NOMs)
STPS	Ministry of Work and Social Welfare
TSS	Total Suspended Solids
UN	United Nations
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNESCO	United Nations Education, Science and Culture Organization
UNISDR	United Nations International Strategy for Disaster Reduction
UNSD	United Nations Statistics Division
WB	World Bank
WHO	World Health Organization
WMO	World Meteorological Organization
WQI	Water Quality Index
ZM	Metropolitan Zone
ZMVM	Metropolitan Zone of the Valley of Mexico
ZOFEMATAC	Federal Land Maritime Zone and Coastal Environment

Annex G. Units of measurement and explanatory notes

Due to the rounding up or down of numbers, the sums in the tables, both in terms of values and percentages, do not necessarily add up to the totals given in the tables.

In the tables in the accompanying DVD, the original values employed can be consulted. In general, all available significant figures are conserved, applying the rounding up or down to the representation of the number through formatting tools, rather than with changes to the number itself.

The units used in this document are expressed according to the Official Mexican Standard NOM-008-SCFI-2002-General Measurement Unit Systems, except as regards the use of the comma as a decimal point; in this case, the period is used.

It should be mentioned that "billions" in this document are considered as per the modern (short scale) English usage, meaning 109 or one thousand millions.

Baseline units, derived or conserved for their use by NOM-008-SCFI-2002

Symbol	Unit	Equivalences
cm	centimeter	1 cm = 0.01 m
ha	hectare	1 ha = 10 000 m^2 = 2.47 acres
hm^3	cubic hectometer	1 hm^3 = 1 000 000 m^3
kg	kilogram	1 kg = 1 000 g
km/h	kilometer per hour	1 km/h = 0.2778 m/s
km^2	square kilometer	1 km^2 = 1 000 000 m^2
km^3	cubic kilometer	1 km^3 = 1 000 000 000 m^3
L, l	liter	1 L = 0.2642 gal
L/s, l/s	liter per second	1 L/s = 0.001 m^3/s
m	meter	1 m = 3.281 ft
m^3	cubic meter	1 m^3 = 0.000810 AF
m^3/s	cubic meter per second	1 m^3/s = 35.3 cfs
mm	millimeter	1 mm = 0.001 m
mm	millimeter	1 mm = 0.0394 in
t	metric tonne	1 t = 1 000 kg
W	watt	1 W = 1 m^2 kg/s^3

Prefixes to form multiples

Symbol	Name	Value
T	tera	10^{12}
G	giga	10^9
M	mega	10^6
k	kilo	10^3
h	hecto	10^2
c	centi	10^{-2}
m	milli	10^{-3}

Units not included in NOM-008-SCFI-2002

Symbol	Unit	Equivalences
AF	acre-foot	1 AF = 1233 m^3
cfs	cubic foot per second	1 cfs = 0.0283 m^3/s
ft	foot	1 foot = 0.3048 m
gal	gallon	1 gal = 3.785 L
in	inch	1 in = 25.4 mm
inhab	inhabitants	Not applicable
MAF	million acre-feet	1 MAF = 1.23 km^3
MASL	meters above sea level	Not applicable
pesos	Mexican pesos	1 Mexican peso = 0.0743 United States dollars = 0.0535 Euros *
ppm	parts per million	1 ppm = 0.001 g/L
USD	United States dollar	1 United States dollar = 13.4591 Mexican pesos *

* The exchange rate was considered in June 2009.
Examples of measurement:
1 m^3 = 1 000 liters
1 hm^3 = 1 000 000 m^3
1 km^3 = 1 000 hm^3 = 1 000 000 000 m^3
1 TWh = 1 000 GWh = 1 000 000 MWh

Annex H. Analytical Index

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