Statistics on Water in Mexico, 2011 edition

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Statistics on Water in Mexico, 2011 edition

National Water Commission

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Cover image: Composition with the headdress (copilli or penacho) of Tlaloc, the God of rain, according to the Aztec vision of the world, based on the Codex Borgia.

Introduction

This publication includes eight chapters through which the reader can consult the most relevant information on water in Mexico, at the national, regional and state levels, under different headings.

This edition, like the previous ones, is published thanks to the support of the different areas of the National Water Commission of Mexico (CONAGUA), as well as other institutions that provide information on related aspects, which allows the different sections to be put together, and thus allow for a detailed overview to be drawn up of the situation as regards water in Mexico and its relationship with other themes.

We have aimed to present our readers with historical series with the greatest possible range of data. Between the different editions of the book, variations can be identified in the figures stated, which are the consequence of a greater precision in the data, due to results of studies available at the time of going to press.

This publication has evolved over the course of time and will continue evolving in the future. In this way, we aspire in a short period of time to have an on-line edition and to be able to make available to readers the databases and historical series on our institution's website, for their rapid consultation.

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.

Tlaloc abstraction from the Codex Borgia

Contents

Geographical and socio-economic context

1

1.1 Geographical and demographic aspects

The United Mexican States extend over a surface area of 1.964 million km², of which 1.959 million km² corresponds to the mainland area and the remainder to its islands. The Exclusive Economic Zone (EEZ) 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 km², as shown in diagram D1.1 and table T1.1.

There are factors which determine 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 map M1.1).

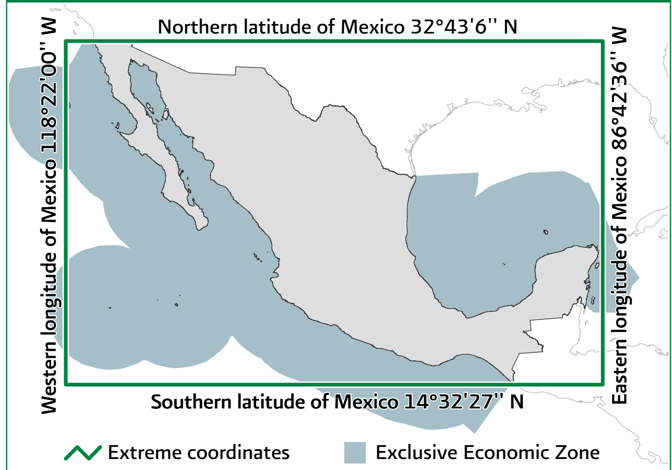
The second factor is that, due to the significant geographical accidents which characterize Mexico's relief (see graph G1.1), there is a great variety of climates. The geographical location and the relief have a direct impact on the availability of water resources.

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.

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.

D1.1 Extreme coordinates and EEZ



See note [a] in Annex D. The complete map is available on the DVD.

Mexico is made up of 31 states and one Federal District (Distrito Federal or 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].

Since the mid-20th century, the population has shown a marked trend towards abandoning small rural localities and congregating in urban areas. From 1950 to 2005, the country's population quadrupled, and went from being predominantly rural[4] (57.3%) to mainly urban (76.5%), as can be observed in G1.2.

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

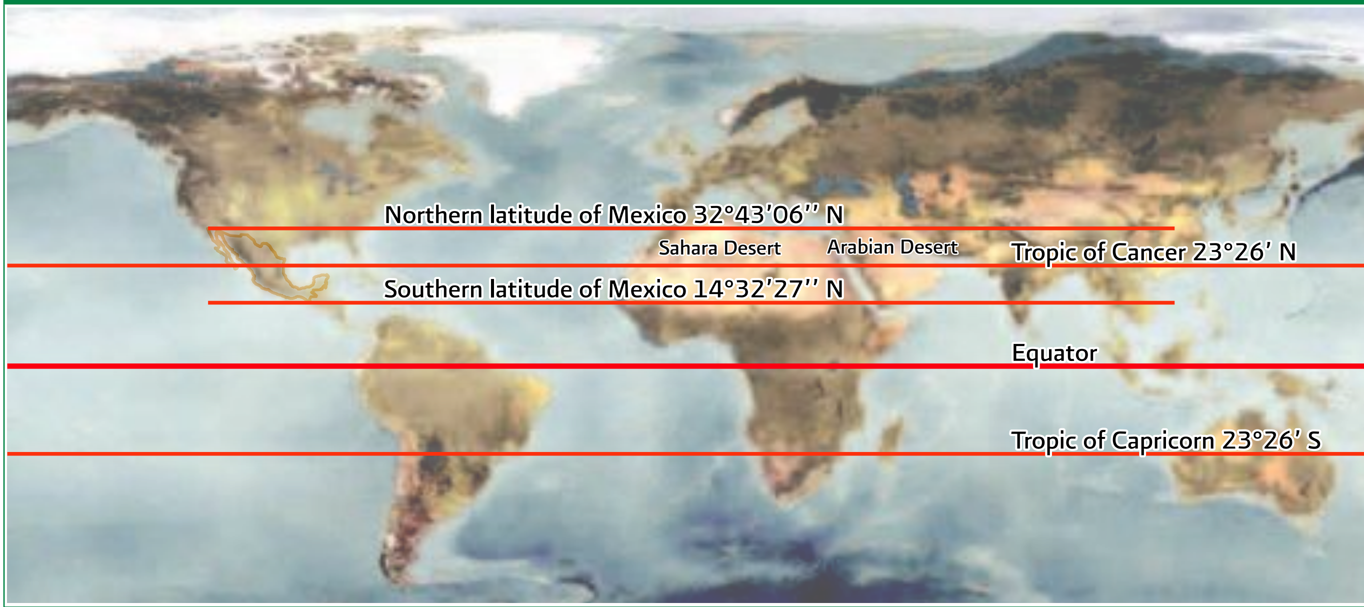
4 Rural localities are defined as those with less than 2,500 inhabitants, whereas urban localities have a population equal or greater than 2,500 inhabitants.

T1.1 Location and territorial extension of Mexico

Territorial extension	International borders of the mainland territory
Territorial area: 1 964 375 km² Mainland: 1 959 248 km² Island-based: 5 127 km²	With the United States of America: 3 152 km With Guatemala: 956 km With Belize: 193 km
Length of the coastline:11,122 km	**Extreme geographical coordinates:**
Pacific Ocean: 7 828 km Gulf of Mexico and Caribbean Sea: 3 294 km	• **To the North:** 32° 43′ 06″ latitude North. Monument 206, on the border with the United States of America. • **To the South:** 14° 32′ 27″ latitude North. At the mouth of the Suchiate river, border with Guatemala. • **To the West:** 118° 22′00″ longitude West. Isla Guadalupe. • **To the East:** 86° 42′ 36″ longitude West. Isla Mujeres.

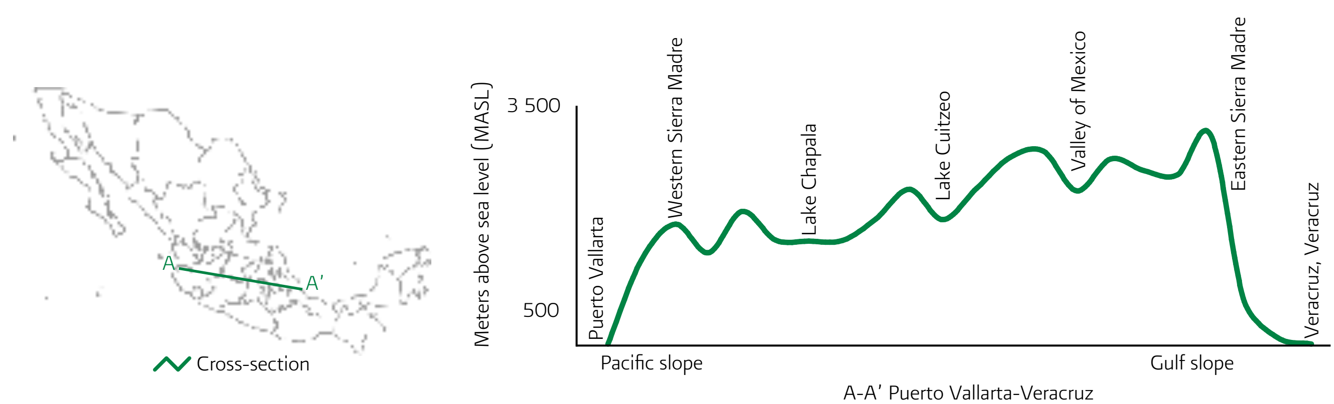
Source: INEGI. *Yearbook of Statistics of the United Mexican States 2009.* Mexico 2010.

M1.1 Geographical location of Mexico in the world



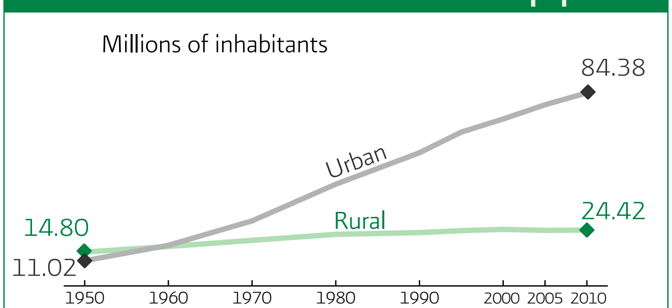
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
NASA Earth Observatory. *Blue Marble: Next Generation. Monthly images: April.* Consulted on http://earthobservatory.nasa.gov/Features/BlueMarble/BlueMarble.php (15/07/2010).

G1.1 Profile of the elevation from Puerto Vallarta to Veracruz



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
Jarvis, H.I. Reuter, A. Nelson, E. Guevara, 2008, *Hole-filled seamless SRTM data V4, International Centre for Tropical Agriculture (CIAT).*
Consulted on: http://srtm.cgiar.org (15/07/2010).

G1.2 Evolution in Mexico's urban and rural population



See note [b] in Annex D. The complete graphic is available on the DVD.

According to the results of the II Census on Population and Housing from 2005[5], in Mexico there are 187,938 inhabited localities, spread out according to their population as shown in T1.2.

5 The results of the 2010 Census on Population and Housing as regards localities will be available later in 2011. The data on population used in this volume are the result of projections based on data by locality in the II Census on Population and Housing 2005. In the years in which a census is not carried out, projections and other tools are available in order to estimate Mexico's demographic behavior.

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

Size of locality (population)	Number of localities	Population (millions of inhabitants)	Percentage of the population
More 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 as of the date of the Census (17/10/2005).
The sums may not add up perfectly due to the rounding up or down of the figures.
Source: INEGI. *II Census on Population and Housing 2005.*

In 2005, 54.1% of the population of Mexico lived in areas over 1,500 meters above sea level, as shown in G1.3.

As of December 2009, the projected population of Mexico was estimated at 108 million inhabitants

On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):

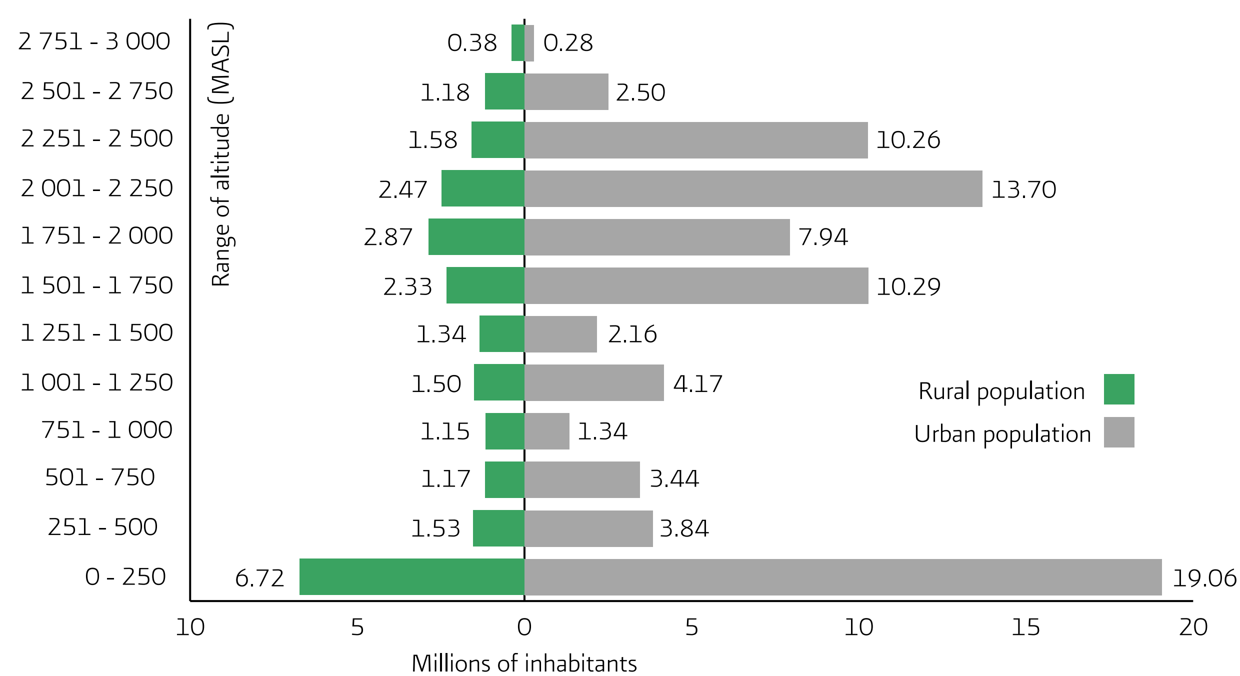
- TM(Poblacion),
- TM(Coberturas),
- TM(Proyeccion_final_año) and,
- TM(Proyeccion_mitad_año).

1.2 Population centers

In 2009 there were 30 population centers in Mexico with more than 500,000 inhabitants, of which 27 were part of a metropolitan zone (MZ)[6] and the remainder were non-suburban municipalities. These population centers are shown in M1.2.

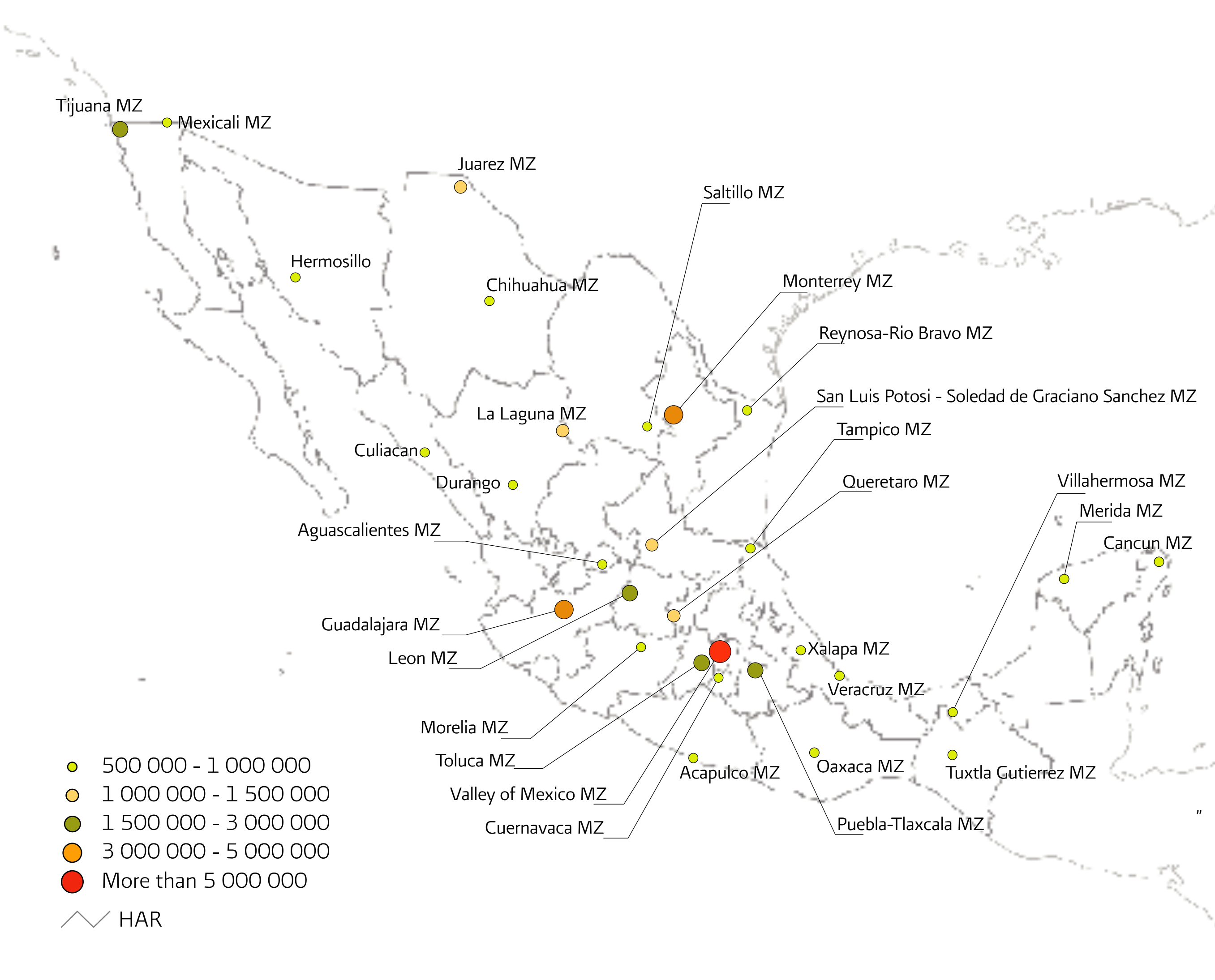
6 A metropolitan zone is defined as the sum of two or more municipalities including a city of 50,000 or more inhabitants, and the urban area, functions and activities of which go beyond the municipal limit into which they were originally confined, incorporating as part of the municipality or of its area 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.

G1.3 Distribution of the urban and rural population by range of altitude of the localities



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 on Population and Housing 2005.*

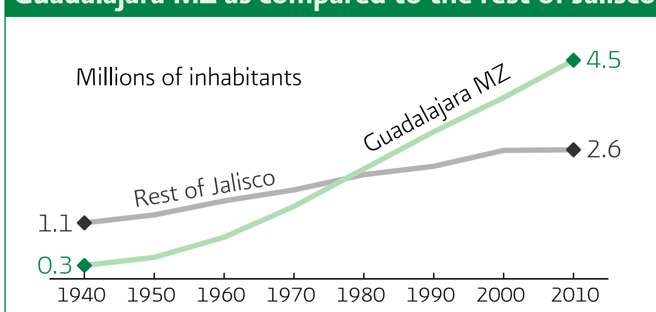
M1.2 Population centers of more than 500,000 inhabitants, projection 2009



Note: Includes Metropolitan Zones (MZ) and non-suburban municipalities. The population in 2009 is calculated based on projections from the CONAPO.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAPO. *Population Projections in Mexico 2005-2050.* Mexico, 2007.
SEDESOL, INEGI and CONAPO. *Limits of the Metropolitan Zones in Mexico 2005.* Mexico, 2007.
INEGI. II *Census on Population and Housing 2005.*

The process of concentration of the population in urban localities has resulted in the accelerated growth of these areas, which has implied stronger pressure on the environment and on institutions, due to the increasing demand for services. The example of the growth of the metropolitan zone of Guadalajara in the period from 1940 to 2005, and its projection for 2010, compared with the rest of the state of Jalisco, can be appreciated in G1.4. It is estimated that in 2010, the Guadalajara MZ represented 63% of the total population of the state.

G1.4 Evolution of the population in the Guadalajara MZ as compared to the rest of Jalisco



See note [c] in Annex D. The complete graphic is available on the DVD

On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only): TM(Zonas_metropolitanas).

It is estimated that in 2009, eleven Metropolitan Zones with a population of more than one million inhabitants concentrated 38% of the total population of Mexico, or 41 million inhabitants.

1.3 Economic indicators

Around the world, 2009 was marked by a severe economic contraction, the recovery from which began in the second semester of that year. The Bank of Mexico considered in its 2009 annual report that Mexico's economy suffered a contraction in its Gross Domestic Product (GDP) of 6.5% that year. The annual inflation was 3.57%, as observed in T1.3.

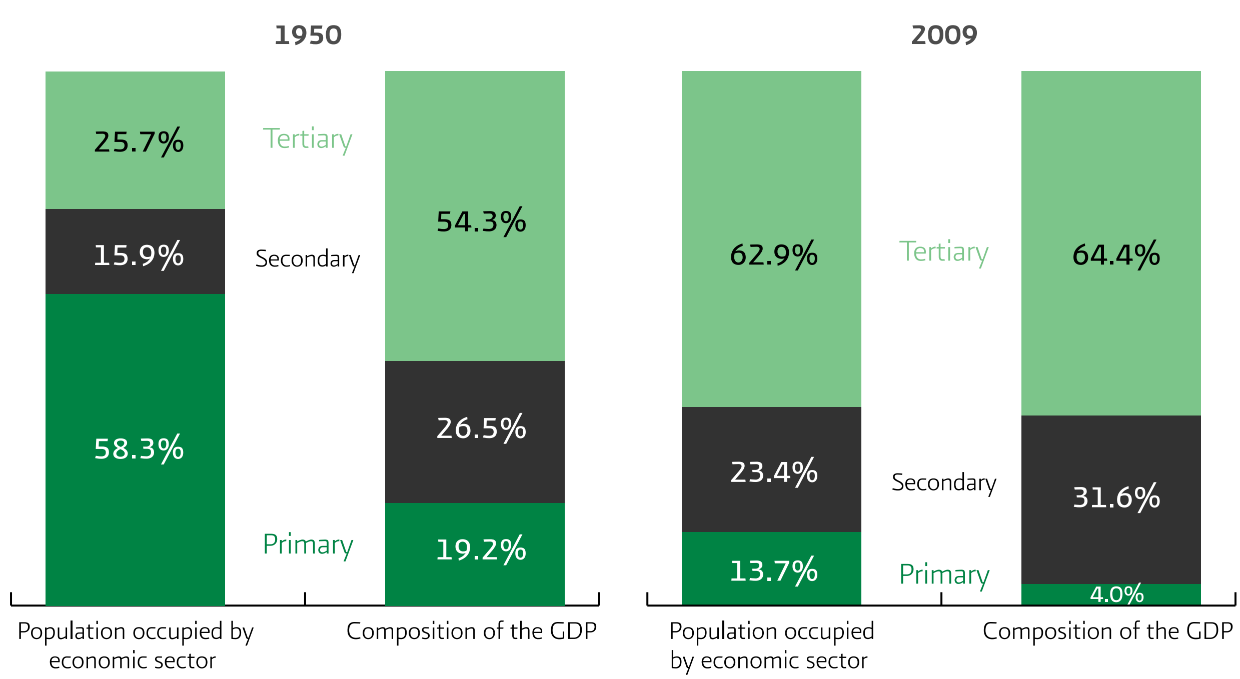
T1.3 Main economic indicators in Mexico, from 1990 to 2009

Indicators	1990	1995	2000	2005	2009
GDP in billions of pesos (constant prices)	5 253	5 660	7 381	8 114	8 346
Per capita GDP in pesos (constant prices)	63 112	62 100	75 346	78 056	77 597
Inflation based on the National Consumer Price Index (December each year)	29.93%	51.97%	8.96%	3.33%	3.57%

Note: The baseline year for constant prices is 2003.
Source: For the GDP: International Monetary Fund. 2010. *World Economic Outlook Database October 2010*. Consulted on: http://www.imf.org (27/10/2010).
For inflation: Bank of Mexico. 2010. Consulted on: http://www.banxico.org.mx/PortalesEspecializados/inflacion/inflacion.html#ANUAL (27/10/2010).

Throughout the 20th century, the contribution of agriculture and livestock activities, silviculture and fishing to

G1.5 Change in the composition of the GDP and population occupied by sectors, 1950 and 2009



Note: For illustrative purposes only. The representation of the charges allocated for bank services was simplified, representing indirectly measured financial intermediation services, with a negative sign.
Source: For 1950: ITAM. *Historical Statistics in Mexico – Gross Domestic Product by Activity 1950-1985*, based on Economic Indicators from the Bank of Mexico, and *Staff occupied by economic sector 1790-1996*. Consulted on http://biblioteca.itam.mx/recursos/ehm.html (15/07/2010).
For 2009: INEGI. *Bank of Economic Information – trimestral Gross Domestic Product 2003 baseline for 2003 prices, absolute values and Population occupied by national economic activity*. Consulted on http://dgcnesyp.inegi.org.mx (15/07/2010).

Mexico's GDP has progressively decreased, whereas industry and services have grown, as can be observed in G1.5. This change is also evident in the population occupied by economic sector[7], since the Mexicans occupied in the tertiary sector went from 25.7% in 1950 to 62.9% in 2009.

In 2009, 14 out of every 100 Mexicans with an active occupation worked in the primary sector

1.4 Poverty Index and rating

In conformity with Mexico's General Law on Social Development, the definition, identification and measuring of poverty in Mexico is the responsibility of the National Council for the Evaluation of Social Development Policies (CONEVAL), a body created in 2006.
According to the value in the poverty index, calculated by CONEVAL based on the II Census of Population and Housing 2005, the poverty rating is determined, which can be very low, low, medium, high or very high. D1.2 and T1.A on the DVD present the geographical distribution of the municipalities in Mexico with a high and very high poverty rating.

D1.2 Municipalities with a high and very high poverty rating (2007)

See note [d] in Annex D. The complete map is available on the DVD

7 The primary sector includes agriculture and livestock, silviculture and fishing activities. The secondary sector contemplates mining, the manufacturing industry, construction and electricity, gas and water. The tertiary sector includes trade, restaurants and hotels, transport, storage and communications, financial services, insurance, real estate and renting activities, community, social and personal services.

On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
- TM(Municipios_rezago_social).

"In 2005, 7.8 million Mexicans lived in municipalities with a high or very high poverty rating"

1.5 The Hydrological-Administrative Regions (HAR) for water management

For the purpose of the management and preservation of Mexico's water resources, since 1997 the country has been divided into 13 HAR, which are made up by grouping together catchments, considered the basic units for water resources management, and whose limits respect municipal divisions, so as to facilitate the integration of socio-economic information.

The CONAGUA, an administrative, normative, technical and consultative agency in charge of water management in the country, carries out its functions through 13 River Basin Organizations, the scope of competence of which are the HAR (see M1.3).

The municipalities that make up each one of these HAR are indicated in the River Basin Organizations' Territorial Constituency Agreement, published in the Official Government Gazette. The definition currently used is that of December 12, 2007.

In addition, the CONAGUA has 20 Local Offices in the states in which no River Basin Organization has its headquarters.

On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
- HC(Caracteristicas_municipales).

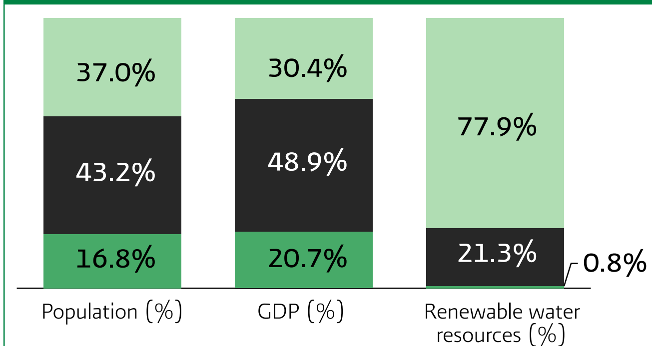
1.6 Regional contrast between development and renewable water resources

The aggregate national values, such as population, renewable water resources (see chapter 2) or GDP, conceal the great regional diversity in Mexico. The HAR can thus be classified into broader groups according to their contribution to the nation's GDP, as shown in T1.4 and map M1.A on the DVD.

Some contrasts between the regional characteristics are worth mentioning. For example, HAR XIII Waters of the Valley of Mexico, which makes a significant contribution to the GDP, represents by itself one fifth of the population of Mexico, whereas it presents low renewable water resources. In contrast, the grouping of the HARs I, II, III, V, VI, IX, X and XI, which make a low contribution to the GDP, have the lion's share of renewable water resources in Mexico, as can be observed in G1.6.

The HAR XIII Waters of the Valley of Mexico is home to 1 out of every 5 Mexicans, who only have 0.8% of Mexico's renewable water resources

G1.6 Regional contrast between development and renewable water resources, 2009



See note [e] in Annex D. The complete graphic is available on the DVD.

T1.4 Grouping of HAR according to their contribution to Mexico's GDP

RHA		Mainland surface (km^2)	Renewable water resources (hm^3/year)	Population as of December 2009	Contribution to Mexico's GDP (%)	Grouping
I	Baja California Peninsula	145 385	4 667	3 781 528	3.36	Type III (Medium)
II	Northwest	205 218	8 499	2 615 193	2.44	Type III (Medium)
III	Northern Pacific	152 013	25 630	3 959 757	3.10	Type III (Medium)
IV	Balsas	119 248	21 680	10 624 805	10.78	Type II (High)
V	Southern Pacific	77 525	32 824	4 127 573	1.79	Type III (Medium)
VI	Rio Bravo	379 552	12 163	10 982 077	14.29	Type II (High)
VII	Central Basins of the North	202 562	7 898	4 186 376	2.59	Type III (Medium)
VIII	Lerma-Santiago-Pacific	190 367	34 533	20 974 080	14.29	Type II (High)
IX	Northern Gulf	127 166	25 564	4 968 766	6.87	Type III (Medium)
X	Central Gulf	104 790	95 866	9 647 742	4.72	Type III (Medium)
XI	Southern Border	101 231	157 754	6 618 463	5.51	Type III (Medium)
XII	Yucatan Peninsula	137 753	29 645	4 064 141	9.55	Type II (High)
XIII	Waters of the Valley of Mexico	16 438	3 513	21 422 957	20.72	Type I (Very high)
	Total	**1 959 248**	**460 237**	**107 973 454**	**100.00**	

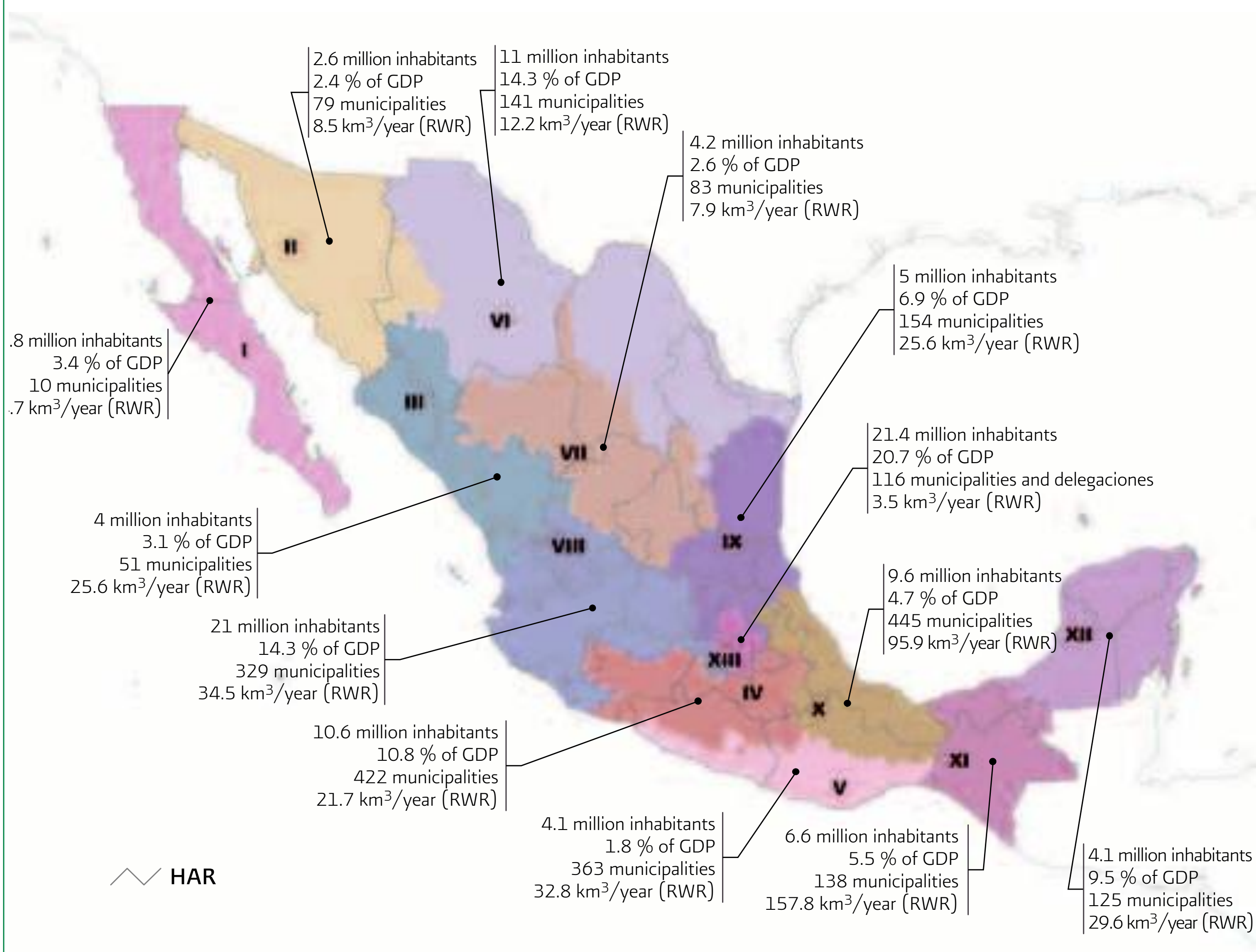
Note: The GDP per HAR was calculated based on the Ecological Gross Domestic Product and the 2008 Gross Censual Added Value from the 2004 economic censuses.
The calculation of renewable water resources refer to historical values according to the availability of hydrological studies.
The values may not add up to the total due to the rounding of the figures.
The population in 2009 was calculated based on the CONAPO's 2006-2030 projections. Population as of the month of December.
Source: For the mainland surface area: INEGI, *Municipal Geo-statistical Framework, Version 3.1.1.* 2008.
For the calculation of renewable water resources: CONAGUA. Deputy Director General's Office for Planning. 2010.
Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.
INEGI. *Mexico's System of National Accounts. Gross Domestic Product by State, 2003-2007.* Baseline of 2003.

1.7 Summary of data by HAR and state

The main demographic and socio-economic data on each HAR, as well as those related to renewable water resources (see chapter 2), are indicated in in M1.3 and T1.B on the DVD.

At the state level, the data on the population and its density is shown in T1.5, along with the mainland surface area and contribution to the GDP, among other information.

M1.3 Data on demographic and socio-economic aspects and renewable water resources by HAR, 2009



Note: The population as of 2009 was calculated based on CONAPO's 2006-2030 projections. Population as of December.
RWR: Renewable water resources.
The GDP per HAR was calculated based on the Gross Censual Added Value from the 2004 economic censuses.
The HAR 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. 2010.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 Geo-statistical Framework, Version 3.1.1. 2008.*

T1.5 Geographical, demographic and socio-economic data by state

No	State	Population as of 2000 Census (inhabitants)	Population as of 2009 (inhabitants)	Mainland surface area (km^2)	Population density 2009 (inhabitants/km^2)	Contribution to Mexico's GDP 2008 (%)	Municipalities or delegations of Mexico City (number)
1	Aguascalientes	944 285	1 150 625	5 618	205	1.0	11
2	Baja California	2 487 367	3 209 233	71 463	45	2.8	5
3	Baja California Sur	424 041	572 295	73 922	8	0.6	5
4	Campeche	690 689	800 582	51 352	16	6.8	11
5	Coahuila de Zaragoza	2 298 070	4 530 268	151 623	30	3.1	38
6	Colima	542 627	3 406 832	5 625	606	0.5	10
7	Chiapas	3 920 892	2 642 065	73 178	36	1.8	118
8	Chihuahua	3 052 907	604 730	247 478	2	3.1	67
9	Distrito Federal	8 605 239	8 844 334	1 496	5 912	16.9	16
10	Durango	1 448 661	1 553 053	123 287	13	1.2	39
11	Guanajuato	4 663 032	5 055 976	30 609	165	3.7	46
12	Guerrero	3 079 649	3 137 481	63 652	49	1.4	81
13	Hidalgo	2 235 591	2 427 585	20 824	117	1.6	84
14	Jalisco	6 322 002	7 043 575	78 598	90	6.2	125
15	Mexico	13 096 686	14 934 468	22 357	668	8.8	125
16	Michoacan de Ocampo	3 985 667	3 956 693	58 614	68	2.4	113
17	Morelos	1 555 296	1 681 096	4 882	344	1.0	33
18	Nayarit	920 185	970 727	27 815	35	0.6	20
19	Nuevo Leon	3 834 141	4 475 052	64 225	70	7.6	51
20	Oaxaca	3 438 765	3 549 706	93 524	38	1.6	570
21	Puebla	5 076 686	5 678 445	34 283	166	3.3	217
22	Queretaro	1 404 306	1 735 761	11 707	148	1.8	18
23	Quintana Roo	874 963	1 337 942	38 784	34	1.4	9
24	San Luis Potosi	2 299 360	2 490 231	61 112	41	1.9	58
25	Sinaloa	2 536 844	2 654 201	57 377	46	2.0	18
26	Sonora	2 216 969	2 521 601	179 484	14	2.4	72
27	Tabasco	1 891 829	2 055 571	24 743	83	3.7	17
28	Tamaulipas	2 753 222	3 211 662	80 243	40	3.4	43
29	Tlaxcala	962 646	1 142 249	4 006	285	0.5	60
30	Veracruz de Ignacio de la Llave	6 908 975	7 286 793	71 846	101	4.6	212
31	Yucatan	1 658 210	1 933 900	37 409	52	1.3	106
32	Zacatecas	1 353 610	1 378 730	75 313	18	0.8	58
	Total	**97 483 412**	**107 973 454**	**1 946 449**	**55**	**100.0**	**2 456**

Note: The population as of 2009 was calculated based on CONAPO's 2006-2030 projections. Population as of December.
The sum of the surface areas does not add up to the national total of 1 959 248 km^2, since, according to the Municipal Geo-statistical Framework, Version 3.1.1 (2008), there are seven areas in Mexico still to be assigned, totaling 12 799 km^2.
The municipalities include Tulum, Quintana Roo, recently created.
The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
INEGI. *General Censuses.*
INEGI. *Mexico's System of National Accounts. Gross Domestic Product by State, 2003-2007. Baseline of 2003.*
INEGI. *Municipal Geo-statistical Framework, Version 3.1.1.* 2008.

State of water resources

2

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[1], have been grouped and/or divided into watersheds. Up to December 31, 2009, the availability of water in 722 watersheds had been published, as per the standard NOM-011-CONAGUA-2000, whereas by December 31, 2010, nine other watersheds had been added.

On the DVD, you will find the availability agreements by watershed currently published, in the spreadsheet (in Spanish only):
• TM(Cuencas_hidrologicas).As regards the catchments, the following sheet and map are available:
• TM(Cuencas_hidrograficas).
• M2.A

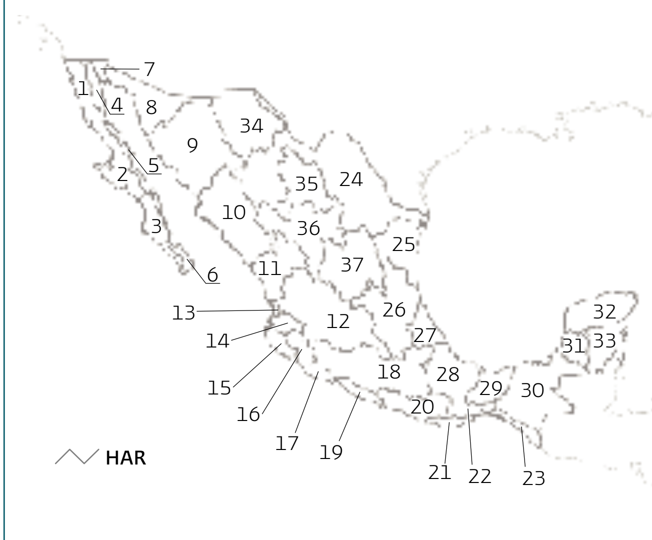
The country's catchments have been organized into 37 hydrological regions that are shown in diagram D2.1, and are in turn grouped into the 13 Hydrological-Administrative Regions (HAR) mentioned in the previous chapter.

As regards groundwater, the country is divided into 653 aquifers, as published in the Official Government Gazette (DOF) on December 5, 2001, and the limits of which are presented in map M2.1, according to the coordinates of the simplified polygons presented in the DOF on August 13, 2007, January 3, 2008 and August 28, 2009 (please refer to 2.5 Groundwater).

The CONAGUA has 4,008 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.

1 The value obtained by the difference between the mean annual volume of runoff from a catchment downstream and the current annual volume committed downstream.

D2.1 Hydrological regions



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

See note [a] in Annex D. The complete map is available on the DVD.

M2.1 Limits of the aquifers by HAR, 2009

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

Table T2.1 includes 1,064 climate reference stations, employed for the calculation of the normal precipitation (see Precipitation in this same chapter).

T2.1 Number of climate stations and stream gages in Mexico, 2009

Type of station	Number of stations
Climate stations	3 324
Stream gages	684
Total	**4 008**

Note: Of the total of 5 368 climate stations, 3 324 were in operation at the time of going to press.

Source: For stream gages: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

For climate stations: CONAGUA. Coordination of the National Meteorological Service. 2010.

2.2 Renewable water resources[2]

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

2 The maximum quantity of water that can feasibly be used in a region, meaning the quantity of water that is renewed by rainfall and the water that comes from other regions or countries (inflows). It is calculated as the mean natural annual internal surface runoff, plus the total annual recharge of aquifers, plus the water inflows from other regions, minus the water outflows to other regions (in the case of Mexico, the mean values determined from available studies are used). Source: Gleick, P. *The World's Water 2002-2003. The biennial report on freshwater resources 2002-2003.* 2002.

Every year, Mexico receives around 1,489 billion cubic meters of water in the form of precipitation. Of this water, it is estimated that 73.1% evaporates and returns to the atmosphere, 22.1% runs off into rivers and streams and the remaining 4.8% naturally filters through to the subsoil and recharges the aquifers. Taking into account the water outflows to and inflows from neighboring countries, as well as the incidental recharge (see glossary), every year the country has 460 billion cubic meters of renewable freshwater. Graph G2.1 shows the components and values that make up the calculation of renewable water resources.

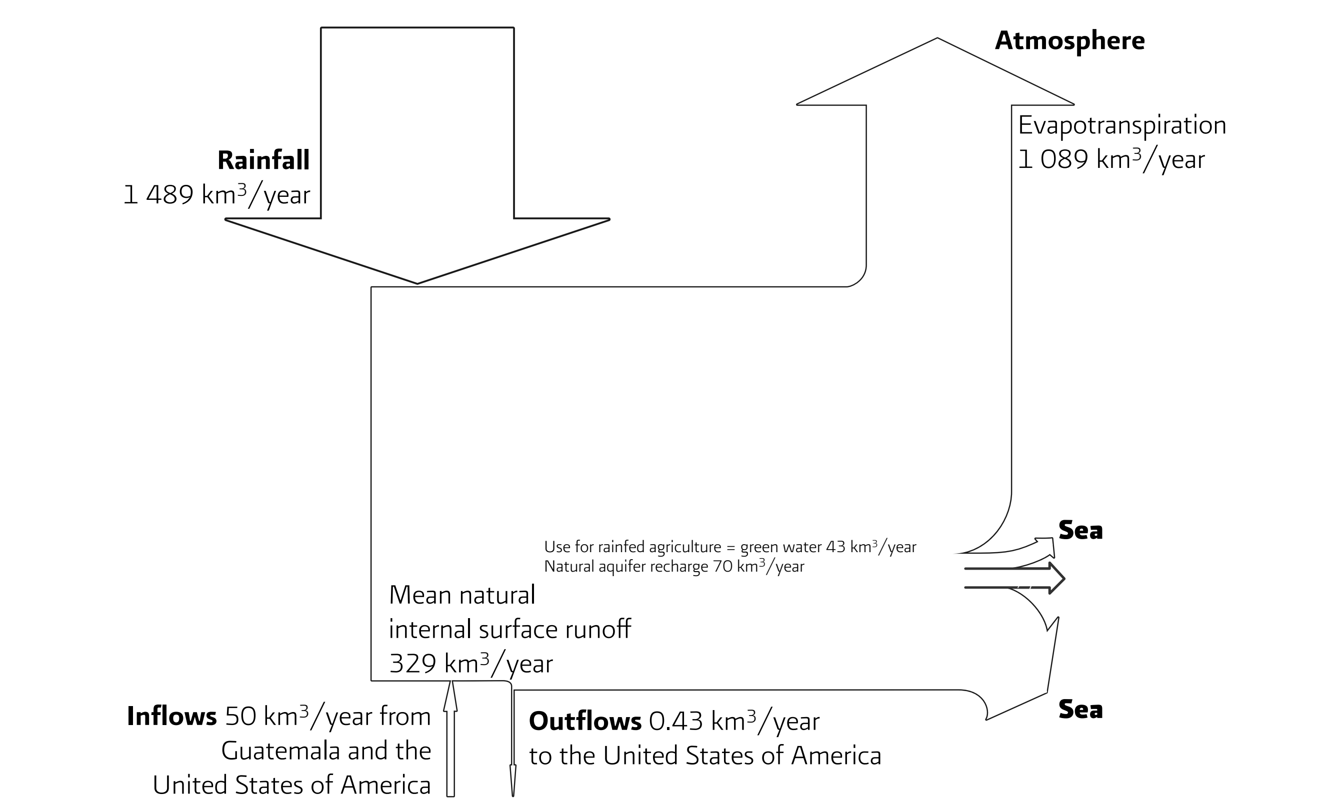
The inflows from other countries represent the volume of water generated in the eight watersheds shared with the three countries with which Mexico has borders (United States of America, Guatemala and Belize) and which run off to Mexico. The outflows represent the volume of water that Mexico is bound by the 1944 "Water Treaty"[3] to deliver to the United States of America.

It should be added 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. The majority of the rainfall occurs in the summer, whereas the rest of the year is relatively dry.
- Distribution in space. Some regions of the country have an abundant precipitation and low population density, whereas in others exactly the opposite effect occurs.

3 "TREATY BETWEEN THE GOVERNMENT OF THE UNITED MEXICAN STATES AND THE GOVERNMENT OF THE UNITED STATES OF AMERICA ON THE DISTRIBUTION OF INTERNATIONAL WATER RESOURCES IN THE COLORADO AND TIJUANA RIVERS AND THE RIO GRANDE, FROM FORT QUITMAN, TEXAS, TO THE GULF OF MEXICO".

G2.1 Mean annual values of the components of the hydrological 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 2009.
The natural aquifer recharge reported in the graph, plus 9 km³ of incidental recharge, constitute the total mean recharge.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs. 2010 | CONAGUA. Deputy Director General's Office for Water Management. 2010.

- The area of analysis. 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 HAR, such as I Baja California Peninsula, XIII Waters of the Valley of Mexico, VI Rio Bravo, VII Central Basins of the North and VIII Lerma-Santiago-Pacific, the per capita renewable water resources are alarmingly low. In T2.2 the renewable water for each of the regions of the country may be observed.

Precipitation

Mexico's normal precipitation in the period from 1971 to 2000 was 760 millimeters. The normal values, according to the World Meteorological Organization (WMO), correspond to average measurements calculated for a uniform and relatively long period, which must include at least 30 years of data collection, considered as a minimum representative climate period. Furthermore, this period should start on January 1 of a year ending with one, and end on December 31 of a year ending in zero.

T2.3 presents the normal precipitation by HAR in the period from 1971 to 2000, whereas T2.A on the DVD shows this data by state for the same period. In the majority of Mexico, the precipitation occurs mainly between June and September, with the exception of the Baja California Peninsula, where it takes places mainly in the winter.

In Mexico, 68% of the normal monthly precipitation occurs between June and September.

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 G2.2.

T2.2 Per capita renewable water resources by HAR

HAR		Renewable water resources (hm^3/year)	Population as of December 2009 (millions of inhabitants)	Per capita renewable water resources 2009 (m^3/ inhabitant/year)	Total mean natural surface runoff[a] (hm^3/year)	Total mean aquifer recharge (hm^3/ year)
I	Baja California Peninsula	4 667	3.78	1 234	3 367	1 300
II	Northwest	8 499	2.62	3 250	5 074	3 426
III	Northern Pacific	25 630	3.96	6 473	22 364	3 267
IV	Balsas	21 680	10.62	2 040	17 057	4 623
V	Southern Pacific	32 824	4.13	7 952	30 800	2 024
VI	Rio Bravo	12 163	10.98	1 107	6 857	5 306
VII	Central Basins of the North	7 898	4.19	1 887	5 506	2 392
VIII	Lerma-Santiago-Pacific	34 533	20.97	1 646	26 431	8 102
IX	Northern Gulf	25 564	4.97	5 145	24 227	1 338
X	Central Gulf	95 866	9.65	9 937	91 606	4 260
XI	Southern Border	157 754	6.62	23 835	139 739	18 015
XII	Yucatan Peninsula	29 645	4.06	7 294	4 330	25 316
XIII	Waters of the Valley of Mexico	3 513	21.42	164	1 174[b]	2 339
	National total	**460 237**	**107.97**	**4 263**	**378 530**	**81 707**

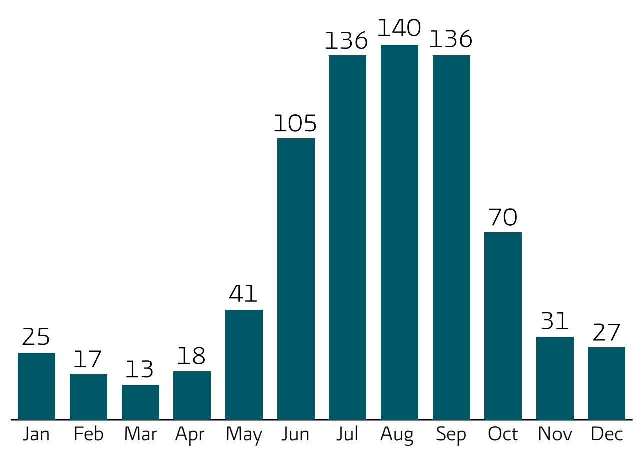
Note: The quantities expressed in this table are indicative in nature and for planning purposes only; they may not be used by themselves to grant water concessions or determine the feasibility of a project. The calculations of renewable water resources refer to historical values according to the availability of hydrological studies.
[a] Composed of the mean natural internal surface runoff plus the inflows, minus the outflows to other countries.
[b] Includes Mexico City's wastewater.
The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs. CONAPO. *Population Projections in Mexico 2005-2050.* Mexico, 2008.

T2.3 Monthly normal precipitation by HAR, 1971-2000 (millimeters)

HAR	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	1 187
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	1 558
XI Southern Border	60	52	38	52	135	278	219	266	332	222	114	77	1 846
XII Yucatan Peninsula	48	31	29	38	83	172	158	173	212	147	76	52	1 218
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 values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Coordination of the National Meteorological Service. 2010.

G2.2 Normal monthly precipitation in Mexico

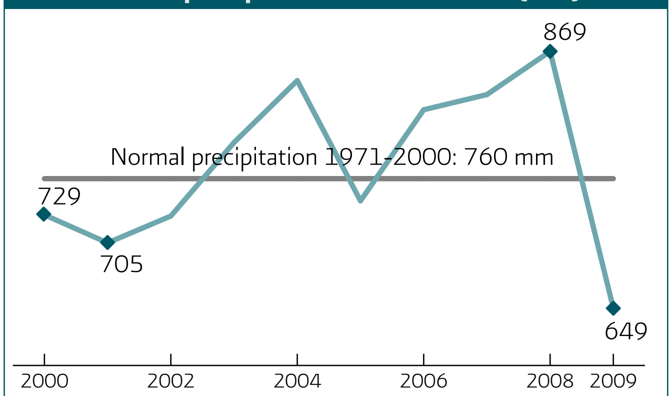


See note [b] in Annex D. The complete graph is available on the DVD.

It may be observed, for example, that in the HAR XI Southern Border, which receives the greatest quantity of rain, the normal annual precipitation for 1971- 2000 was 11 times higher than in the HAR I Baja California Peninsula, the driest one. This regional variation in the normal precipitation is highlighted in G2.3 and M2.2.

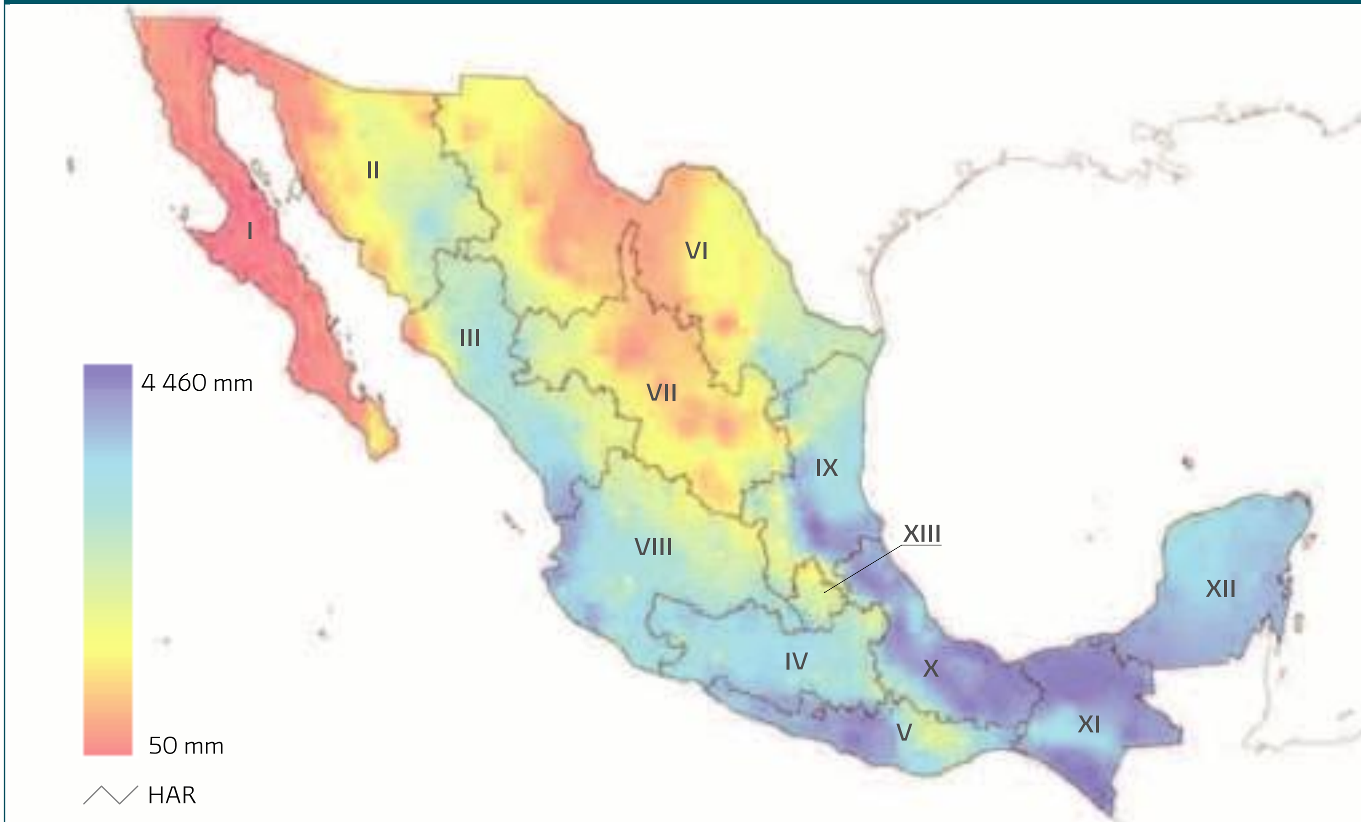
To illustrate the regional variation in rainfall, G2.3 shows thee cross-sections that allow the precipitation profiles to be visualized in Guaymas-Matamoros (A-A'), Puerto Vallarta-Veracruz (B-B') and Acapulco-Chetumal (C-C'). The graphs show in blue the profile of the variation in the precipitation over the period 1971-2000, throughout these cross-sections. The accumulated precipitation in the Mexican Republic from January 1 to December 31, 2009 reached a sheet of 649 mm, which was 14.6% lower than the normal value for the period from 1971 to 2000 (760 mm). The annual series of accumulated precipitation from 2000 to 2009 can be appreciated in G2.4.

G2.4 Annual precipitation, 2000-2009 (mm)



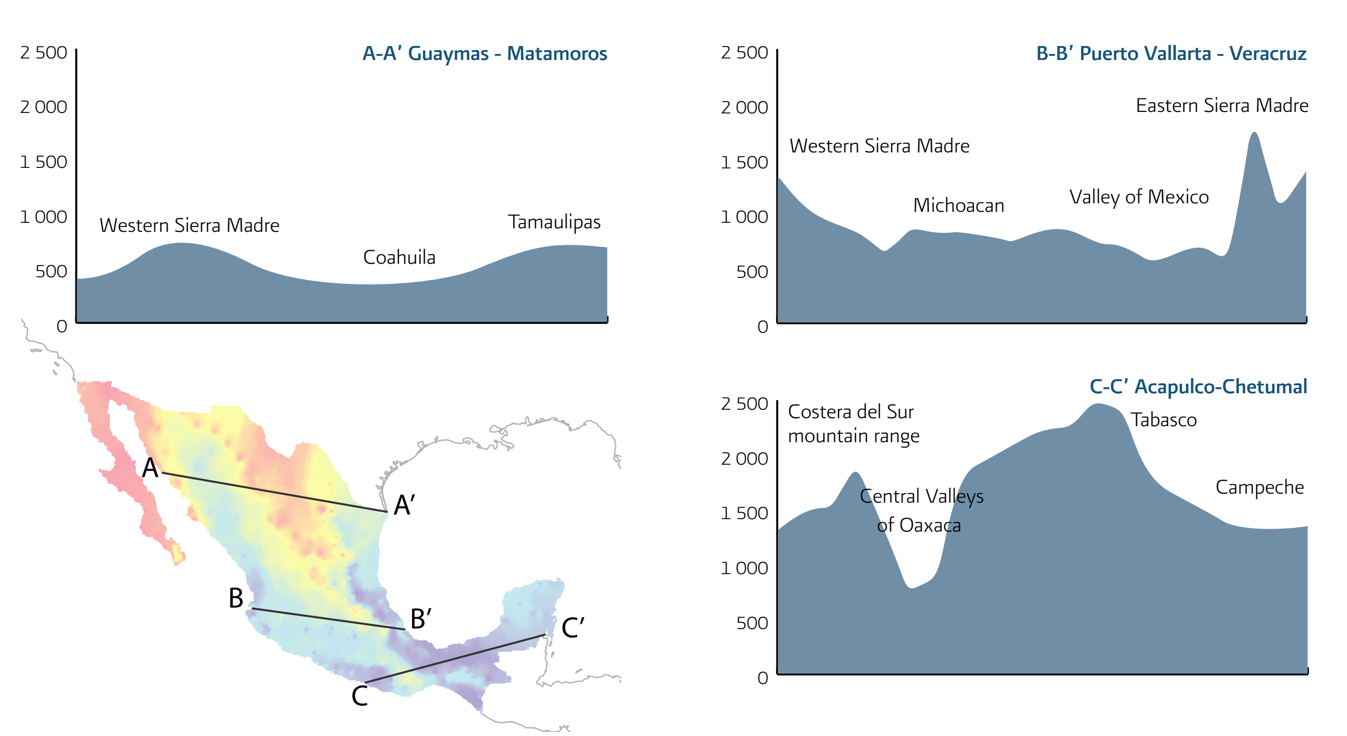
See note [c] in Annex D. The complete graph is available on the DVD.

M2.2 Distribution of the annual precipitation in Mexico, 1971-2000



Source: CONAGUA. Coordination of the National Meteorological Service. 2010.

G2.3 Precipitation profiles (millimeters)



Source: CONAGUA. Deputy Director General's Office for Planning. Produced based on: CONAGUA. Coordination of the National Meteorological Service. 2010.

2.3 Hydro-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 118 km/h, they are referred to as hurricanes (see R2.1); when they are between 62 km/h and 118 km/h, they are called tropical storms; and finally when the winds are less than 62 km/h, they are defined as tropical depressions.

Between 1970 and 2009, 177 tropical cyclones hit the coasts of Mexico (see G2.A on the DVD). T2.4 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 coast, intense hurricanes have been more frequent on the Atlantic side.

In M2.3 and T2.B on the DVD, the 19 intense hurricanes (category H3, H4 or H5) that occurred in Mexico between 1970 and 2009 are shown. It should be noted that no intense hurricanes occurred in 2009.

• On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
• TM(Ciclones).

R2.1 Hurricanes and the Saffir-Simpson scale

A hurricane is a tropical cyclone in which the maximum sustained winds are greater than 118 km/h. In these cases 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 winds (km/h)	Storm tide that it normally generates (m)	Characteristics of the possible material damage and floods
H1	From 118 to 154	1.2 to 1.5	Small trees toppled; some flooding on the lowest-lying coastal highways.
H2	From 154 to 178	1.8 to 2.5	Rooftops, doors and windows damaged; trees uprooted.
H3	From 178 to 210	2.5 to 4.0	Cracks appear in small buildings; flooding in low-lying and flat grounds.
H4	From 210 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	Higher than 250	Higher than a 5.5	Very severe and extensive damage to windows and doors. Roofs lifted off many residences and industrial buildings.

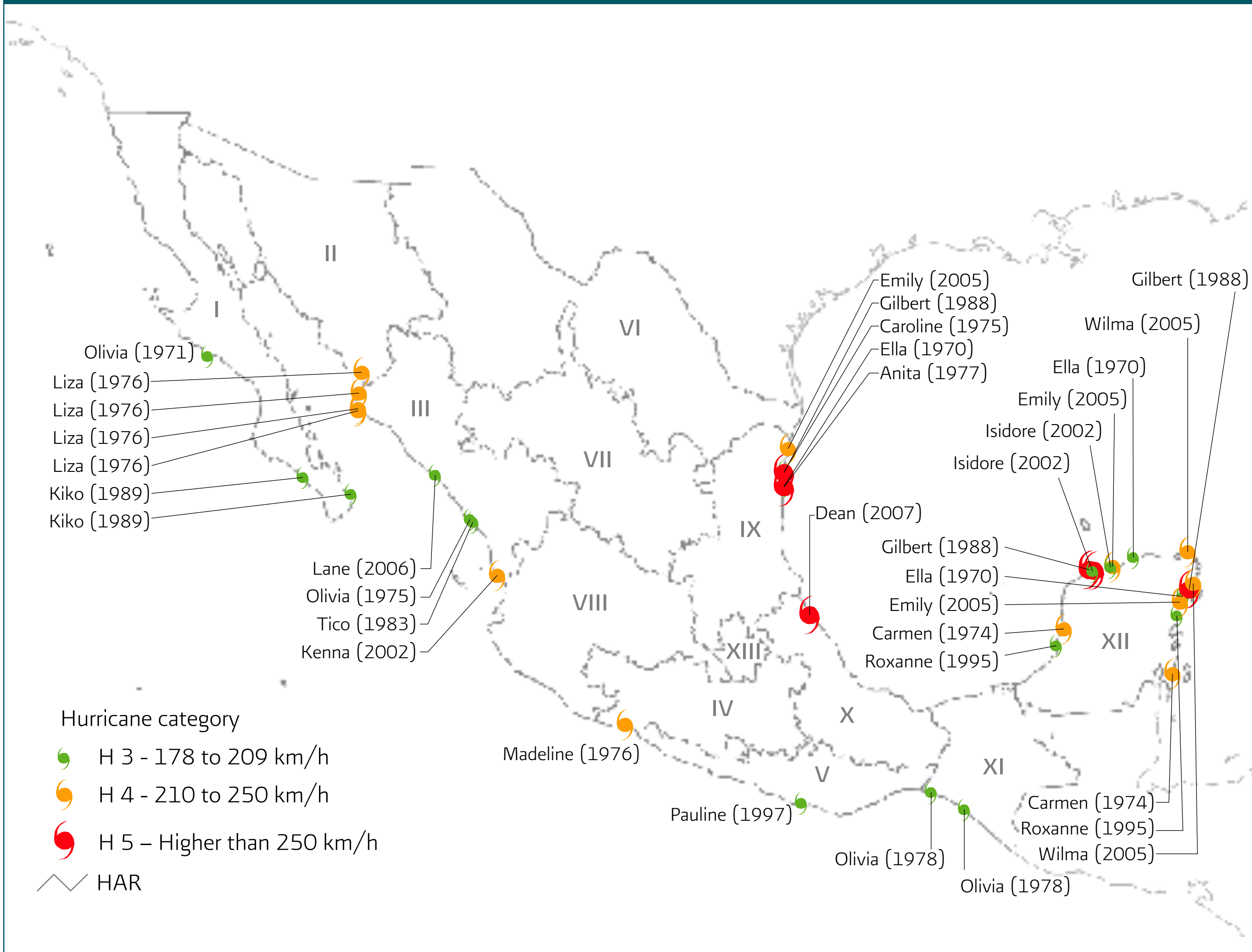
Source: CONAGUA. Coordination of the National Meteorological Service. Consulted on: http://smn.cna.gob.mx (15/10/2010).

T2.4 Tropical cyclones that hit Mexico between 1970 and 2009

Ocean	Tropical depressions	Tropical storms	Moderate hurricanes (H1 and H2)	Intense hurricanes (H3-H5)	Total
Atlantic	22	21	11	11	65
Pacific	25	42	37	8	112
Total	**47**	**63**	**48**	**19**	**177**

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. 2010.

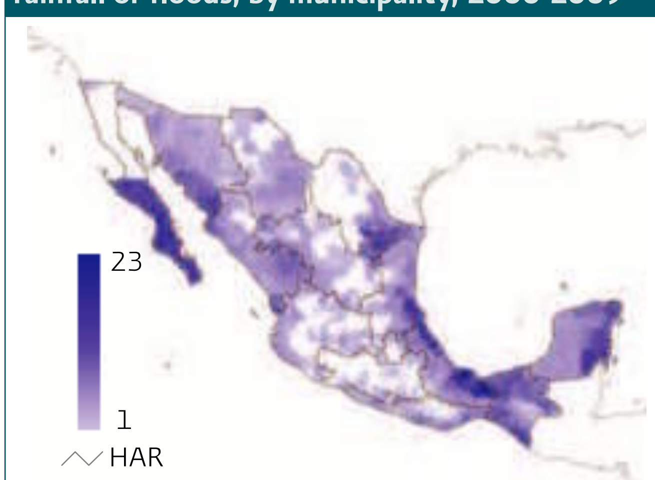
M2.3 Intense hurricanes (categories H3-H5), 1970-2009



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Coordination of the National Meteorological Service. 2010.

Intense precipitations, such as those associated with tropical cyclones, in addition to factors like the topography, land use and the status of vegetable cover, may bring about effects on society. The National Disaster Prevention Center maintains a database of emergency, disaster and climate contingency declarations[4], which highlights (see D2.2) the distribution of the municipalities with declarations due to cyclones, rainfall or floods and which have received support through the National Disaster Fund (FONDEN) or the Program to Attend Climate Contingencies (PACC).

D2.2 Number of declarations due to cyclones, rainfall or floods, by municipality, 2000-2009



See note [d] in Annex D. The complete map is available on the DVD.

4 Area of Economic and Social Studies of the CENAPRED, based on information in the Official Government Gazette (DOF). Consulted on: http://atl.cenapred.unam.mx/metadataexplorer/EES/BDDEDD.html (15/10/2010).

Droughts

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

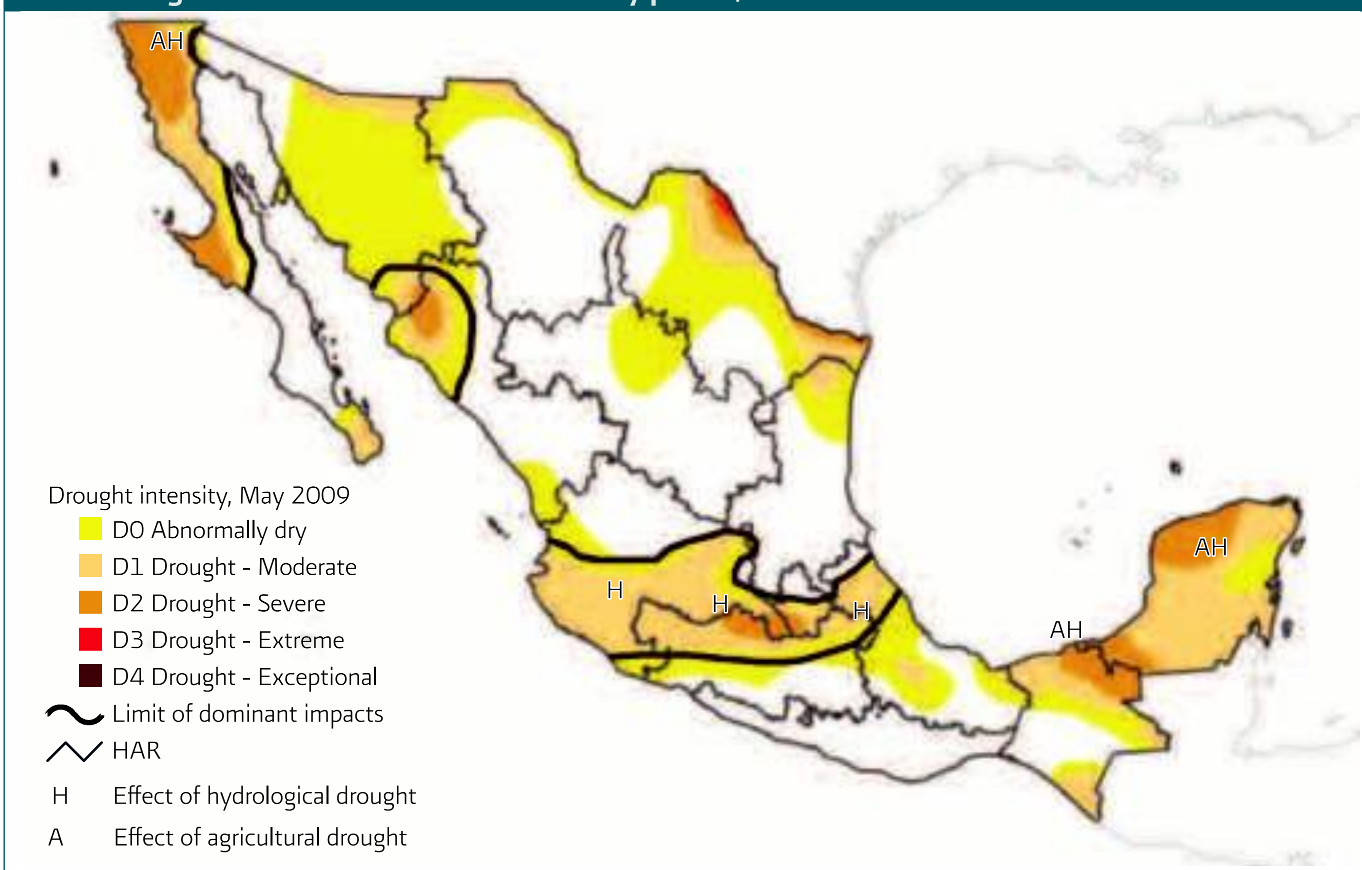
For the first estimation, corresponding to the end of the dry season, in May 2009 (see M2.4), it was noted that precipitation was 16% higher than the normal value, with positive anomalies in Durango, Sonora, Sinaloa, Jalisco and Chihuahua. By contrast, negative anomalies were noted in Baja California, Baja California Sur, Yucatan, Campeche, Tamaulipas and Nuevo Leon.

The Baja California Peninsula remained in an abnormally dry to severe state, whereas the northeast of Mexico presented an increase in the intensity, from abnormally dry (D0) to extreme drought (D3). In Sonora and Chihuahua, the drought condition continued without change despite the precipitation, whereas the drought condition with a hydrological impact was registered in the center of Mexico, with intensities of abnormally dry (D0) to severe (D2). Of particular note was the D2 intensity in Michoacan, the State of Mexico and Mexico City.

The rain in the southeast (Chiapas) caused the disappearance of the abnormally dry area (D0) that covered it. Some areas in the north of the Yucatan Peninsula continued under severe drought conditions (D2), and moderate drought (D1) occurred in Quintana Roo, along with forest fires. The CONAGUA reported a drop in the availability in dams in the northwest, central-north, northeast, center and southern regions.

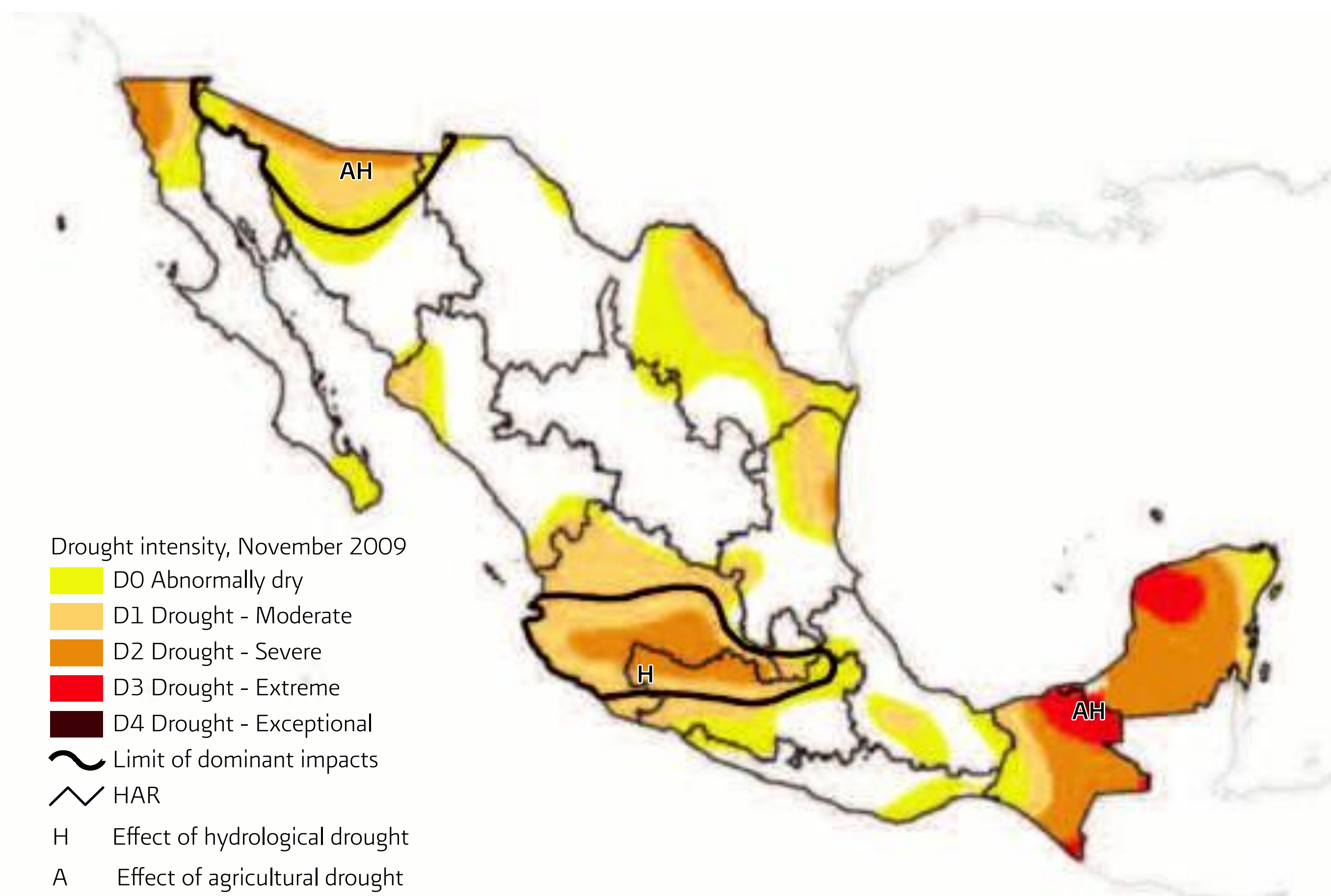
For the second drought estimation, at the end of the rainy season, in November 2009 (see M2.5), rainfall was reported that was higher than the normal value, caused by cold fronts and hurricane Ida, which affected the Yucatan Peninsula, with positive anomalies in Nayarit, Quintana Roo, Nuevo Leon and Campeche, whereas Baja California Sur, the State of Mexico, Queretaro and Morelos presented negative anomalies.

M2.4 Drought conditions at the end of the dry period, 2009



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Coordination of the National Meteorological Service. 2010.

M2.5 Drought conditions at the end of the rainy season, 2009

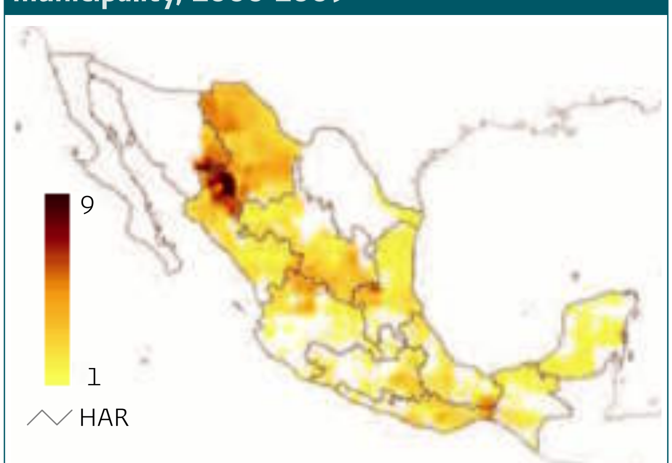


Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Coordination of the National Meteorological Service. 2010.

The drought conditions and intensities remained as in previous months, with minor changes. Worth mentioning is the disappearance of the exceptional drought conditions (D4) in Tabasco and Yucatan, due to the passing of cold fronts that brought with them rain and floods on the Tabasco plain. From January 1 to December 3, 2009, 9,540 forest fires occurred. The most affected states were Baja California, Chihuahua, Coahuila, Zacatecas, Michoacan, Guerrero, Oaxaca, Chiapas, Quintana Roo and Yucatan. The CONAGUA reported reductions in the availability in dams in the northwest, central-north, northeast and southern regions. The central region maintained its levels.Even if the drought reported in the NADM is established with a different methodology to that used by the FONDEN and PACC, in D2.3 the distribution of municipalities with declarations due to droughts for the period 2000-2009 is shown[5].

5 CENAPRED. *Idem.*

D2.3 Number of drought declarations, by municipality, 2000-2009



See note [e] in Annex D. The complete map is available on the DVD.

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 (see M2.6), through which 87% of the country's surface runoff flows, and whose catchments cover 65% of the country's mainland surface area.

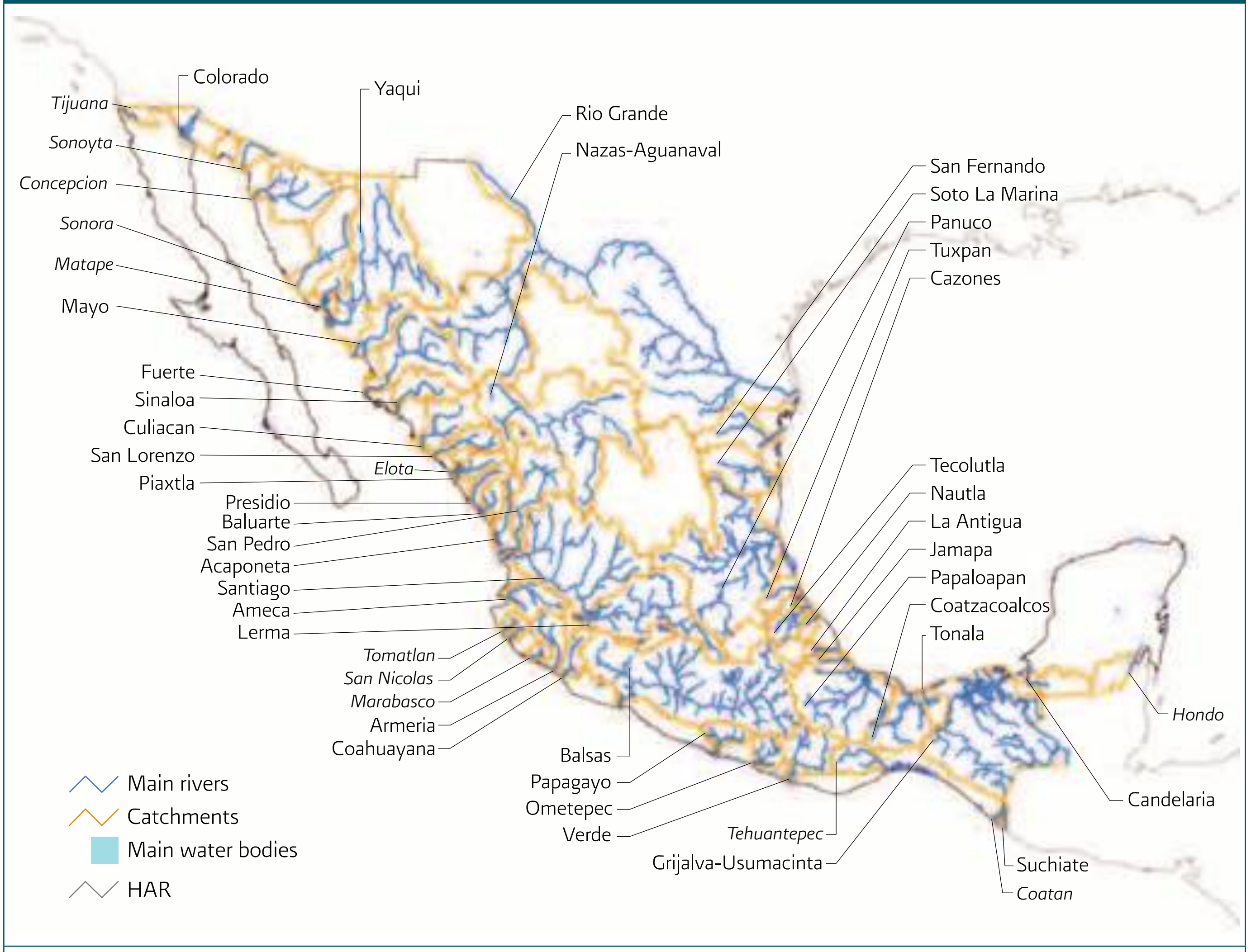
For the surface area they cover, the catchments of the Rio Grande and Balsas River stand out, as do the Rio Grande and Grijalva-Usumacinta River for their length. The Lerma, Nazas and Aguanaval are inland-flowing rivers.

In T2.5, T2.6 and T2.7, the most relevant data is shown on Mexico's main rivers, according to the water body into which they flow.

Two thirds of the surface runoff belongs to seven rivers: Grijalva-Usumacinta, Papaloapan, Coatzacoalcos, Balsas, Panuco, Santiago and Tonala, whose catchments represent 22% of the surface area of Mexico.

On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
- TM(Rios_principales).

M2.6 Main rivers with their catchments



Note: The rivers whose names appear in italics are those that have a mean annual surface runoff lower than 1 km³.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T2.5 Characteristics of the main rivers that flow into the Pacific Ocean and Gulf of California, ordered by their mean natural runoff

No	River	HAR	Mean natural surface runoff[a] (millions of m^3/year)	Catchment area (km^2)	Length of the river (km)	Maximum 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 Southern Pacific	5 937	18 812	342	6
4	Ometepec	V Southern Pacific	5 779	6 922	115	4
5	El Fuerte	III Northern Pacific	5 176	33 590	540	6
6	Papagayo	V Southern Pacific	4 237	7 410	140	6
7	San Pedro	III Northern Pacific	3 417	26 480	255	6
8	Yaqui	II Northwest	3 163	72 540	410	6
9	Culiacan	III Northern Pacific	3 122	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 Northern Pacific	2 100	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	1 863	3 840	160	6
16	Baluarte	III Northern Pacific	1 838	5 094	142	5
17	San Lorenzo	III Northern Pacific	1 680	8 919	315	5
18	Acaponeta	III Northern Pacific	1 438	5 092	233	5
19	Piaxtla	III Northern Pacific	1 415	11 473	220	5
20	Presidio	III Northern Pacific	1 250	6 479	NA	4
21	Mayo	II Northwest	1 232	15 113	386	5
22	Tehuantepec	V Southern Pacific	950	10 090	240	5
23	Coatan[b]	XI Southern Border	751	605	75	3
24	Tomatlan	VIII Lerma-Santiago-Pacific	668	2 118	NA	4
25	Marabasco	VIII Lerma-Santiago-Pacific	648	2 526	NA	5
26	San Nicolas	VIII Lerma-Santiago-Pacific	543	2 330	NA	5
27	Elota	III Northern Pacific	506	2 324	NA	4
28	Sonora	II Northwest	408	27 740	421	5
29	Concepcion	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
		32	**81 719**	**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 includes the runoff from transboundary catchments.
[b] The mean natural surface runoff from this river includes inflows 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 speaking to the catchment itself. The runoff from the Colorado River considers the inflow as per the 1944 Water 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.
The stream order was determined according to the Strahler method. | For more information, please consult the DVD.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T2.6 Characteristics of the main rivers that flow into the Gulf of Mexico and Caribbean Sea, ordered by their mean natural runoff

No	River	HAR	Mean natural surface runoff[a] (millions of m³/year)	Catchment area (km²)	Length of the river (km)	Maximum stream order
33	Grijalva-Usumacinta[b]	XI Southern Border	115 536	83 553	1 521	7
34	Papaloapan	X Central Gulf	44 662	46 517	354	6
35	Coatzacoalcos	X Central Gulf	28 093	17 369	325	5
36	Panuco	IX Northern Gulf	20 330	84 956	510	7
37	Tonala	X Central Gulf	11 389	5 679	82	5
38	Tecolutla	X Central Gulf	6 095	7 903	375	5
39	Bravo[b]	VI Rio Bravo	5 588	225 242	NA	7
40	Jamapa	X Central Gulf	2 563	4 061	368	4
41	Nautla	X Central Gulf	2 217	2 785	124	4
42	La Antigua	X Central Gulf	2 139	2 827	139	5
43	Soto La Marina	IX Northern Gulf	2 086	21 183	416	6
44	Tuxpan	X Central Gulf	2 076	5 899	150	4
45	Candelaria[b]	XII Yucatan Peninsula	2 011	13 790	150	4
46	Cazones	X Central Gulf	1 712	2 688	145	4
47	San Fernando	X Northern Gulf	1 545	17 744	400	5
48	Hondo[b, c]	XII Yucatan Peninsula	533	7 614	115	4
		16	**248 575**	**549 810**		

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 includes the runoff from transboundary catchments.
[b] The mean natural surface runoff from this river includes inflows 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 part.
[c] The length of the Hondo River belongs to the border between Mexico and Belize.
NA: Not available.
The stream order was determined according to the Strahler method. | For more information, please consult the DVD.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T2.7 Characteristics of the main inland-flowing rivers, ordered by the mean natural surface runoff

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

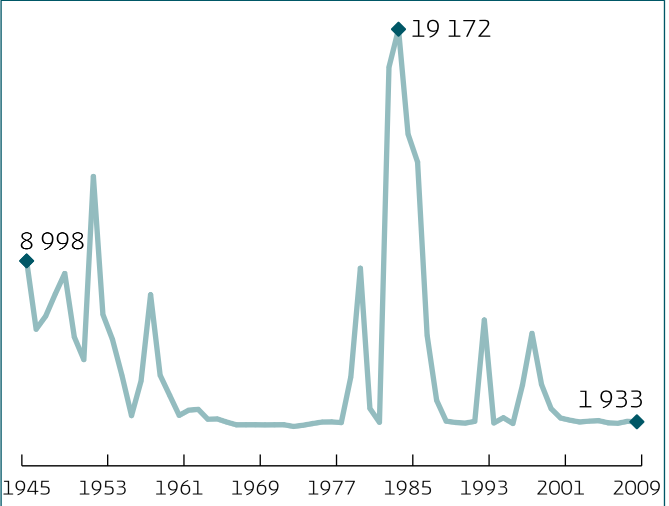
Note: 1 hm^3 = 1 million cubic meters.
[a] The data on mean natural surface runoff represents the mean annual value of their historical registry and includes the runoff from transboundary catchments.
[b] This river is considered an inland river because it flows into Lake Chapala.
NA: Not available.
The stream order was determined according to the Strahler method. | For more information, please consult the DVD.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

Mexico's transboundary catchments

Mexico shares eight catchments with its neighboring countries: three with the United States of America (Grande, Colorado and Tijuana), four with Guatemala (Grijalva-Usumacinta, Suchiate, Coatan and Candelaria) and one with both Belize and Guatemala (River Hondo), the data on which is presented in T2.8.

The waters of the Rio Grande and the Colorado and Tijuana rivers are shared according to the indications of the "Water Treaty" signed in Washington, D.C. on February 3, 1944. 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 2009 is shown in G2.5.

G2.5 Volume delivered from the Colorado River (hm^3)



See note [f] in Annex D. The complete graph is available on the DVD.

T2.8 Characteristics of the rivers with transboundary catchments, by HAR

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

Note: 1 hm^3 = 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
The data on the mean natural surface runoff and the catchment area were obtained from available hydrological studies.
NA: Not available.
Source: Conagua. Deputy Director General's Office for Technical Affairs. 2010."

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

As regards the Rio Grande (called the Río Bravo in Mexico), T2.9 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 less on the whole, as an average amount in cycles of five consecutive years 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 the event of extraordinary drought or serious accident in the hydraulic systems on the measured Mexican tributaries, making it difficult for Mexico to make available the run-off of 431.72 million cubic meters annually, any deficiencies existing at the end of the aforesaid five-year cycle shall be made up in the following five-year cycle with water from the said measured tributaries.
3. Whenever the conservation capacities assigned to the United States in at least two of the major international reservoirs shared by both countries (La Amistad and Falcon) are filled with waters belonging to the United States, a cycle of five years shall be considered as terminated and all debits fully paid, whereupon a new five-year cycle shall commence.

T2.10 Capacities assigned in the international dams (millions of cubic meters, hm³)

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

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

Main lakes in Mexico

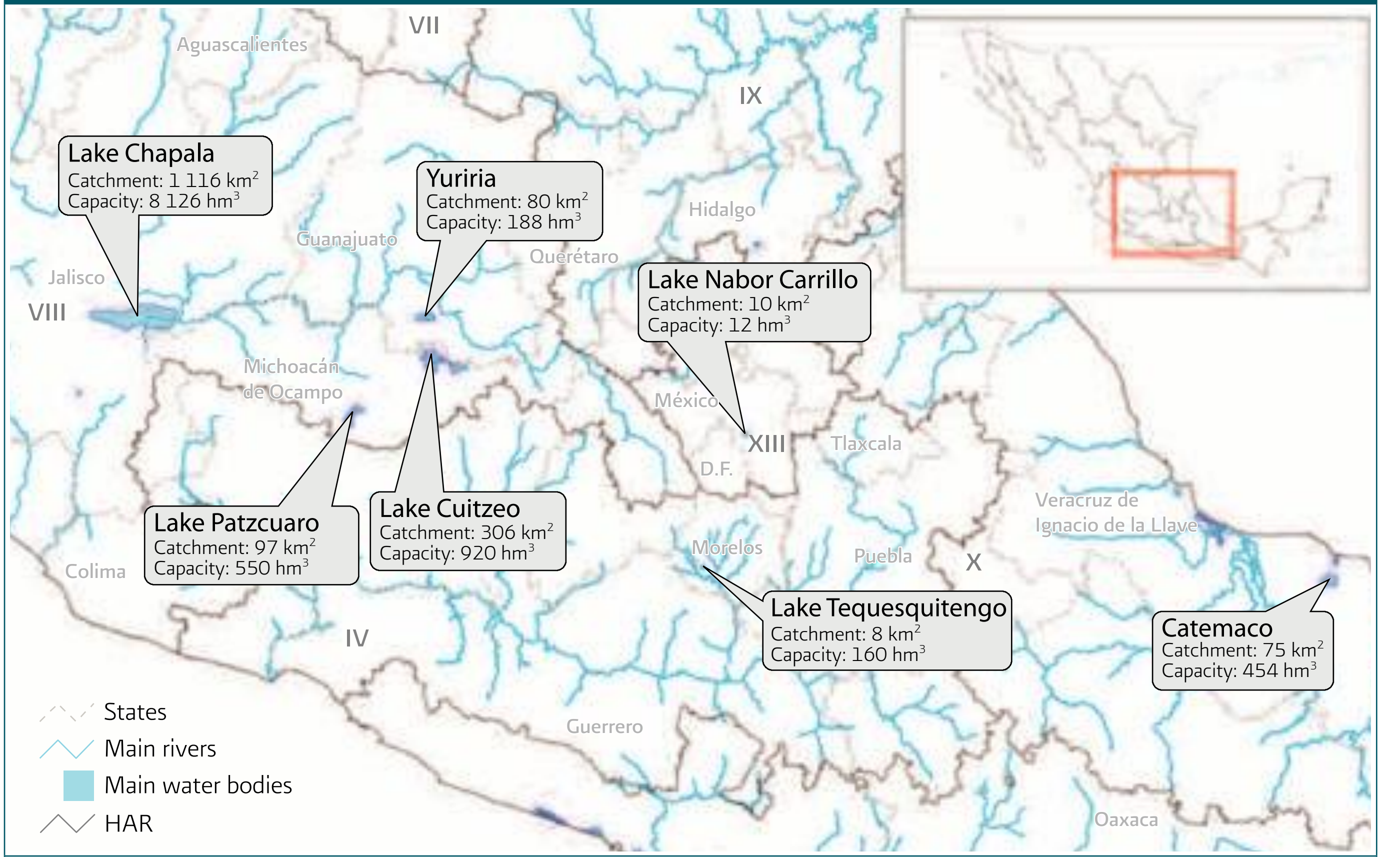
In M2.7, as well as T2.C on the DVD, Mexico's main lakes according to the extension of their own catchment are shown. Lake Chapala is the biggest inland lake in Mexico, with a depth that varies between 4 and 6 m. The behavior of its volumes stored per year is shown in G2.6.

T2.9 Distribution of the waters of the Rio Grande according to the 1944 Treaty

The United Mexican States' share	The United States of America's share
All of the waters reaching the main channel of the Rio Grande from the San Juan and Alamo Rivers.	All of the waters reaching the main channel of the Rio Grande from the Pecos and Devils Rivers, Goodenough Spring and Alamito, Terlingua, San Felipe and Pinto Creeks.
Two-thirds of the flow reaching the main channel of the Rio Grande from the Conchos, San Diego, San Rodrigo, Escondido and Salado Rivers and the Las Vacas Arroyo.	One third of the flow reaching the main channel of the Rio Grande from the following six Mexican channels: the Conchos, San Diego, San Rodrigo, Escondido and Salado rivers, and the Las Vacas Arroyo.
One-half of all other flows not otherwise allotted in the Treaty that reaches the main channel, between Quitman and Falcon.	One half of all other flows not otherwise allotted in the Treaty occurring in the main channel of the Rio Grande, between 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.

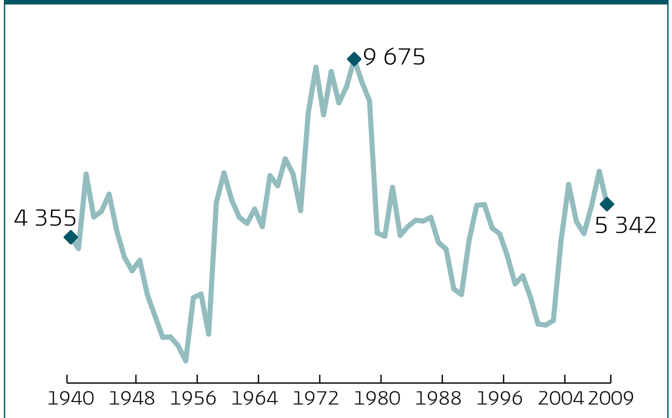
Source: IBWC. *Treaties and Conventions*. Consulted on http://www.sre.gob.mx/cila/ (15/07/2010).

M2.7 Main lakes in Mexico according to their own catchment



Note: Refers to the mean volume stored, since no up-to-date studies exist on their storage capacity.
The area indicated corresponds to the river's own catchment.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

G2.6 Volumes stored in Lake Chapala (hm³)



See note [g] in Annex D. The complete graph is available on the DVD.

2.5 Groundwater

The importance of groundwater is manifest due to the magnitude of the volume employed by the main users, since almost 37% (30.1 billion m³/year in 2009) of the total volume allocated for offstream uses is from groundwater sources. As already mentioned, for the purpose of groundwater management, the country has been divided into 653 aquifers, the official names of which were published in the DOF on December 5, 2001. As of December 31, 2009, the availability of groundwater in 282 aquifers had been published in the DOF[6], and by December 31, 2010, another 121 had been added.

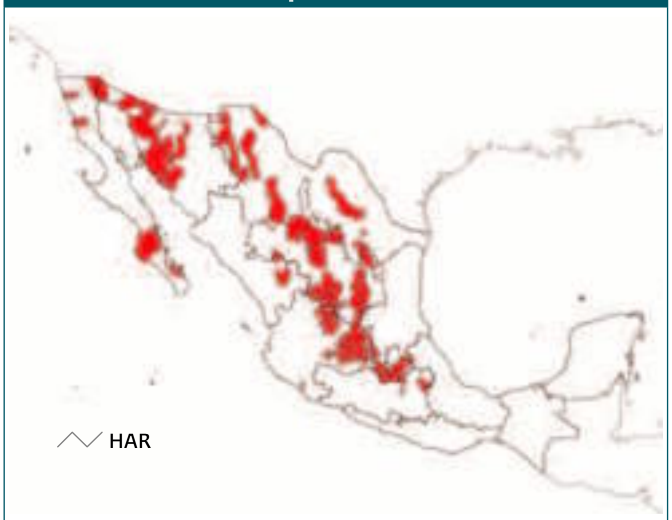
On the DVD, you will find the availability agreements per aquifer currently published, as well as the data related to this issue on the spreadsheet (in Spanish only):
• TM(Acuiferos).

6 The mean annual volume of groundwater that can be withdrawn from a hydrogeological unit for different uses, in addition to the withdrawals already allocated and the natural discharge committed, without jeopardizing the balance of ecosystems.

Overdrafting of aquifers

Since the 1970s, the number of overexploited aquifers has grown steadily. In 1975, there were 32 overdrafted aquifers, 80 in 1985, and 100 overdrafted aquifers as of December 31, 2009 (see D2.4). From these overdrafted aquifers, 53.6% of groundwater is withdrawn for all uses. According to the results of recent studies, it is defined whether aquifers are overdrafted or cease to be so, based on the withdrawal/recharge ratio. The statistics on aquifers are presented in T2.11.

D2.4 Overdrafted aquifers, 2009



See note [h] in Annex D. The complete map is available on the DVD.

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

The phenomenon of soil salinization and the presence of brackish groundwater occur as a result of high indices of evaporation in areas of low levels of groundwater, 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 sedimentary formations that are ancient, superficial, of marine origin and evaporite, in which the interaction of groundwater with the geological material through which it passes produces the higher salt content.

T2.11 Mexico's aquifers, by HAR, 2009

HAR		Number of aquifers				Mean recharge (hm³)
		Total	Overdrafted	With saltwater intrusion	Suffering from the phenomena of soil salinization and brackish groundwater	
I	Baja California Peninsula	87	8	9	5	1 300
II	Northwest	63	13	5	0	3 426
III	Northern Pacific	24	2	0	0	3 267
IV	Balsas	46	2	0	0	4 623
V	Southern Pacific	35	0	0	0	2 024
VI	Rio Bravo	100	15	0	7	5 306
VII	Central Basins of the North	68	24	0	19	2 392
VIII	Lerma-Santiago-Pacific	127	30	0	0	8 102
IX	Northern Gulf	40	2	0	0	1 338
X	Central Gulf	22	0	2	0	4 260
XI	Southern Border	23	0	0	0	18 015
XII	Yucatan Peninsula	4	0	0	1	25 316
XIII	Waters of the Valley of Mexico	14	4	0	0	2 339
National total		**653**	**100**	**16**	**32**	**81 707**

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

As of the end of 2009, 32 aquifers with the presence of saline soils and brackish water had been identified, mainly located in the Baja California Peninsula and in the Mexican Plateau, which bring 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.

At the same time, by the end of 2009 saltwater intrusion had occurred in 16 coastal aquifers nationwide, as shown in M2.8.

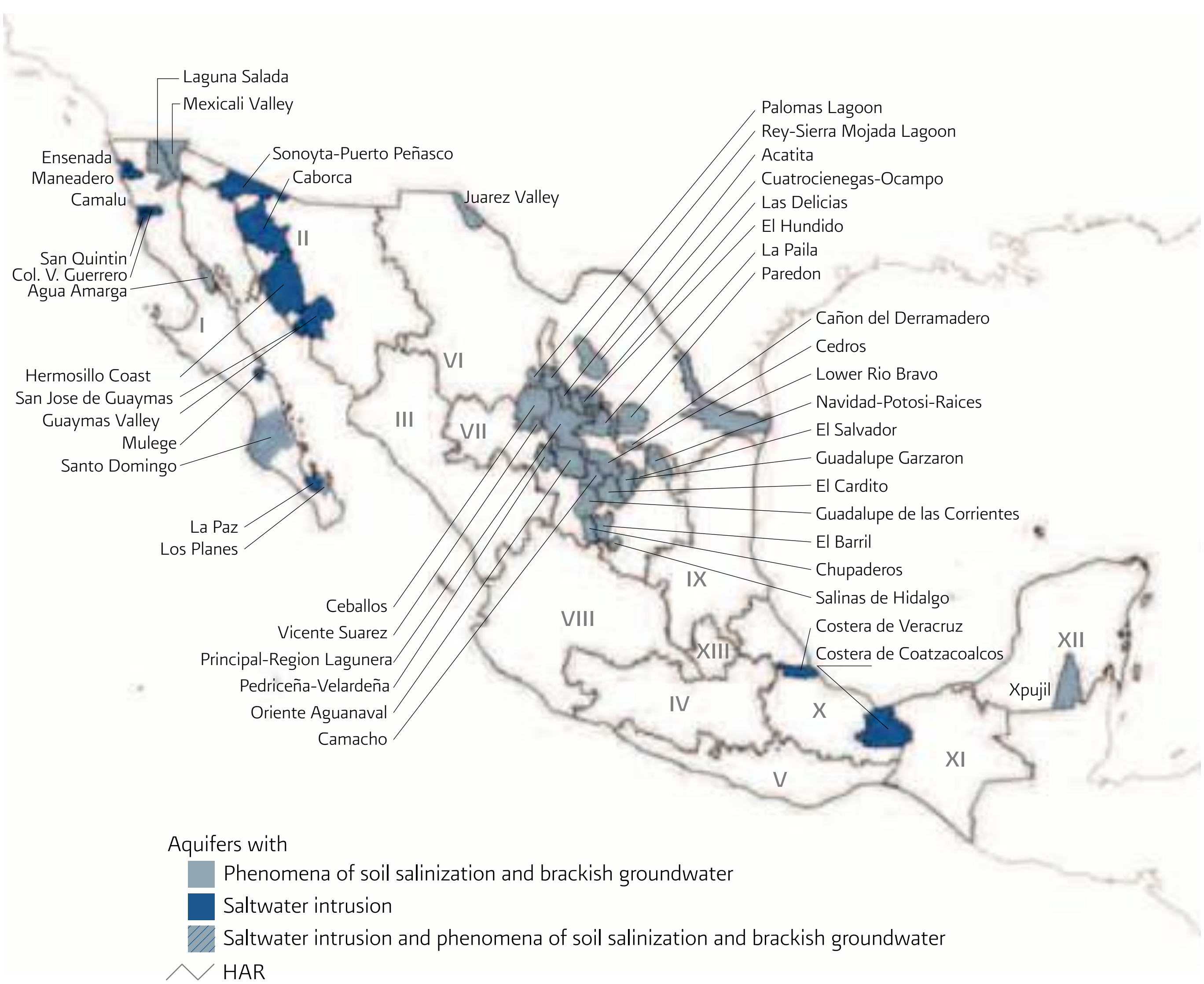
2.6 Water quality

Monitoring of water quality

In 2009, the National Monitoring Network had 1,510 sites, distributed throughout Mexico, as described in T2.12.

The physical-chemical and biological determinations are carried out in the National Laboratory Network,

M2.8 Aquifers with saltwater intrusion and/or soil salinization and brackish groundwater, 2009



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs. Groundwater Department. 2010.

which is made up of 13 laboratories in the River Basin Organizations and 15 in the local offices.

T2.12 Sites in the National Monitoring Network, 2009

Network	Area	Sites (number)
Primary Network	Surface bodies	220
	Coastal zones	78
	Groundwater	150
Secondary Network	Surface bodies	272
	Coastal zones	23
	Groundwater	45
Special Studies	Surface bodies	162
	Coastal zones	53
	Groundwater	409
Groundwater Reference Network		98
Total		**1 510**

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T2.13 Samples for biological monitoring, by HAR, 2009

HAR	Number of samples
IV Balsas	23
VII Central Basins of the North	27
IX Northern Gulf	3
X Central Gulf	5
Total	**58**

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

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.

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). 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.

BOD_5 determines the quantity of biodegradable organic matter whereas 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.

TSS 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 that shows significant signs of municipal and non-municipal wastewater discharges, as well as areas with severe deforestation.

It should be mentioned that the water quality monitoring sites 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 T2.D on the DVD.

The evaluation of water quality for 2009 for the quality indicators was carried out according to the terms established in T2.14, with the results recorded in the subsequent tables and graphs.

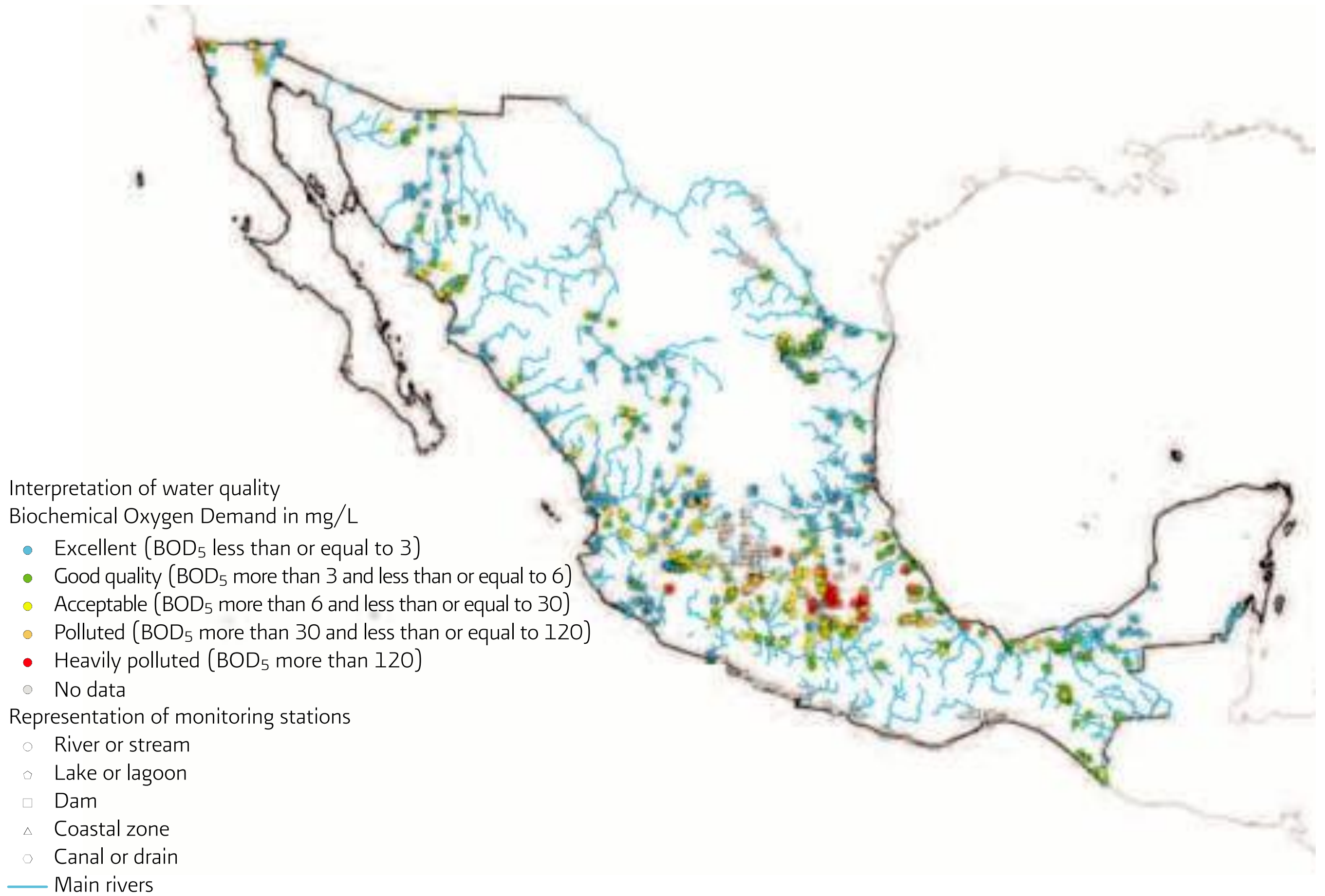
According to the results of the water quality evaluations of the three indicators (BOD_5, COD and TSS) applied to the monitoring sites in 2009, it was determined that 21 catchments were classified as heavily polluted in one, two or all three of these indicators. These catchments are shown in M2.12 and in T2.E on the DVD.

T2.14 Number of monitoring sites with data for each water quality indicator, 2009

Water quality indicator	Number of monitoring sites
Biochemical Oxygen Demand (BOD_5)	605
Chemical Oxygen Demand (COD)	646
Total Suspended Solids (TSS)	744

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

M2.9 Water quality according to the BOD5 indicator, in surface water monitoring sites, 2009



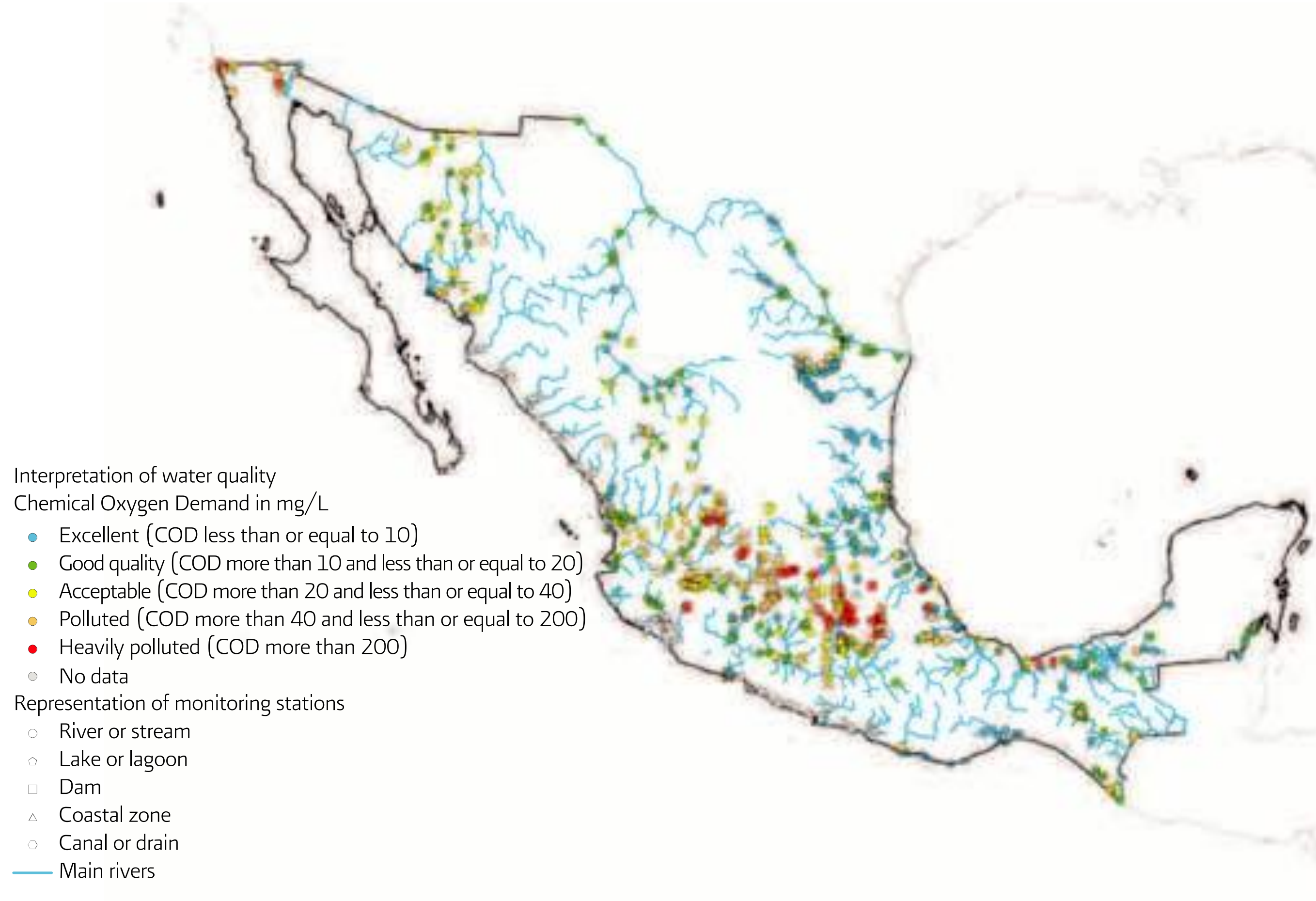
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T2.15 Percentage distribution of monitoring sites in surface water bodies by HAR, according to the BOD_5 indicator, 2009

HAR		Excellent	Good quality	Acceptable	Polluted	Heavily polluted
I	Baja California Peninsula	27.3	9.1	45.5	13.6	4.5
II	Northwest	50.0	26.5	23.5	0.0	0.0
III	Northern Pacific	70.7	12.2	17.1	0.0	0.0
IV	Balsas	16.6	23.8	41.7	13.1	4.8
V	Southern Pacific	0.0	0.0	0.0	0.0	0.0
VI	Rio Bravo	48.6	46.2	2.6	2.6	0.0
VII	Central Basins of the North	90.0	10.0	0.0	0.0	0.0
VIII	Lerma-Santiago-Pacific	48.7	9.3	24.0	12.7	5.3
IX	Northern Gulf	80.9	11.9	4.8	2.4	0.0
X	Central Gulf	0.0	70.3	13.0	11.1	5.6
XI	Southern Border	0.0	86.1	13.9	0.0	0.0
XII	Yucatan Peninsula	90.0	0.0	10.0	0.0	0.0
XIII	Waters of the Valley of Mexico	4.2	0.0	20.8	25.0	50.0
National tota		**41.0**	**26.8**	**19.7**	**7.9**	**4.6**

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

M2.10 Water quality according to COD indicator, in surface water monitoring sites, 2009



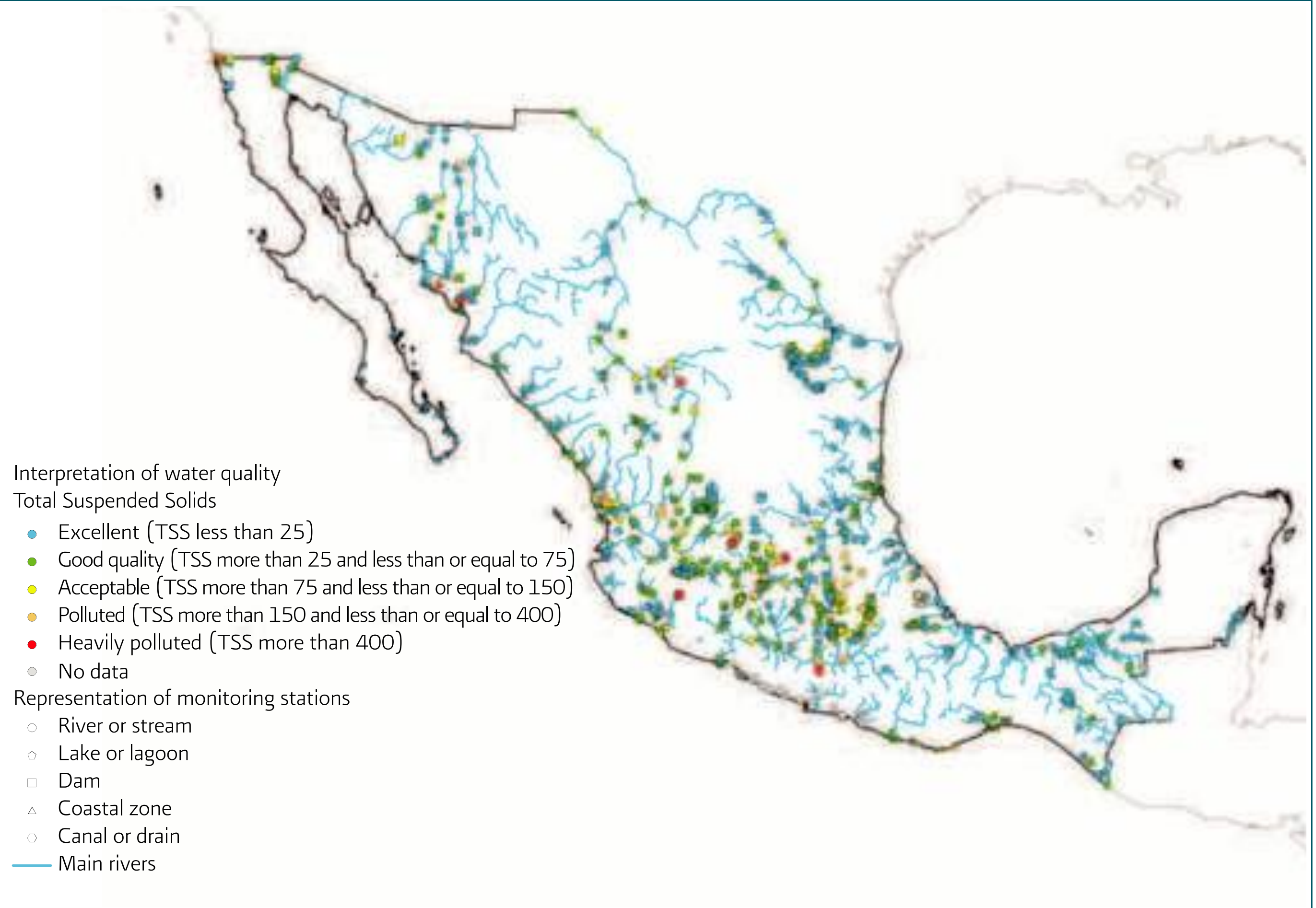
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T2.16 Percentage distribution of monitoring sites in surface water bodies by HAR, according to the COD indicator, 2009

HAR		Excellent	Good quality	Acceptable	Polluted	Heavily polluted
I	Baja California Peninsula	4.5	0.0	13.6	68.2	13.7
II	Northwest	43.5	17.7	24.2	14.5	0 1
III	Northern Pacific	11.7	41.2	11.8	35.3	0.0
IV	Balsas	9.5	21.4	27.4	28.6	13.1
V	Southern Pacific	96.0	0.0	4.0	0.0	0.0
VI	Rio Bravo	51.6	39.8	1.1	7.5	0.0
VII	Central Basins of the North	25.0	30.0	45.0	0.0	0.0
VIII	Lerma-Santiago-Pacific	4.0	17.3	26.7	42.0	10.0
IX	Northern Gulf	55.6	22.2	11.1	6.7	4.4
X	Central Gulf	39.6	8.3	22.9	25.0	4.2
XI	Southern Border	16.6	50.0	13.9	13.9	5.6
XII	Yucatan Peninsula	55.0	30.0	10.0	5.0	0.0
XIII	Waters of the Valley of Mexico	4.1	0.0	12.5	29.2	54.2
National total		**28.3**	**22.1**	**18.6**	**23.5**	**7.5**

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

M2.11 Water quality according to the TSS indicator, in surface water monitoring sites, 2009



Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T2.17 Percentage distribution of monitoring sites in surface water bodies by HAR, according to the TSS indicator, 2009

RHA		Excellent	Good quality	Acceptable	Polluted	Heavily polluted
I	Baja California Peninsula	68.4	18.5	5.6	5.6	1.9
II	Northwest	69.4	17.7	4.8	4.8	3.3
III	Northern Pacific	41.4	36.6	17.1	4.9	0.0
IV	Balsas	35.6	42.9	14.3	6.0	1.2
V	Southern Pacific	32.0	52.0	12.0	4.0	0.0
VI	Rio Bravo	82.8	12.9	4.3	0.0	0.0
VII	Central Basins of the North	30.0	40.0	20.0	5.0	5.0
VIII	Lerma-Santiago-Pacific	35.4	38.4	15.1	7.6	3.5
IX	Northern Gulf	51.7	31.0	12.1	5.2	0.0
X	Central Gulf	72.1	14.8	1.9	9.3	1.9
XI	Southern Border	69.4	30.6	0.0	0.0	0.0
XII	Yucatan Peninsula	95.0	5.0	0.0	0.0	0.0
XIII	Waters of the Valley of Mexico	24.0	24.0	20.0	32.0	0.0
National total		**53.5**	**28.9**	**10.1**	**5.9**	**1.6**

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

M2.12 Catchments with monitoring sites classified as heavily polluted for BOD5, COD and/or TSS, 2009

Note: The signs indicate schematically the catchment registered for the monitoring sites.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010..

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), slightly brackish (1,000-2,000 mg/L), brackish (2,000-10,000 mg/L) and saline (>10,000 mg/L). The limit between freshwater and slightly 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 up of beaches and their associated watersheds and aquifers is promoted. The finality of the program is to prevent and redress 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, 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[7]/100 ml is considered the maximum limit for recreational use.

Water quality classification criteria on beaches:

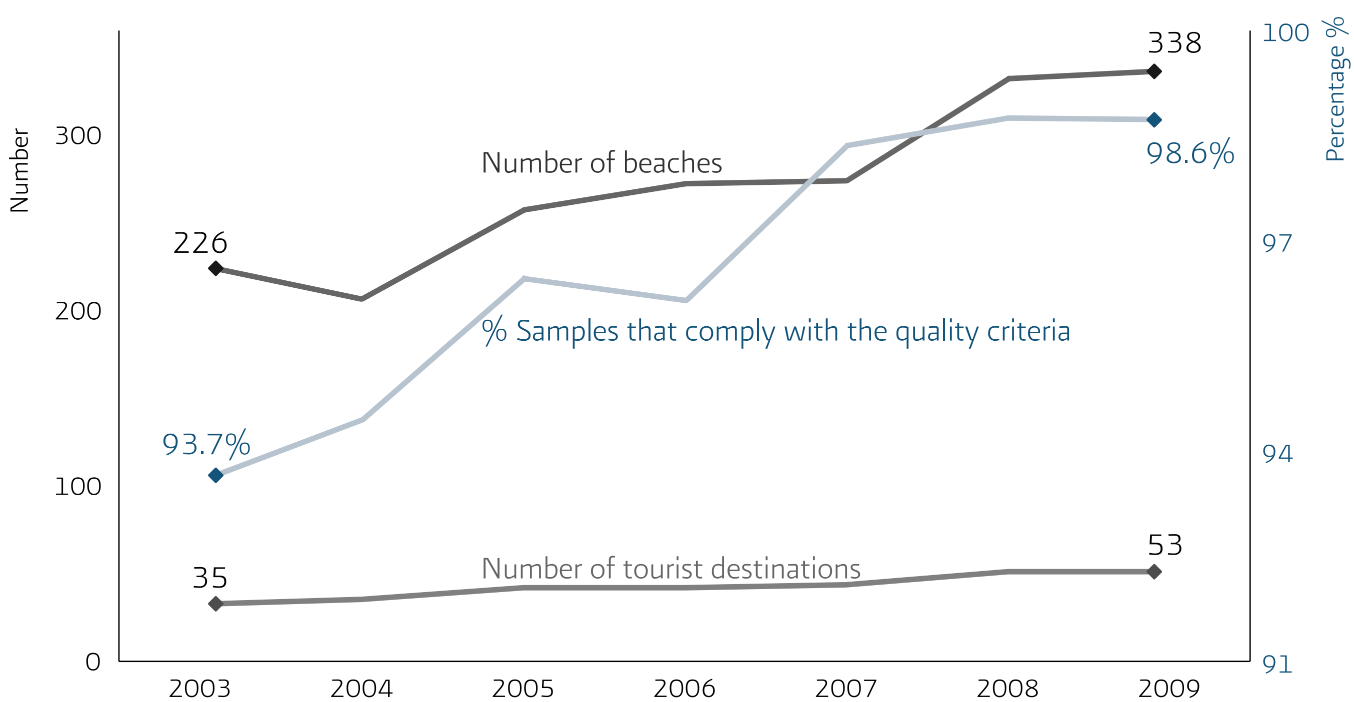
- 0-200 MLN/100 ml, the beach is considered SUITABLE for recreational use.
- › 200 MLN/100 ml, the beach is considered UNSUITABLE for recreational use.

According to the reports by the National Information System on Water Quality on Mexican Beaches, the bacteriological monitoring on beaches, carried out by the Ministry of Health through its state representation and published on the website of COFEPRIS, water quality on Mexico's beaches improved between 2003 and 2009, as shown in G2.7.

In M2.13, the bacteriological quality is shown on tourist beaches for 2009.

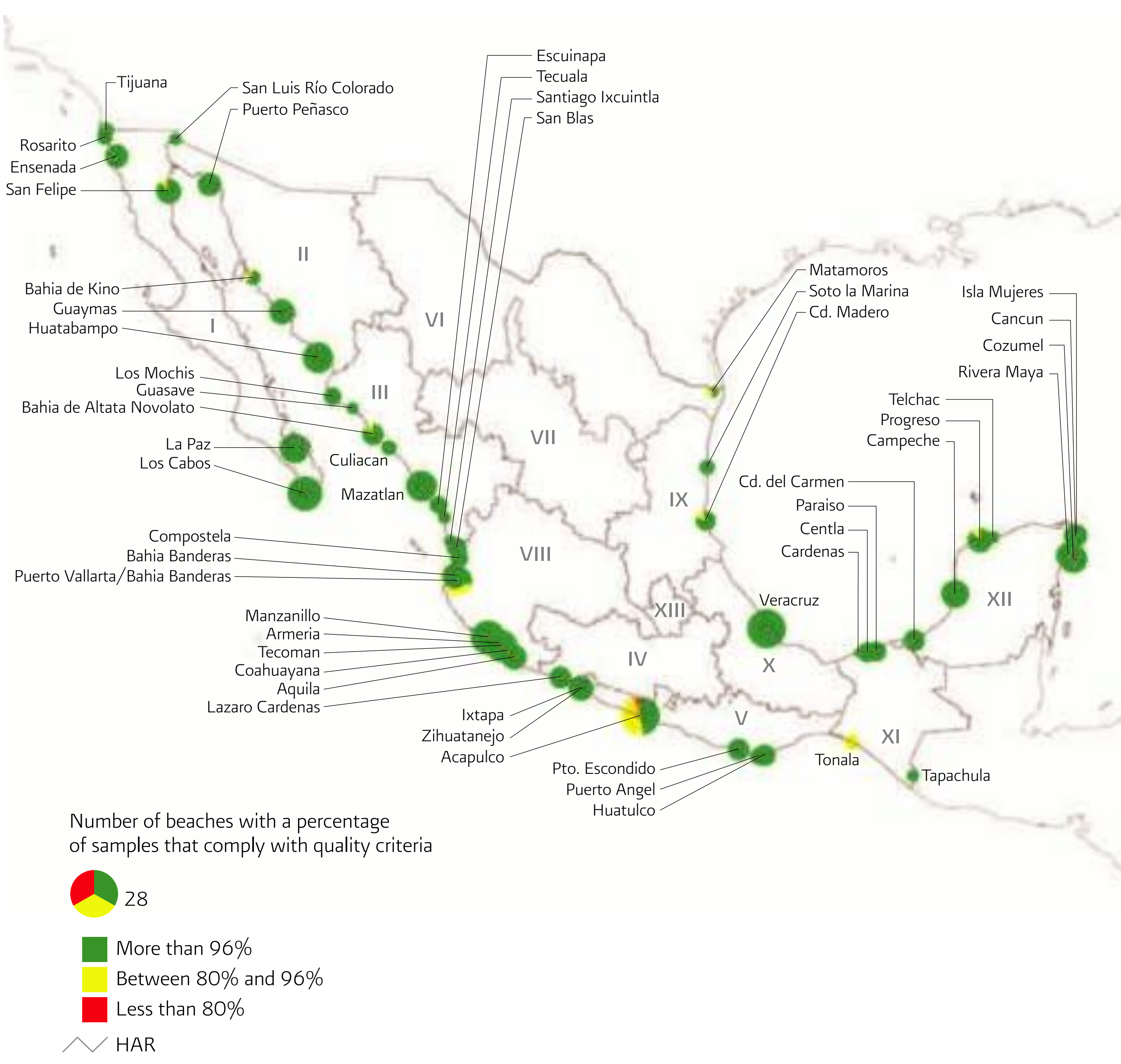
7 MLN (Most Likely Number).

G2.7 Results of the water quality monitoring program on beaches, 2003-2009



See note i in Annex D. The complete graph is available on the DVD.

M2.13 Bacteriological water quality on tourist beaches, 2009



Note: The size of the pie graph is proportional to the number of beaches sampled by the Clean Water Program. In the key, the height corresponding to 28 sampled beaches is shown.

Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
SEMARNAT. CONAGUA. PROFEPA. SEMAR. SECTUR. COFEPRIS. *Clean Beach Program*, Mexico, 2010.

Uses of water

3

3.1 Classification of uses of water

Water is used in different ways in practically all areas of human activity, whether it be for basic needs or to produce and exchange of goods and services.

In the Public Registry of Water Duties (REPDA), the volumes allocated (or assigned, in the case of volumes destined for public urban or domestic use) 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 main headings; four that correspond to offstream uses, namely agriculture, public supply, self-supplying industry and electricity generation excluding hydropower, and finally hydropower, which is considered separately since it corresponds to an instream use of water. In this chapter the term **grouped use** will be used to distinguish these five main groups.

In graph G3.1 the evolution in the volume allocated for offstream uses can be observed, in the period from 2001 to 2009. 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 15%, whereas the groundwater increased by 21%.

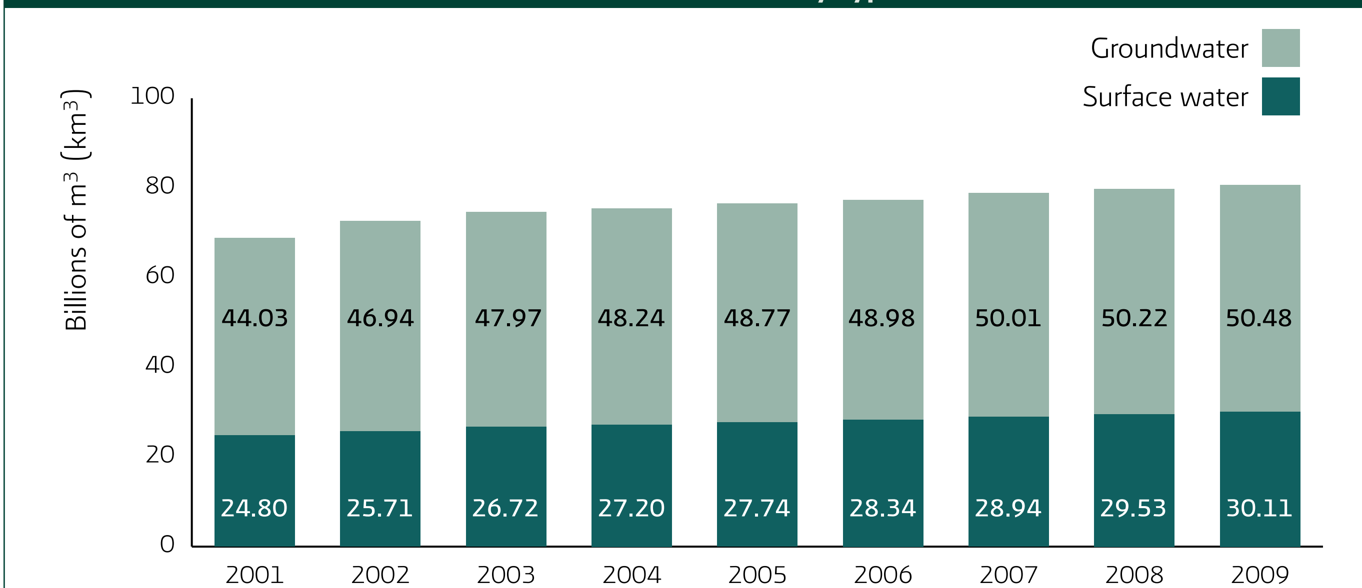
Offstream uses allocated or assigned in 2009: 80.6 km^3. Instream uses allocated in 2009: 164.6 km^3

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
• TM(Usos).

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

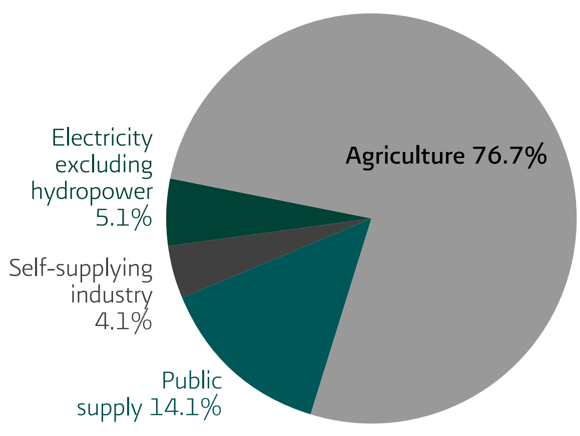
The greatest volume allocated for offstream uses of water is the one corresponding to the grouped use for agriculture, as can be observed in table T3.1 and G3.2. This grouped use mainly considers the water employed in irrigation. It should be mentioned that Mexico is one of the countries with the most substantial irrigation infrastructures in the world (see chapter 4).

G3.1 Evolution in the volume allocated for offstream uses by type of source, 2001-2009



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA: Deputy Director General's Office for Water Management. 2010.

G3.2 Distribution of the volumes allocated for grouped offstream uses, 2009



See note [a] in Annex D. The complete graph is available on the DVD.

As regards hydropower plants, which represent an instream use of water resources, 136.1 billion cubic meters (km^3) of water were used nationwide in 2009. It should be pointed out that for this use, the same water is used and counted several times, in all the country's plants.

T3.1 Grouped offstream uses, according to the type of withdrawal source, 2009

Use	Origin		Total volume (km^3)	Percentage of withdrawal
	Surface water (km^3)	Groundwater (km^3)		
Agriculture[a]	40.9	20.9	61.8	76.7
Public supply[b]	4.3	7.1	11.4	14.1
Self-supplying industry[c]	1.6	1.7	3.3	4.1
Electricity excluding hydropower	3.6	0.4	4.1	5.1
Total	**50.5**	**30.1**	**80.6**	**100.0**

Note: 1 km^3 = 1,000 hm^3 = 1 billion m^3.
The data corresponds to the volumes allocated as of December 31, 2009.
The values may not add up to the total due to the rounding of the figures.
[a] Includes the agricultural, livestock, aquaculture, multiple and "others" headings of the REPDA classification. Also includes 1.30 km^3 of water corresponding to Irrigation Districts that are 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. 2010.

R3.1 "Water measures"

Since ancient times, different units of measurement have been used, which have gone through a long process of uniformization and standardization, reaching the relatively recent adoption of the decimal metric system, of daily use in Mexico.

Water management, in the sense of assigning quantities of water to different users over time, requires the measurement of both volumes and volumetric flows (volume/time).

In Mexico, measures of Spanish origin were employed from colonial times to the beginning of the 20th century. These "water measures", according to the context of the time, defined the size of the opening, outlet or spillway through which the water passed, with a relationship that could be described as "the bigger the opening, the greater the flow". However, this direct relationship is only the case at a constant flow speed. Since they did not consider consistently the measurement of speed, the "water measures" had different interpretations through time.

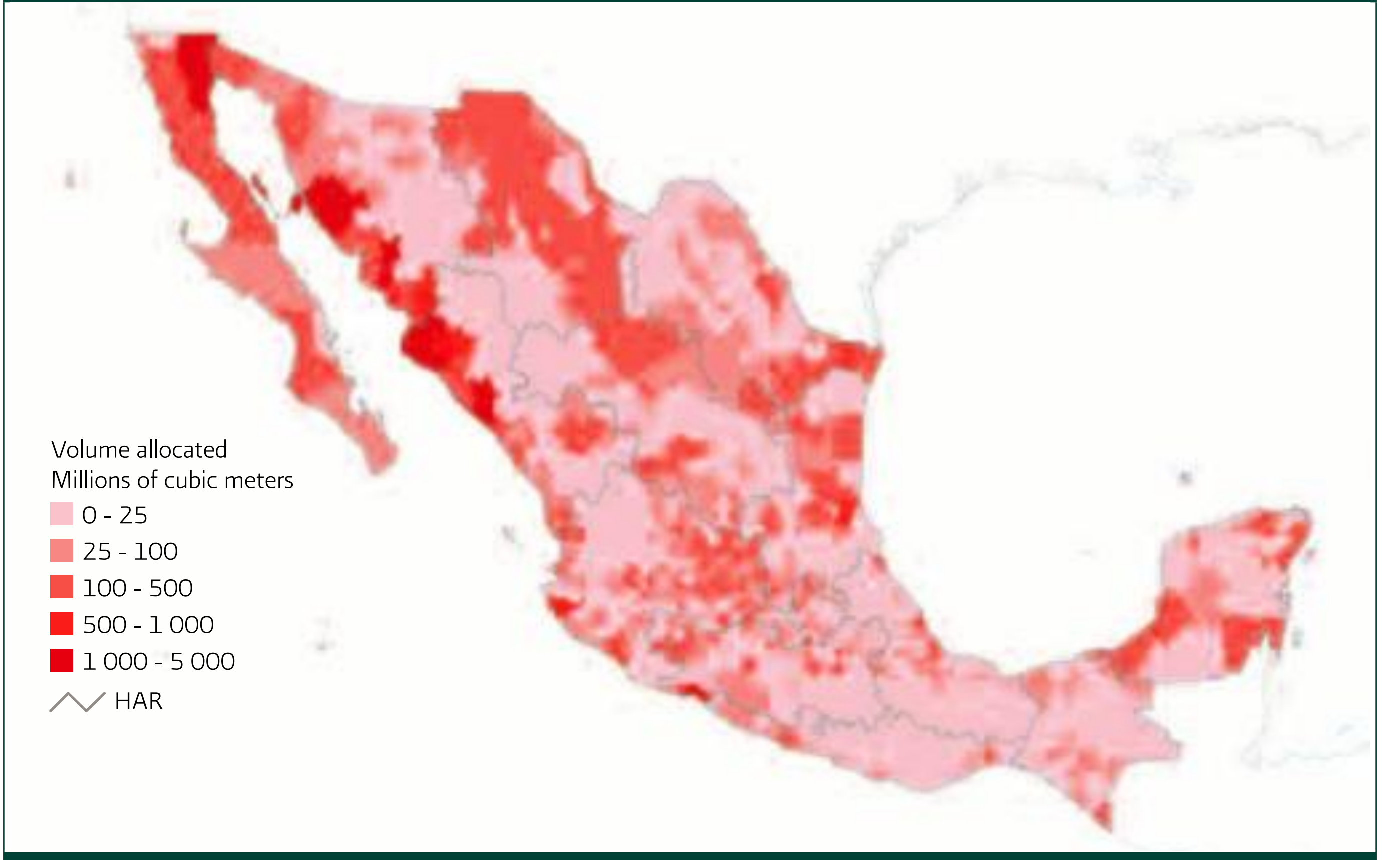
Old units	Old equivalents	Size of the opening, outlet or spillway in cm^2	Range of equivalences in l/s
1 straw ("paja")	NA	0.3	0.0075 to 0.00766
1 real ("real")	18 straws ("pajas")	6.1	0.135 to 0.137
1 orange ("naranja")	8 reals ("reales")	48.8	1.08
1 furrow ("surco")	3 oranges ("naranjas")	146.3	3.24 to 17.50
1 ox ("buey")	48 furrows ("surcos")	7022.6	159 to 163.85

Note: NA = Not Applicable.
Source: Hermosa, Jesús. *Manual of Geography and Statistics in the Mexican Republic*. Instituto Mora, Colección Facsímiles. First edition 1857, First fax reprint 1991.
Palerm, J. and Carlos Chairez. *Ancient water measures*. Relationships, Autumn, Vol. 23, Number 92. El Colegio de Michoacán, Zamora, Mexico 2002. pp 227-251.

3.2 Distribution of uses throughout Mexico

Map M3.1 shows the volume allocated for offstream uses in 2009, by municipality. The volume is allocated or assigned from surface water or groundwater sources. The dominant source per municipality is shown in M3.2. It should be mentioned that when there is a difference of less than 5% between both sources, it is considered that there is no predominant source, and they are referred to as similar sources.

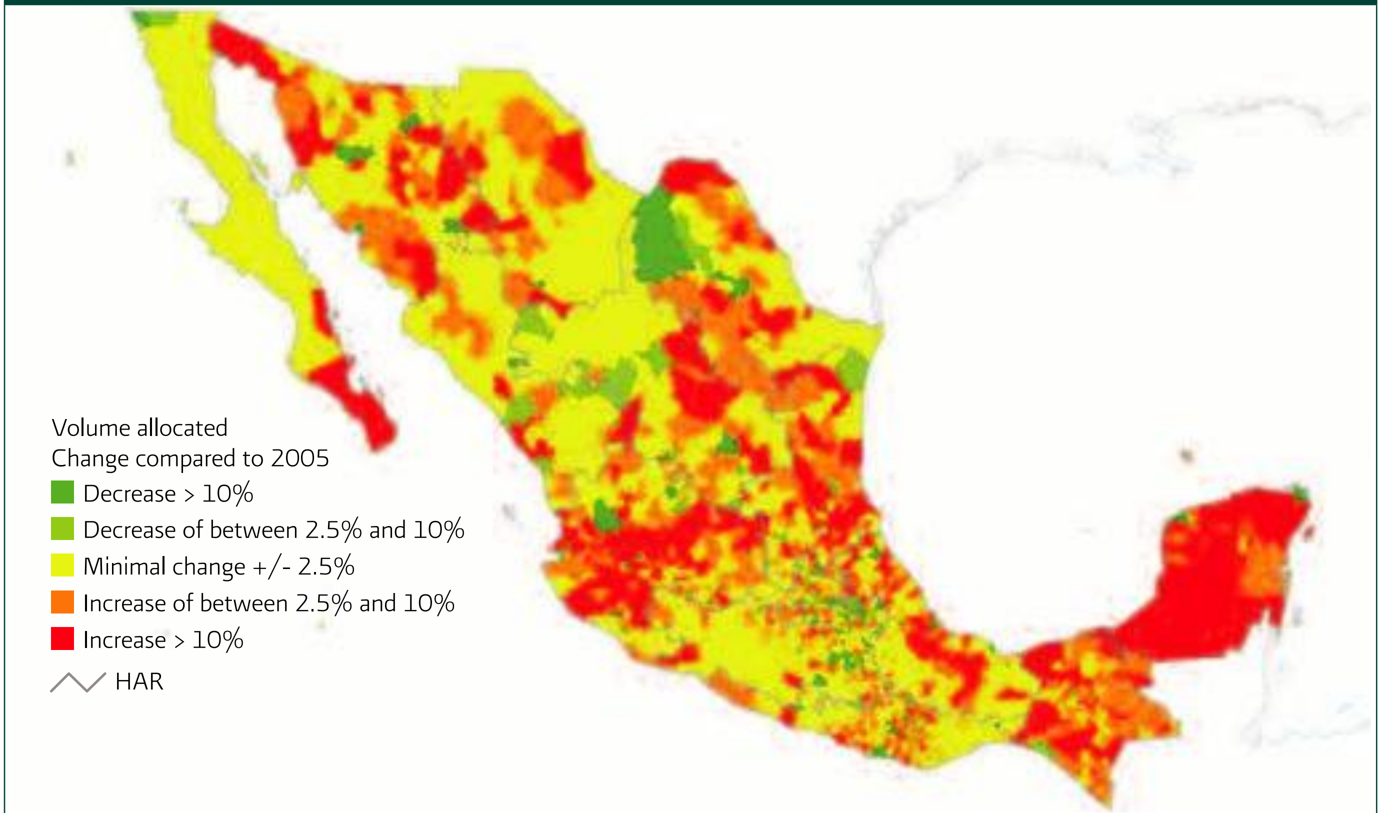
M3.1 Intensity of offstream uses, by municipality, 2009



M3.2 Predominant source for offstream uses, by municipality, 2009

M3.3 Predominant grouped offstream use, by municipality, 2009

M3.4 Evolution in offstream uses, by municipality, comparison 2005-2009



For all maps. 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. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Water Management. 2010.

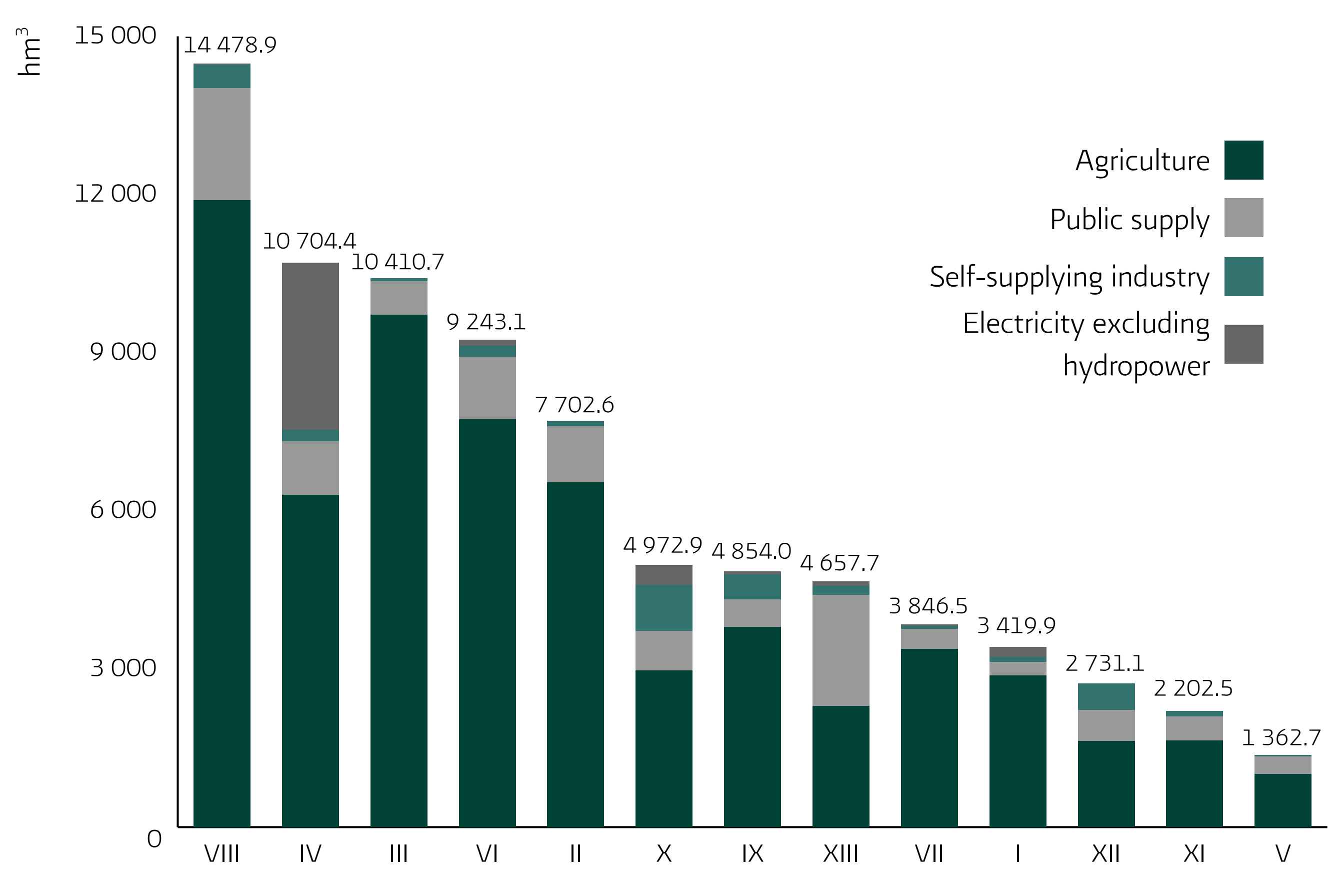
Similarly, the distribution of uses varies throughout Mexico. By considering the volumes allocated or assigned at the municipal level, it is possible to establish if one particular grouped use dominates over the others. In the majority of municipalities in Mexico, the grouped use for agriculture is the dominant one, followed by the grouped use for public supply, as observed in M3.3.

The distribution of uses can also be visualized according to the evolution of volumes over time. M3.4 compares the volume allocated or assigned by municipality in 2009 compared to the volume in 2005, highlighting if it increased or decreased.

G3.3 and T3.A on the DVD show the way in which volumes of water have been allocated for grouped offstream uses in Mexico. It can be observed that the Hydrological-Administrative Regions (HAR) 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 HAR, with the exception of IV Balsas, where the Petacalco thermoelectric plant, located near the mouth of the Balsas River, occupies a significant volume of water.

T3.2 and G3.A on the DVD show the information on the volumes of water allocated by state, among which Sinaloa and Sonora stand out, where there are large areas under irrigation.

G3.3 Volumes allocated for grouped offstream uses, by HAR, 2009



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 31, 2009.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management. 2010.

T3.2 Volumes allocated by grouped offstream uses, by state, 2009 (hm^3)

No	State	Volume allocated	Agriculture[a]	Public supply[b]	Self-supplying industries excluding thermoelectric plants[c]	Electricity excluding hydropower[d]
1	Aguascalientes	617.9	487.0	119.1	11.8	0.0
2	Baja California	3 008.3	2 545.6	185.6	81.9	195.2
3	Baja California Sur	411.6	333.0	61.5	13.3	3.9
4	Campeche	745.2	583.6	140.9	20.8	0.0
5	Coahuila de Zaragoza	1 961.4	1 626.3	186.8	73.4	74.9
6	Colima	1 685.1	1 575.7	84.9	24.5	0.0
7	Chiapas	1 715.9	1 407.7	273.2	35.0	0.0
8	Chihuahua	5 151.4	4 589.7	476.4	57.9	27.5
9	Federal District (Mexico City)	1 122.9	1.3	1 089.6	32.1	0.0
10	Durango	1 551.9	1 369.3	152.7	18.3	11.5
11	Guanajuato	4 176.8	3 444.3	651.5	60.5	20.5
12	Guerrero	4 277.0	849.7	288.7	16.5	3 122.1
13	Hidalgo	2 355.9	2 079.7	171.1	22.4	82.6
14	Jalisco	4 064.8	3 170.7	723.8	170.1	0.1
15	State of Mexico	2 723.2	1 269.6	1 279.6	167.1	6.9
16	Michoacan de Ocampo	5 134.4	4 629.4	312.6	144.2	48.2
17	Morelos	1 261.4	938.1	266.3	56.9	0.0
18	Nayarit	1 213.4	1 056.5	107.0	50.0	0.0
19	Nuevo Leon	2 054.4	1 459.2	511.9	82.5	0.8
20	Oaxaca	1 113.8	875.0	203.6	35.2	0.0
21	Puebla	2 418.5	1 962.0	385.0	65.0	6.5
22	Queretaro	1 019.6	658.6	294.3	60.9	5.7
23	Quintana Roo	791.9	138.1	201.7	452.1	0.0
24	San Luis Potosi	1 363.0	1 131.1	171.4	29.5	31.0
25	Sinaloa	9 186.0	8 635.1	508.3	42.6	0.0
26	Sonora	7 514.9	6 375.8	1 041.8	90.2	7.0
27	Tabasco	422.2	175.3	184.0	62.9	0.0
28	Tamaulipas	3 854.4	3 372.9	318.5	108.9	54.0
29	Tlaxcala	245.1	149.6	76.2	19.2	0.0
30	Veracruz de Ignacio de la Llave	4 719.7	2 628.6	568.6	1 152.0	370.5
31	Yucatan	1 248.0	956.7	246.0	36.2	9.1
32	Zacatecas	1 457.1	1 318.9	112.7	25.6	0.0
	Total	**80 587.0**	**61 794.0**	**11 395.4**	**3 319.7**	**4 077.9**

Note: The values may not add up to the total due to the rounding of the figures. The volumes are as of December 31, 2009. 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, excluding hydropower.

Source: CONAGUA. Deputy Director General's Office for Water Management. 2010.

3.3 Grouped use for agriculture

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. According to the VII Agricultural, Livestock and Forest Census (2007), the latest one available nationwide, the surface area in agricultural production units was 30.22 million hectares, of which 18% was for irrigation and the remainder was rainfed.

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.

Additionally, every year the area harvested varies between 17 and 21 million hectares per year (Agro-Food and Fishing Information Service, 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) was 3.8% in 2009[2].

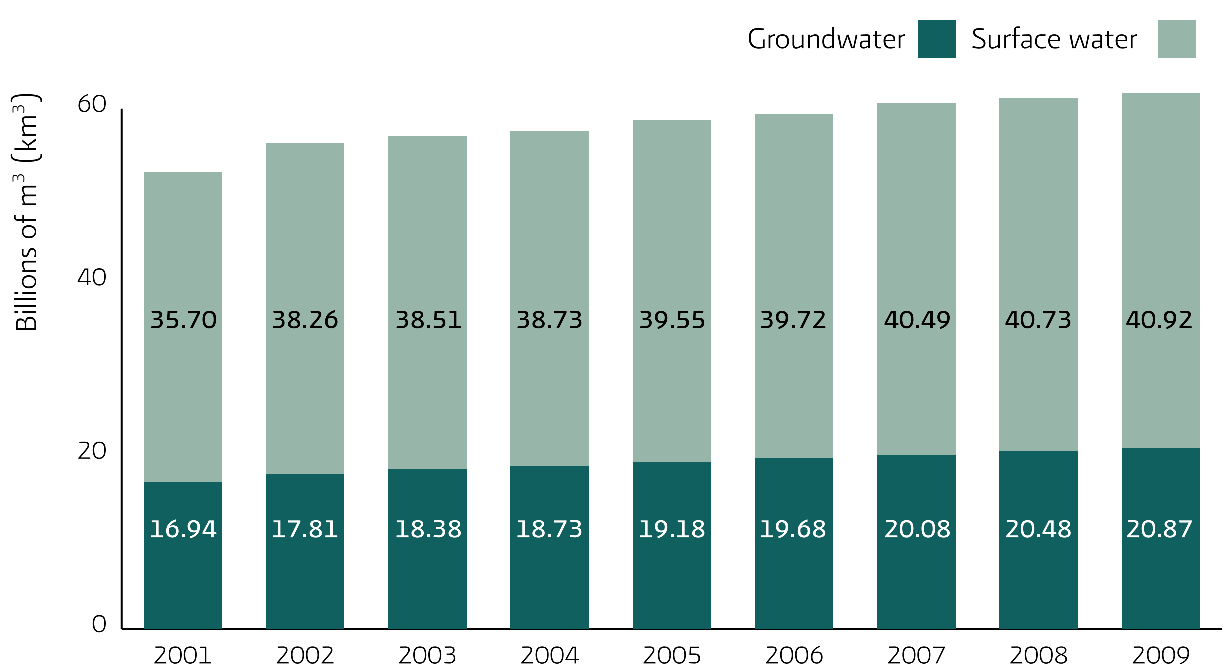
According to the National Inquiry of Occupation and Employment (ENOE in Spanish), the population occupied in this subsector up to the fourth trimester of 2009 was 6.1 million people, which represents 13.7% of the economically active population of Mexico[3], as a result of which it has been estimated that 30 million Mexicans directly depend upon this activity, the majority of them rurally-based.

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

2 INEGI. *Economic Information Bank-Trimestrial Gross Domestic Product, 2003 baseline at 2003 prices, absolute values.* Consulted on: http://dgcnesyp.inegi.org.mx (15/07/2010).

3 STPS-National Inquiry of Occupation and Employment (ENOE). *Trimestral Indicators.* Consulted on: http://interdsap.stps.gob.mx:150/302_0058enoe.asp (15/07/2010).

G3.4 Evolution in the volume allocated for grouped use for agriculture, by type of source, 2001-20099



Note: Includes the agriculture, livestock, aquaculture, multiple and others uses of the REPDA classification.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management. 2010.

It is worth mentioning that the yield in tons per hectare of irrigation agriculture is 2.2 to 3.6 times higher than the area under a rainfed regime (see 4.3 Hydro-Agricultural Infrastructure).

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).

33.8% of the water allocated for agriculture, aquaculture, livestock, multiple and other uses comes from groundwater sources, which represents an increase of 23.2% in the volume allocated, in the period from 2001 to 2009, as can be observed in G3.4.

Of every 100 liters of water allocated or assigned for offstream uses in 2009, 77 corresponded to the grouped use for agriculture

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

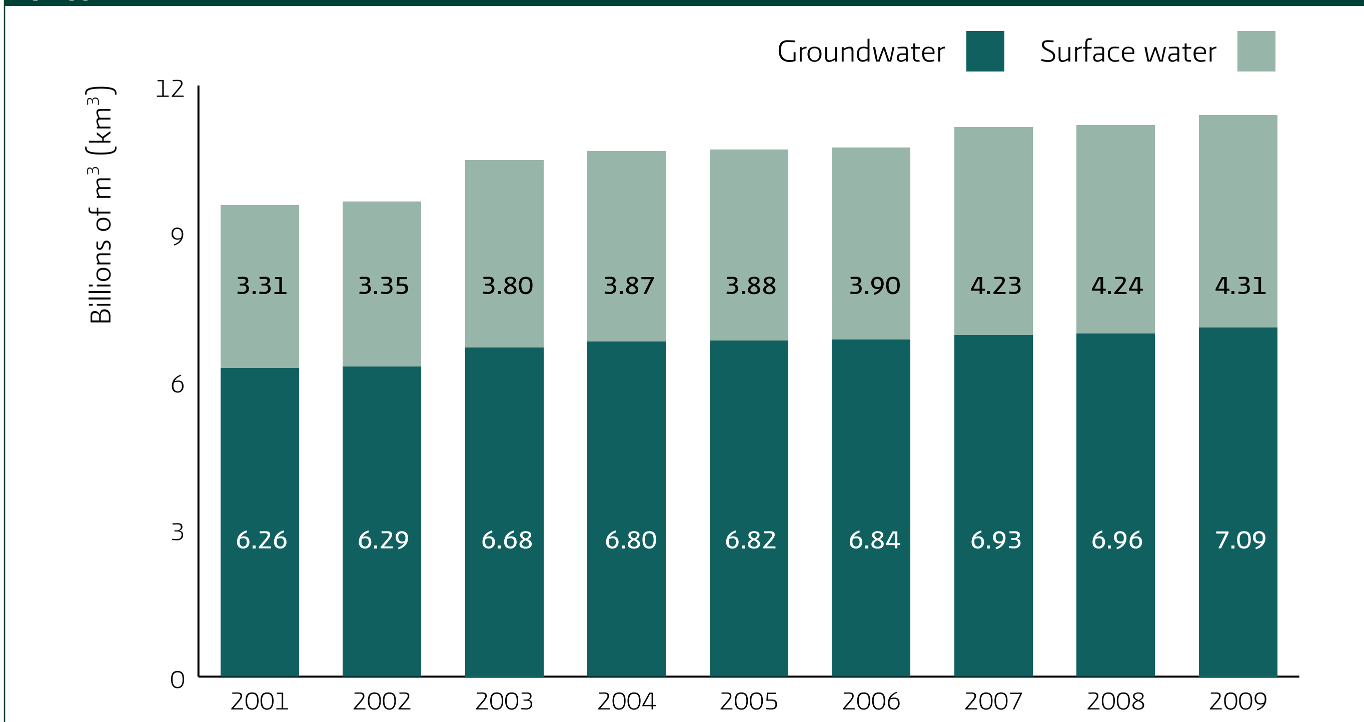
3.4 Grouped use for public supply

The use for public supply consists of the water delivered through the drinking water networks, which supply domestic (home) 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 2007-2012 National Development Plan and the 2007-2012 National Water Resources Program.

For public water supply, which covers the public urban and domestic headings, the predominant source is groundwater, with 62.2% of the volume, as can be appreciated in G3.5. It is worth noting that in the period reported on, the surface water allocated for this use increased by 30.3%.

G3.5 Evolution in the volume allocated for grouped use for public supply, by type of source, 2001-2009



Note: Includes the public urban and domestic headings of the REPDA classification.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Water Management. 2010.

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

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

Of every 100 liters of water allocated or assigned for offstream uses in 2009, 14 corresponded to the grouped use for public supply

3.5 Grouped use for self-supplying industry

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

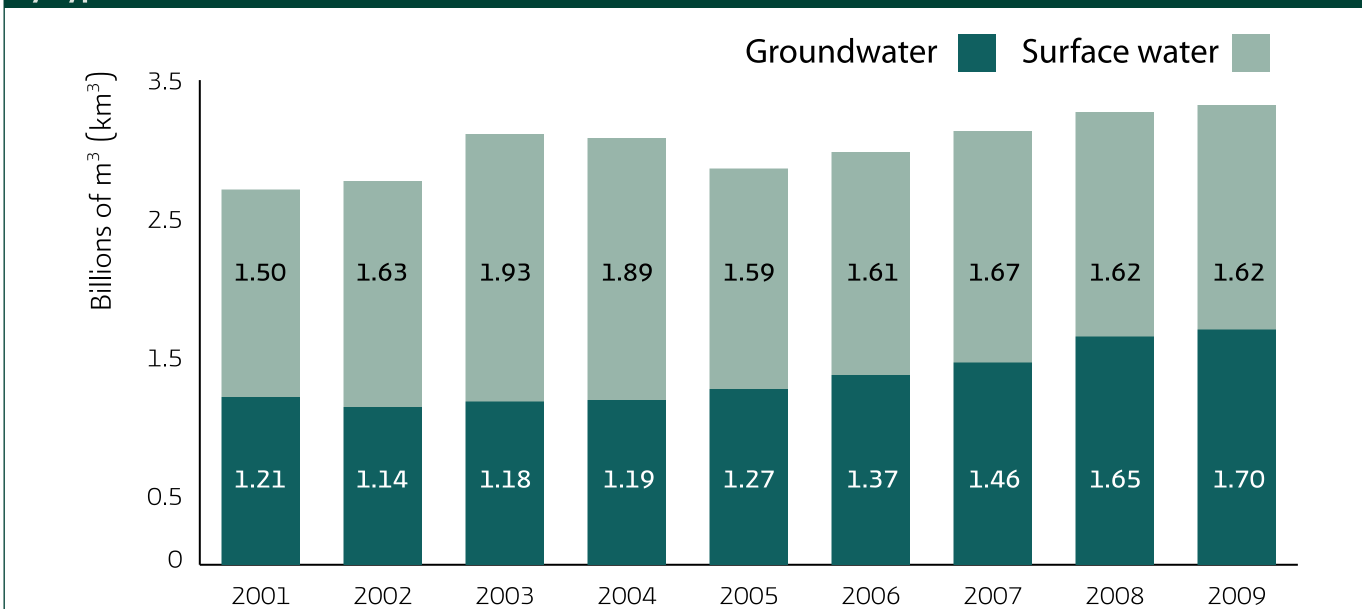
According to the North American Industrial Classification System (NAICS)[4], secondary activities, known traditionally as "industry", are made up of the mining, electricity, water and piped gas supply sectors to end users, as well as construction and the manufacturing industry. It should be added that,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

Of every 100 liters of water allocated or assigned for offstream uses in 2009, 4 corresponded to the grouped use for self-supplying industry

Even if it only represents 4.1% of the total use of water, the grouped use for self-supplying industry, which includes the industrial, service, agro-industrial and trade headings of the REPDA, presents a strong growth trend, as shown in G3.6. It should be mentioned that in the period reported on, the predominant source went from being surface water to groundwater, with a growth of 40.5% in the volume allocated for this source.

4 INEGI. *Structure of the NAICS Mexico.* Consulted on: http://www.inegi.gob.mx/est/contenidos/espanol/metodologias/censos/scian/estructura.pdf (15/07/2010).

G3.6 Evolution in the volume allocated for the grouped use for self-supplying industry, by type of source, 2001-2009



Note: Includes the industrial, service, agro-industrial and trade headings of the REPDA classification.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Water Management. 2010.

3.6 Use in energy generation excluding hydropower

The water included under this heading refers to that used in energy generation except for hydropower, which therefore includes dual steam, coal-electric, combined cycle, turbo-gas and internal combustion plants.

According to the findings of the Ministry of Energy (SENER), in 2009 the plants of the Federal Commission for Electricity (CFE in Spanish) and Luz y Fuerza del Centro (LFC) considered in this grouped use, including External Energy Producers (EEP) for public service, generated 207 TWh, which represented 88.7% of the total of electricity produced in Mexico[5]. The corresponding plants have an installed capacity of 40,303 MW, or 78% of Mexico's total capacity[6]. It should be noted that 76.6% of the water allocated for this use in Mexico correspond to the coal-electric plant in Petacalco, situated on the Guerrero coast, very close to the mouth of the river Balsas.

T3.3 shows the annual evolution in the grouped use for energy generation in the period 1999-2009.

Of every 100 liters of water allocated or assigned for offstream uses in 2009, 5 corresponded to the grouped use of energy generation excluding hydropower

5 Excluding the generation by permit holders, co-generation and self-supply. (SENER, 2010).

6 Idem.

T3.3 Gross generation and effective electricity generation capacity, excluding hydropower, in Mexico, 1999-2009

Parámetro/Año	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Gross generation of electricity excluding hydropower (TWh) Parameter/Year	148.2	159.6	168.7	175.5	182.8	181.9	189.5	193.3	203.9	195.2	207.0
Total gross generation of electricity (TWh)	180.9	192.7	197.1	200.4	202.6	207.0	217.2	223.6	230.9	234.1	233.5
Percentage compared to the total gross generation	81.9	82.8	85.6	87.6	90.2	87.9	87.3	86.4	88.3	83.4	88.7
Effective generation capacity excluding hydropower (MW)	26 047	27 078	28 900	31 569	34 946	36 021	35 998	38 330	39 685	39 762	40 303
Effective total installed generation capacity (MW)	35 666	36 697	38 519	41 184	44 561	46 552	46 533	48 897	51 029	51 105	51 686
Percentage compared to the total effective capacity	**73.0**	**73.8**	**75.0**	**76.7**	**w 78.4**	**77.4**	**77.4**	**78.4**	**77.8**	**77.8**	**78.0**

Note: The effective capacity and the gross generation are at the end of each period, not including co-generators and self-suppliers of electricity.
1 TWh = 1,000 GWh.
The effective capacity and gross generation consider both CFE including External Energy Producers (EEP), (also known as Independent Power Producers (IPP) and who do not generate through hydropower plants), as well as the now extinct LFC.
Figures revised and updated by the SENER.
Source: SENER. *Fourth Activity Report 2010.* Consulted on: http://www.sener.gob.mx/webSener/res/0/CuartoInformeLaboresSENER2010.pdf (15/10/2010).
SENER. *Effective generation capacity 1999-2009.* Consulted on: http://www.sener.gob.mx/webSener/res/PE_y_DT/ee/Capacidad_Efectiva.xls (15/10/2010).
SENER. *Gross electricity generation 1999-2009.* Consulted on: http://www.sener.gob.mx/webSener/res/PE_y_DT/ee/Generacion_Bruta.xls (15/10/2010).

3.7 Use in hydropower plants

Nationwide, the HAR XI Southern Border and IV Balsas are those which have the greatest allocation of water for this use, since these regions are home to the rivers with the heaviest flows and consequently the country's largest hydropower plants, as shown in T3.4. The volume allocated for this use nationwide is 164.6 billion cubic meters[7], of which variable quantities are used every year.

However, in 2009, the hydropower plants used 136.1 billion cubic meters of water, which allowed 26.4 TWh of electricity to be generated, which corresponds to 11.3% of Mexico's total generation[8]. The installed capacity in hydropower plants is 11,383 MW, which corresponds to 22.0% of the capacity installed in Mexico[9] (see T3.5).

7 CONAGUA. REPDA. 2010.

8 Idem.

9 Idem.

T3.4 Volumes declared for the payment of duties for hydropower production, by HAR, 1999-2009

HAR		Volume of water declared (millions of cubic meters, hm^3)										
		1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
I	Baja California Peninsula	0	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	3 128
III	Northern Pacific	7 950	8 309	9 479	5 859	5 168	7 284	11 598	10 747	11 184	13 217	11 405
IV	Balsas	41 524	32 596	25 992	45 588	30 969	35 207	32 141	21 820	31 099	30 573	28 060
V	Southern Pacific	2 075	2 104	1 891	1 705	1 925	2 049	1 890	1 949	2 140	2 245	2 063
VI	Rio Bravo	2 503	2 867	2 067	1 550	1 110	462	2 074	2 263	2 890	1 968	2 960
VII	Central Basins of the North	0	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	9 031
IX	Northern Gulf	1 230	1 230	1 180	989	997	1 598	1 488	810	1 105	2 912	1 441
X	Central Gulf	19 407	16 844	15 510	12 602	12 108	16 043	13 978	17 835	14 279	14 040	13 674
XI	Southern Border	62 322	92 365	65 821	44 454	34 056	36 454	41 573	77 246	46 257	68 793	64 305
XII	Yucatan Peninsula	0	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	19
National total		**153 269**	**165 842**	**128 849**	**120 982**	**96 163**	**110 581**	**115 386**	**140 295**	**122 832**	**150 669**	**136 085**

Note: The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Water Management. 2010.

T3.5 Gross generation and effective hydropower generation capacity, in Mexico

Parameter/year	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Gross hydropower generation (TWh)	32.7	33.1	28.4	24.9	19.8	25.1	27.6	30.3	27.0	38.9	26.4
Gross total generation of electricity (TWh)	180.9	192.7	197.1	200.4	202.6	207.0	217.2	223.6	230.9	234.1	233.5
Percentage compared to the gross total generation	18.1	17.2	14.4	12.4	9.8	12.1	12.7	13.6	11.7	16.6	11.3
Effective hydropower generation capacity (MW)	9 618	9 619	9 619	9 615	9 615	10 530	10 536	10 566	11 343	11 343	11 383
Effective total generation capacity installed (MW)	35 666	36 697	38 519	41 184	44 561	46 552	46 533	48 897	51 029	51 105	51 686
Percentage compared to the total effective capacity	**27.0**	**26.2**	**25.0**	**23.3**	**21.6**	**22.6**	**22.6**	**21.6**	**22.2**	**22.2**	**22.0**

Note: The effective capacity and the gross generation are at the end of each period, not including permit holders, co-generators and self-suppliers of electricity. 1 TWh = 1,000 GWh. The effective capacity and gross generation consider both CFE including External Energy Producers (EEP), (also known as Independent Power Producers (IPP) and who do not generate through hydropower plants), as well as the now extinct LFC. | Figures revised and updated by the SENER.
Source: SENER. *Fourth Activity Report 2010.* Consulted on: http://www.sener.gob.mx/webSener/res/0/CuartoInformeLaboresSENER2010.pdf (15/10/2010).
SENER. *Effective generation capacity 1999-2009.* Consulted on: http://www.sener.gob.mx/webSener/res/PE_y_DT/ee/Capacidad_Efectiva.xls (15/10/2010).
SENER. *Gross electricity generation 1999-2009.* Consulted on: http://www.sener.gob.mx/webSener/res/PE_y_DT/ee/Generacion_Bruta.xls (15/10/2010).

3.8 Degree of water stress

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

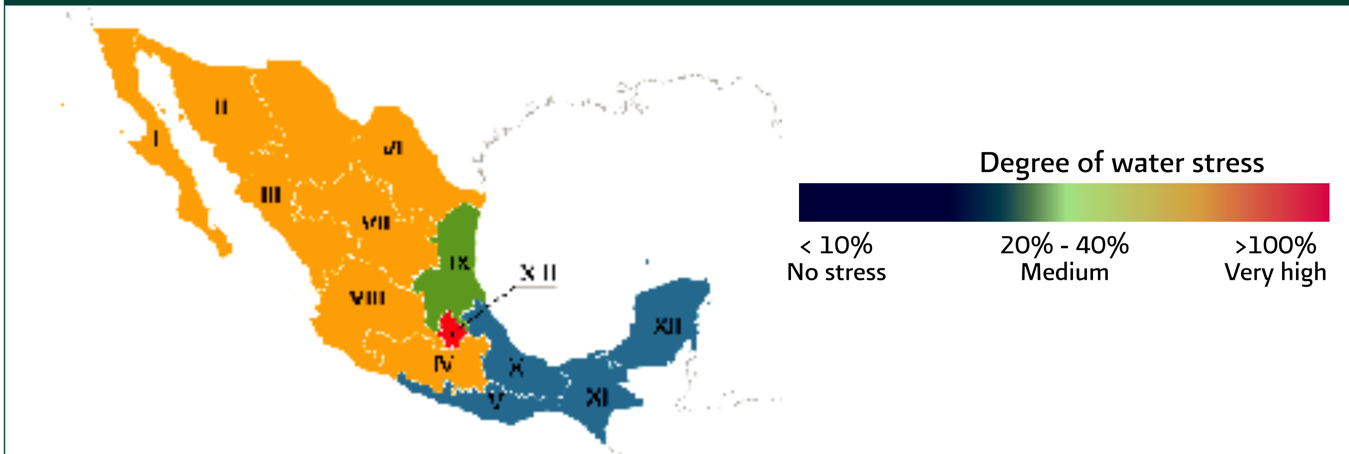
On the whole, Mexico is experiencing a degree of water stress of 17.5%, which is considered moderate; however, the central, northern and northwest area of the country is experiencing a high degree of water stress. In T3.6 and diagram D3.1, this indicator is shown for each of the country's HAR.

T3.6 Degree of water stress, by HAR, 2009

HAR		Total volume of water allocated (millions of m³)	Mean renewable water resources (millions of m³)	Degree of water stress (%)	Classification of water stress
I	Baja California Peninsula	3 420	4 667	73.3	High
II	Northwest	7 703	8 499	90.6	High
III	Northern Pacific	10 411	25 630	40.6	High
IV	Balsas	10 704	21 680	49.4	High
V	Southern Pacific	1 363	32 824	4.2	No stress
VI	Rio Bravo	9 243	12 163	76.0	High
VII	Central Basins of the North	3 846	7 898	48.7	High
VIII	Lerma-Santiago-Pacific	14 479	34 533	41.9	High
IX	Northern Gulf	4 854	25 564	19.0	Low
X	Central Gulf	4 973	95 866	5.2	No stress
XI	Southern Border	2 203	157 754	1.4	No stress
XII	Yucatan Peninsula	2 731	29 645	9.2	No stress
XIII	Waters of the Valley of Mexico	4 658	3 513	132.6	Very high
Total nacional		**80 587**	**460 237**	**17.5**	**Moderada**

Notes: The values may not add up to the total due to the rounding of the figures.
Degree of water stress = 100*(Total volume of water allocated/renewable water resources).
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Water Management. 2010.
CONAGUA. Deputy Director General's Office for Technical Affairs. 2010

D3.1 Degree of water stress, by HAR, 2009



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs. 2010 | CONAGUA. Deputy Director General's Office for Water Management. 2010.

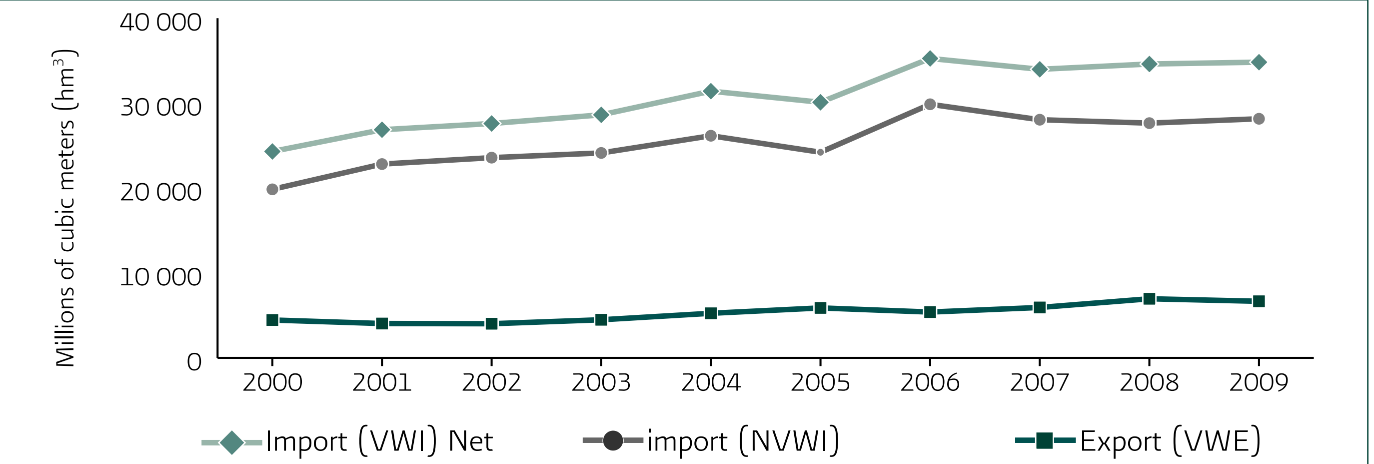
3.9 Virtual water in Mexico

Virtual water is defined as the total quantity of this liquid 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.

As a result of Mexico's commercial exchanges with other countries, in 2009 Mexico had a virtual water export (VWE) of 6,664.6 million cubic meters, and a virtual water import (VWI) of 34,817.2, meaning that it had a net virtual water import (NVWI) of 28,152.6 million cubic meters. In G3.7 and T3.B on the DVD, the evolution in the period from 2000-2009 is shown.

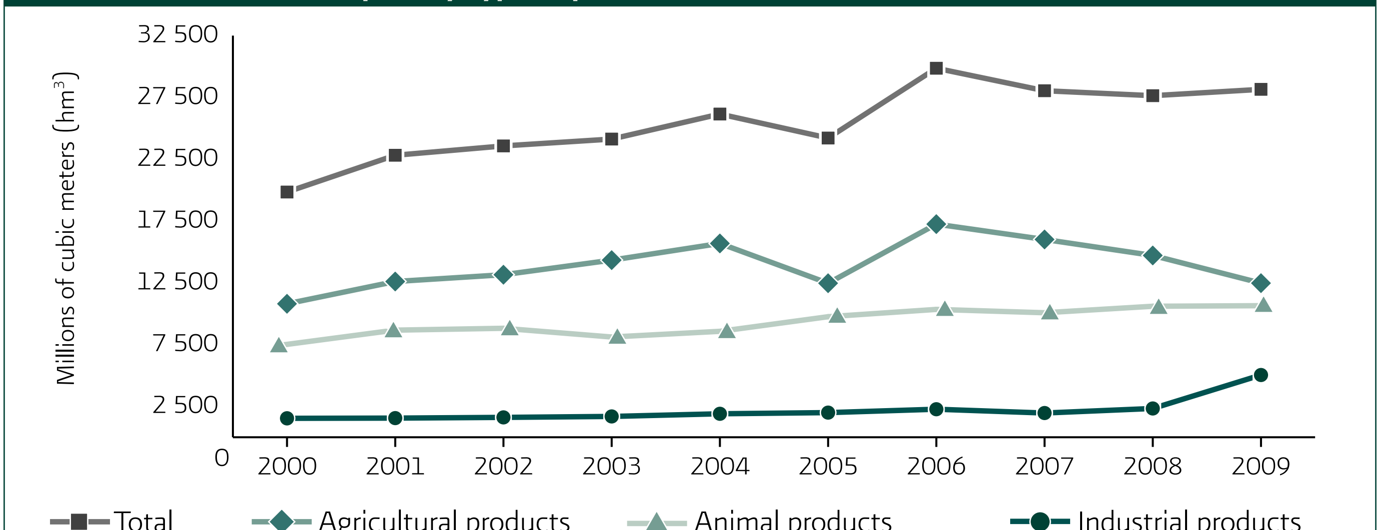
Of the resulting NVWI, 44.3% corresponded to agricultural products, 37.8% to animal products and the remaining 17.9% to industrial products. G3.8 shows the annual evolution in the period from 2000 to 2009, from which the increase in the import of industrial products (+116% as compared to 2008) and the decrease in the import of agricultural products (-15% as compared to the previous year) should be highlighted.

G3.7 Net virtual water import in Mexico, 2000-2009



Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

G3.8 Net virtual water import by type of product, in Mexico, 2000-2009



Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

Water infrastructure

4

4.1 Mexico's water infrastructure

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

- 4,462 reservoirs and water retention berms[1].
- 6.50 million hectares with irrigation.
- 2.9 million hectares with technified rainfed infrastructure.
- 631 water treatment plants in operation.
- 2,029 municipal wastewater treatment plants in operation.
- 2,186 industrial wastewater treatment plants in operation.
- 3,000 km of aqueducts.

R4.1 Main projects

The following projects are at different stages of completion:

Drinking water and sanitation

- Aqueduct II (Queretaro): Regulating dam and a 108 km aqueduct to supply Queretaro.
- El Realito (San Luis Potosi): a 50 hm³ dam and a 125 km aqueduct to supply San Luis Potosi and Celaya.
- Cleaning-up of Guadalajara: two 10.75 m³/s treatment plants.
- Cleaning-up of the Valley of Mexico: six 40 m³/s treatment plants, the 150 m³/s Eastern Drainage Tunnel (TEO), and the Río La Compañía Tunnel.
- El Zapotillo (Guanajuato and Jalisco): a 911 hm³ dam and a 145 km aqueduct to supply Guadalajara, Leon and Los Altos de Jalisco.
- Arcediano (Jalisco): a 450 hm³ dam and an 8 km aqueduct to supply Guadalajara.

Hydro-agricultural

- Irrigation District 014 (Baja California and Sonora): Modernization and technification of 203 400 hectares
- Lerma-Chapala basin: Modernization and technification of 323 000 hectares
- Rio Grande basin: Modernization and technification of 73 000 hectares
- Picachos (Sinaloa): a 562 hm³ dam for irrigation of 22 500 hectares and supply to Mazatlan.
- El Naranjo (Colima and Jalisco): a 135 hm³ dam for irrigation of 7 500 hectares

Source: Luege T., J.L. 2008. *The Water Agenda in Mexico.* Presentation at the II National Meeting of Delegates of the Agrarian Attorney. (29/10/2008).
Luege T., J.L. 2010. *Great works in the water sector.* Presentation at the Congress and Expo on Infrastructure, Mexico 2010. (28/10/2010).

4.2 Reservoirs

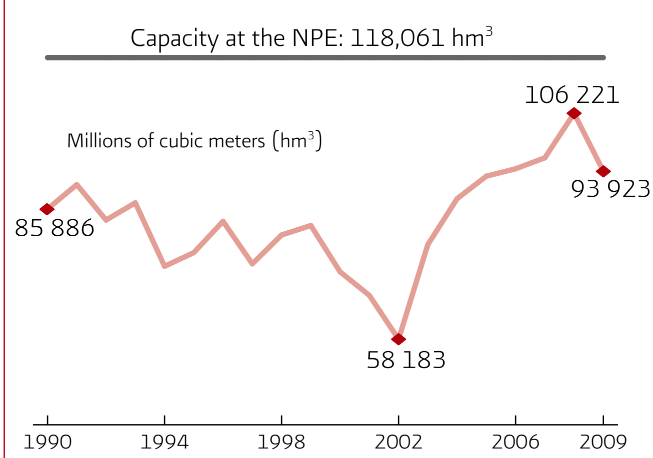
There are more than 4,462 reservoirs and water retention berms in Mexico, of which 667 are classified as large dams, according to the definition of the International Commission on Large Dams (ICOLD).

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 m³. 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.A on the DVD. This volume depends upon the precipitation and runoff in the different regions of the country, as

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only)
• TM(Presas_principales).

G4.1 Volume in the 100 main reservoirs



See note ᵃ in Annex D. The complete graphic is available on the DVD.
Note: Volume as of December 31 each year.
NPE: Normal Pool Elevation.

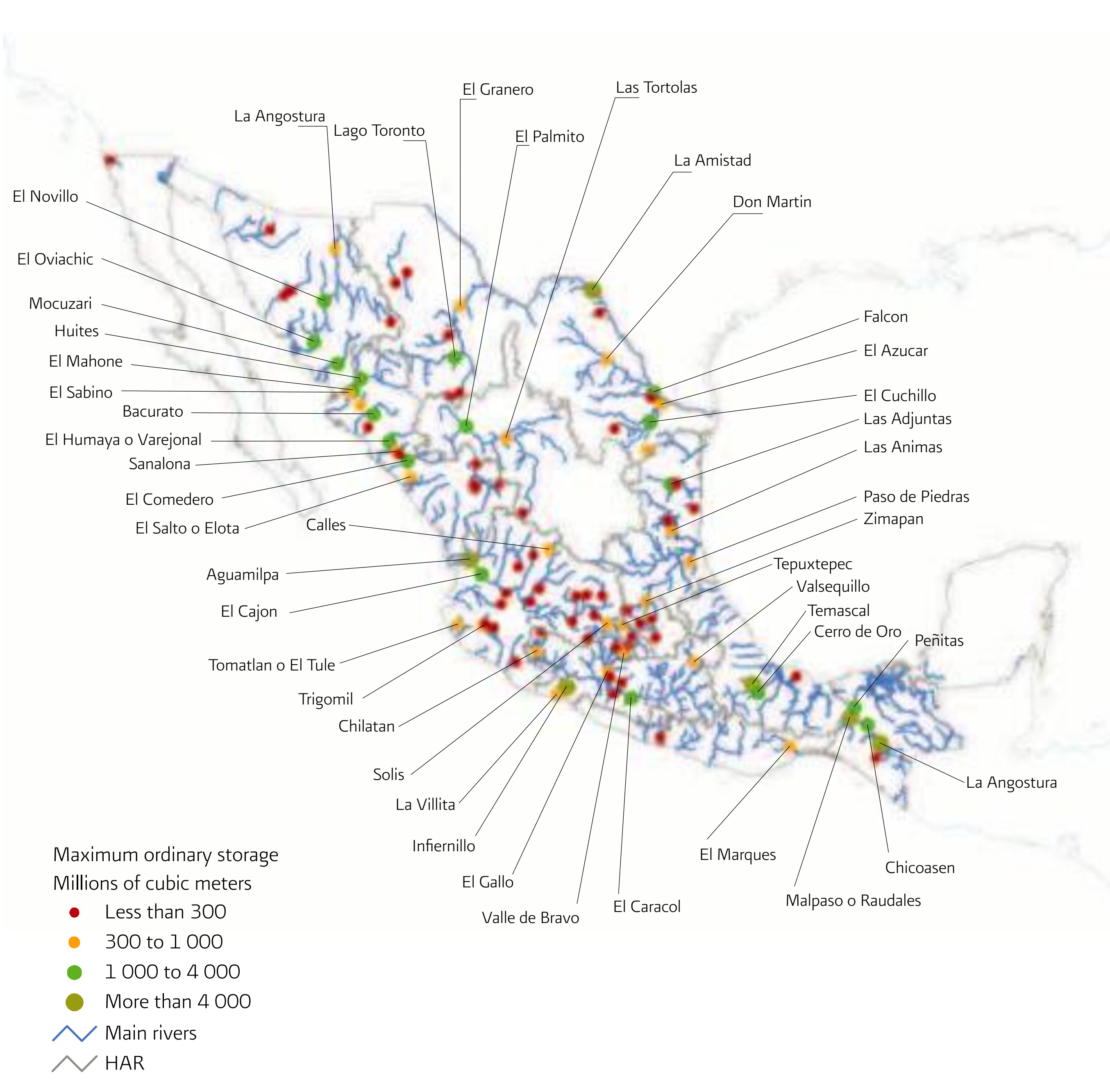
1 An approximate number, due to the insufficient registry of berms.

2 Those with the largest storage capacity.

well as the dams' operation policies, defined by their purposes, both in terms of supply for various uses and flood control.

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 placement 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 for which they were destined, among them hydropower generation, public water supply, irrigation and flood control.

M4.1 Main reservoirs in Mexico according to their storage capacity, 2009



Note: The reservoirs whose name is indicated have a capacity of more than 300 hm³.
For the information presented, a coastal polygon line that describes the lagoon systems was employed, instead of the municipal coastal limits, which are usually employed.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T4.1 Storage capacity and use of Mexico's main reservoirs, 2009

No	Code	Official name	Given name	Capacity at the NPE (hm^3)	Hydrological-Administrative Region (HAR)	Uses
1	693	Dr. Belisario Dominguez	La Angostura	12 762	XI Southern Border	G
2	1453	Infiernillo	Infiernillo	12 500	IV Balsas	G, C
3	706	Netzahualcóyotl	Malpaso o Raudales	10 596	XI Southern Border	G, C
4	2754	Presidente Miguel Aleman	Temascal	8 119	X Central Gulf	G, C
5	2516	Solidaridad	Aguamilpa	5 540	VIII Lerma-Santiago-Pacific	G, I
6	345	La Amistad International	La Amistad	4 462	VI Rio Bravo	G, I, P, C
7	3440	Falcon International	Falcon	3 912	VI Rio Bravo	P, C, G
8	3617	General Vicente Guerrero Consumador de la Independencia Nacional	Las Adjuntas	3 910	IX Northern Gulf	I, P
9	1084	Lazaro Cardenas	El Palmito	3 336	VII Central Basins of the North	I, C
10	3148	Adolfo Lopez Mateos	El Humaya or Varejonal	3 072	III Northern Pacific	G, I
11	3243	Alvaro Obregon	El Oviachic	2 989	II Northwest	G, I
12	3320	Plutarco Elias Calles	El Novillo	2 963	II Northwest	G, I
13	3218	Miguel Hidalgo y Costilla	El Mahone	2 921	III Northern Pacific	G, I
14	3216	Luis Donaldo Colosio	Huites	2 908	III Northern Pacific	G, I
15	750	La Boquilla	Lago Toronto	2 894	VI Rio Bravo	I, G
16	3210	Jose Lopez Portillo	El Comedero	2 800	III Northern Pacific	G, I
17	2742	Miguel de la Madrid	Cerro de Oro	2 600	X Central Gulf	I
18	2538	Leonardo Rodriguez Alcaine	El Cajon	2 282	VIII Lerma-Santiago-Pacific	G
19	3203	Gustavo Diaz Ordaz	Bacurato	1 860	III Northern Pacific	G, I
20	701	Manuel Moreno Torres	Chicoasen"	1 632	XI Southern Border	G
21	1463	Carlos Ramirez Ulloa	El Caracol	1 521	IV Balsas	G
22	3241	Adolfo Ruiz Cortines	Mocuzari	1 114	II Northwest	G, I
23	688	Angel Albino Corzo	Peñitas	1 091	XI Southern Border	G
24	2689	Cuchillo-Solidaridad	El Cuchillo	1 025	VI Rio Bravo	P,I
25	3490	Marte R. Gomez	El Azucar	995	VI Rio Bravo	I
26	2708	Presidente Benito Juarez	El Marques	977	V Southern Pacific	I
27	1679	Ing. Fernando Hiriat Balderrama	Zimapan	930	IX Northern Gulf	G
28	1436	Solis	Solis	870	VIII Lerma-Santiago-Pacific	I, C
29	3302	Lazaro Cardenas	La Angostura	864	II Northwest	I, P
30	3229	Sanalona	Sanalona	673	III Northern Pacific	G, I
31	494	Venustiano Carranza	Don Martin	614	VI Rio Bravo	I, P, C
32	3557	Estudiante Ramiro Caballero Dorantes	Las Animas	571	IX Northern Gulf	I
33	3211	Josefa Ortiz de Dominguez	El Sabino	514	III Northern Pacific	I
34	1710	Cajon de Peña	Tomatlan or El Tule	511	VIII Lerma-Santiago-Pacific	I
35	2257	José María Morelos	La Villita	510	IV Balsas	G, I
36	3693	Chicayan	Paso de Piedras	468	IX Northern Gulf	I
37	2206	Constitución de Apatzingán	Chilatan	450	IV Balsas	I, C

T4.1 Storage capacity and use of Mexico's main reservoirs, 2009

No	Code	Official name	Given name	Capacity at the NPE (hm^3)	Hydrological-Administrative Region (HAR)	Uses
38	3154	Ing. Aurelio Benassini Viscaino	El Salto or Elota	415	III Northern Pacific	I, C
39	1477	El Gallo	El Gallo	410	IV Balsas	I
40	2126	Valle de Bravo	Valle de Bravo	391	IV Balsas	P
41	1045	Francisco Zarco	Las Tortolas	365	VII Central Basins of the North	C, I
42	49	Plutarco Elias Calles	Calles	340	VIII Lerma-Santiago-Pacific	I
43	2826	Manuel Avila Camacho	Valsequillo	331	IV Balsas	I
44	1782	General Ramon Corona Madrigal	Trigomil	324	VIII Lerma-Santiago-Pacific	I
45	2382	Tepuxtepec	Tepuxtepec	323	VIII Lerma-Santiago-Pacific	G, I
46	825	Ing. Luis L. Leon	El Granero	309	VI Rio Bravo	I, C
47	3202	Ing. Guillermo Blake Aguilar	El Sabinal	300	III Northern Pacific	C. I
48	2631	Jose Lopez Portillo	Cerro Prieto	300	VI Rio Bravo	P, I
49	813	Francisco I. Madero	Las Virgenes	296	VI Rio Bravo	I, C
50	1328	Laguna de Yuriria	Yuriria	288	VIII Lerma-Santiago-Pacific	I
51	1825	Manuel M. Dieguez	Santa Rosa	258	VIII Lerma-Santiago-Pacific	G
52	1035	Federalismo Mexicano	San Gabriel	255	VI Rio Bravo	I, P, C
53	1507	Vicente Guerrero	Palos Altos	250	IV Balsas	I
54	3478	Presidente Lic. Emilio Portes Gil	San Lorenzo	231	IX Northern Gulf	I
55	4365	Trojes Solidaridad	Trojes	220	VIII Lerma-Santiago-Pacific	I
56	3239	Abelardo L. Rodriguez	Hermosillo	220	II Northwest	I, P, C
57	2167	El Bosque	El Bosque	220	IV Balsas	P, C
58	2286	Melchor Ocampo	El Rosario	200	VIII Lerma-Santiago-Pacific	I
59	3662	Canseco	Laguna de Catemaco	200	X Central Gulf	G
60	1583	Endho	Endho	182	XIII Aguas del Valle de México	I, C
61	2136	Villa Victoria	Villa Victoria	177	IV Balsas	P
62	3308	Ing. Rodolfo Felix Valdez	El Molinito	150	II Northwest	I, C
63	1315	Ignacio Allende	La Begoña	150	VIII Lerma-Santiago-Pacific	I, C
64	1926	Tacotan	Tacotan	149	VIII Lerma-Santiago-Pacific	I, C
65	1702	Basilio Vadillo	Las Piedras	146	VIII Lerma-Santiago-Pacific	I
66	1304	La Gavia	La Gavia	145	VIII Lerma-Santiago-Pacific	C
67	3747	El Chique	El Chique	140	VIII Lerma-Santiago-Pacific	I
68	917	El Tintero	El Tintero	138	VI Rio Bravo	I, C
69	1499	Revolución Mexicana	El Guineo	127	V Southern Pacific	I, C
70	2011	Huapango	Huapango	122	IX Northern Gulf	I
71	3790	Gobernador Leobardo Reynoso	Trujillo	118	VII Central Basins of the North	I
72	3197	Lic. Eustaquio Buelna	Guamuchil	113	III Northern Pacific	I, P, C
73	1365	La Purísima	La Purisima	110	VIII Lerma-Santiago-Pacific	I, C
74	1459	Andres Figueroa	Las Garzas	103	IV Balsas	I
75	711	Juan Sabines	El Portillo II or Cuxquepeques	100	XI Southern Border	I
76	1203	Santiago Bayacora	Bayacora	100	III Northern Pacific	I

T4.1 Storage capacity and use of Mexico's main reservoirs, 2009						
No	Code	Official name	Given name	Capacity at the NPE (hm³)	Hydrological-Administrative Region (HAR)	Uses
77	237	Abelardo L. Rodriguez	Rodriguez or Tijuana	92	I Península de Baja California	P, C
78	5133	Derivadora Las Blancas	Las Blancas	90	VI Rio Bravo	I, C
79	836	Las Lajas	Las Lajas	90	VI Rio Bravo	I, C
80	1887	El Salto	El Salto	85	VIII Lerma-Santiago-Pacific	P
81	731	Abraham Gonzalez	Guadalupe	85	II Northwest	I, C
82	2202	Cointzio	Cointzio	85	VIII Lerma-Santiago-Pacific	I, P
83	1057	General Guadalupe Victoria	El Tunal	81	III Northern Pacific	I
84	3807	Miguel Aleman	Excame	81	VIII Lerma-Santiago-Pacific	I, G, C
85	1800	Ing. Elias Gonzalez Chavez	Puente Calderon	80	VIII Lerma-Santiago-Pacific	P
86	1040	Francisco Villa	El Bosque	79	III Northern Pacific	I
87	2886	Constitución de 1917	Presa Hidalgo	70	IX Northern Gulf	I
88	2113	Tepetitlan	Tepetitlan	68	VIII Lerma-Santiago-Pacific	I
89	4604	Corral de Palmas	Rompepicos	65	VI Rio Bravo	C
90	3267	Cuauhtemoc	Santa Teresa	62	II Northwest	I
91	2359	San Juanico	La Laguna	60	IV Balsas	I, C
92	1478	Hermenegildo Galeana	Ixtapilla	58	IV Balsas	I
93	2005	Guadalupe	Guadalupe	57	XIII Aguas del Valle de México	I
94	3562	Republica Española	Real Viejo or El Sombrero	55	IX Northern Gulf	I
95	4677	Ing Juan Guerrero Alcocer	Vinoramas	55	III Northern Pacific	I, P, C
96	867	Pico del Aguila	Pico del Aguila	50	VI Rio Bravo	I
97	1166	San Bartolo	Santa Lucia	46	III Northern Pacific	I
98	381	La Fragua	La Fragua	45	VI Rio Bravo	I
99	1918	Ing. Santiago Camarena	La Vega	44	VIII Lerma-Santiago-Pacific	I
100	4758	La Patria es Primero	Las Alazanas	40	IX Northern Gulf	I

Note: Abbreviations = G: Hydropower generation, I: Irrigation, P: Public water supply, C: Flood control.
NPE: Normal Pool Elevation.
The Pico del Aguila reservoir does not have a given name, so its official name is used as its given name.
The code corresponds to the National Reservoir Inventory.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

4.3 Hydro-agricultural infrastructure

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

The IDs and IUs 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.

It should be mentioned that the productivity in areas under irrigation regimes is greater than in areas using rainfed agriculture. In 2009, for the main crops by area harvested, corn grain, sorghum grain and beans, the mean productivity in tons per hectare in areas under irrigation[3] was 2.2 to 3.6 times higher than in rainfed areas.

In 2009, corn grain produced 7.33 tons/ hectare in irrigated areas, and 2.06 tons/ hectares in rainfed areas

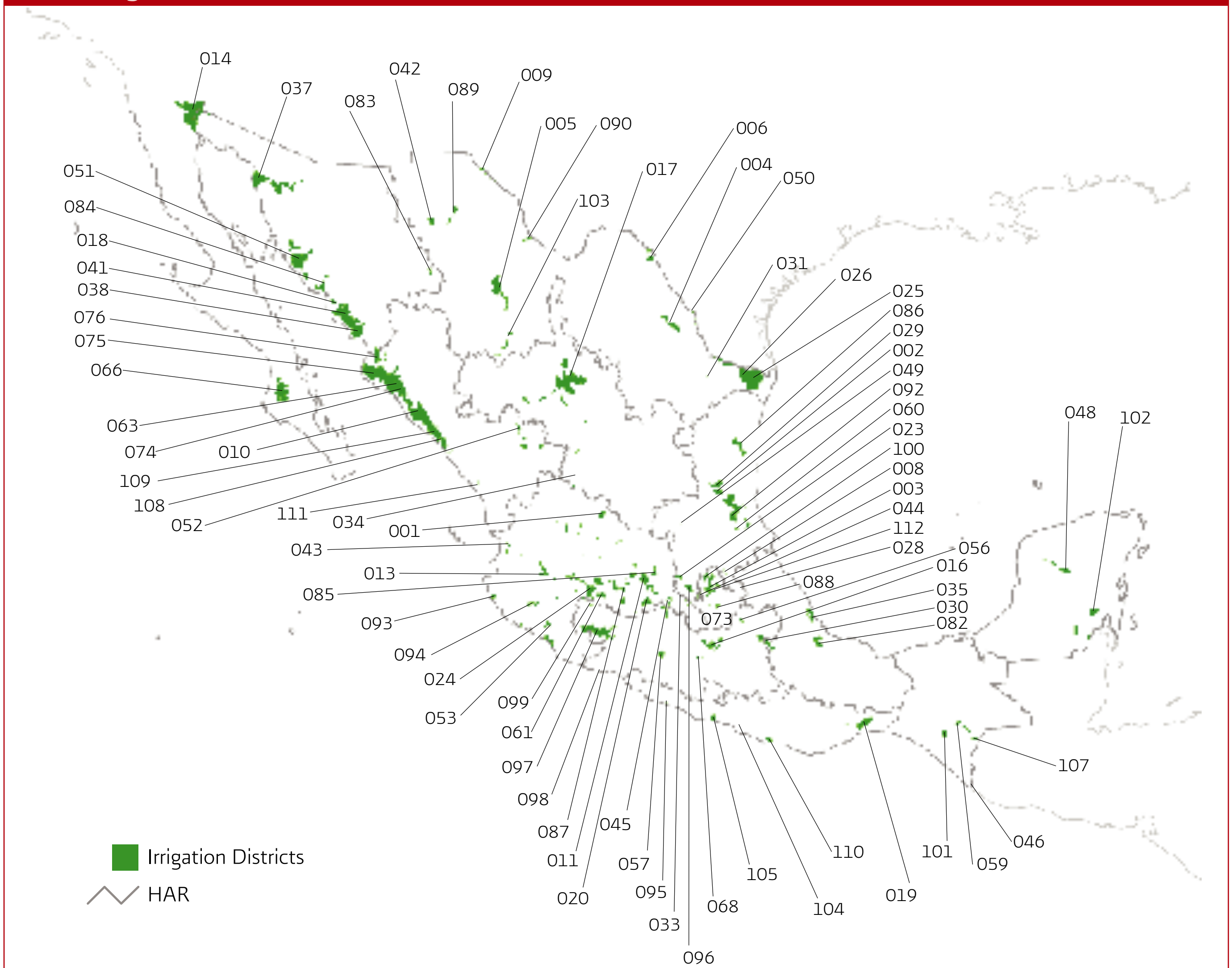
3 CONAGUA. Deputy Director General's Office for Planning. Produced based on: SIAP-SAGARPA. *Annual Production. Closing agricultural productivity by crop.* Consulted on: http://www.siap.gob.mx/index.php?option=com_wrapper&view=wrapper&Itemid=350 (15/10/2010).

Irrigation Districts (IDs)

IDs 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 IDs are shown in M4.2 and T4.2. In T4.A on the DVD, data is presented on the IDs, whereas G4.2 illustrates the evolution of water used in the IDs for the agricultural years 1989-90 to 2007-08.

M4.2 Irrigation Districts, 2009



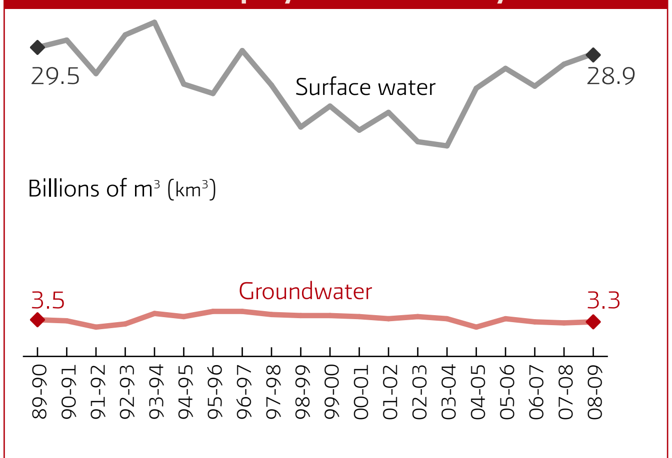
Note: The numbers correspond to the codes of each Irrigation District.
Source: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure. 2010.

T4.2 IDs by HAR, 2009

HAR		Number of IDs	Total surface area (ha)	Users	Physical area irrigated, agricultural year 2008/09 (ha)	Volume distributed (hm³)
I	Baja California Peninsula	2	246 906	17 990	226 041	2 734.5
II	Northwest	7	502 281	39 323	391 472	3 941.2
III	Northern Pacific	9	789 034	90 500	755 450	9 811.4
IV	Balsas	9	225 511	55 192	151 325	2 447.9
V	Southern Pacific	5	75 389	6 118	28 460	538.6
VI	Rio Bravo	12	554 597	33 184	368 433	3 261.1
VII	Central Basins of the North	1	116 577	34 126	69 820	1 023.8
VIII	Lerma-Santiago-Pacific	14	499 237	86 024	318 291	4 141.6
IX	Northern Gulf	13	265 594	28 221	135 960	1 520.7
X	Central Gulf	2	43 508	7 200	31 248	796.1
XI	Southern Border	4	36 399	5 279	25 969	353.8
XII	Yucatan Peninsula	2	36 871	5 197	10 051	66.1
XIII	Waters of the Valley of Mexico	5	104 998	54 311	79 611	1 581.9
Total		**85**	**3 496 902**	**462 665**	**2 592 131**	**32 218.6**

Note: The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. *Agricultural Statistics in the Irrigation Districts. Agricultural year 2008-2009* | Deputy Director General's Office for Hydro-Agricultural Infrastructure. 2009.

G4.2 Volume employed in the IDs, by source



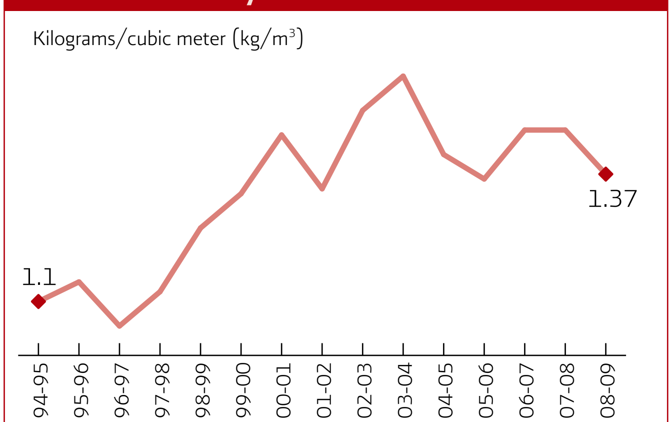
See note [b] in Annex D. The complete graphic is available on the DVD.

Water is employed in IDs by means of gravity or pumping, when electromechanical assistance is required as a result of the topographic layout of the source in question. In turn, the surface water 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 T4.B on the DVD.

The productivity of water in the IDs 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 plots and its application there. The evolution in this efficiency is shown in G4.3.

In the current environment, in which a decrease in availability is foreseen as a result of climate change, it is imperative to increase conveyance efficiencies. It should

G4.3 Productivity in IDs



See note [c] in Annex D. The complete graphic is available on the DVD.

be mentioned that water productivity may fluctuate greatly according to the meteorological conditions, as well as the phenological characteristics of each crop.

For the agricultural year 2008-2009, the main crops according to the area harvested were corn and wheat, which together represent 45.6% of the surface area harvested. It should be mentioned that these two crops combined are 23.5% of the production in tons and 36.4% of the value of production. The main crops are presented in T4.C on the DVD.

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, with the support of a program of partial rehabilitation of the infrastructure that was allocated via irrigation modules to user associations.

Up to December 2009, 99 % of the total surface of the IDs had been transferred to the users. Up to that time, only two IDs had not been totally transferred to the users, as shown in T4.D on the DVD.

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

Irrigation Units (IUs)

IUs (also 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 IUs (see T4.3).

We recommend consulting the annual publication "Agricultural Statistics of the Irrigation Units", produced by the CONAGUA.

Technified Rainfed Districts (TRDs)

In Mexico's tropical and subtropical plains, which have an excess of humidity and constant floods, the federal government has established the TRDs, in which infrastructure has been built to remove the excess water.

T4.7 lists the main characteristics of the TRDs. Similarly to the Irrigation Districts, the TRDs have gradually been transferred to organized users.

T4.3 Area harvested, production and yield of the IUs by HAR, agricultural year 2007-2008

HAR		Area harvested (ha)	Production (ton)	Yield (ton/ha)
I	Baja California Peninsula	40 763	868 156	21.30
II	Northwest	204 384	2 502 962	12.25
III	Northern Pacific	479 372	7 051 692	14.71
IV	Balsas	382 051	8 475 717	22.18
V	Southern Pacific	108 971	1 244 127	11.42
VI	Rio Bravo	334 590	3 404 590	10.18
VII	Central Basins of the North	286 643	7 622 051	26.59
VIII	Lerma-Santiago-Pacific	940 423	20 387 677	21.68
IX	Northern Gulf	580 464	8 823 117	15.20
X	Central Gulf	102 668	4 019 517	39.15
XI	Southern Border	38 843	1 594 410	41.05
XII	Yucatan Peninsula	50 357	934 058	18.55
XIII	Waters of the Valley of Mexico	81 637	1 927 185	23.61
Total		**3 631 166**	**68 855 259**	**18.96**

Source: CONAGUA. *Agricultural Statistics in Irrigation Units 2007-2008*. 2009.

T4.4 Characteristics of the TRDs, 2009						
No.	**Code**	**Name**	**HAR**	**State**	**Area (thousands of ha)**	**Users (Number)**
1	001	La Sierra	XI Southern Border	Tabasco	32.1	1 178
2	002	Zanapa Tonala	XI Southern Border	Tabasco	106.9	6 919
3	003	Tesechoacan	X Central Gulf	Veracruz de Ignacio de La Llave	18.0	1 139
4	005	Pujal Coy II	IX Northern Gulf	San Luis Potosi and Tamaulipas	220.0	9 987
5	006	Acapetahua	XI Southern Border	Chiapas	103.9	5 050
6	007	Centro de Veracruz	X Central Gulf	Veracruz de Ignacio de La Llave	75.0	6 367
7	008	Oriente de Yucatán	XII Yucatan Peninsula	Yucatan	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-Comitan	XI Southern Border	Chiapas	48.0	5 397
11	012	La Chontalpa[a]	XI Southern Border	Tabasco	91.0	5 000
12	013	Balancan-Tenosique	XI Southern Border	Tabasco	115.3	4 289
13	015	Edzna-Yohaltun	XII Yucatan 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	Zona sur de Yucatan	XII Yucatan Peninsula	Yucatan	67.3	880
20	025	Verde River	XII Yucatan Peninsula	Campeche	134.9	1 984
21	026	Valle de Ucum[a]	XII Yucatan 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
No.	**23**			**Total**	**2 859.1**	**119 956**

Note: [a] TRDs that have not yet been transferred to the users.
Source: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure. 2010.

4.4 Drinking water and sanitation infrastructure

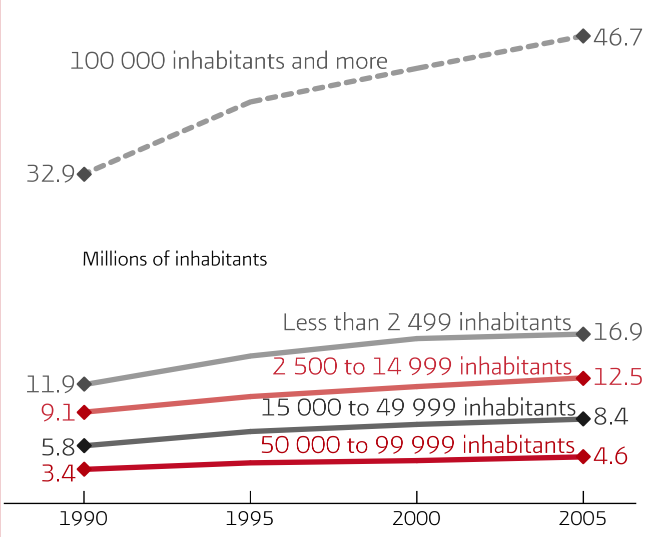
Drinking water coverage

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 appropriate for human consumption.

Bearing in mind the aforementioned definition and the results of the Census on Population and Housing from 2005, up to October 17 that year, 89.2% of the population had drinking water coverage. The CONAGUA estimates that by the end of 2009, the drinking water coverage had risen to 90.7%, which breaks down as 94.3% in urban zones and 78.6% in rural areas. T4.E on the DVD indicates the evolution in the drinking water coverage to the population of Mexico, calculated based on the different Censuses.

The evolution in 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 more rapidly than in smaller localities, as can be observed in G4.4.

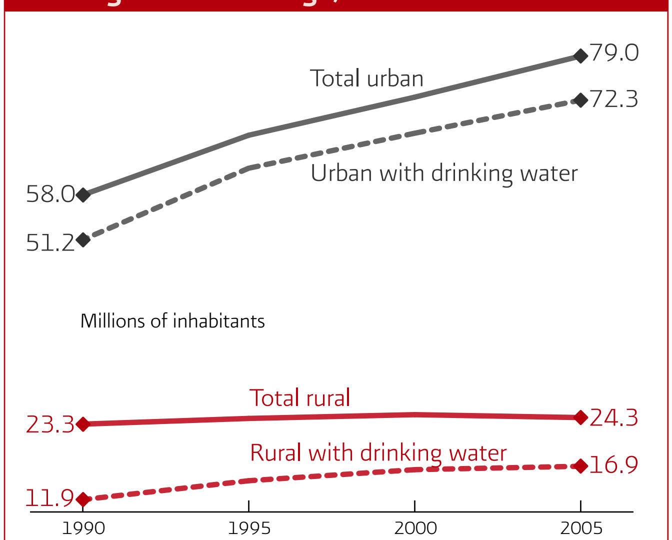
G4.4 Population with drinking water coverage, by population ranges



See note [d] in Annex D. The complete graphic is available on the DVD.

However, it should be taken into account that the increase in the population is greater in urban localities, whereas in rural localities it decreases. G4.5 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 Total population and population with drinking water coverage, rural and urban



See note [e] in Annex D. The complete graphic is available on the DVD.

Sanitation coverage

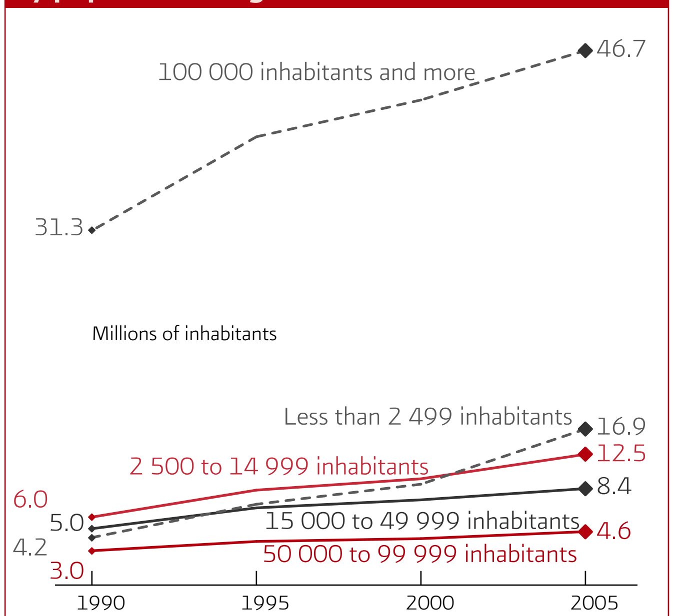
Additionally, the CONAGUA considers that improved sanitation coverage includes those citizens connected to the sanitation network or a septic tank, wastepipe, ravine, crevice, lake or sea.

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 17 of that year, 85.6% of the population had improved sanitation coverage.

The CONAGUA estimates that at the end of 2009, the improved sanitation coverage was 86.8%, composed of 93.9% coverage in urban areas and 63.2% in rural zones. Table T4.F on the DVD shows the composition of the sanitation coverage nationwide, calculated based on the different Censuses.

As in the case of drinking water, the evolution in the population with sanitation coverage is also differentiated as regards the size of the population in each 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 G4.6 and G4.7.

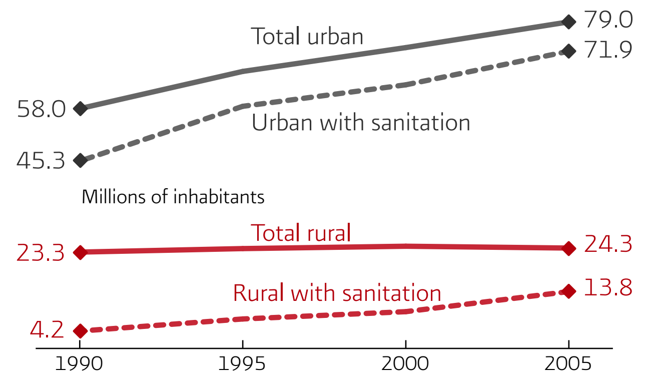
G4.6 Population with sanitation coverage, by population ranges



See note [F] in Annex D. The complete graphic is available on the DVD.

G4.7 illustrates the evolution in the population with sanitation coverage and the total population, considering in both cases both its rural and urban components.

G4.7 Total population and population with sanitation coverage, rural and urban



See note [g] in Annex D. The complete graphic is available on the DVD.

The evolution in coverage both for drinking water and sanitation, considering the urban and rural scopes, is illustrated in T4.5.

In T4.6 the drinking water and sanitation coverage by Hydrological-Administrative Region (HAR) is shown. It can be observed that the HARs with the greatest backlogs in both areas are V Southern Pacific, IX Northern Gulf, X Central Gulf and XI Southern Border.

T4.5 Coverage of the national population with drinking water and sanitation, according to the urban and rural scopes, series of Census years from 1990 to 2005

Scope	1990 Census (%)	1995 Census (%)	2000 Census (%)	2005 Census (%)
	12/03/1990	05/11/1995	14/03/2000	17/10/2005
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**
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. 2010. Produced based on: CONAGUA. *Portable Information Cubes 2008. Population, Housing and Water; Uses and Hypercube.*
INEGI. *Censuses of Population and Housing*. Information published in various formats.

T4.6 Coverage of the population with drinking water and sanitation services by HAR, series of Census years from 1990 to 2005 (percentage)

HAR		Drinking water				Sanitation			
		12/03/90	05/11/95	14/02/00	17/10/05	12/03/90	05/11/95	14/02/00	17/10/05
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	Yucatan 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. 2010. Produced based on:
CONAGUA. Portable Information Cubes 2008. Population, Housing and Water; Uses and Hypercube.
INEGI. *Censuses of Population and Housing*. Information published in various formats.

We recommend consulting the annual publication "Situation of the Drinking Water, Sewerage and Sanitation Subsector", published by the CONAGUA.

The states with the greatest backlogs in drinking water coverage are: Guerrero, Oaxaca and Chiapas; whereas in terms of sanitation, Oaxaca, Guerrero and Yucatan are those with the lowest coverage rates, as shown in T4.G on the DVD.

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 ones, as regards their length and flow, are listed in T4.7.

T4.7 Main aqueducts in Mexico by HAR, 2009

No	Aqueduct	HAR	Length (km)	Design flow (L/s)	Year of completion	Supplies	Operated by
1	Colorado 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
2	Vizcaino-Northern Pacific	I Baja California Peninsula	206	62	1990	Localities of Bahia Asuncion, Bahia 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 Mexico City with water from the Valle de Bravo, Villa Victoria and El Bosque reservoirs, 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 reservoir	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 reservoir	Water and Sanitation Services of Monterrey, I.P.D.
6	Lerma	VIII Lerma-Santiago-Pacific and XIII Waters of the Valley of Mexico	60	14 000	1975	Mexico City with water from the aquifers located in the upper area of Lerma River	Mexico City Water System
7	Armeria-Manzanillo	VIII Lerma-Santiago-Pacific	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
9	Vicente Guerrero Dam-Ciudad Victoria	IX Northern Gulf	54	1 000	1992	Ciudad Victoria, Tamaulipas, with water from the Vicente Guerrero reservoir	Municipal Drinking Water and Sanitation Commission of Victoria, Tamaulipas

T4.7 Main aqueducts in Mexico by HAR, 2009

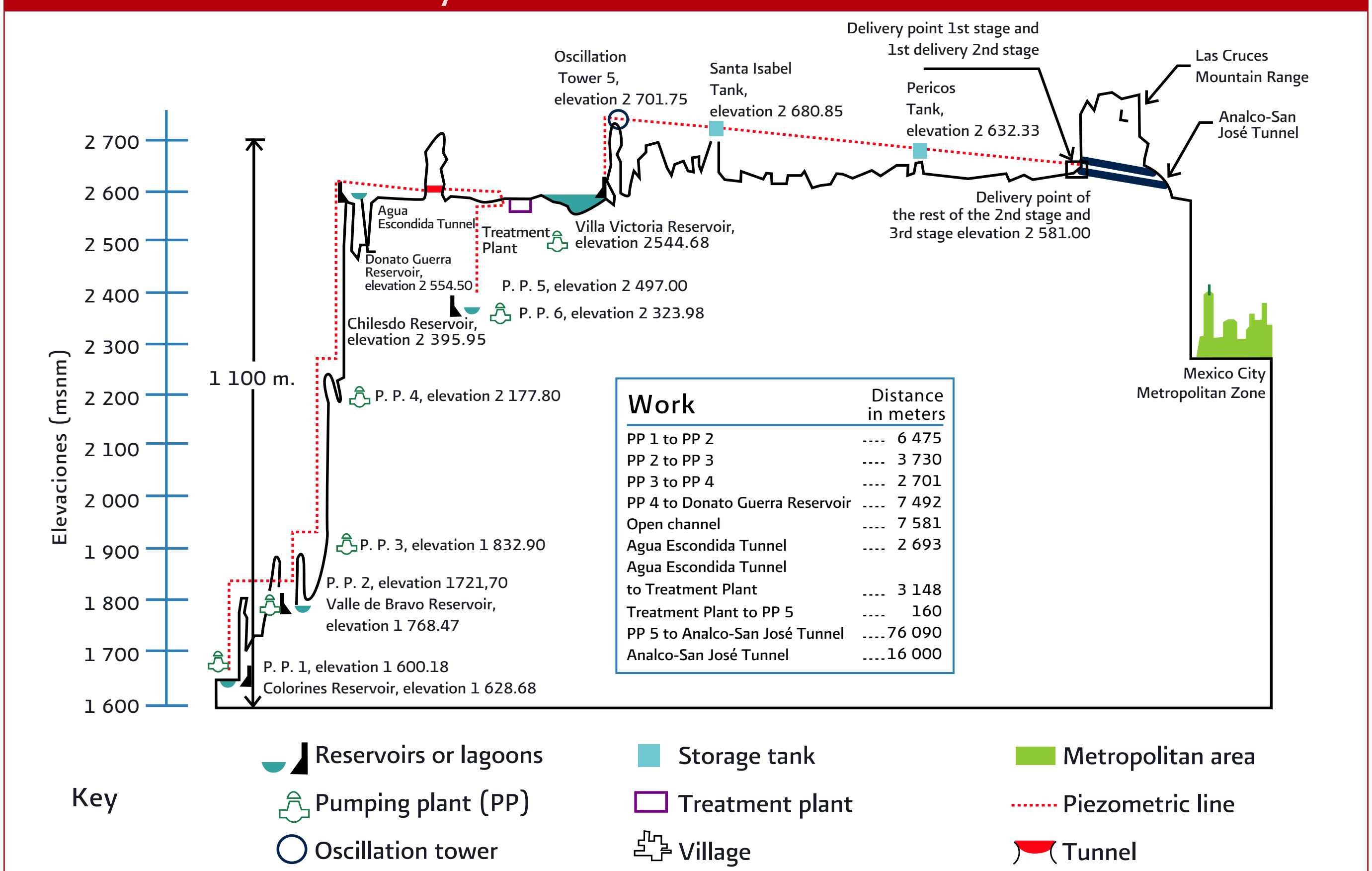
10	Uxpanapa-La Cangrejera	X Central Gulf	40	20 000	1985	22 industries located in the southern part of the state of Veracruz	CONAGUA
11	Yurivia-Coatzacoalcos and Minatitlan	X Central Gulf	64	2 000	1987	Cities of Coatzacoalcos and Minatitlan, Veracruz with water from the Ocotal and Tizizapa rivers	Coatzacoalcos Municipal Drinking Water and Sanitation Commission, Coatzacoalcos, Veracruz
12	Huitzilapan River-Xalapa	X Central Gulf	55	1 000	2000	City of Xalapa de Enriquez, Veracruz de Ignacio de la Llave	Coatzacoalcos Municipal Drinking Water and Sanitation Commission, Xalapa, Veracruz
13	Chicbul-Ciudad del Carmen	XII Yucatan 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. 2010.

Cutzamala System

The Cutzamala System, which supplies 11 delegations of Mexico City (the 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 supplies (approximately 485 million cubic meters every year), but also because of the

G4.8 Profile of the Cutzamala System



Source: CONAGUA. Valley of Mexico River Basin Organization. Statistics of the Region XIII. 2007.

difference in elevation (1,100 m) that it overcomes. It contributes 18% of the supply for all uses in the Valley of Mexico catchment, calculated at 82 m³/s, which is complemented by the Lerma System (6%), groundwater withdrawal (73%) and rivers and springs (3%)[4].

The pumping system, necessary to overcome the difference in elevation, uses a significant amount of electricity. In 2008, the electricity used was 1.29 TWh, which represented 0.6% of Mexico's total electricity generated that year, and its cost was 1,844 million pesos. As a comparison, the cost represented 6.4% of the CONAGUA's end-of-year expenses for that year.

The Cutzamala System is made up of seven diversion and storage reservoirs, six pumping stations and one treatment plant with the characteristics indicated in T4.H on the DVD.

4 Luege T., J.L. *2008.Sustainable water program in the Valley of Mexico watershed.* Presentation made at the Water Tribune, Zaragoza 2008 Water Expo, Spain, 16/07/2008.

The Cutzamala System's energy consumption is the equivalent of 0.6% of Mexico's total energy generation

G4.8 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.

The annual volumes provided by the Cutzamala System are presented in T4.8.

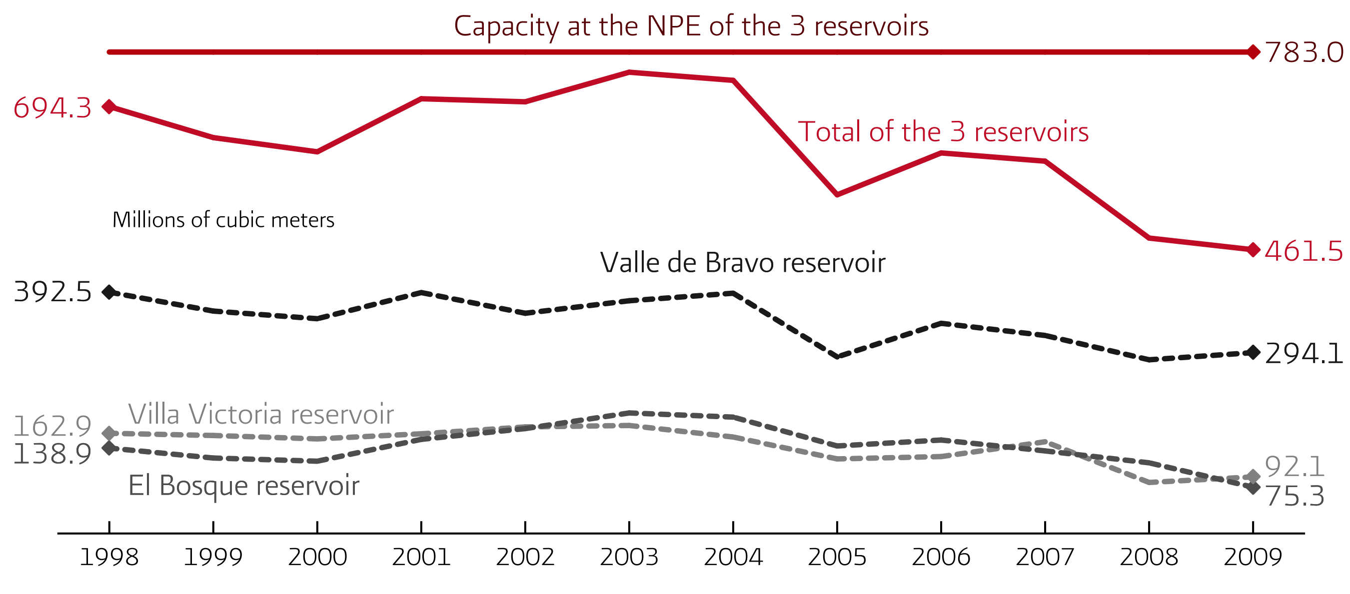
It should be mentioned that the Cutzamala System is subject to the variations in the hydrological regime of its components. In recent years, reductions have been registered in the system's storage reservoirs, as shown in G4.9.

T4.8 Volumes and flows supplied with the Cutzamala System, 1991-2009

Year	Delivery to Mexico City		Delivery to the State of Mexico		Total	
	Volume hm³/year	Mean flow m³/s	Volume hm³/year	Mean flow m³/s	Volume hm³/year	Mean flow m³/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
2009	244.60	7.74	155.38	4.92	399.97	12.66

Source: CONAGUA. Waters of the Valley of Mexico River Basin Organization. 2010.

G4.9 Evolution in the storage in the Cutzamala System's reservoirs



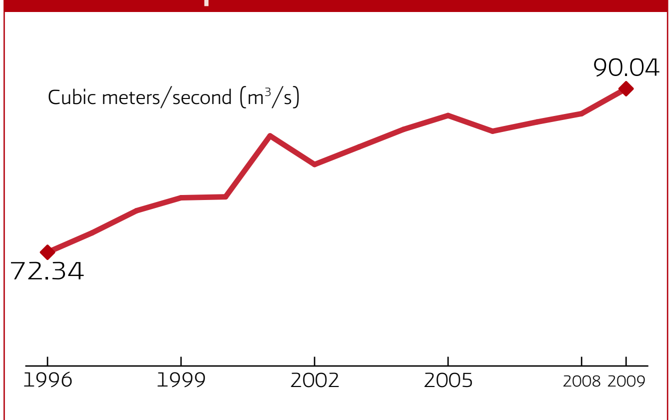
Note: The storage is reported on December 31 of each year.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on data from: CONAGUA. Waters of the Valley of Mexico River Basin Organization. 2010.

Treatment plants

Municipal treatment plants condition the water quality in surface and/or groundwater sources for public urban use. In 2009, 90.04 m^3/s was treated in the 631 plants in operation in Mexico. The evolution in the flow treated annually is illustrated in G4.10.

The distribution of treatment plants is listed in T4.9 by HAR, and they are listed at the state level in T4.I on the DVD. T4.10 illustrates the main treatment processes applied in municipal plants.

G4.10 Municipal flow treated



See note [h] in Annex D. The complete graphic is available on the DVD.

T4.9 Treatment plants in operation, by HAR, 2009

	HAR	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
I	Baja California Peninsula	41	12.22	6.66
II	Northwest	24	4.13	2.14
III	Northern Pacific	154	9.28	7.75
IV	Balsas	20	22.76	17.28
V	Southern Pacific	8	3.18	2.59
VI	Rio Bravo	60	26.30	15.90
VII	Central Basins of the North	67	0.56	0.40
VIII	Lerma-Santiago-Pacific	112	19.95	12.48
IX	Northern Gulf	43	6.66	5.89
X	Central Gulf	9	6.64	4.15
XI	Southern Border	49	16.13	10.63
XII	Yucatan Peninsula	1	0.01	0.01
XIII	Waters of the Valley of Mexico	43	5.27	4.17
	Total	**631**	**133.09**	**90.04**

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 | The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010

T4.10 Main treatment processes applied, 2009

Main process	Purpose	Plants		Flow treated	
		No	%	m^3/s	%
Softening	Elimination of hardness	21	3.3	0.63	0.7
Adsorption	Elimination of organic traces	15	2.4	0.84	0.9
Conventional treatment	Elimination of suspended solids	195	30.9	62.29	69.2
Patented treatment	Elimination of suspended solids	140	22.2	6.64	7.4
Reversible electrodialysis	Elimination of dissolved solids	1	0.02	0.06	0.01
Direct filtration	Elimination of suspended solids	62	9.8	14.19	15.8
Slow filters	Elimination of suspended solids	7	1.1	0.38	0.4
Reverse osmosis	Elimination of dissolved solids	174	27.6	1.29	1.4
Removal of iron and manganese		16	2.5	3.73	4.1
Total		**631**	**100**	**90.04**	**100**

Note: The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

We recommend consulting the annual publication "National inventory of municipal drinking water and wastewater treatment plants in operation", published by the CONAGUA.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only): TM(Plantas_potabilizadoras).

4.5 Water treatment and reuse

Wastewater discharges

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.

The sequence of generation, collection and treatment is shown in T4.11.

In 2009, 37.1% of the municipal wastewater generated was treated

T4.11 Municipal and non-municipal wastewater discharges, 2009

Urban centers (municipal discharges):		
Wastewater	7.49	km^3/year (237.5 m^3/s)
Wastewater collected in sewer systems	6.59	km^3/year (209.1 m^3/s)
Pollutants treated	2.78	km^3/year (88.1 m^3/s)
Pollutants generated	2.02	million tons of BOD_5 per year
Pollutants collected in sewer systems	1.78	million tons of BOD_5 per year
Pollutants removed by treatment systems	0.61	million tons of BOD_5 per year
Non-municipal uses, including industry:		
Wastewater	6.01	km^3/year (190.4 m^3/s)
Pollutants treated	1.16	km^3/year (36.7 m^3/s)
Pollutants generated	6.95	million tons of BOD_5 per year
Pollutants removed by treatment systems	1.33	million tons of BOD_5 per year

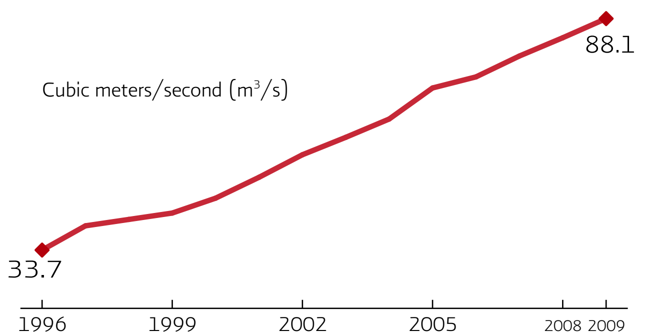
Note: BOD_5, 5-day Biochemical Oxygen Demand.
1 km^3 = 1 000 hm^3 = billion m^3.
Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010 | CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

In 2009, 19.3% of the non-municipal wastewater generated, including industry, was treated

Municipal wastewater treatment plants

In 2009, the 2,029 plants in operation in Mexico treated 88.1 m^3/s, or 42% of the 209.1 m^3/s collected in sewer systems. The evolution in the flow treated per year is shown in G4.11.

G4.11 Flow of municipal wastewater treated



See note [i] in Annex D. The complete graphic is available on the DVD.

In T4.12, the wastewater treatment plants in operation by HAR are shown, as they are at the state level in T4.J on the DVD.

T4.12 Municipal wastewater treatment plants in operation, by HAR, 2009

HAR		Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
I	Baja California Peninsula	54	8.68	6.68
II	Northwest	100	4.80	2.92
III	Northern Pacific	282	9.01	7.04
IV	Balsas	162	8.22	6.10
V	Southern Pacific	86	4.56	3.39
VI	Rio Bravo	205	28.84	21.68
VII	Central Basins of the North	124	5.79	4.50
VIII	Lerma-Santiago-Pacific	513	23.97	18.58
IX	Northern Gulf	104	3.39	2.54
X	Central Gulf	140	6.72	4.06
XI	Southern Border	102	3.35	2.37
XII	Yucatan Peninsula	72	2.65	1.90
XIII	Waters of the Valley of Mexico	85	10.89	6.35
Total		**2 029**	**120.86**	**88.13**

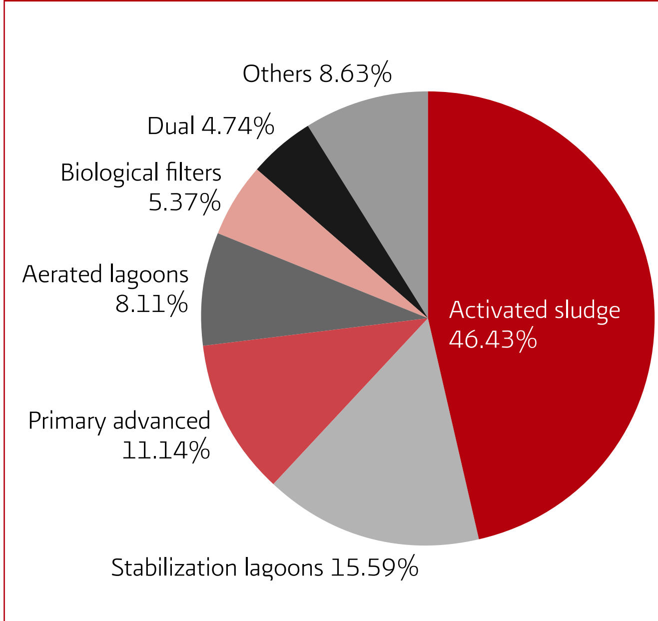
Note: The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- TM(Plantas_tratamiento).

We recommend consulting the annual publication "National inventory of municipal drinking water and wastewater treatment plants in operation", published by the CONAGUA.

The distribution of treatment plants is shown in M4.3, and their main treatment processes are illustrated in G4.12.

G4.12 Main municipal wastewater treatment processes, 2009

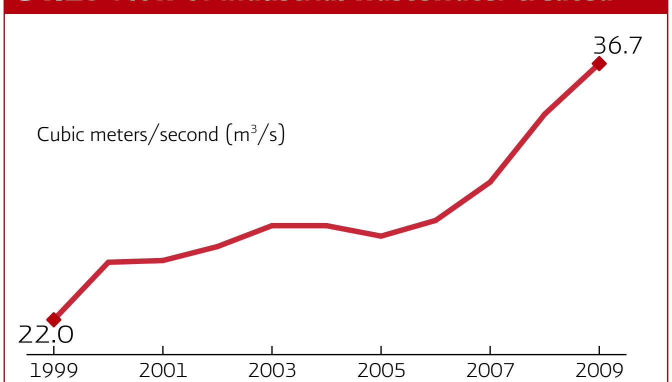


See note [j] in Annex D. The complete graphic is available on the DVD.

Industrial wastewater treatment plants

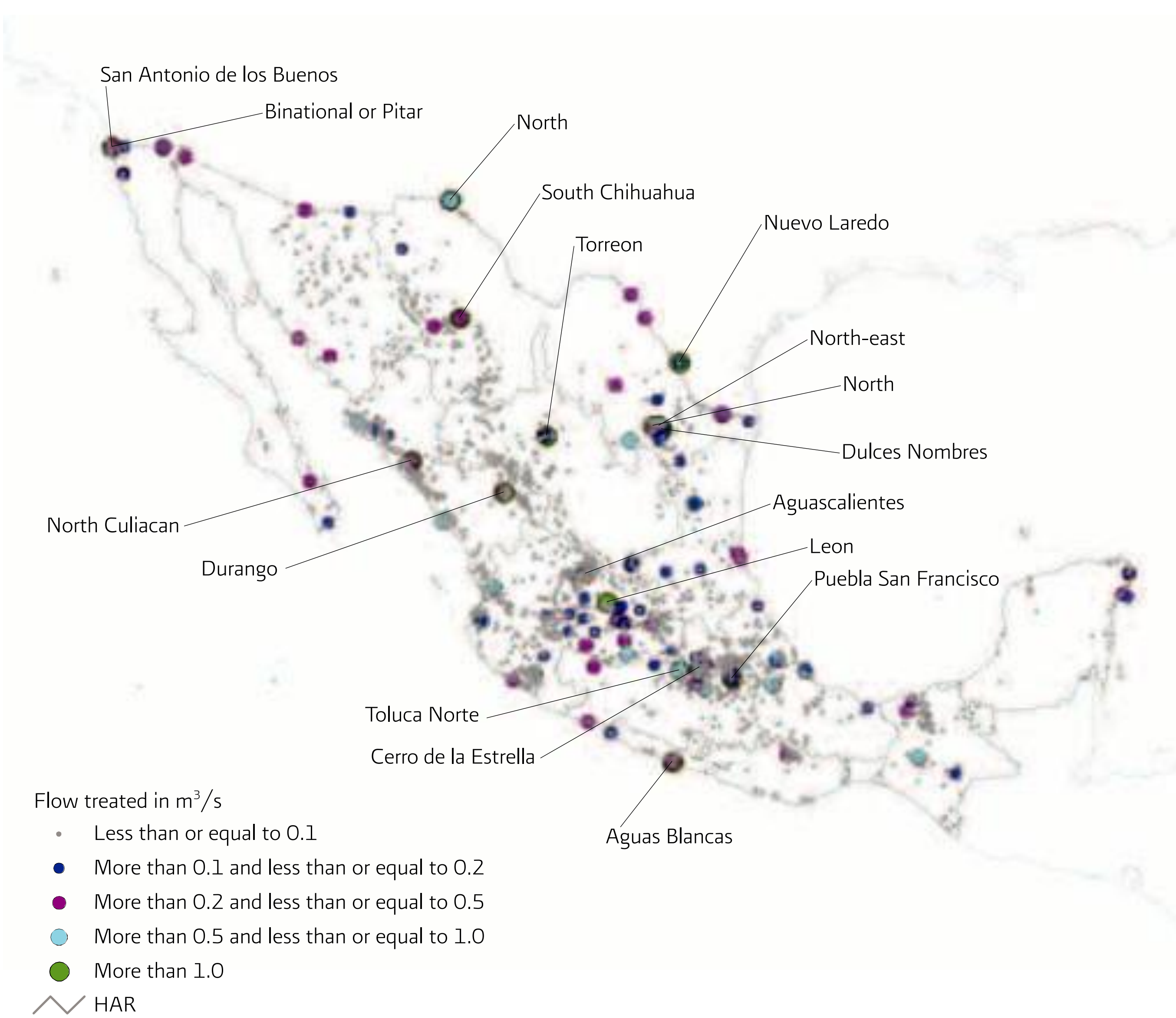
In 2009, industry treated 36.7 m^3/s of wastewater, in 2,186 plants in operation nationwide.

G4.13 Flow of industrial wastewater treated



See note [k] in Annex D. The complete graphic is available on the DVD.

M4.3 Municipal wastewater treatment plants, 2009



Note: The plants whose name is shown treated a flow of more than 1.0 m^3/s.
Source: CONAGUA. Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

The evolution in the period 1996-2009 is shown in G4.13, the distribution by states in T4.13, whereas T4.14 illustrates the main processes in which industrial treatment is itemized.

Wastewater reuse

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, of particular interest is the transfer of wastewater collected in sewer networks to agricultural crops. To a lesser degree, this wastewater is reused in industry, as well as in thermoelectric plants, as is the case of the Villa de Reyes thermoelectric station in San Luis Potosi.

In the reuse of wastewater of industrial origin (non-municipal), worth mentioning is the reuse of wastewater from sugar mills to grow sugar cane in the state of Veracruz.

In G4.14, the different transfers of water between uses can be identified.

T4.13 Industrial wastewater treatment plants in operation by state, 2009

State	Number of plants in operation	Installed capacity (m^3/s)	Flow treated (m^3/s)
Aguascalientes	53	0.25	0.12
Baja California	61	0.48	0.00
Baja California Sur	7	0.01	0.01
Campeche	49	0.50	0.16
Coahuila	67	0.88	0.61
Colima	8	0.47	0.31
Chiapas	47	6.18	3.04
Chihuahua	20	0.66	0.29
Federal District (Mexico City)	200	0.80	0.34
Durango	42	0.83	0.47
Guanajuato	45	0.40	0.18
Guerrero	7	15.33	0.03
Hidalgo	41	3.49	3.00
Jalisco	36	1.51	1.51
State of Mexico	315	4.84	3.27
Michoacán	76	2.83	0.63
Morelos	81	1.22	0.76
Nayarit	4	0.16	0.16
Nuevo Leon	84	4.13	3.00
Oaxaca	15	1.22	0.90
Puebla	116	2.99	2.72
Queretaro	120	1.19	0.51
Quintana Roo	2	0.01	0.01
San Luis Potosi	81	1.33	1.18
Sinaloa	89	3.21	0.80
Sonora	25	0.42	0.22
Tabasco	124	1.05	0.64
Tamaulipas	52	3.94	2.84
Tlaxcala	108	0.23	0.20
Veracruz	166	11.62	8.69
Yucatan	36	0.11	0.07
Zacatecas	9	0.16	0.04
Total	**2 186**	**72.47**	**36.70**

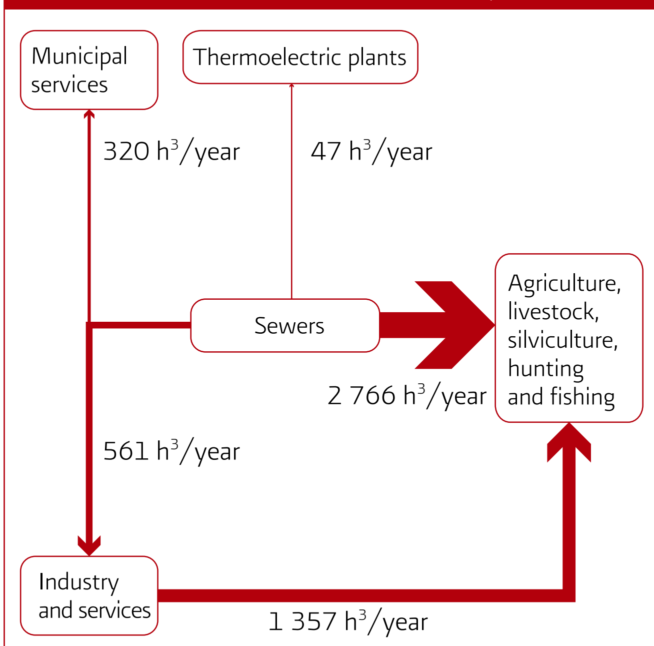
Note: The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

T4.14 Types of industrial wastewater treatment, 2009

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.	731	14.64	33.44
Secondary	To remove colloidal and dissolved organic materials	1 193	18.39	54.57
Tertiary	To remove dissolved materials, including gases, natural and synthetic organic substances, ions, bacteria and viruses.	88	1.26	4.03
Not specified		174	2.41	7.96
Total		**2 186**	**36.70**	**100.00**

Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

G4.14 Wastewater reuse in Mexico, 2009



Note: hm^3/year= 1 million cubic meters per year.
Source: CONAGUA. Deputy Director General's Office for Planning. *Water Accounts*. 2010.

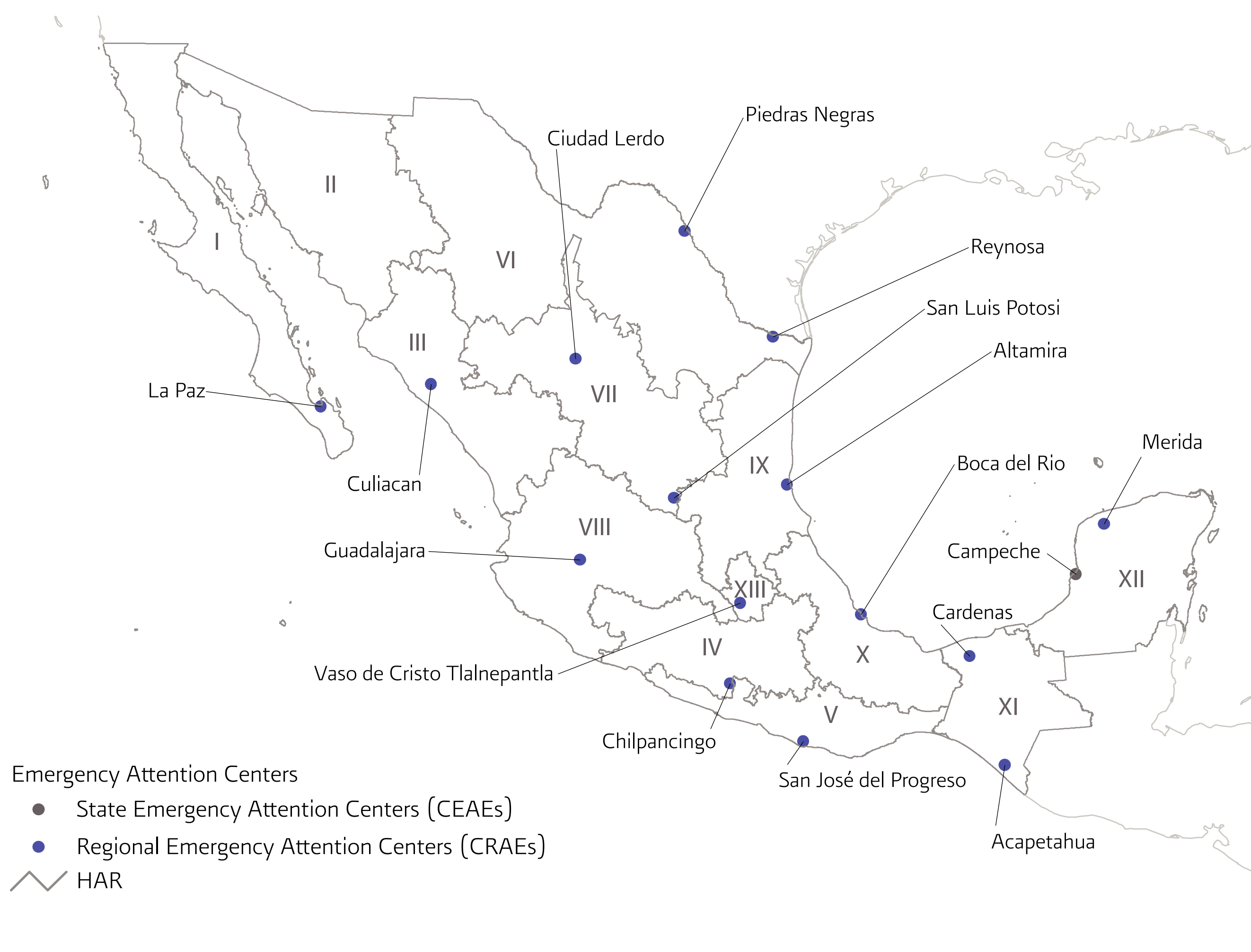
4.6 Emergency attention and flood protection

As part of the Infrastructure Protection and Emergency Attention program (PIAE in Spanish), the CONAGUA has set up 16 Regional Emergency Attention Centers (CRAEs in Spanish) in various areas of the country, with the aim of supporting the states and municipalities in supplying drinking water and sanitation in situations of risk. In June 2009, the first State Emergency Attention Center was established in Campeche. 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.

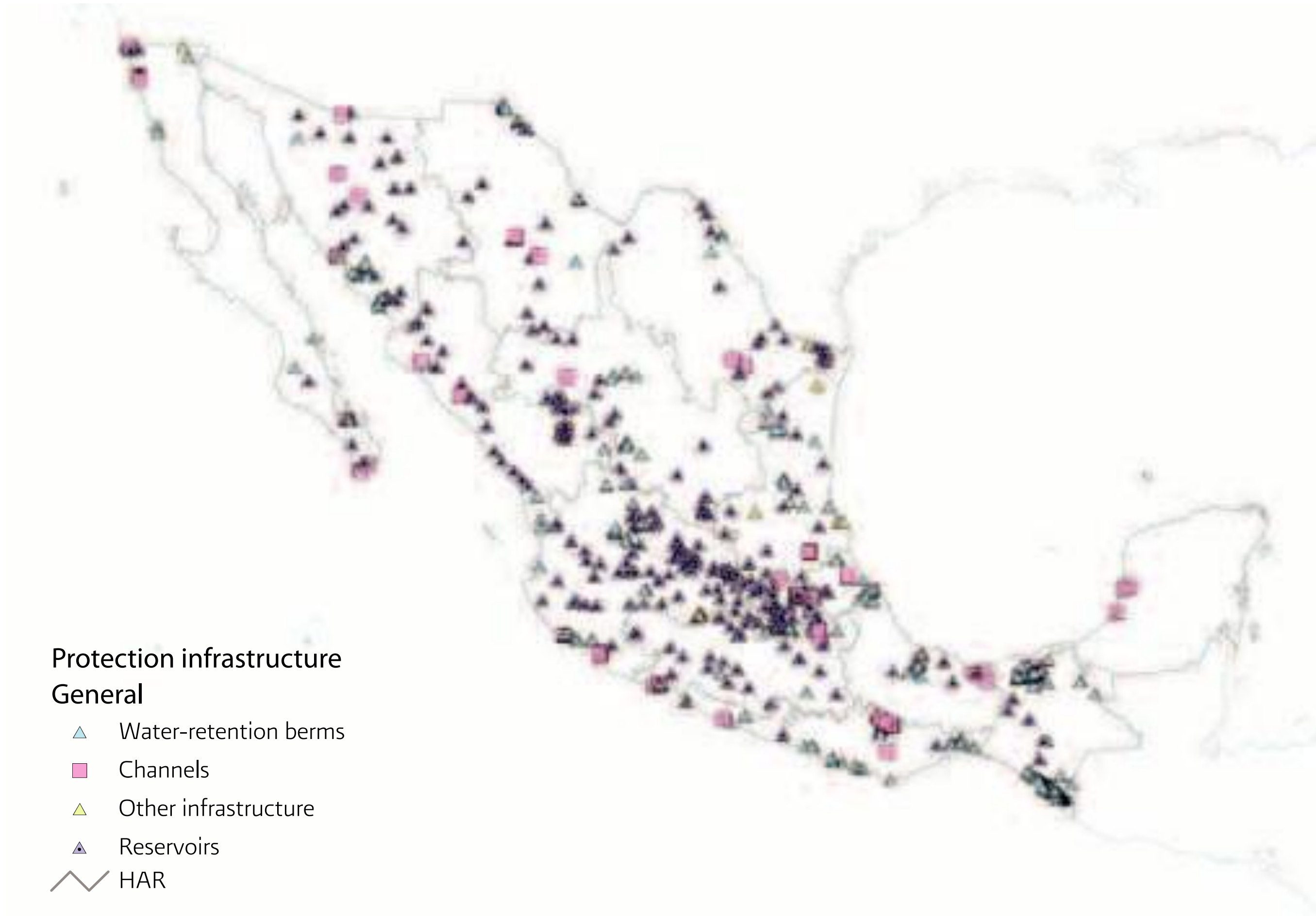
As regards the issue of floods, in which emergency attention actions range from early warning on risks of extreme hydrometeorological phenomena, the development of prevention plans, the construction and maintenance of protection infrastructure and inter-institutional coordination, the recent integration of the National Inventory of Flood Protection Infrastructure (INOPCI in Spanish) should be highlighted, which is the origin of M4.5.

M4.4 Emergency Attention Centers, 2009



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Coordination for Emergency Attention and River Basin Councils. 2010.

M4.5 Flood protection infrastructure



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure. *National Inventory of Flood Protection Infrastructure in Natural Channels*. 2008.

Water management tools

5

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:

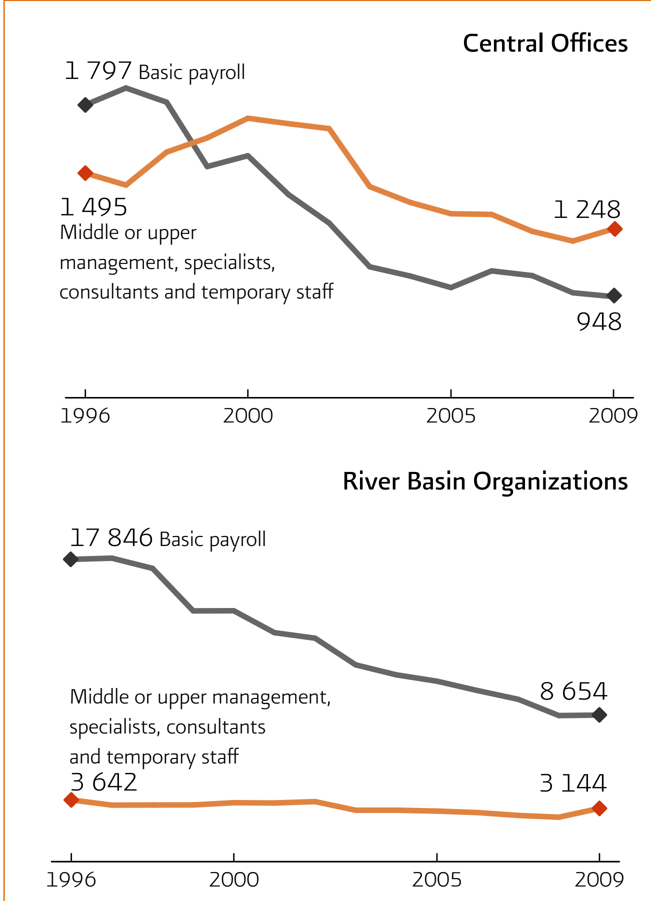
Mission

To manage and preserve the nation's water resources 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

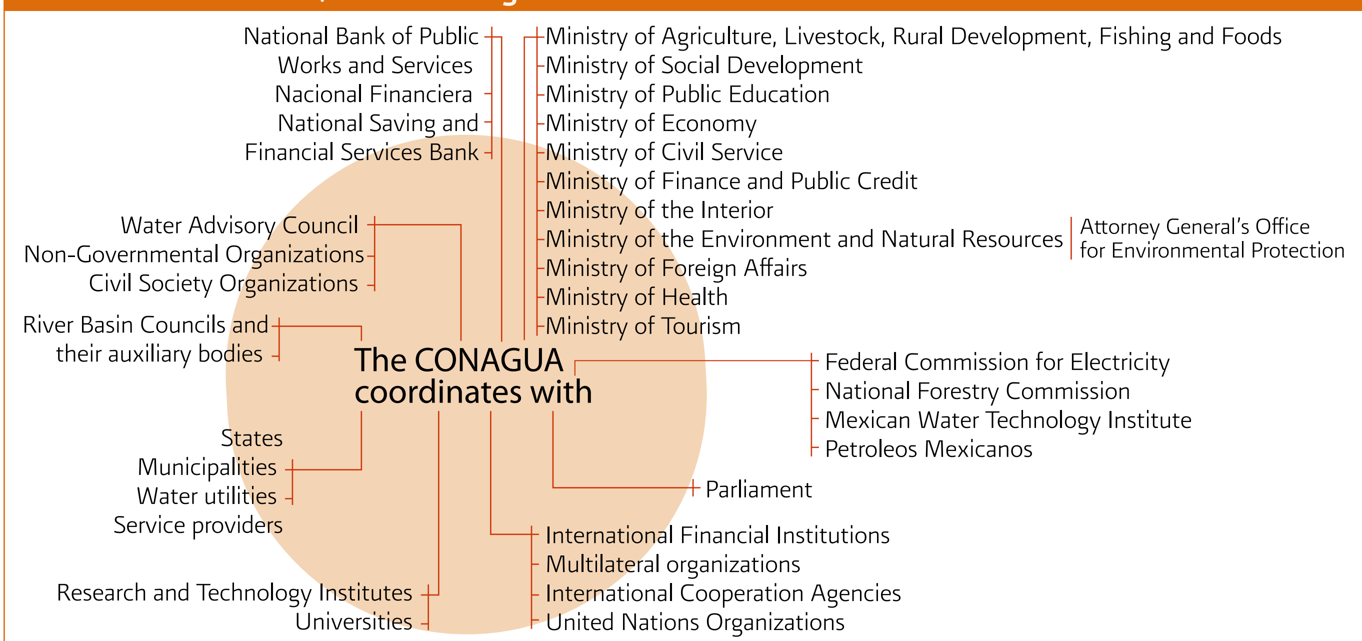
To be a technical authority and a promoter of the participation of society and governmental bodies in Integrated Water Resources Management and the management of inherent public goods.

G5.1 Staff in the CONAGUA, 1996-2009



See note [a] in Annex D. The complete graphic is available on the DVD.

G5.2 Main institutions, bodies and agencies with which the CONAGUA coordinates



Source: CONAGUA, *2007-2012 National Water Resources Program, Mexico*, 2007.
CONAGUA. *Study on the Crosscutting Nature of Federal Public Policies in the Water Sector*, Mexico, 2005.

In 1989, the year of creation of the CONAGUA, it had 38,188 employees, a number which in recent years has reduced significantly. Thus in December 2009, the CONAGUA had 13,994 employees, of which 2,196 were assigned to its Central Offices and the remainder to the River Basin Organizations (RBOs) and Local Offices (LO). This trend can be observed in graphic 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, companies, private sector, civil society and international organizations. G5.2 and T5.A in the DVD show the main institutions with which the CONAGUA coordinates for the attainment of the goals of the 2007-2012 National Water Resources Program.

According to article 115 of the Mexican Constitution, municipalities are responsible for providing drinking water, sewerage and sanitation services, subject to the compliance with both federal and state laws. The latest census that was offered a complete registry nationwide[1], found that the number of employees involved in the provision of drinking water, sewerage and sanitation ser- vices was 94,225 (2004).

5.2 Legal framework for the use of water in Mexico

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

1 INEGI. *Census of Capture, Treatment and Water Supply*, 2004.

Deeds registered in the Public Registry of Water Duties (REPDA)

Since the LAN was issued (1992), concession or allocation deeds and discharge permits have been registered in the REPDA. Up to December 2009, 361,916 concession deeds for the use of the nation's water resources had been registered in the REPDA, which corresponds to a volume of 80,587 million cubic meters (hm³) allocated for offstream uses and 164,564 hm³ for instream uses (in hydropower plants). The distribution of these deeds according to their use is shown in table T5.1, whereas T5.2 illustrates the distribution of deeds by hydrological-administrative region (HAR), considering in addition the concepts of discharge permits, federal zone permits and material extraction. By number, HAR VI Rio Bravo and VIII Lerma-Santiago-Pacific concentrate 30% of the total number of concession and/or allocation deeds.

59.5% of the total number of concession or allocation deeds correspond to the grouped use for agriculture

T5.1 Concession or allocation deeds registered in the REPDA, 2009

Grouped uses	Deeds registered in the REPDA	
	Number	Percentage
Agriculture[a]	215 355	59.50
Public water supply[b]	136 172	37.63
Self-supplying industry[c]	10 286	2.84
Thermoelectric plants	44	0.01
Subtotal offstream uses	361 813	99.97
Instream use (hydropower plants)	103	0.03
Total	**361 916**	**100**

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, brought about as a result of the projects awaiting registration.
Source: CONAGUA. Deputy Director General's Office for Water Management. 2010.

T5.2 Deeds registered in the REPDA, by HAR, 2009 (number of deeds)

HAR		Concessions and/or allocations[a]		Discharge permits	Federal zone permits	Material extraction
		Surface water	Subsurface water			
I	Baja California Peninsula	2 225	8 957	583	1 379	398
II	Northwest	4 599	19 056	636	2 946	86
III	Northern Pacific	12 394	12 414	614	8 768	346
IV	Balsas	15 121	12 076	1 542	7 850	302
V	Southern Pacific	8 586	17 076	367	8 143	231
VI	Rio Bravo	6 449	36 519	604	5 942	52
VII	Central Basins of the North	3 450	26 686	928	3 362	51
VIII	Lerma-Santiago-Pacific	18 634	48 372	2 357	19 754	639
IX	Northern Gulf	7 815	13 212	761	10 989	194
X	Central Gulf	12 262	16 758	1 554	18 014	600
XI	Southern Border	24 478	7 769	683	11 672	200
XII	Yucatan Peninsula	178	23 530	2 805	74	3
XIII	Waters of the Valley of Mexico	1 102	2 242	633	1 754	0
Total		**117 293**	**244 667**	**14 067**	**100 647**	**3 102**

Note: [a] One concession and/or allocation deed may cover one or more uses or permits.
Source: CONAGUA. Deputy Director General's Office for Water Management. 2010.

With the aim of making the transfer of rights more efficient and transparent, Water Banks have been created, as specialized bodies, in charge of providing advisory and management services for the transferal of rights, and which provide the users of the nation's water resources with legal certainty and transparency in the operations they carry out.

At the end of 2010, a total of 15 Water Banks had been established in Mexico, which are currently being operated by the following River Basin Organizations: Waters of the Valley of Mexico, Balsas, Central Basins of the North, Southern Border, Lerma-Santiago-Pacific, Central Gulf, Northern Gulf, Northwest, Northern Pacific, Southern Pacific, Baja California Peninsula, Yucatan Peninsula and Rio Bravo, as well as the local offices in Chihuahua and Zacatecas. In these Banks, the users receive personalized attention and technical and administrative support. Web-based sites are also in operation with catchment, concession and allocation trackers, a registry and consultation of offers and requests, as well as the normativity in effect.

Prohibition zones

With the aim of reversing the trend towards the overexploitation of the county's aquifers and watersheds, the federal government has issued prohibitions to restrict[2] water withdrawals in various areas. The prohibition zones are recorded in the REPDA.

In the case of groundwater, up to December 2009, 160 prohibition zones were in force, decreed or agreed upon in the period from 1948 to 2007[3]. In map M5.1 you will see a graphic representation of the areas of Mexico which have some type of prohibition zone that restricts groundwater extraction.

2 According to the LAN, in a prohibition **zone**, no additional use is allowed to those established by law, these uses also being controlled through specific regulations. The LAN also defines **reserve zones**, where limitations are imposed on the use of available water resources, as well as **regulated zones**, where a specific water management is required to guarantee the sustainability of water resources. The three types of zones are recorded in the REPDA.

3 CONAGUA. *Registry of groundwater prohibition.* Consulted on: http://www.conagua.gob.mx/CONAGUA07/Noticias/VEDAS_SUBTERRANEAS_P.pdf (15/10/2010).

M5.1 Prohibition zones for groundwater extraction, by HAR, 2009

Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010

In the case of surface water, the 149 existing prohibitions registered in the REPDA were decreed or agreed upon between 1929 and 1978[4]. It should be mentioned that in 2006 the suspension of the prohibition on various catchments of Papaloapan River and its tributaries and sub-tributaries was decreed.

Similarly, 5 reserve zones are registered, published in the Official Government Gazette (DOF) in the period from 1960 to 1992[5].

4 CONAGUA. *Registry of surface water prohibition.* Consulted on: http://www.conagua.gob.mx/CONAGUA07/Noticias/VEDAS_SUPERFICIALES_INTERNE_REPDA.pdf (15/10/2010).

5 CONAGUA. *Registry of water reserves.* Consulted on: http://www.conagua.gob.mx/CONAGUA07/Noticias/Reglamentos_Reservas_REPDA.pdf (15/10/2010).

Publication of mean annual water availabilities

The LAN establishes that in order to assign concession or allocation 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 these 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 water resources".

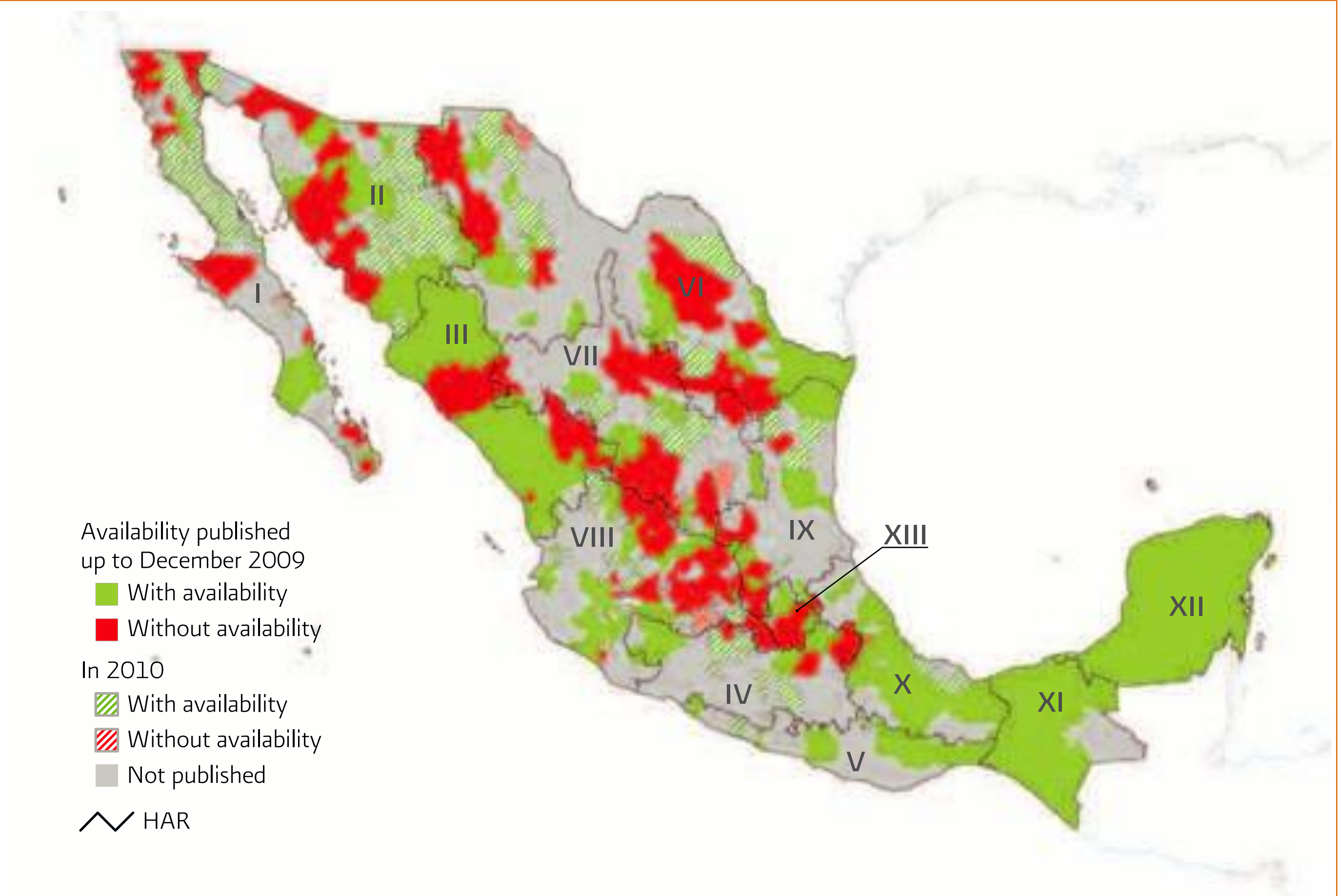
On December 31, 2009, the availabilities of 282 hydrogeological units or aquifers, from which 84% of the country's groundwater is withdrawn, had been published in the DOF, as well as that of 722 watersheds. It should be added that up to December 31, 2010, the availability of 121 additional hydrogeological units had been published, as well as 9 watersheds. M5.2 and M5.3 show the location of Mexico's watersheds and aquifers whose availability had been published in the DOF on December 31, 2009.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- TM(Cuencas_Hidrologicas) and,
- TM(Acuiferos).

M5.2 Watersheds with published availability, by HAR

Note: For the information presented, a coastal polygon line that describes the lagoon systems was employed, instead of the municipal coastal limits, which are usually employed.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

M5.3 Aquifers with published availability, by HAR



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

Classification Declarations for Mexico's water bodies

The 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 DOF.

According to article 87 of the LAN, the Classification Declarations contain the limits of the water bodies studied in which the pollution 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.

5.3 Water economy and finances

Duties for the use of the nation's water resources

Both companies and individuals that use Mexico's water resources are bound to pay the corresponding water duties, with or without the benefit of concession or allocation deeds, authorizations or permits assigned 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 (LFD in Spanish), which is updated annually, and is reflected in M5.4. In general the cost per cubic meter is higher in the zones of lesser availability, as can be observed in T5.3.

For the setting of duties for wastewater discharges, 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 LFD.

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 278C of the LFD.

The use of water for agriculture and livestock, provided it does not exceed the volume allocated, does not pay duties for the use of the nation's water resources

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- TM(Zonas_Disponibilidad).
- TM(Derechos_aguas_nacionales).

We recommend consulting the Federal Duties Law, enacted every year.

M5.4 Availability zones for the charging of duties, by HAR, 2009

Note: Values taken from the publication in the DOF (27/11/2009) on the reforms to the LFD.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: Federal Duties Law 2009.

T5.3 Duties for the use of the nation's water resources, according to availability zones, 2010 (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 of 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
Agriculture and livestock, without exceeding the concession	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Agriculture and livestock, for every m^3 that exceeds the concession	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95	12.95
Spas and recreation 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 extraction of seawater, or for brackish water with concentrations of more than 2 500 mg/l of total dissolved solids (certified by the CONAGUA).
[a] Refers to any use other than those mentioned.
Values taken from the publication in the DOF (27/11/2009) on the reforms to the LFD, with quantities updated by a resolution on the tax law in the DOF on 28/12/2009.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: Federal Duties Law. 2010.

The CONAGUA's income collection

The CONAGUA is a fiscal authority, and intervenes in the charging of duties for the use of Mexico's water resources and its inherent public goods. In T5.4 and T5.5, the CONAGUA's income collection through the charging of duties may be visualized, which includes the concepts of the use of the nation's water resources; the 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 from the Cutzamala System to the Metropolitan Area of the Valley of Mexico or to Irrigation District (ID) modules.

T5.4 The CONAGUA's income collection through the charging of duties, by concept, 2000-2009 (millions of pesos at constant 2009 prices)										
Concept	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Use of the nation's water resources	7 343.8	7 122.3	7 645.8	8 231.5	7 796.5	7 814.4	7 386.8	7 875.1	8 003.7	7 938.5
Bulk water supply to urban and industrial centers	1 311.7	1 332.9	1 292.8	1 473.9	1 383.9	1 634.6	1 516.4	1 601.5	2 148.5	2 074.7
Irrigation services	168.0	192.5	193.3	176.2	179.6	184.3	176.4	210.2	204.8	225.7
Material extraction	46.4	50.1	38.8	34.9	44.3	40.7	60.1	40.1	44.9	45.7
Use of receiving bodies	51.1	91.2	71.0	82.1	80.8	61.4	55.7	63.4	61.2	179.4
Use of federal zones	29.3	28.4	28.3	30.2	38.6	32.5	30.6	38.0	33.0	38.2
Various	330.4	275.6	267.6	133.0	89.8	89.9	134.1	103.8	348.6	213.9
Total	**9 280.7**	**9 092.9**	**9 537.5**	**10 161.7**	**9 613.5**	**9 857.7**	**9 360.1**	**9 932.1**	**10 844.7**	**10 716.0**

Note: The sums may not add up to the total due to the rounding of the figures.
The conversion of pesos at current prices to constant 2009 prices was carried out based on the average National Consumer Price Index for each year.
"Various" refers to transaction services, VAT and fines, among others.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

It should be mentioned that the payment for wastewater discharges (use of receiving bodies), which in 2008 was the equivalent of 0.6% of the total income collected, rose in 2009 to 1.7%, an almost three-fold increase. The context of the increase is that only 37.1% of the municipal discharges and 19.3% of the non-municipal discharges are treated, including industry, as shown in T4.11 in the previous chapter.

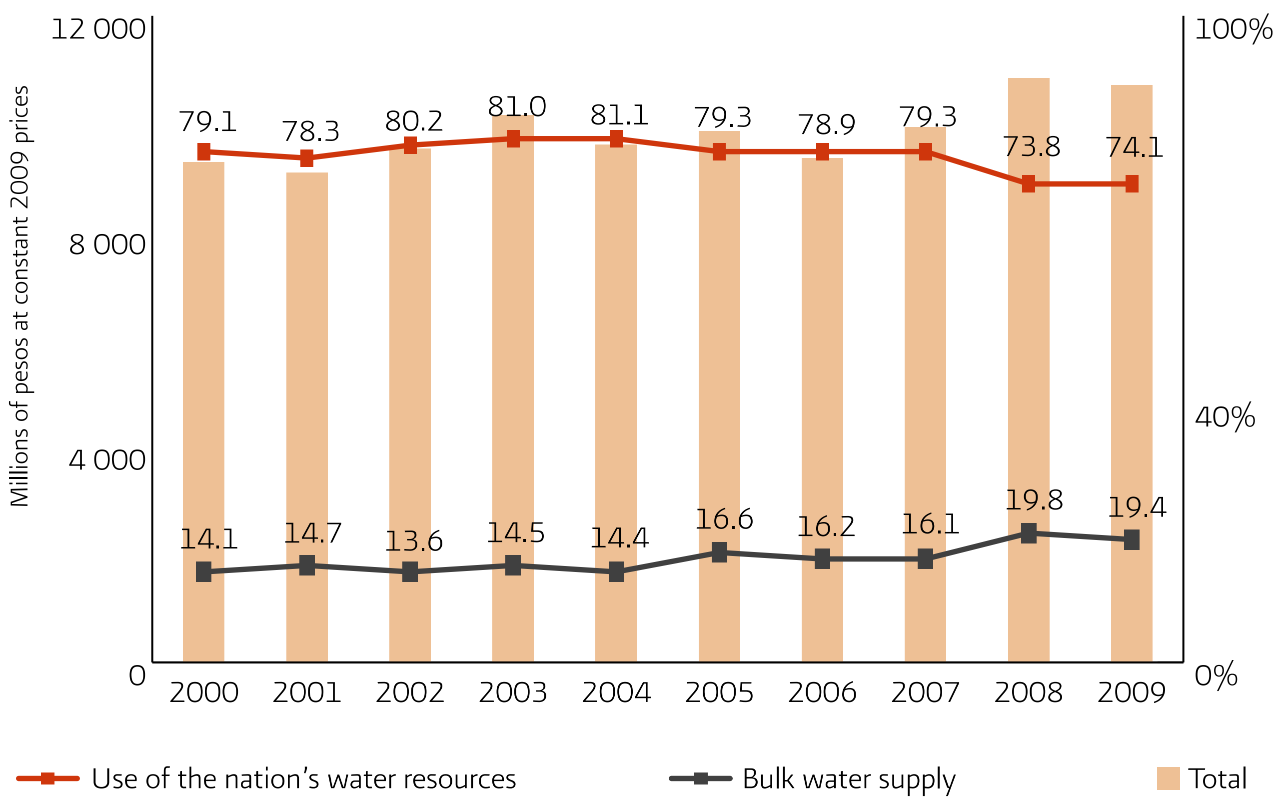
Compared to the period 2000-2007, the CONAGUA's income collection increased for 2008 and 2009, at constant 2009 prices. As can be observed in G5.3, the composition of this collection changed slightly. In percentage terms, the concepts of extraction and use of the nation's water resources decreased, going from the range of 78-81% per year in the period 2000-2007 to 74% per year in the period 2008-2009. On the other hand, the concept of bulk water supply for urban and industrial centers went from the range of 14-16% in the period 2000- 2007 to 19-20% annually in the period 2008-2009.

From the creation of the CONAGUA in 1989 onwards, the income collection through the charging of duties increased noticeably compared to the previous period. From 1995 onwards, it has varied between 8 and 10 billion pesos at constant 2009 prices, with a slight growth trend, as can be appreciated in G5.4.

By HAR, the income collection for 2009 is presented in T5.5. Particularly worth highlighting is that the HAR VIII Lerma-Santiago-Pacific XIII, Waters of the Valley of Mexi co and VI Rio Bravo contribute 64% of the income collected.

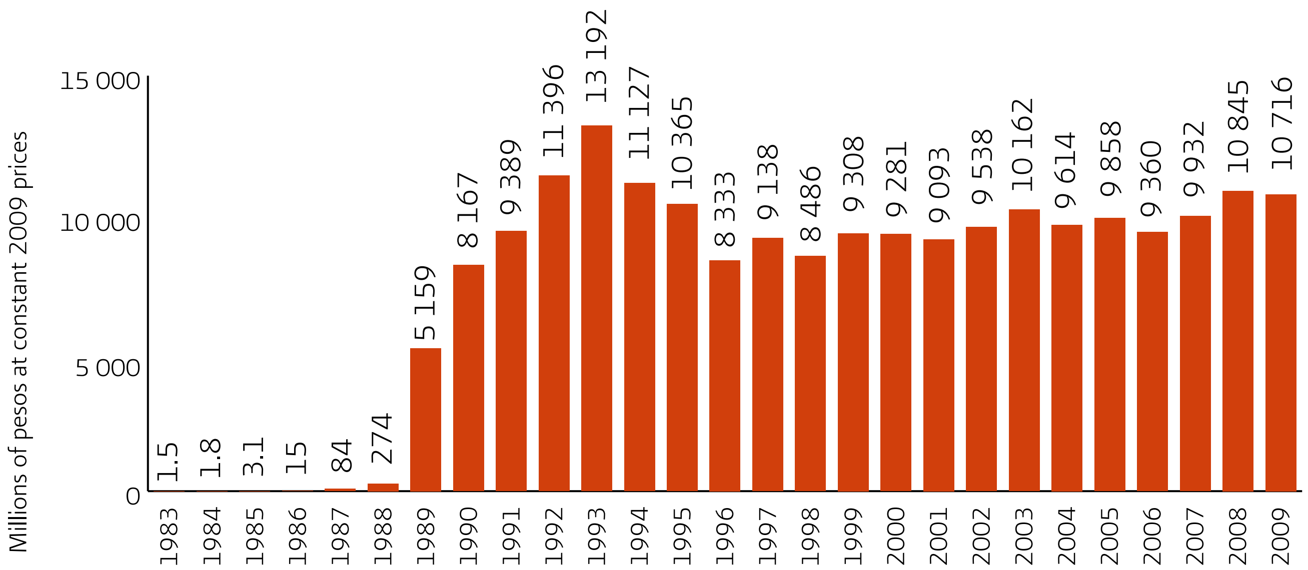
On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- TM(Recaudacion_concepto).

G5.3 Evolution of the CONAGUA's income collection, showing the two main components, 2000-2009



Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

G5.4 The CONAGUA's income collection from the charging of duties, 1983-2009



Source: CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

T5.5 The CONAGUA's income collection through the charging of duties and public services, by HAR, 2009 (millions of pesos)

HAR		Concepts							
		Use of the nation's water resources	Bulk water supply to urban and industrial centers	Irrigation services	Material extraction	Use of receiving bodies	Use of federal zones	Various	Total
I	Baja California Peninsula	168.9	0.0	59.6	4.9	10.8	7.1	6.8	258.1
II	Northwest	321.7	0.0	17.6	1.0	4.3	0.5	2.1	347.2
III	Northern Pacific	209.5	0.0	56.6	14.0	1.9	1.9	2.7	286.7
IV	Balsas	545.3	2.7	5.5	0.3	23.5	1.9	23.2	602.5
V	Southern Pacific	189.4	0.0	3.3	1.8	0.1	0.7	2.1	197.4
VI	Rio Bravo	1 132.1	0.0	19.8	0.4	11.0	5.7	13.9	1 182.9
VII	Central Basins of the North	547.4	0.0	16.3	0.6	16.8	0.9	9.0	590.9
VIII	Lerma-Santiago-Pacific	1 791.4	45.3	19.6	13.0	86.6	7.4	32.2	1 995.5
IX	Northern Gulf	340.8	0.0	12.1	.4	5.9	4.7	4.5	368.4
X	Central Gulf	573.1	52.8	3.9	1.3	6.4	0.5	33.4	671.4
XI	Southern Border	325.6	0.0	0.4	7.9	7.0	0.7	4.4	346.0
XII	Yucatan Peninsula	140.0	0.0	0.2	0.0	2.4	0.1	5.8	148.4
XIII	Waters of the Valley of Mexico	1 653.3	1 973.8	10.7	0.0	2.8	6.2	73.9	3 720.7
Total		**7 938.5**	**2 074.7**	**225.7**	**45.7**	**179.4**	**38.2**	**213.9**	**10 716.0**

Note: The sums may not add up to the total due to the rounding of the figures.
"Various" refers to transaction services, regularizations and fines, among others.
Source: CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

T5.6 shows the income collection corresponding to each of the uses indicated in article 223 of the LFD as regards water. Similarly, T5.8 shows the values for 2009 by HAR.

T5.6 Income collection for the use of the nation's water resources, 2000-2009 (millions of pesos at constant 2009 prices)

Use	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
General regime[a]	6 160.1	6 085.7	5 824.5	5 938.9	5 482.0	5 365.9	5 101.9	5 478.1	5 459.4	5 383.0
Public urban	538.3	508.5	1 334.9	1 906.3	1 863.9	1 995.4	1 759.8	1 893.1	1 942.0	2 012.7
Hydropower plants	618.0	499.3	459.3	384.0	428.0	430.0	502.1	481.7	572.7	511.1
Spas and recreational centers	27.2	28.2	26.7	1.2	21.9	22.6	22.5	21.6	28.9	31.1
Aquaculture	0.2	0.6	0.4	1.0	0.7	0.6	0.4	0.6	0.7	0.5
Total	**7 343.8**	**7 122.3**	**7 645.8**	**8 231.5**	**7 796.5**	**7 814.4**	**7 386.8**	**7 875.1**	**8 003.7**	**7 938.5**

Note: The sums may not add up to the total due to the rounding of the figures | [a] Refers to any use other than those mentioned.
Source: CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

T5.7 Volumes declared for the payment of duties, 2000-2009 (millions of cubic meters, hm³)

Use	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
General regime[a]	1 392	1 079	1 118	1 223	1 369	1 265	1 306	1 764	1 796	1 939
Public urban	662	1 682	4 182	6 550	6 397	7 083	8 240	7 584	7 639	5 609
Hydropower plants	165 842	128 849	120 982	96 163	110 581	115 386	140 295	122 832	150 669	136 085
Spas and recreational centers	164	128	115	32	80	94	115	84	86	64
Aquaculture	92	192	176	211	285	397	159	308	309	344
Total	**168 153**	**131 930**	**126 574**	**104 179**	**118 713**	**124 225**	**150 115**	**132 571**	**160 499**	**144 041**

Note: The sums may not add up to the total due to the rounding of the figures. | [a] Refers to any use other than those mentioned.
Source: CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

T5.8 Income collection for the use of the nation's water resources, by HAR, 2009 (millions of pesos)

HAR		General regime[a]	Public urban	Hydropower plants	Spas and recreational centers	Aquaculture	Total
I	Baja California Peninsula	67.0	101.9	0.0	0.0	0.0	168.9
II	Northwest	225.6	84.3	11.8	0.0	0.0	321.7
III	Northern Pacific	93.2	73.4	42.8	0.0	0.1	209.5
IV	Balsas	299.7	131.5	104.9	9.1	0.2	545.3
V	Southern Pacific	130.3	51.4	7.7	0.0	0.0	189.4
VI	Rio Bravo	790.6	328.0	12.0	1.5	0.0	1 132.1
VII	Central Basins of the North	449.8	97.4	0.0	0.2	0.0	547.4
VIII	Lerma-Santiago-Pacific	1 384.0	364.2	34.0	9.1	0.1	1 791.4
IX	Northern Gulf	298.4	37.1	5.3	0.1	0.0	340.8
X	Central Gulf	461.5	59.8	51.7	0.1	0.0	573.1
XI	Southern Border	74.8	9.9	240.9	0.0	0.0	325.6
XII	Yucatan Peninsula	118.5	21.5	0.0	0.0	0.0	140.0
XIII	Waters of the Valley of Mexico	989.7	652.5	0.1	11.0	0.0	1 653.3
Total		**5 383.0**	**2 012.7**	**511.1**	**31.1**	**0.5**	**7 938.5**

Note: The sums may not add up to the total due to the rounding of the figures. | [a] Refers to any use other than those mentioned.
Source: CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

The volumes declared, meaning those reported by users in their declarations for the payment of duties, are shown in T5.7 for the period 2000-2008, classified by uses, as well as in T5.9 by HAR for 2009.

• On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
• TM(Recaudacion_uso).

T5.9 Volumes declared for the payment of duties for the use of the nation's water resources, by HAR, 2009 (millions of cubic meters, hm³)

HAR		Use					
		General regime[a]	Public urban	Hydropower plants	Spas and recreational centers	Aquaculture	Total
I	Baja California Peninsula	6.1	319.8	0.0	0.4	0.0	326.3
II	Northwest	36.6	223.8	3 127.7	0.1	6.7	3 395.0
III	Northern Pacific	18.4	209.6	11 405.1	0.9	160.0	11 794.1
IV	Balsas	76.6	556.9	28 059.6	21.5	46.7	28 761.2
V	Southern Pacific	52.6	157.8	2 063.4	0.0	0.0	2 273.8
VI	Rio Bravo	398.3	640.9	2 960.4	2.4	1.9	4 003.8
VII	Central Basins of the North	40.1	174.3	0.0	0.5	0.9	215.8
VIII	Lerma-Santiago-Pacific	146.3	1 211.9	9 030.9	13.8	66.3	10 469.2
IX	Northern Gulf	59.4	78.7	1 441.0	2.1	16.7	1 597.9
X	Central Gulf	928.5	348.6	13 673.7	17.4	33.1	15 001.3
XI	Southern Border	53.5	215.4	64 304.7	0.1	5.0	64 578.6
XII	Yucatan Peninsula	29.6	136.1	0.0	0.1	0.0	165.8
XIII	Waters of the Valley of Mexico	93.1	1 335.2	18.8	4.4	6.6	1 458.2
Total		**1 939.0**	**5 609.0**	**136 085.3**	**63.5**	**344.0**	**144 040.8**

Note: The sums may not add up to the total due to the rounding of the figures | [a] Refers to any use other than those mentioned.
Source: CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

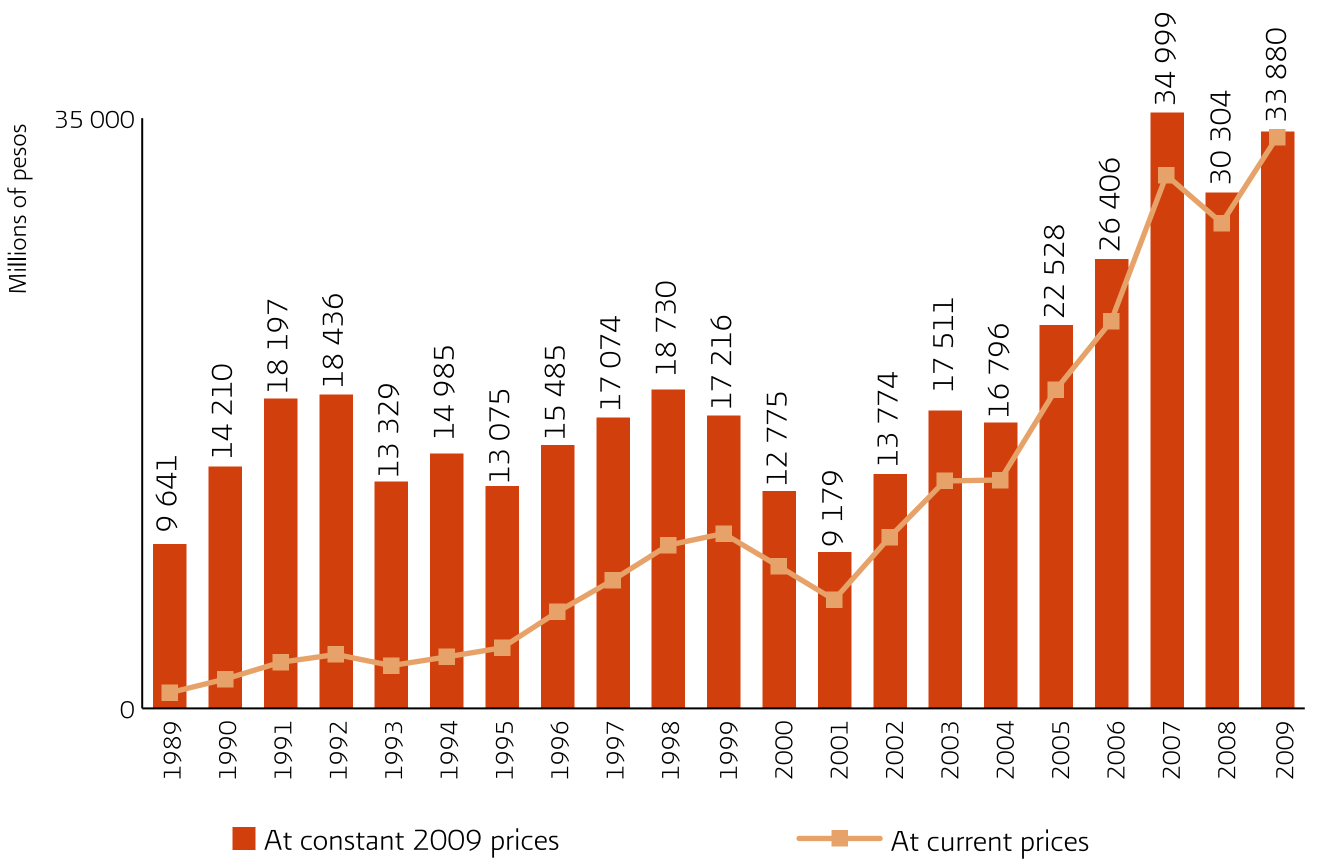
The CONAGUA's budget

The evolution in the CONAGUA's end-of-year budget is shown in G5.5. The budget authorized for the CONAGUA for any given fiscal year is defined at the end of the previous year, although it should be mentioned that throughout the fiscal year budgetary adjustments take place, as a result of which the end-of-year budget varies from the originally authorized budget, as presented in G5.6.

It is interesting to compare the end-of-year revenues against the income collected. As shown in G5.7, the CONAGUA manages a greater budget than the sum of its collected duties. For 2009, the income collected was the equivalent of 32% of the end-of-year budget.

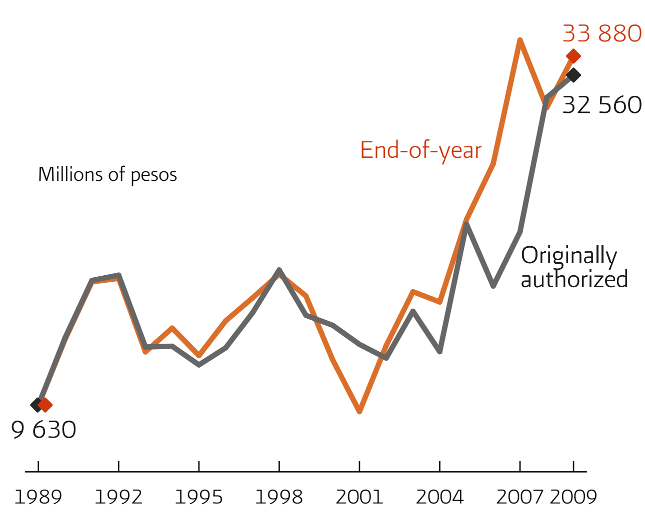
The evolution in the investment in the drinking water, drainage and sanitation subsector is shown in T5.10. It should be mentioned that this investment has diverse origins. For 2009, as observed in T5.11, 49% of the investment was of federal origin, whereas the states contributed 18.5%, municipalities 12% and other sources, considering state commissions, housing developers, credits, contributions from private initiative and others, the remaining 20.5%.

G5.5 Evolution in the CONAGUA's end-of-year budget, 1989-2009



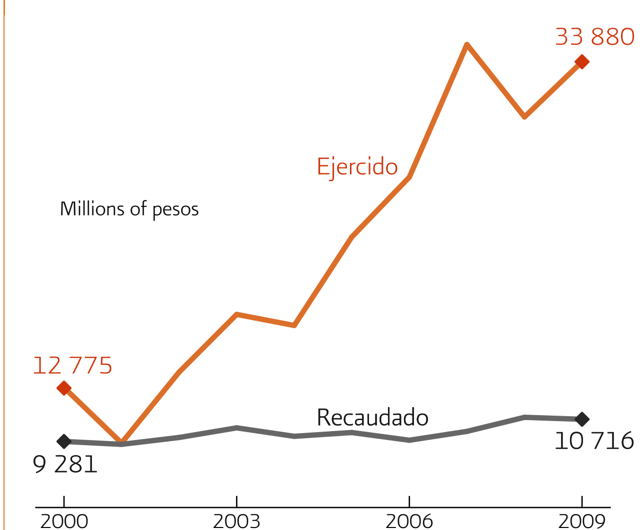
Note: The conversion of pesos at current prices to constant 2009 prices was carried out based on the average National Consumer Price Index from January to December of each year.
Source: CONAGUA. Deputy Director General's Office for Administration. 2010.

G5.6 The CONAGUA's originally authorized and end-of-year budgets



Constant 2009 prices.
See note [b] in Annex D. The complete graphic is available on the DVD.

G5.7 Comparison between the CONAGUA's income collection and end-of-year budget



Constant 2009 prices.
See note [c] in Annex D. The complete graphic is available on the DVD.

T5.10 Investments applied to the drinking water, sewerage and sanitation subsector (millions of pesos at constant 2009 prices)

Year	Drinking water	Sewerage	Sanitation	Improvement of efficiency	Others[a]	Total
2002	4 842	5 486	2 079	1 624	111	14 143
2003	6 726	6 404	1 570	1 214	228	16 143
2004	6 638	6 750	1 909	1 345	88	16 729
2005	10 009	9 825	3 896	1 900	140	25 769
2006	6 266	6 702	2 096	2 754	284	18 101
2007	10 345	8 214	1 921	2 711	627	23 818
2008	11 053	9 853	2 435	3 212	1 162	27 714
2009	9 961	10 848	2 278	5 428	1 733	30 247

Note: [a] Considers: Storm drainage, operating costs and supervision.
The sums may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

T5.11 Investments reported by program and agency by the sector of origin of the resources, 2009 (millions of pesos)

Concept	Federal	State	Municipal	Credit/Private initiative/Others	Total
The CONAGUA's investments	**12 763.7**	**5 055.0**	**2 948.0**	**1 806.0**	**22 572.7**
Drinking water and sanitation in urban zones	5 556.4	4 192.2	1 057.3	333.2	11 139.2
Valley of Mexico[a]	2 540.1	0.0	0.0	18.5	2 558.6
Duty returns	1 890.7	0.0	1 890.7	0.0	3 781.3
Clean Water	37.4	38.9	0.0	0.0	76.3
PROSSAPYS[b]	2 135.5	823.8	0.0	0.0	2 959.3
PROMAGUA[b]	603.7	0.0	0.0	1 454.3	2 058.0
Other agencies	**2 051.5**	**541.3**	**694.6**	**4 386.8**	**7 674.3**
SEDESOL	1 531.8	305.6	633.1	59.5	2 530.0
CONAVI	0.0	0.0	0.0	4 320.4	4 320.4
CDI	519.8	235.7	61.5	6.9	823.9
Total	**14 815.3**	**5 596.3**	**3 642.6**	**6 192.8**	**30 247.0**

Notes: [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.
The sums may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation, SEDESOL, BANOBRAS, CONAVI, CDI and service providers. 2010.

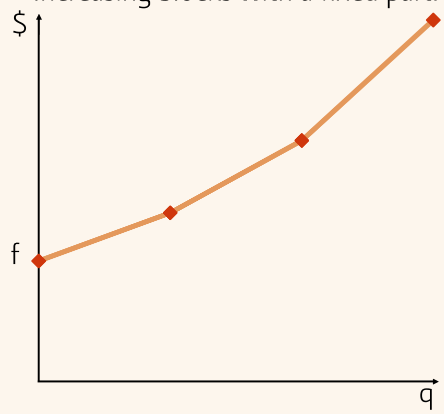
Water tariffs

Drinking water tariffs are defined 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 (see T5.B on the DVD).

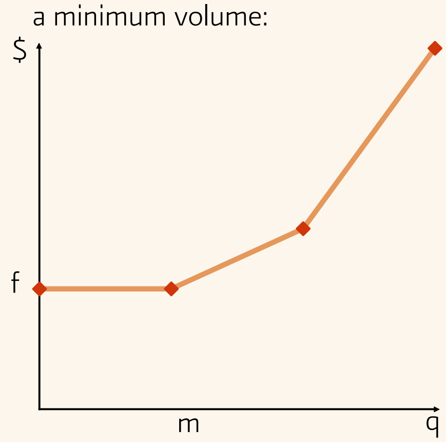
In principle, tariffs have the objective of completely recovering the costs incurred by the service provider. There is a Mexican Standard on the evaluation of tariffs (NMX- AA-147-SCFI-2008), published in April 2009, which contains a definition of these costs.

R5.1 Common tariff structures in Mexico

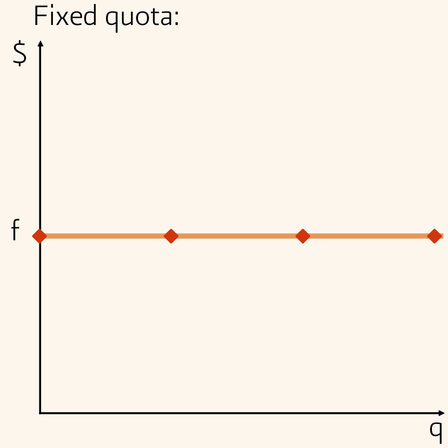
Increasing blocks with a fixed part:



Increasing blocks with a fixed part and a minimum volume:



Fixed quota:



Note: Illustrative schemes which do not imply amounts or volumes, and do not qualify or make a judgment on the characteristics of each tariff structure.
q = Volume consumed
f = Amount to pay for 0 consumption
m = Volume up to which the minimum tariff is charged
Source: CONAGUA. Deputy Director General's Office for Planning. 2009.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- TM(Marco_juridico_entidades_federativas).

The tariff level, or the payment due, is expressed in a tariff structure, the majority of times differentiated by the type of users (domestic, commercial and industrial, among others), as well as by some mechanism of redistribution of costs through crossed subsidies, in which marginalized users are benefited by lower tariffs than those considered as non-marginalized users. Tariff structures are generally based on increasing blocks, meaning that the price per cubic meter is higher for a greater consumption of water. It should be mentioned that there are a great variety of mechanisms, including the fixed price, meaning when the user pays a certain amount independently of the water that has been used.

Water tariffs generally include:

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

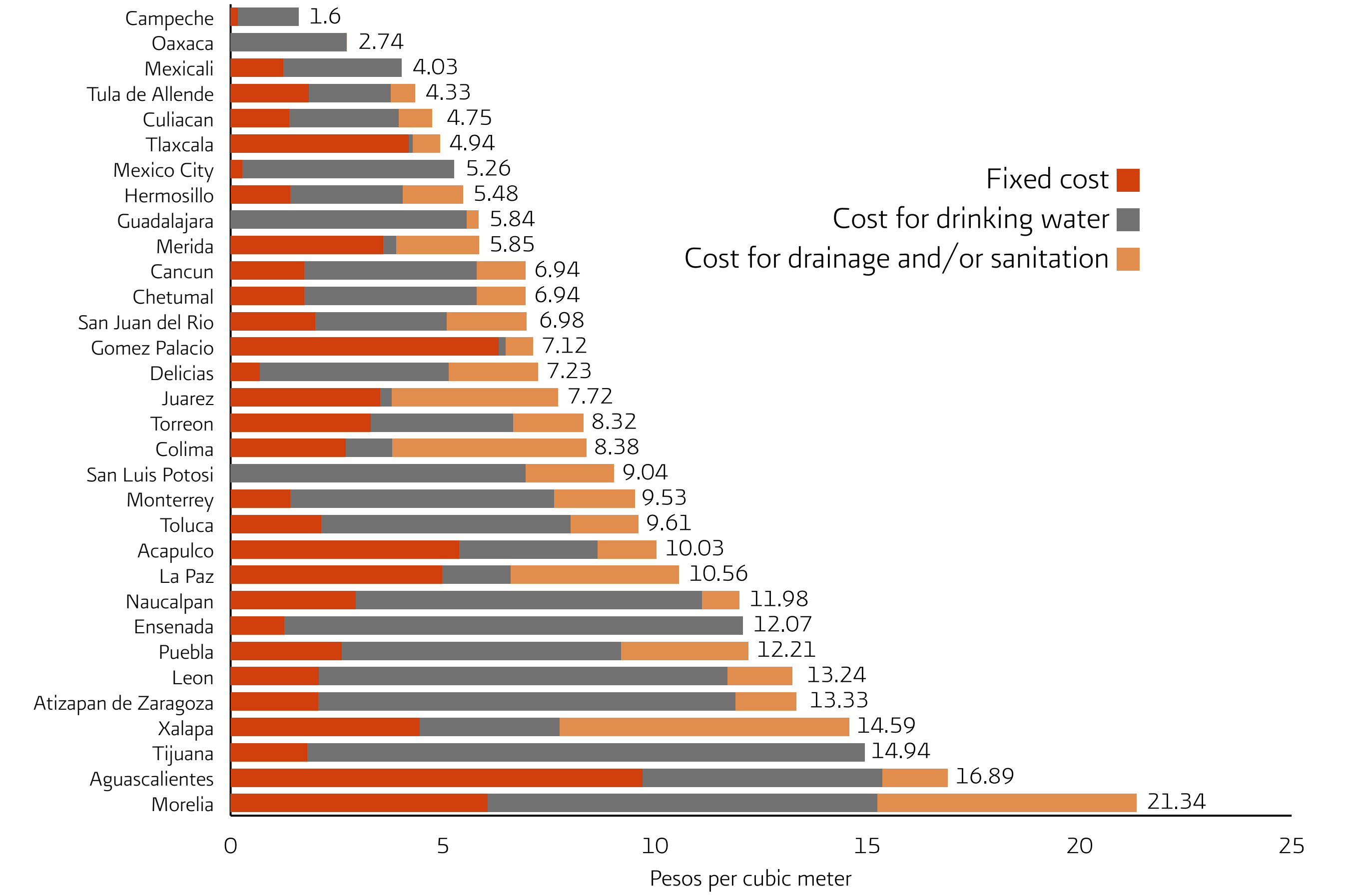
G5.8 indicates, for some cities in Mexico, the drinking water, sewerage and/or sanitation tariffs for a consumption of 30 m^3 per month for domestic use, as well as the highest tariff applicable.

In G5.9 the tariffs are shown for domestic, industrial and commercial use in several localities in Mexico, assuming a consumption of 30 m^3 per month.

It should be mentioned 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 income 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 income collected by the service providers can be viewed in G5.10.

G5.8 Domestic drinking water, sewerage and/or sanitation tariffs in some cities, 2009



Note: The highest applicable tariff for a consumption of 30 m^3 per month.

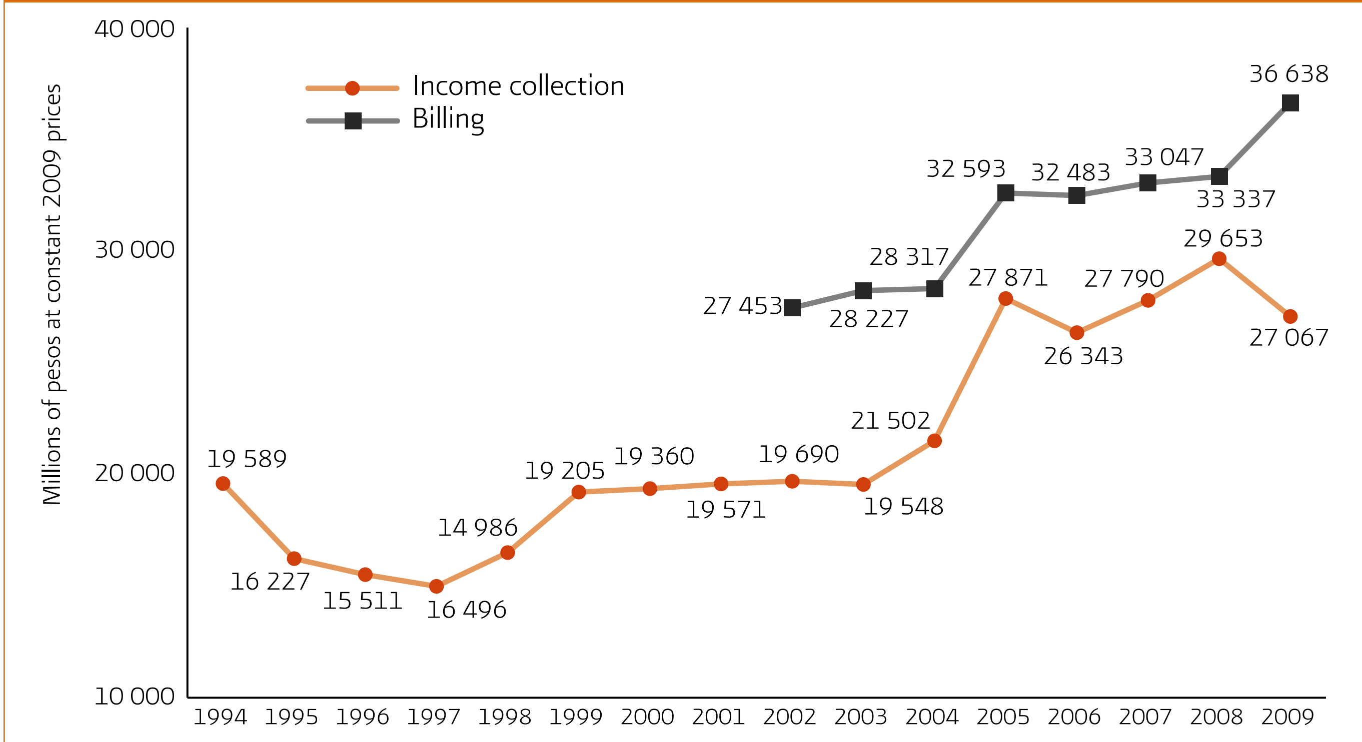
Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

G5.9 Comparison of tariffs for domestic, industrial and commercial use in selected cities, 2009

Note: The highest applicable tariff for a consumption of 30 m^3 per month.

Source: CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

G5.10 Annual billing and income collection of water utilities, 1994-2009



Note: Some states register income greater than the amount 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 around Mexico.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

Resources destined for the sector

It is interesting to contemplate the growing evolution in the main resources destined to the water sector, illustrated in G5.11 as the sum of income collected both 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 income it collects.

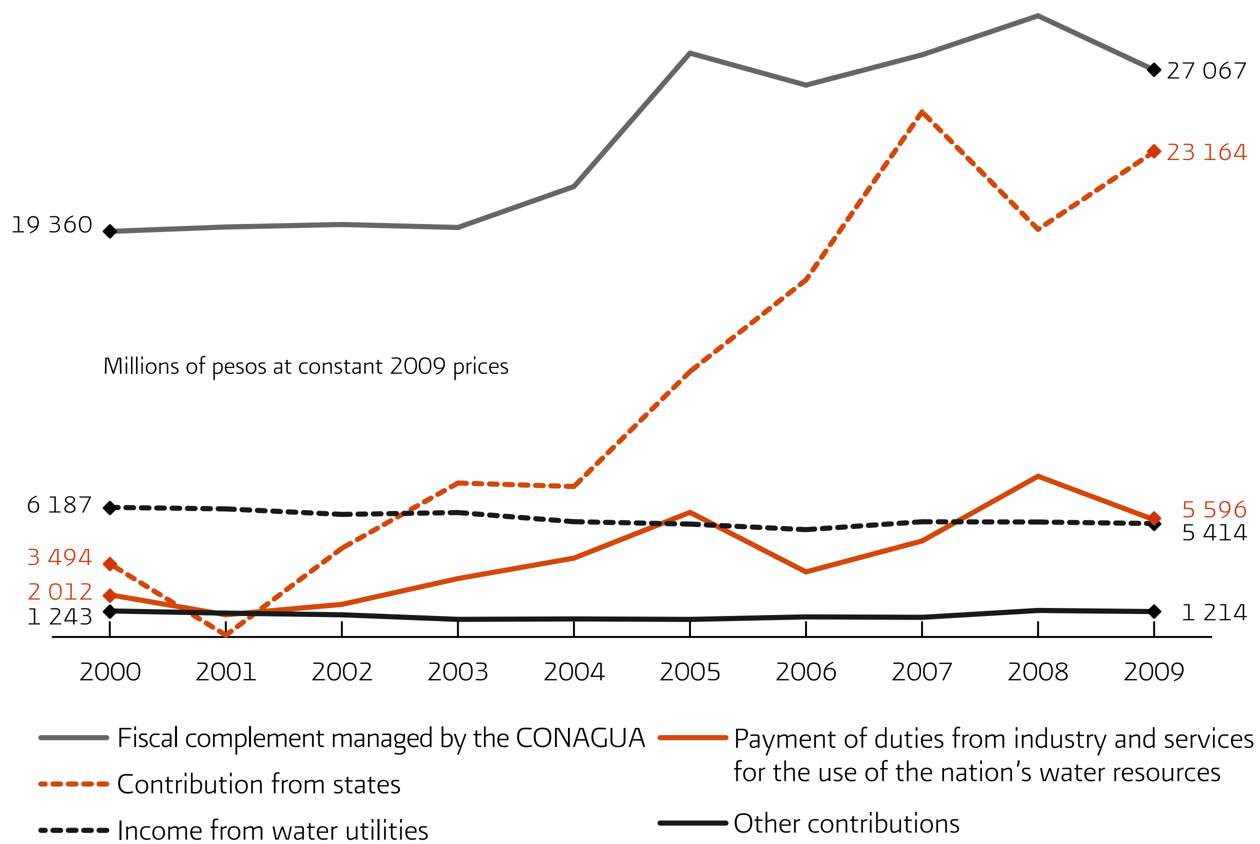
External funding

Among the resources destined for the sector are those that come from international financial institutions, which additionally benefit from some innovative aspects of international experience. Among the projects supported by external credit in 2009, the following stand out:

- Total payment of a credit line for the loan 1645/OC-ME from the Inter-American Development Bank for 150 million dollars, for the Program for the Sustainability of Drinking Water and Sanitation Services in Rural Communities (PROSSAPYS II).
- Extension for the payment of the Program for Technical Assistance for the Improvement of Efficiency in the Drinking Water and Sanitation Sector (PATME) from the International Bank for Reconstruction and Development, for 24.8 million dollars.
- Culmination of the payment of the loan ME-P8 from the Japan Bank for International Cooperation (JBIC) for 210 million dollars, for the Program for Drinking Water and Sanitation in Baja California.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
• TM(Organismos_financieros_internacionales).

G5.11 Main economic resources destined for the water sector, 2000-2009



Note: The conversion to constant 2009 prices was carried out based on the average National Consumer Price Index for each year.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAGUA. Deputy Director General's Office for Administration. 2010.
CONAGUA. Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.
CONAGUA. Coordination of Fiscal Revision and Payments. 2010.

- Preparation of respective donations from the Global Environment Facility (GEF) for the catchment of the Rio Grande and the wetlands of the Gulf of Mexico.

5.4 Participation mechanisms

River Basin Councils and their auxiliary bodies

The LAN establishes that River Basin Councils are multi-stakeholder collegiate bodies, which are coordination and consensus-reaching bodies providing support, consultation and advice, between the CONAGUA, including the corresponding RBO, 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 31, 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 diagram D5.1.

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

The Clean Beach Committees are worthy of special mention. They have the purpose of promoting 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, tourism and the competitiveness of the beaches. As regards the auxiliary bodies, in 2009 three new River Basin Commissions were created, two River Basin Committees, two COTAS 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[6], 81 COTAS and 36 Clean Beach Com mittees (see T5.C on the DVD).

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
• TM(Mecanismos_participacion).

D5.1 Location of the River Basin Councils, 2009

1. Baja California	14. Altiplano
2. Baja California Sur	15. Lerma-Chapala
3. Upper Northwest	16. Santiago River
4. Yaqui and Matape Rivers	17. Central Pacific Coast
5. Mayo River	18. San Fernando-Soto La Marina Rivers
6. Fuerte and Sinaloa Rivers	19. Panuco River
7. Mocorito to Quelita Rivers	20. Tuxpan to Jamapa Rivers
8. Presidio to San Pedro Rivers	21. Papaloapan River
9. Balsas River	22. Coatzacoalcos River
10. Guerrero Coast	23. Chiapas Coast
11. Oaxaca Coast	24. Yucatán Peninsula
12. Rio Bravo	25. Grijalva and Usumacinta Rivers
13. Nazas-Aguanaval	26. Valley of Mexico

See note [d] in Annex D. The complete graphic is available on the DVD.

6 On March 3, 2010, it was determined at the 34th Session of the Follow-up and Evaluation Group of the Valley of Mexico River Basin Council that the issue that had brought about the creation of the Cañada de Madero River Basin Committee had been duly resolved, as a result of which it was decided to disband it on that date.

5.5 Water-related standards

Official Mexican Ecological Standards and those of the water sector

In the following pages, the Mexican environmental standards related to water issues are presented.

It is worth highlighting that, according to the Federal Law on Metrology and Standardization, the Official Mexican Standards (NOMs in Spanish), are technical regulations to be obligatorily observed, whereas the Mexican Norms (NMX) are voluntarily applied.

T5.12 Mexican standards related with the water sector

Group: SEMARNAT Identifier - Description
NOM-001-SEMARNAT-1996 - Maximum permissible limits of pollutants in wastewater discharges in the nation's water resources and goods.
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 in sludge and biosolids 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 - Procedures, specifications and criteria for mine tailings and mine tailing dams.
Group: CONAGUA
NOM-011-CONAGUA-2000 - Conservation of water resources. Specifications and the method to determine the mean annual availability of the nation's water resources.
NOM-001-CONAGUA-1995 - Specifications for airtightness in sanitary sewerage systems.

T5.12 Mexican standards related with the water sector

NOM-002-CONAGUA-1995 - Specifications and testing methods for home drinking water outlets.
NOM-003-CONAGUA-1996 - Requirements for the construction of wells for the prevention of aquifer pollution.
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-2001 - Specifications and testing methods for lavatories.
NOM-010-CONAGUA-2000 - Specifications and testing methods for inlet and discharge valves for lavatory.
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.
Group: Health
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.
NOM-013-SSA1-1993 - Health requirements for the tanks of vehicles used for the transportation and distribution of drinking water.
NOM-014-SSA1-1993 - Health procedures for the sampling of drinking water 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 water management in drinking water networks.
Group: Mexican Standards
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. 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. 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. Guidelines for the provision and evaluation of drinking water services.

Source: CONAGUA. Deputy Director General's Office for Planning. 2010.

T5.12 presents some significant standards. Of special interest is NOM-001-SEMARNAT-1996, given that compliance deadlines have been established for its requirements regarding maximum permissible limits in wastewater discharges into the nation's water and public goods (see T5.13).

NOM-011-CONAGUA-2000 is another standard to be highlighted, since it is the basis upon which the calculation of availability of water in catchments and aquifers is carried out, and it thus makes it possible to comply with one of the CONAGUA's legal obligations. On the other hand, the CONAGUA has issued standards that establish the dispositions, specifications and testing methods that guarantee that the products and services tendered to drinking water, sewerage and sanitation utilities comply with the objective of making use of and preserving the quality and quantity of water.

Additionally, NOM-127-SSA1-1994 establishes the guidelines to guarantee water supply for human use and consumption with appropriate quality. This standard establishes permissible limits of bacteriological characteristics (fecal coliforms and total coliforms); physical and sensory characteristics (color, smell and taste, and cloudiness); chemical characteristics (which include 34 parameters, such as aluminum, arsenic, barium, etc.), as well as treatment methods which should be applied according to the pollutants encountered.

T5.13 Deadlines for compliance of NOM-001-SEMARNAT-1996

Municipal discharges		
Modified compliance dates from:	Population range (According to 1990 Census)	Number of localities (According to 1990 Census)
January 1, 2000	More than 50 000 inhabitants	139
January 1, 2005	From 20 001 to 50 000 inhabitants	181
January 1, 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 1, 2000	More than 3.0	More than 3.0
January 1, 2005	From 1.2 to 3.0	From 1.2 to 3.0
January 1, 2010	Less than 1.2	Less than 1.2

Source: CONAGUA. Deputy Director General's Office for Planning. 2010.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
• TM(Normas).

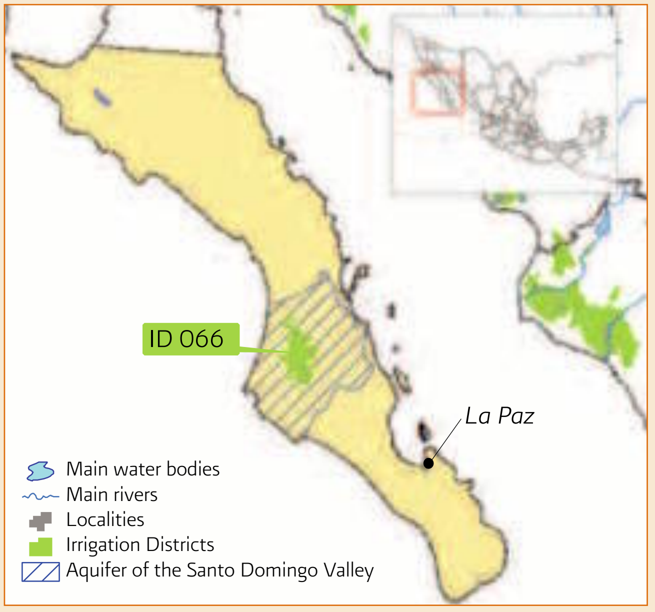
Alternatively, we recommend consulting the CONAGUA's website (http://www.conagua.gob.mx) to get access to the files of the Standards.

R5.2 Recovery of the aquifer of the Santo Domingo Valley

The aquifer of the Santo Domingo Valley is one of the main sources of water supply in the state of Baja California Sur, and its main center of agricultural and livestock production. In conditions of low precipitation (a yearly average of 137 mm) and high evapotranspiration, the aquifer was exploited with growing intensity from 1949 onwards, when the first wells for agriculture were approved. In 1954, ID 066 "Santo Domingo Valley" was established, and by 1963 the extraction of water was causing subsidence of 1.5 m annually, which had a negative impact on water quality. Currently, approximately a half of ID 066 irrigates with water that has concentrations of total dissolved solids of more than 1,500 mg/L, whereas 78% of the wells have a piezometric level below sea level.

Actions to stabilize this situation started in 1962, when the first groundwater regulation was issued. In 1992 the Regulation for the Use of Subsoil Water in the Santo Domingo Valley was published. A wide range of actions have been carried out, among which some stand out, such as the reduction of provisions, sanctions to over-exploiters, reduction in volumes authorized, cancelation of a well, promotion of water culture and training and acquisition of duties by the Federal Government, annual piezometric measurement, monthly verification of extractions, technification of irrigation and re-habilitation of pumping equipment, actions that it was possible to implement through the participation of the Civil Society Association of Users of the ID as well as the creation and strengthening of the COTAS.

One obvious result is that the annual extraction decreased from 453 to 161 hm³/year, between 1988 and 2010, below the recharge level, which is calculated at 188 hm³/year. It is planned to strengthen these actions and to complement them with infrastructure to induce the recharge.



Source: Castro, C. 2010. *Recovery of the aquifer of the Santo Domingo Valley*. Presentation made during the 16th Conference of the Parties to the United Nations Framework Convention on Climate Change (COP16). (03/12/2010).

Water, health and the environment

6

6.1 Health

Having access to drinking water supply 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, such as 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, child mortality has been reduced (see graphic G6.A on the DVD) 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 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 are relevant.

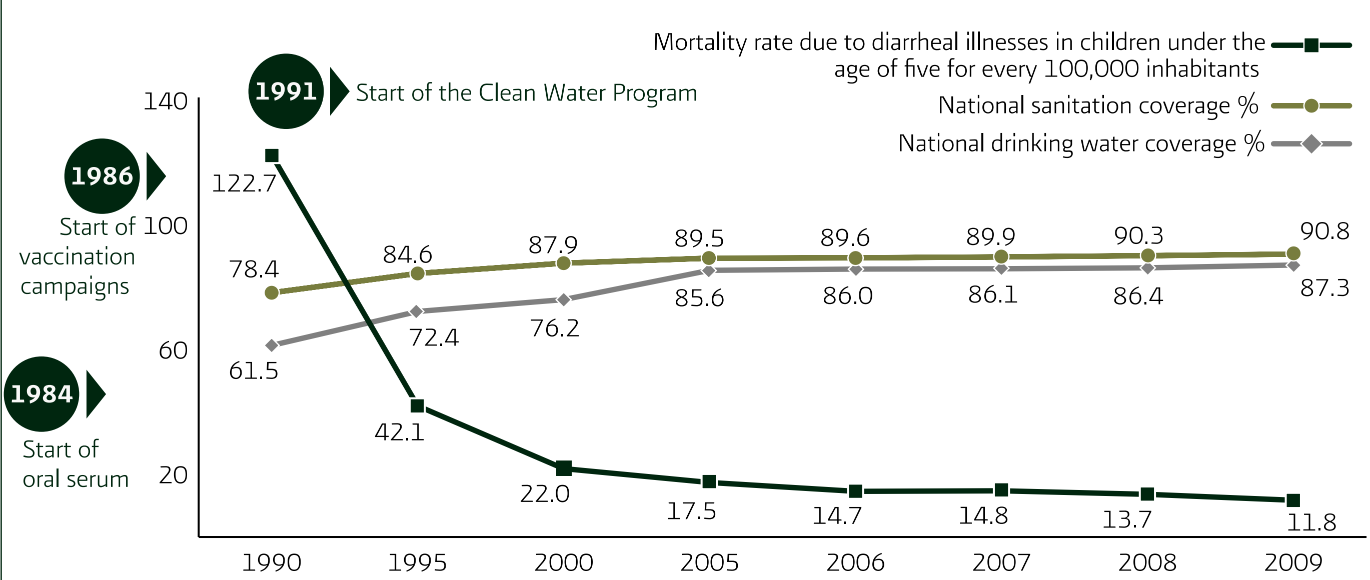
There is a correlation between the increase in coverage of drinking water and improved sanitation services and the decrease in the mortality rate through diarrheal diseases in children

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 G6.1.

The disinfection of water has the purpose of destroying or inactivating pathogenic agents and other microorganisms, with the aim of ensuring that the population receives water suitable for human consumption. The service provider, generally the municipality and in exceptional circumstances the state, is in charge of carrying out the chlorination.

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 Coverage of drinking water and improved sanitation services and the mortality rate through diarrheal diseases in children under the age of five, 1990-2009



Source: For the 1990-2009 data: CONAGUA. Deputy Director General's Office for Planning. Produced based on: Ministry of Health. General Office for Performance Evaluation. 2010.
For the 2007 update: Ministry of Health. *Indicators of results: Health Conditions by State 2001-2007.*
2008-2009 update: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on: Ministry of Health. *Statistical and Epidemiological System on Deaths (SEED).*

The efficiency of the disinfection process of 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 domesstic outlet signals the efficiency of the disinfection process. The municipal situation in 2009 is shown in map M6.1. It should be noted that by December 2009, according to data from the COFEPRIS, the national average for chlorination efficiency was 91.23%[2] and 76.18% of the population was safe from water-related risks[3].

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
• TM(Cloracion).

2 This parameter indicates the status of chlorination of water and is calculated through the average determinations with levels of chlorine >0.2 mg/l as compared to the total determinations carried out.

3 This indicator shows the percentage of the population that is supplied with a formal supply system, which is monitored and in which the water is disinfected.

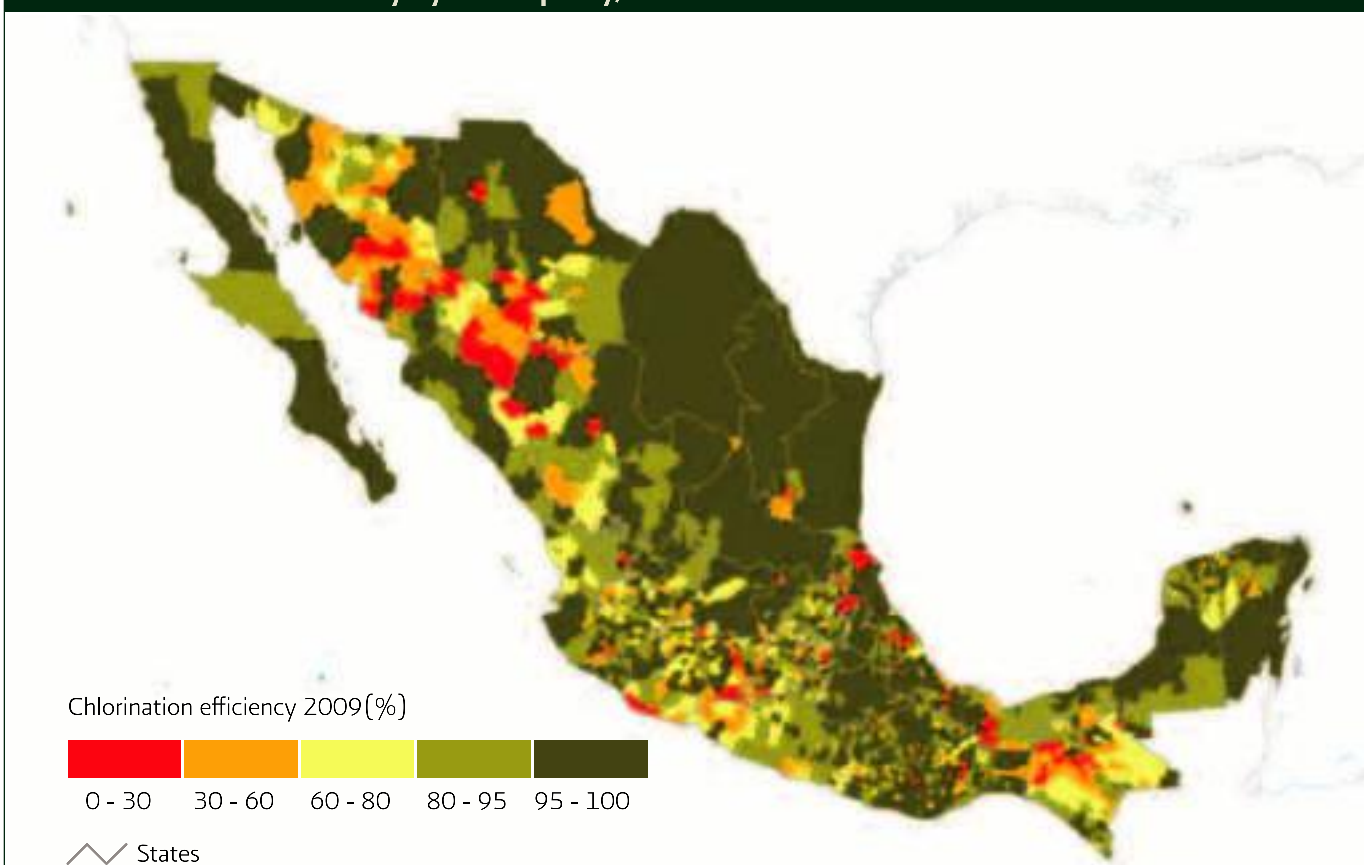
6.2 Vegetation

According to data from INEGI's "Soil Use and Vegetation Chart", Mexico is classified into 12 vegetation groups compatible with the Rzedowski classification system. The occurrence of these types of vegetation in Mexico is shown in G6.2 according to the classification of series I (1980-90), II (1993), III (2002) and IV (2007) (see M6.A on the DVD).

Changing soil uses, reflected in the vegetation, have an impact on the phenomena of erosion, which may be due to the action of either water or air. Erosion in Mexico was evaluated by SEMARNAT in 2002[4], which evaluated that 42% of the territory of Mexico was at risk from water erosion, whereas 89% was at risk from air erosion, as shown in table T6.1.

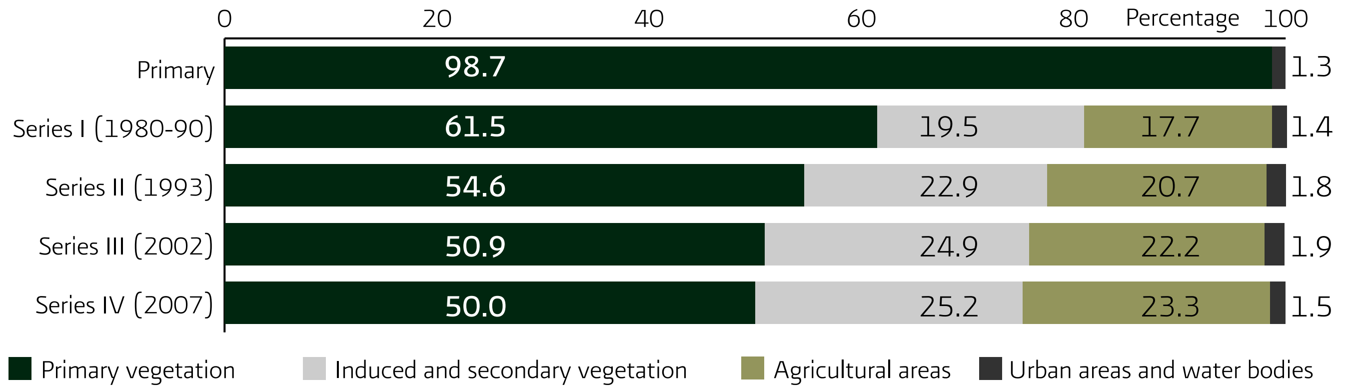
4 SEMARNAT-UACh. *Evaluation of the loss of soil through water and air erosion in the Mexican Republic, scale 1: 1 000 000.* Mexico 2002.

M6.1 Chlorination efficiency by municipality, 2009



Source: COFEPRIS. *Chlorination efficiency 2006, 2007, 2008 and 2009.*

G6.2 Evolution in the use of soil and vegetation based on INEGI's Charts



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. | The years correspond to the period in which the information used in each series was captured.
Source: INEGI. *Basic information for the construction of the rate of deforestation,* Mexico, 2009.

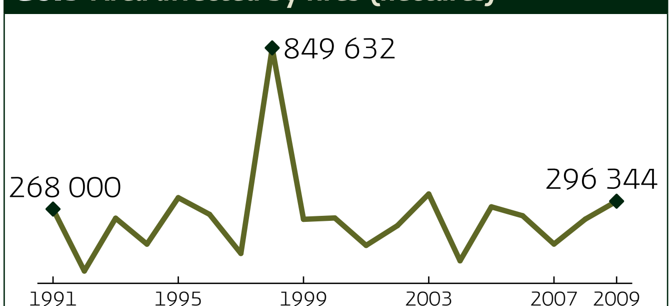
T6.1 Potential soil erosion by degree, 2002 (percentage of the national territory)

	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
Wind erosion	11.0	6.5	30.7	33.6	18.2	100.0

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

The change in soil uses is highlighted by the increase in secondary and induced vegetation, both in urban and agricultural areas. It should be mentioned that erosion processes 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. Another vector of change in vegetation is the incidence of forest fires. In G6.3 the hectares affected by this phenomenon every year are shown.

G6.3 Area affected by fires (hectares)

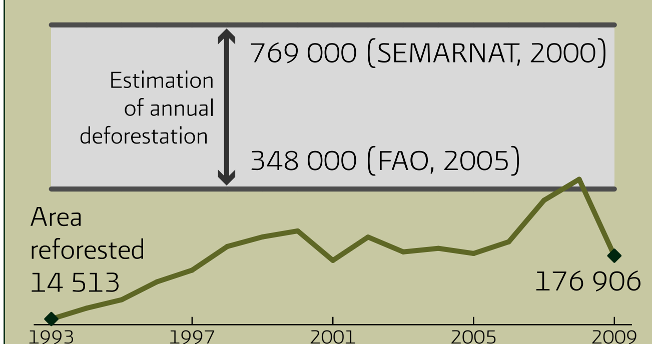


See note [a] in annex D. The complete graphic is available on the DVD.

R6.1 Reforestation and deforestation

Every year in Mexico reforestation activities are carried out. On the other hand, different estimations abound on deforestation: SEMARNAT (2000) considered deforestation the loss of wooded area constituted by forest and rainforests, whereas FAO (2005) determined an area as deforested when it has been transformed for another use of soil.

It is interesting to compare the area reforested annually, registered in the SEMARNAT, against these estimations of deforestation.



See note [b] in annex D. The complete graphic is available on the DVD.

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.

Almost 13% of the area of Mexico is a federal protected area, administered by the CONANP

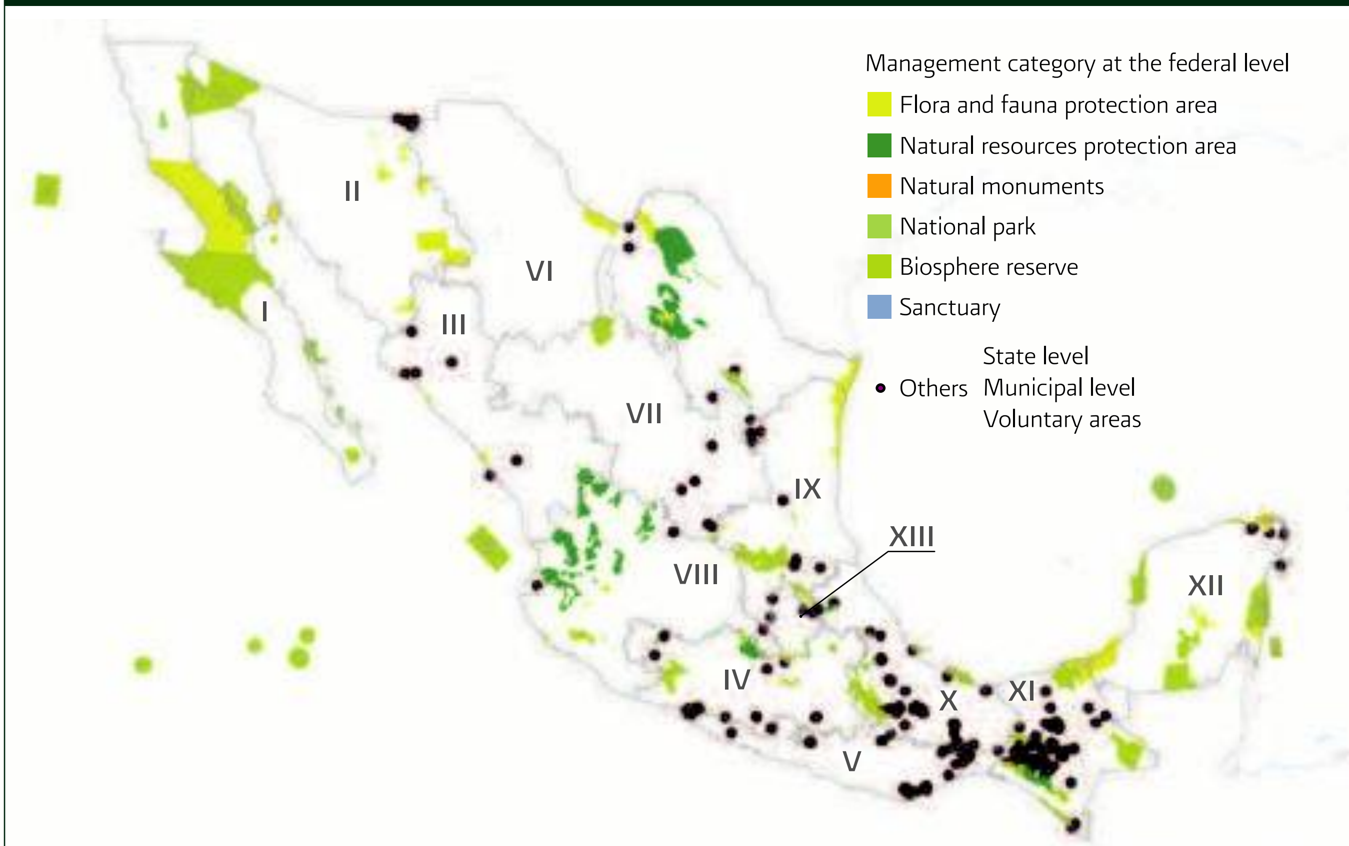
In Mexico, there are protected areas at the federal, state and municipal levels, as well as voluntary ones. At the time of going to press, the number of protected areas, administered by the National Commission for Protected Areas (CONANP in Spanish) was 174, covering a total surface area of 25.4 million hectares, as shown in T6.2. Their geographical distribution is shown in M6.2.

T6.2 Federal protected areas, 2010

Category	Number	Area (ha) 2009
Biosphere reserve	41	12 652 787
National park	67	1 482 489
Natural monument	5	16 268
Natural resources protection area	8	4 440 078
Flora and fauna protection area	35	6 646 942
Sanctuary	18	146 254
Total	**174**	**25 384 818**

Source: CONANP. *Protected areas*. Consulted on: http://www.conanp.gob.mx/que_hacemos (5/11/2010)

M6.2 Protected areas, 2009



Note: The non-federal protected areas are generally small in scope, as a result of which they are represented by their centroids. Federal protected areas are represented by their polygons.
Source: CONANP. Consultation on the Geographical Information System. Mexico, 2010.

6.4 Wetlands

Wetlands constitute a basic and irreplaceable link in the water cycle. Their conservation and sustainable management can 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 pollutants, protection against storms and flood mitigation, the stabilization of coasts and erosion control.

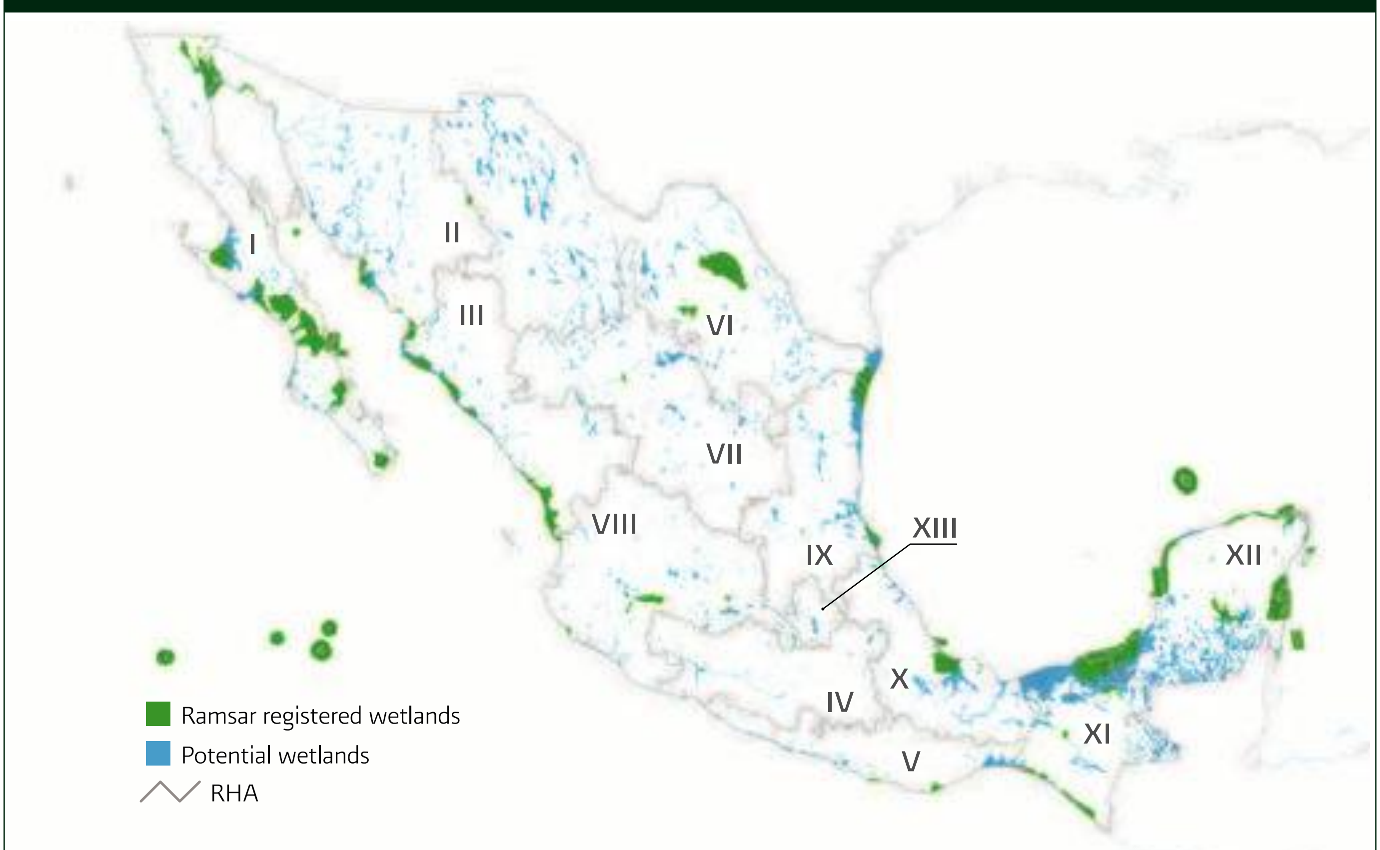
These ecosystems have endured transformation processes with various purposes, and the lack of knowledge on wetlands and their inappropriate management constitute some of the main problems that adversely affect their conservation in Mexico. Nationally, as stipulated in the 1992 National Water Law, it is the CONAGUA's responsibility to carry out and update the National Inventory of Wetlands (INH), as well as to define their contours, classify them and propose standards for their protection, restoration and use.

In this context, in 2008 the cartography of potential wetlands was generated. 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, 130 Mexican wetlands had been registered in the Ramsar Convention, taking the total surface area of the country registered to 8.9 million hectares, with an increase of 7 wetlands. M6.3 shows the wetlands registered in the Ramsar Convention, as well as the potential wetlands that have been identified.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- RAMSAR.

M6.3 Potential wetlands and Ramsar sites



Note: Ramsar sites up to 11/08/2010. Potential wetlands are taken from a 2008 study.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.
CONANP. *Ramsar Sites.* Consulted on: http://ramsar.conanp.gob.mx/sitios.php (15/10/2010)

7 Future scenarios

7.1 Consolidation of sustainable water policy

In the history of Mexico's water policy, three clear phases can be discerned:

1900 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.

1980 From the 1980s onwards, water policy became 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 (REPDA), as a mechanism to provide order to the use of water resources.

2000 At the dawn of the 21st century, a new phase is being defined, that of water sustainability, in which wastewater treatment 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.

This new vision of water in Mexico should allow us to have clean water bodies, balanced supply and demand for water, universal access to water services and cities safe from catastrophic floods, essential elements of the 2030 Water Agenda.

Turning the 2030 Water Agenda into a reality requires the commitment of all

We recommend consulting the website of the 2030 Water Agenda's Virtual Forum http://agendadelagua2030.conagua.gob.mx

R7.1 2030 Water Agenda

The 2030 Water Agenda is a long-term vision that looks to shape an institutional coalition to overcome the sector's backlogs and consolidate a sustainable water policy in Mexico.

Promoted by the CONAGUA, studies and planning actions were carried out in 2009. In March 2010 a request was made from the Federal Executive Branch to put together the 2030 Water Agenda, as a result of which, with the aim of achieving a shared vision between stakeholders and users from the water sector, a public participation process was designed.

The public consultation was carried out in the period from March to November 2010, with a broad response: more than 2,600 participants with more than 3,300 participations.

- **Crosscutting working groups.** To put together a shared vision on the inter-regional and crosscutting tasks of the 2030 Water Agenda.
- **Virtual Forum.** An open space for public participation.
- **Regional Fora.** To establish a recurring reflection and participation regarding the 2030 Water Agenda, with an emphasis on regional issues.
- **National Forum.** A culminating process of interaction, in which the investment requirements are identified. At the time of going to press, various initiatives had been identified grouped into the four main strategic directions of the 2030 Water Agenda, as well as general initiatives that were identified in the consultation process on the issues of planning, funding, information and change management.

Directions and strategies of the 2030 Water Agenda

Clean water bodies
- All municipal wastewater treated
- Trash-free rivers and lakes
- Non-point sources of pollution under control
- All industrial wastewater treated

Balanced supply and demand for water
- All irrigation surfaces with appropriate technology
- Self-managed basins
- Reuse of all treated wastewater
- Aquifers in equilibrium

Universal access to water services
- Suburbs connected to water supply and sanitation networks
- Rural communities with improved water supply
- Efficient water utilities

Settlements safe from catastrophic floods
- Sustainable land-use management
- Flood zones free from human settlements
- Warning and prevention systems with state-of-the-art technology

We recommend consulting the website of the 2030 Water Agenda's Virtual Forum (http://agendadelagua2030.conagua.gob.mx) to find out its conclusions.

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 from the 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, by 2030 approximately 81% of the total population will be based in urban localities, as can be observed in graph G7.1.

It is estimated that 70% of the population growth for 2030 will occur in the Hydrological-Administrative Regions (HARs) VIII Lerma-Santiago-Pacific, XIII Waters of the Valley of Mexico, VI Rio Bravo and I Baja California Peninsula. On the other hand, the HARs 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 HARs in which the highest population growth is expected are at the same time those where there is already a high degree of water stress (see 3.8, Water Stress), which can be appreciated in G7.2. By contrast, in some HARs under a lower degree of water stress (V Southern Pacific, IX Northern Gulf and X Central Gulf), a lower population growth is expected.

In 2030, it is expected that 67% of the population of Mexico will be living in 39 population centers with more than 500,000 inhabitants (see map M7.1).

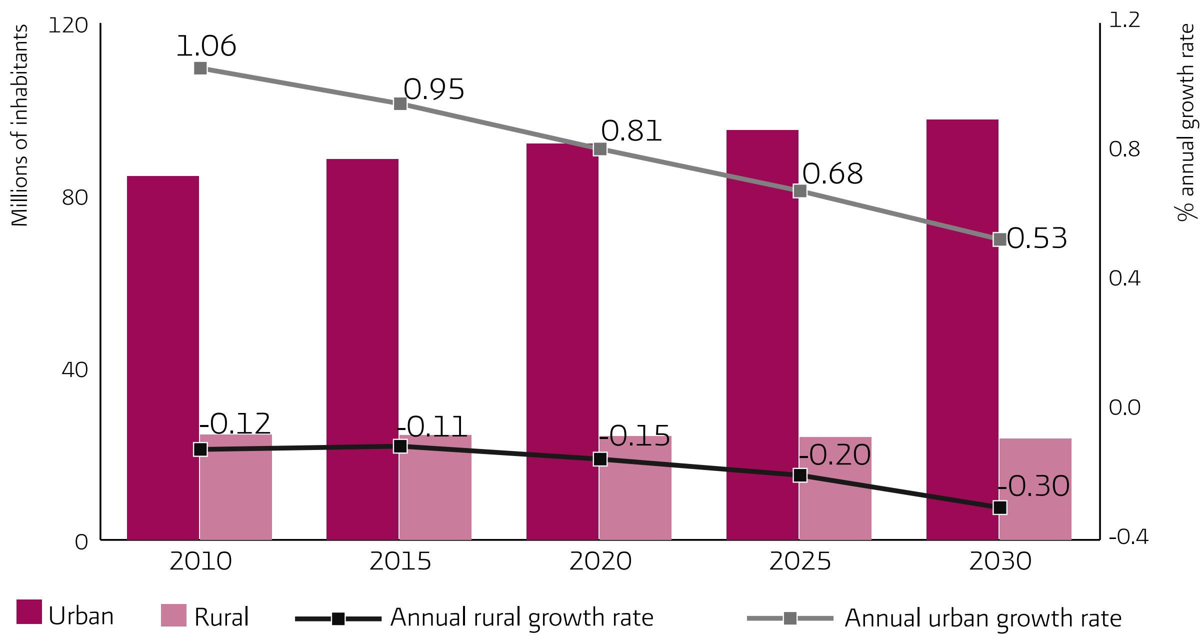
The increasing population will bring about a reduction in the per capita renewable water resources nationwide. The foreseen decrease is shown in G7.3, from 4,230 m^3/inhabitant/year in 2010 to 3,800 in 2030.

By 2030, in some of the country's HARs, 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 T7.2 and diagram D7.1, by 2030 the HARs I Baja California Peninsula, VI Rio Bravo and XIII Waters of the Valley of Mexico will present extremely low per capita levels of renewable water resources.

The evolution foreseen in per capita renewable water resources in some HARs that nowadays present local levels establishes the vital need for efficient management of water resources, with the commitment of all

G7.1 Projection in rural and urban population growth in Mexico, 2010-2030



Note: Population data interpolated on December 31 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. 2010. Produced based on:
CONAPO. *Population Projections in Mexico 2005-2050*. Mexico, 2007.

T7.1 Population in 2010 and 2030, by HAR (thousands of inhabitants)

HAR		Population		Expected population growth
		2010	2030	
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	Yucatan 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**

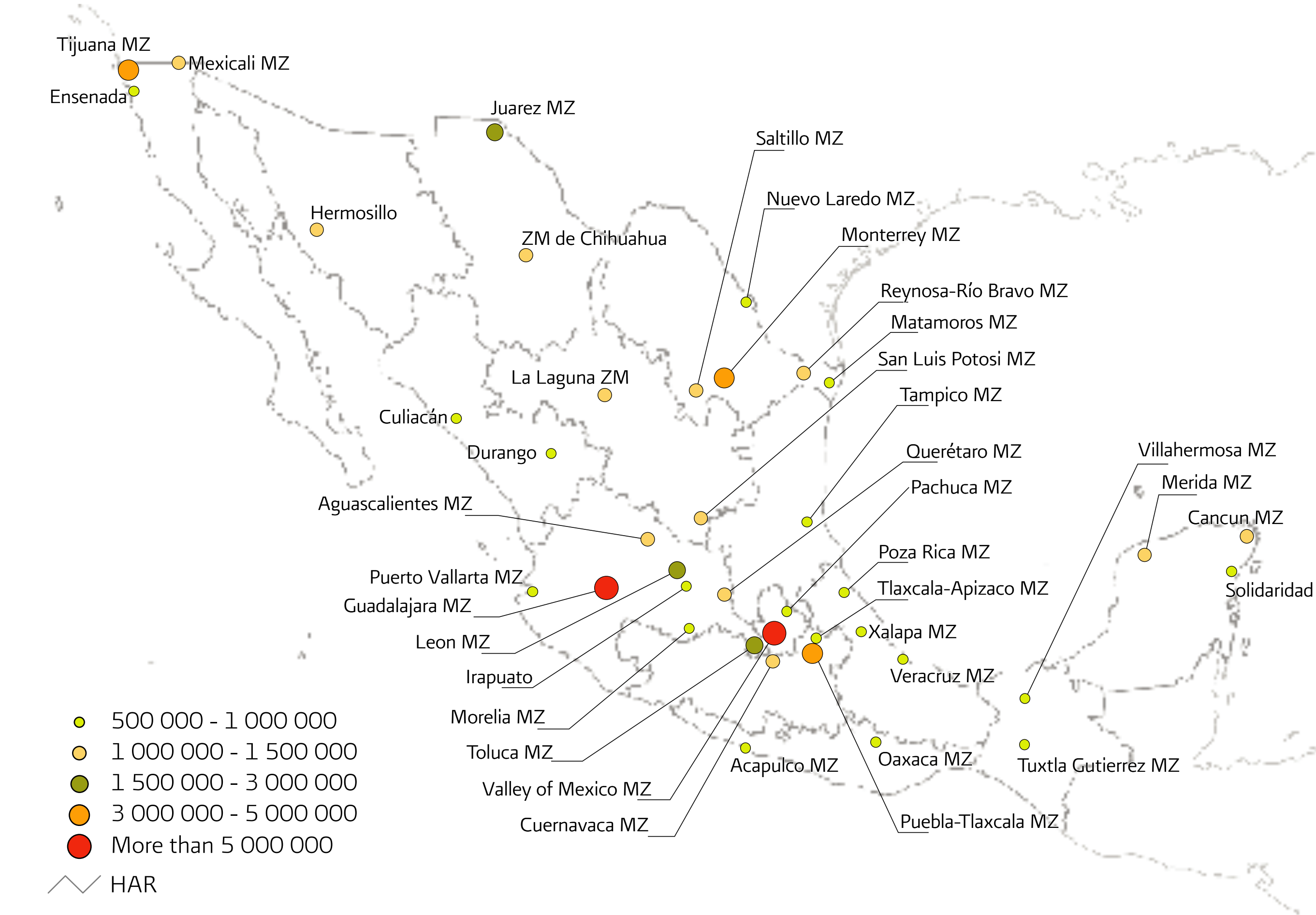
Note: Population data interpolated on December 31 each year.
The values may not add up to the total due to the rounding of the figures.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAPO. *Population Projections in Mexico 2005-2050. Mexico*, 2007.

T7.2 Per capita renewable water resources by HAR, 2010 and 2030

HAR		Renewable water resources media (millions of m^3/year)	Per capita renewable water resources in 2010 (m^3/inhabitant/year)	Per capita renewable water resources by 2030 (m^3/inhabitant/year)
I	Baja California Peninsula	4 667	1 202	789
II	Northwest	8 499	3 225	2 920
III	Northern Pacific	25 630	6 475	6 754
IV	Balsas	21 680	2 033	1 948
V	Southern Pacific	32 824	7 945	8 162
VI	Rio Bravo	12 163	1 094	918
VII	Central Basins of the North	7 898	1 873	1 729
VIII	Lerma-Santiago-Pacific	34 533	1 633	1 469
IX	Northern Gulf	25 564	5 132	5 013
X	Central Gulf	95 866	9 907	9 659
XI	Southern Border	157 754	23 637	21 041
XII	Yucatan Peninsula	29 645	7 151	5 105
XIII	Waters of the Valley of Mexico	3 513	163	148
Total		**460 237**	**4 230**	**3 800**

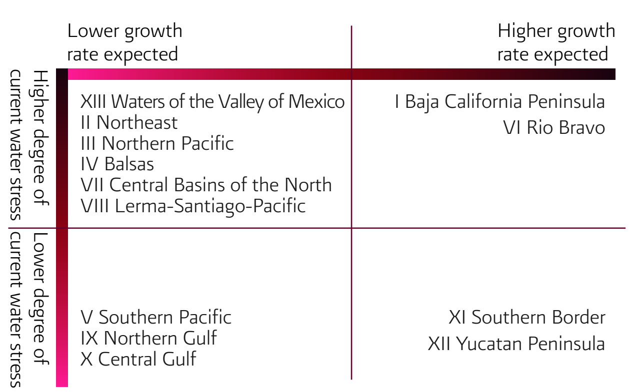
Note: The calculation of per capita renewable water resources is based on population data interpolated on December 31 each year.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on data from:
CONAPO. *Population Projections in Mexico 2005-2050*. Mexico, 2007.
CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

M7.1 Population centers of more than 500,000 inhabitants, 2030



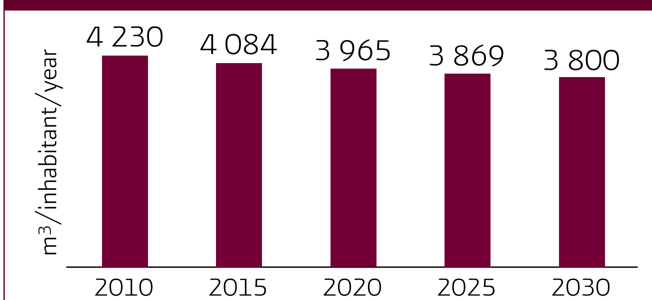
Note: Includes metropolitan zones and isolated municipalities (see 1.2 Population Centers).
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
CONAPO. *Population Projections in Mexico 2005-2050*. Mexico, 2007.
SEDESOL, INEGI and CONAPO. *Limits of the metropolitan zones in Mexico*. Mexico, 2004.
INEGI. II Census on Population and Housing 2005. Mexico, 2007.

G7.2 Current degree of water stress and growth rate, 2010-2030



See note [a] in Annex D. The complete graphic is available on the DVD.

G7.3 Projections of per capita renewable water resources in Mexico



See note [b] in Annex D. The complete graphic is available on the DVD

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- TM(Proyeccion_final_año), and
- TM(Proyeccion_mitad_año).

D7.1 Per capita renewable water resources, 2030

See note [c] in Annex D. The complete graphic is available on the DVD.

On the DVD, you will find the data related to this theme in the spreadsheet (in Spanish only):
- TM(Metas_PNH).

Special attention should be paid to groundwater, the overexploitation of which leads to the reduction of phreatic levels and the consequent subsidence of ground levels, as well as causing wells to have to be dug ever deeper to withdraw water. It is worth mentioning that the majority of the rural population, especially in arid areas, depends almost exclusively on groundwater.

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 rural coverage of drinking water and improved sanitation.

7.3 National Water Planning 2007-2012

The 2007-2012 National Development Plan (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.

In the scheme of the National Democratic Planning System, the 2007-2012 National Water Resources Program (PNH) incorporates 8 objectives (see G7.4), 65 strategies and 115 targets and their corresponding indicators (see T7.A on the DVD); as well as the organizations and institutions that are most relevant for the achievement of each objective, and the challenges to be overcome to reach the planned targets.

On the DVD, you will find the 2007-2012 National Water Resources Program.

G7.4 Objectives of the 2007-2012 National Water Resources Program

National Development Plan 2007-2012
↓
National Environment and Natural Resources Program 2007-2012
↓
National Water Resources Program 2007-2012
↓
Regional water programs

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 hydro-meteorological 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.

Source: CONAGUA. Deputy Director General's Office for Planning. 2010.

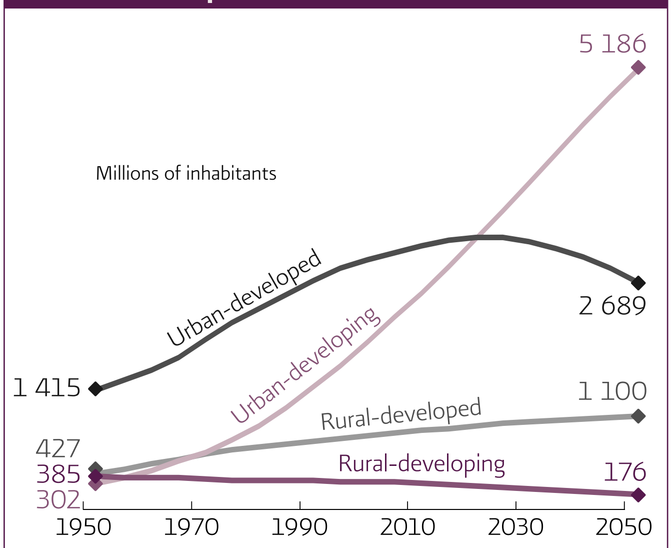
Water in the world

8

8.1 Socio-economic and demographic aspects

In 1950, the world population was 2.53 billion, whereas for 2010, that number had risen to 6.91 billion. Since the 1960s, the growth has mainly been concentrated in developing regions, a trend that will continue for 2050, as can be observed in graph G8.1 and T8.A on the DVD. It is estimated that by 2050, the world population will be 9.15 billion[1].

G8.1 World population, according to region and level of development



See note [a] in Annex D. The complete graph is available on the DVD.

The growing concentration of the population in urban areas should be highlighted, as shown in G8.1. Conversely, the rural population, both in developed and developing countries, shows a decreasing trend.

The population growth in urban areas will mainly occur in developing countries

In table T8.1, the countries with the world's highest population are shown, among which Mexico is in eleventh place of a total of 222 countries. 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.

T8.1 Countries with the highest population, 2010

No	Country	Population (millions of inhabitants)	Population density (inhabitants/km^2)
1	China	1 354.1	141
2	India	1 214.5	369
3	United States of America	317.6	33
4	Indonesia	232.5	122
5	Brazil	195.4	23
6	Pakistan	184.8	232
7	Bangladesh	164.4	1 142
8	Nigeria	158.3	171
9	Russia	140.4	8
10	Japan	127.0	336
11	**Mexico**	**108.0**	**55**
12	Philippines	93.6	312
13	Vietnam	89.0	268
14	Ethiopia	85.0	77
15	Egypt	84.5	84
16	Germany	82.1	230
17	Turkey	75.7	97
18	Iran	75.1	46
19	Thailand	68.1	133
20	Democratic Republic of Congo	67.8	29
21	France	62.6	114
22	United Kingdom	61.9	255
23	Italy	60.1	199
24	South Africa	50.5	41

Source: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat *World Population Prospects: The 2008 Revision*. Consulted on: http://esa.un.org/unpp (15/07/2010).
For Mexico: CONAGUA. Deputy Director General's Office for Planning. 2010.

In T8.2 information is presented on countries with the largest per capita Gross Domestic Product (GDP).

1 UNDESA. *World Population Prospects: The 2008 Revision. Medium fertility variant, 2010-2050*. Consulted on: http://esa.un.org/unpd/wpp2008/index.htm (15/07/2010).

T8.2 Countries with the largest total and per capita GDP					
Total GDP			Per capita GDP		
No	Country	GDP (billions of USD)	No	Country	Per capita *GDP (USD)*
1	United States of America	14 799.56	1	Luxembourg	107 599.25
2	China	5 364.87	2	Norway	88 590.17
3	Japan	5 272.94	3	Qatar	81 962.96
4	Germany	3 332.80	4	Switzerland	69 838.79
5	France	2 668.79	5	Denmark	56 790.20
6	United Kingdom	2 222.63	6	Australia	53 862.04
7	Italy	2 121.12	7	United Arab Emirates	49 995.31
8	Brazil	1 910.50	8	Ireland	48 578.48
9	Canada	1 556.04	9	Netherlands	48 223.68
10	Russia	1 507.59	10	Sweden	47 934.95
11	Spain	1 424.69	11	United States of America	47 701.81
12	India	1 367.22	12	Austria	47 086.84
13	Australia	1 192.96	13	Canada	45 657.52
14	South Korea	991.15	14	Finland	44 650.75
15	**Mexico**	**874.90**	15	Belgium	43 354.39
16	Netherlands	797.45	16	France	42 414.48
17	Turkey	710.74	17	Japan	41 365.76
18	Indonesia	670.42	18	Germany	40 678.66
19	Switzerland	512.07	19	Singapore	40 336.29
20	Poland	479.03	20	Iceland	38 834.59
21	Belgium	471.77	59	Turkey	9 950.39
22	Sweden	443.72	60	Brazil	9 886.00
23	Saudi Arabia	438.01	**62**	**Mexico**	**8 102.94**
29	South Africa	329.54	73	South Africa	6 609.01

Note: Current prices. The values vary as compared to T1.3 due to the conversion of monetary units. The years reported for each country vary between 2008 and 2009.
Source: *International Monetary Fund, World Economic Outlook Database, April 2010.*
Consulted on: http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/weoselgr.aspx, (10/09/2010).

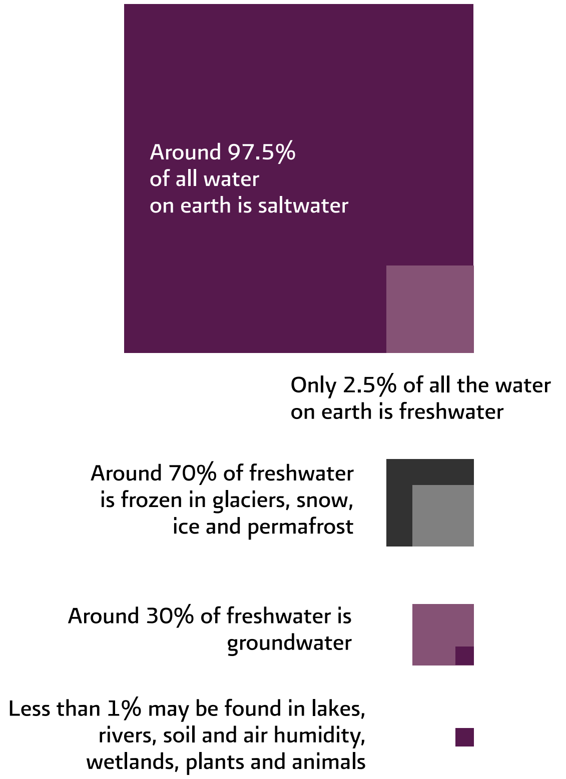
It is worth mentioning that Mexico is ranked 62nd worldwide out of the 181 countries evaluated. In terms of the total GDP, Mexico is ranked 15th worldwide.

8.2 Components of the water cycle in the world

The mean 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, snow and ice (see 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 expensive to effectively use.

G8.2 Global distribution of water in the world



Source: Clarke, R. and J. King. *The Water Atlas. 2004.*

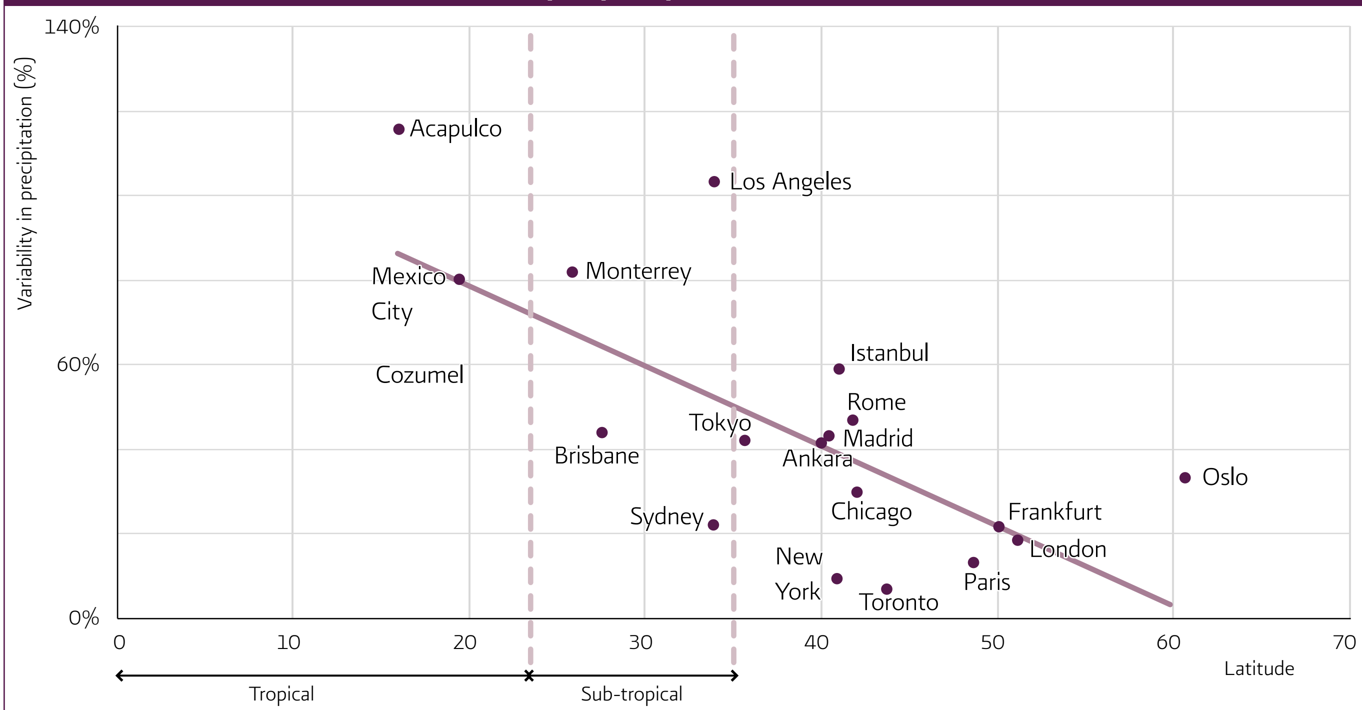
Precipitation

Precipitation constitutes an important part of the hydrologic cycle, since it produces the planet's renewable water resources. However, precipitation varies from region to region and seasonally.

G8.3 allows the existing correlation between mean precipitation patterns, measured by their coefficient of variation, and the latitude in various cities in the world, to 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.

- On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
- TM(Datos_mundiales).

G8.3 Correlation between the variability in precipitation and latitude



Note: The normal periods contemplated 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. 2010. Produced based on: World Climate. Consulted on: http://www.worldclimate.com. (06/09/2010). CONAGUA. Deputy Director General's Office for Technical Affairs. 2010.

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 86th place worldwide out of 177 countries on which data is available, as shown in T8.3.

The renewable water resources present significant variations in time and space

T8.3 Countries with the highest per capita renewable water resources, 2010

No	Country	Population (thousands of inhabitants)	Renewable water resources (billions of m³)	Per capita renewable water resources (m³/inhabitant/year)
1	French Guiana	220	134	609 091
2	Iceland	315	170	539 683
3	Guyana	763	241	315 858
4	Surinam	515	122	236 893
5	Congo	3 615	832	230 152
6	Papua New Guinea	6 577	801	121 788
7	Bhutan	687	78	113 537
8	Gabon	1 448	164	113 260
9	Salomon Islands	511	45	87 476
10	Canada	33 259	2 902	87 255
11	Norway	4 767	382	80 134
12	New Zealand	4 230	327	77 305
13	Peru	28 837	1 913	66 338
14	Bolivia	9 694	623	64 215
15	Belize	301	19	61 628
16	Liberia	3 793	232	61 165
17	Chile	16 804	922	54 868
18	Paraguay	6 238	336	53 863
19	Laos	6 205	334	53 747
20	Colombia	45 012	2 132	47 365
23	Brazil	191 972	8 233	42 886
60	United States of America	311 666	3 069	9 847
86	**Mexico**	**108 555**	**460**	**4 263**
96	France	62 036	204	3 284
104	Turkey	73 914	232	2 890
145	South Africa	49 668	50	1 007

Note: 1 km³ = 1,000 hm³ = 1 billion m³. Source: FAO. *Information System on Water and Agriculture, Aquastat.* 2008. Consulted on: http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=es (6/10/2010).

Climate change

Different estimations agree with a foreseen increase, towards the end of the 21st century, in the world's temperature, anywhere between two and four degrees centigrade. Among the scenarios generated by the Intergovernmental Panel on Climate Change (IPCC), it is expected that this increase in temperature will have a significant impact on the hydrological cycle, generating a greater variability in traditional precipitation patterns, soil humidity and runoff[2].

This situation will complicate the activities of other economic sectors that depend upon the availability of water resources, such as food production, power generation and environmental conservation, as well as drinking water and sanitation supply. To face this issue, it is essential to develop adaptation strategies that fully consider water resources as part of a multi-sectorial focus.

R8.1 COP16 and the D4WCC

The COP16/CMP6 was the 16th edition of the Conference of the Parties to the United Nations Framework Convention on Climate Change, as well as the 6th Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol. It was held in Cancun, Quintana Roo, Mexico, from November 29 to December 10, 2010.

"Parties" are understood as those national states that have signed and ratified both of these international treaties, committing to observe and comply with their terms regarding international cooperation against climate change. The Framework Convention has been signed by 194 State Parties and the Kyoto Protocol has been ratified by 184. Within the framework of COP16, the Dialogs for Water and Climate Change (D4WCC) were held, a series of side events organized by the CONAGUA with the support of a group of national and international partners. The D4WCC provided a platform which allowed different positions on the issue of water-based adaptation to be shared, as well as raising awareness about the importance of considering water-based adaptation. As a result of this effort, the construction of a World Water and Climate Agenda has begun.

Source: COP16 CMP6 Mexico 2010. Consulted on: http://cc2010.mx/index.html (30/12/2010)
Dialogs for Water and Climate Change (D4WCC). Consulted on: http://www.d4wcc.org.mx/ (30/12/2010)
MFA. Decisions adopted by COP16 and CMP6. Consulted on: http://www.sre.gob.mx/csocial/acuerdoscop16/acuerdoscop16.html (30/12/2010)

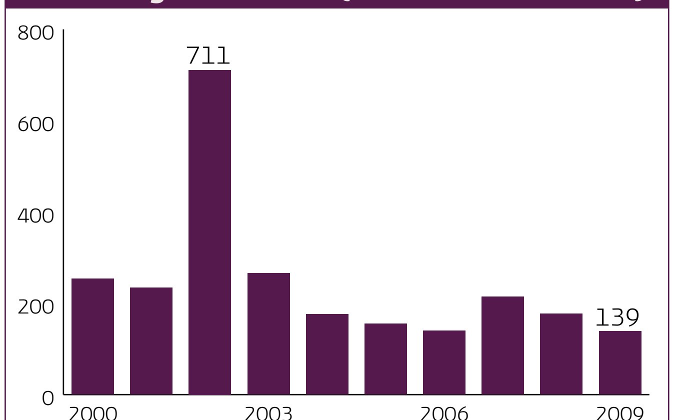
Extreme hydro-meteorological phenomena

Extreme hydro-meteorological phenomena, such as droughts, floods and hurricanes, are natural events that frequently result in disasters with human and material losses. In the analysis of disasters, it may be inferred that the damages estimated as a percen tage of GDP are significantly higher in developing countries, which may be further accentuated if the global trend towards the concentration of population in urban localities continues.

Droughts, food insecurity, extreme temperatures, floods, forest fires, insect infestations, water-related landslides and windstorms are all considered disasters of climate and hydro-meteorological origin[3]. This type of disasters represents a significant proportion of the estimated damage caused by disasters, which in 2009 represented 35.41 billion dollars, (see G8.A on the DVD), 85% of the total damage caused by all types of disasters.

The number of people affected by climate and hydro-meteorological disasters in the period between 1999 and 2009 is shown in G8.4, which reveals the annual

G8.4 People affected by climate and hydro-meteorological disasters (millions of inhabitants)



See note b in Annex D. The complete graph is available on the DVD.

2 IPCC. *Climate Change and Water, IPCC Technical Paper VI*, Geneva, Switzerland, 2008.

3 Source: International Federation of the Red Cross and Red Crescent Societies (IFRC). *World Disasters Report 2010.* Consulted on: http://www.ifrc.org/Docs/pubs/disasters/wdr2010/WDR2010-full.pdf (21/10/2010).

variability in the occurrence of large disasters due to hydro-meteorological 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.

8.3 Uses of water and infrastructure

In the 20th century, the world population tripled, whereas water withdrawals multiplied six-fold. This situation contributed to the increase in the degree of water stress around the world.

In T8.4, the countries with the highest water withdrawals are shown, in which it can be observed that Mexico is ranked in eighth place.

The main use of water resources worldwide, according to estimations from the FAO, is agriculture, with 72% of the total withdrawal.

On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
- TM(Datos_mundiales).

T8.4 Countries with the highest water withdrawal and the percentage of use for agriculture, industry and public supply

No	Country	Total water withdrawal (km^3/year)	% Use for agriculture	% Use for industry	% Use for public supply
1	India	761.0	90.4	2.23	7.4
2	China	554.1	64.6	23.21	12.2
3	United States of America	478.4	40.2	46.11	13.7
4	Pakistan	183.5	94.0	0.76	5.3
5	Iran	93.3	92.2	1.18	6.6
6	Japan	88.4	62.5	17.87	19.7
7	Indonesia	82.8	91.3	0.68	8.0
8	**Mexico**	**80.6**	**76.7**	**9.20**	**14.1**
9	Philippines	78.9	83.1	9.45	7.4
10	Vietnam	71.4	68.1	24.14	7.8
11	Egypt	68.3	86.4	5.86	7.8
12	Russia	66.2	19.9	59.82	20.2
13	Iraq	66.0	78.8	14.70	6.5
14	Brazil	59.3	61.8	17.96	20.3
15	Uzbekistan	58.3	93.2	2.06	4.7
16	Thailand	57.3	90.4	4.85	4.8
17	Canada	46.0	11.8	68.68	19.6
18	Italy	44.4	45.1	36.71	18.2
19	Turkey	40.1	73.8	10.72	15.5
20	France	40.0	9.8	74.47	15.7
21	Germany	38.9	2.9	82.12	14.9
22	Ukraine	37.5	52.5	35.39	12.2
23	Sudan	37.3	96.7	0.70	2.7
42	South Africa	12.5	62.7	6.05	31.2

Note: The uses consider agriculture, industry including cooling in energy stations and public supply.
The years reported for each country vary between 2000 and 2009. The values for Mexico are updated to 2009.
1 km^3 = 1,000 hm^3 = 1 billion m^3.
Source: FAO. *Information System on Water and Agriculture, Aquastat.* 2008.
Consulted on: http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=es (6/10/2010).

Industrial use

Industry is one of the main motors of growth and economic development. Around 20% of water is employed in industry, this quantity being the equivalent of a consumption of 130 m^3 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 under this heading are oil stations, the metal, paper and wood industries, food processing and the manufacturing industry.

Use for agriculture

Irrigation is fundamental to meet the world's food requirements. Only 19% (FAO, Aquastat, 2010) of the area on which crops are grown has irrigation infrastructure, but that area produces more than a third of the world's food (FAO, Water and Food Security, 2010). Additionally, it should be mentioned that in recent years, agriculture has used greater quantities of agrochemical products, resulting in pollution of soil and aquifers.

Mexico is in 6th place worldwide in terms of the surface area with irrigation infrastructure, the first places being occupied by China, India and the United States of America, as shown in T8.5.

Hydropower generation

Energy performs a key function in poverty reduction, the promotion of economic activities and the improvement

T8.5 Countries with the largest area with irrigation infrastructure

No	Country	Area with totally dominant irrigation infrastructure (thousands of ha)	Area cultivated (thousands of ha)	Irrigation infrastructure compared to the area cultivated
1	India	66 334	169 320	39.2
2	China	62 559	122 543	51.1
3	United States of America	24 722	173 200	14.3
4	Pakistan	19 270	21 200	90.9
5	Iran (Islamic Republic of)	8 132	18 770	43.3
6	Indonesia	6 722	37 100	18.1
7	Thailand	6 415	18 850	34.0
8	**Mexico**	**6 460**	**26 900**	**24.0**
9	Bangladesh	5 050	8 700	58.0
10	Turkey	4 970	24 505	20.3
11	Vietnam	4 585	9 415	48.7
12	Russian Federation	4 454	123 442	3.6
13	Uzbekistan	4 223	4 620	91.4
14	Italy	3 950	9 768	40.4
15	Spain	3 671	17 300	21.2
16	Iraq	3 525	5 450	64.7
17	Egypt	3 422	3 542	96.6
18	Afghanistan	3 199	7 910	40.4
19	Japan	3 128	4 628	67.6
20	Brazil	2 878	68 500	4.2
21	France	2 670	19 331	13.8
22	Kazakhstan	2 314	22 800	10.1
23	Chile	1 900	1 722	110.3
31	South Africa	1 498	15 450	9.7

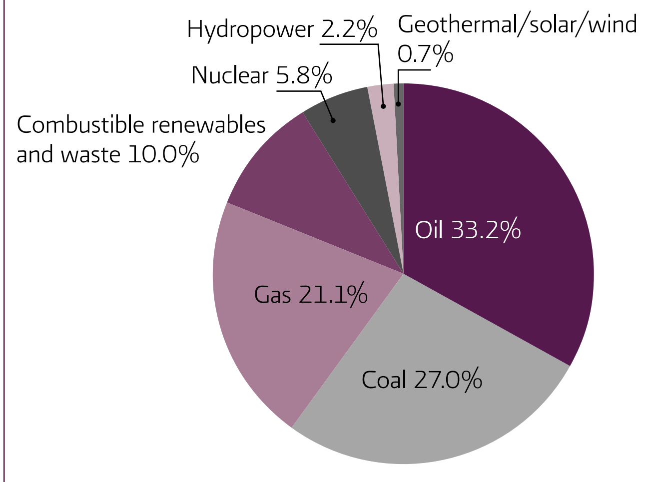
Note: The years reported vary in each country from 1993 to 2008. Source: FAO. *Information System on Water and Agriculture, Aquastat.* 2010. Consulted on: http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=es, (24/09/2010). For Mexico: CONAGUA. Deputy Director General's Office for Hydro-Agricultural Infrastructure. 2010.

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 2008, going from 6.115 to 12.267 billion metric tons of oil equivalent. Water is mainly used in energy generation processes in two ways: in cooling thermoelectric plants and turning the turbines in hydropower plants. In 2008, of the total primary energy supply, 2.2% was generated by hydropower, as can be observed in G8.5.

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.

G8.5 Sources of energy supply (2008)

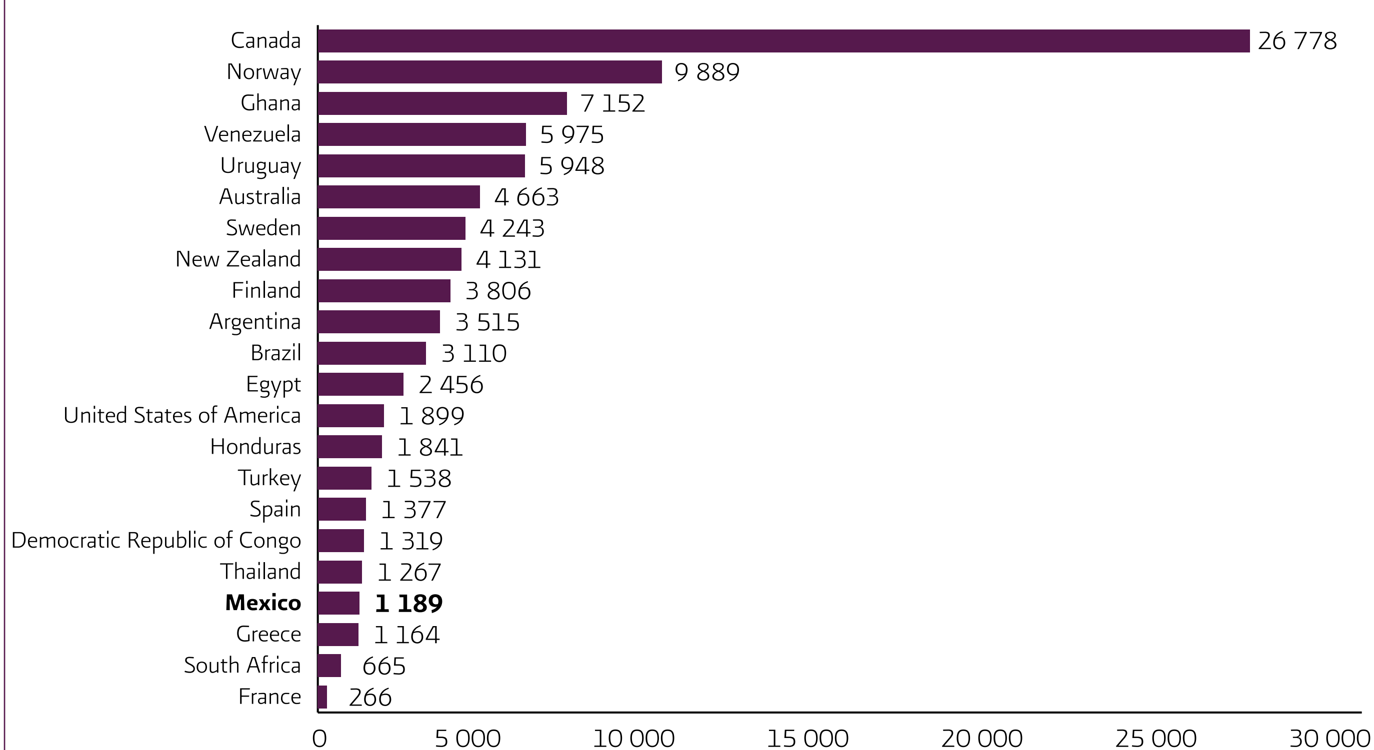


See note [c] in Annex D. The complete graph is available on the DVD.

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 per capita storage capacity in the world, as shown in G8.6.

G8.6 Per capita storage capacity in selected countries (m^3/inhabitant)



Source: CONAGUA. Deputy Director General's Office for Planning. Produced based on data from:
ICOLD. *World Register of Dams.* France, 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 that 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, one of the countries with a larger water footprint, 2,483 m^3 is required, and in China, the figure is 702 m^3 (see T8.B on the DVD), one of the lowest water footprints.

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 entails 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. The values are different in each country, depending on the climate conditions and the efficiency in the use of water, as shown in T8.C on the DVD."

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.

Degree of water stress

The degree of water stress is calculated by dividing the withdrawal by the renewable water resources. Due to their low availability, the Middle East countries suffer from high water stress, as can be observed in M8.1 and T8.C and in T8.D on the DVD, whereas Mexico is in 58th place according to this indicator.

> On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
> • TM(Datos_mundiales).

Drinking water, 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, "Ensuring environmental sustainability", contains target 7.C, related to drinking water and sanitation, which establishes the target of reducing by half the proportion of people without sustainable access to safe drinking water[4] and improved sanitation services[5], between the reference year (1990) and 2015[6].

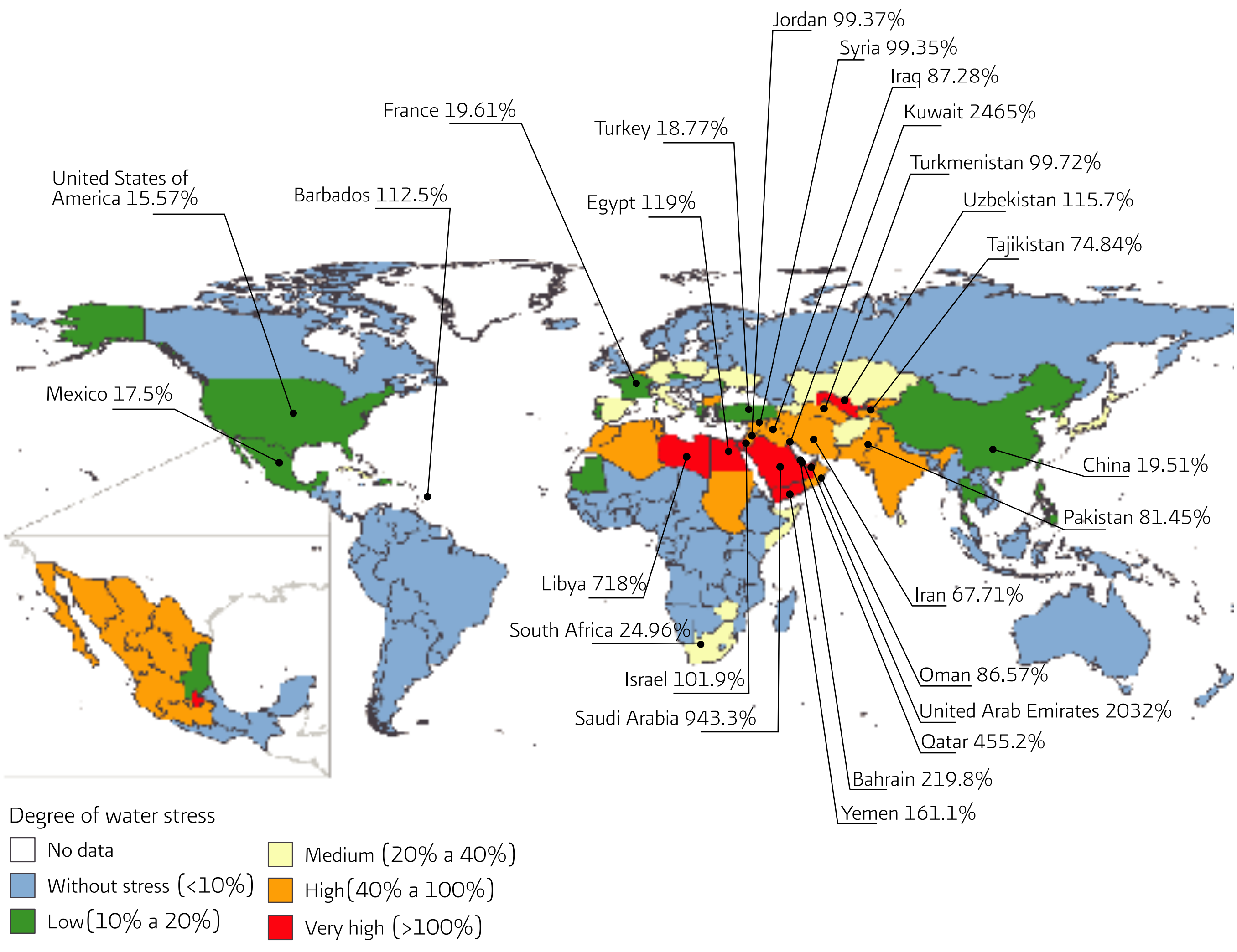
By 2008, even though 87% of the world population and 84% of the population in developing countries had access to improved drinking water supply sources, around 884 million people remained without access to this service. On the other hand, whereas 61% of the world population

4 Those that are protected against outside pollution, especially fecal matter.

5 Those that hygienically ensure that there is no contact between people and fecal matter.

6 The follow-up of the MDGs is through the joint UN led by UNICEF-WHO, known as the Joint Monitoring Programme on water supply and sanitation. The last report is from 2010, with data from 2008

M8.1 Degree of water stress, 2009



Note: The values shown correspond to countries with the highest degree of water stress, as well as the reference countries presented in this chapter.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
FAO. *Information System on Water and Agriculture, Aquastat.* Consulted on: http://www.fao.org/nr/water/aquastat/data/query/index.html?lang=es (4/11/2010).

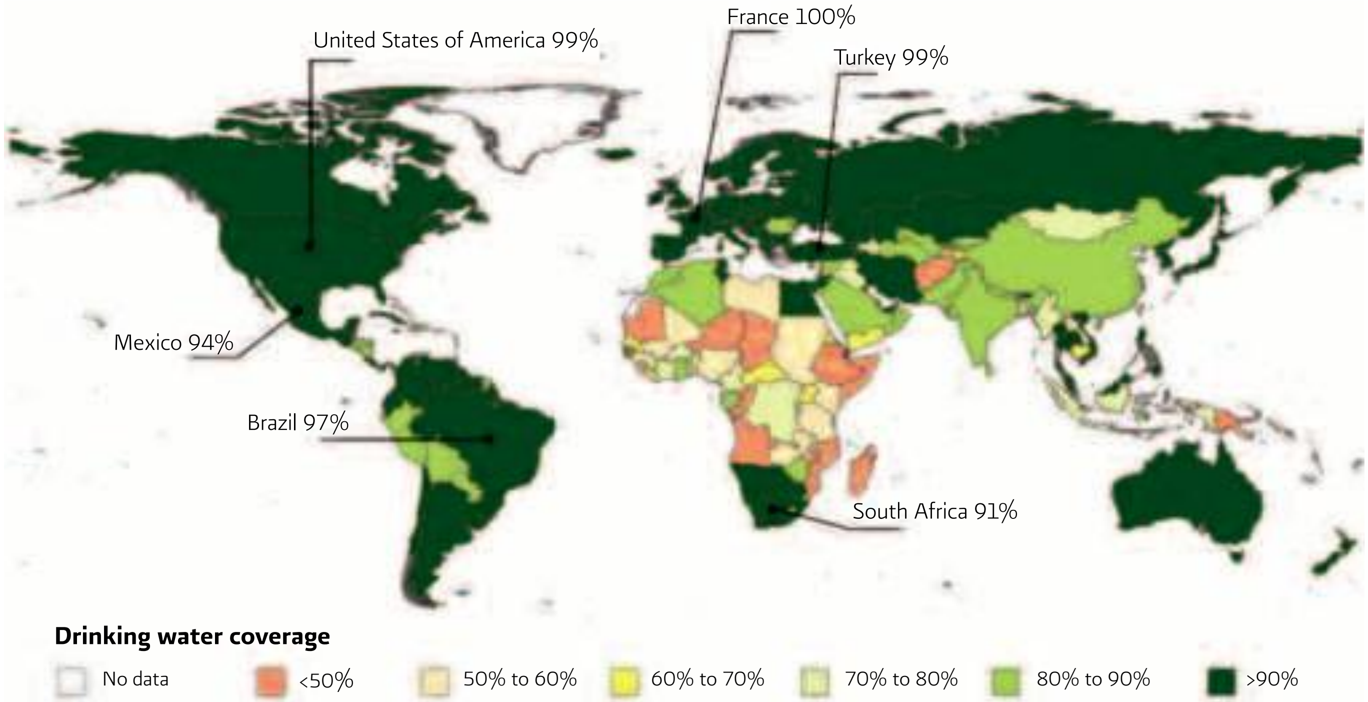
and 52% of the population of developing countries had access to improved sanitation services, approximately 2.6 billion people did not benefit from this access.

The disparity between both services should be noted, meaning that while it is considered that the drinking water target is on course to be met, the sanitation target is believed to be at risk of not being met. Regional variations are significant. In the case of sanitation, 72% of the population without access to improved sanitation services lives in Asia, whereas for improved drinking water supply sources, 37% of the population without access lives in Sub-Saharan Africa.

MDG target 7.C should be considered from two perspectives. The first is the close link between water and health, meaning that extending 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.

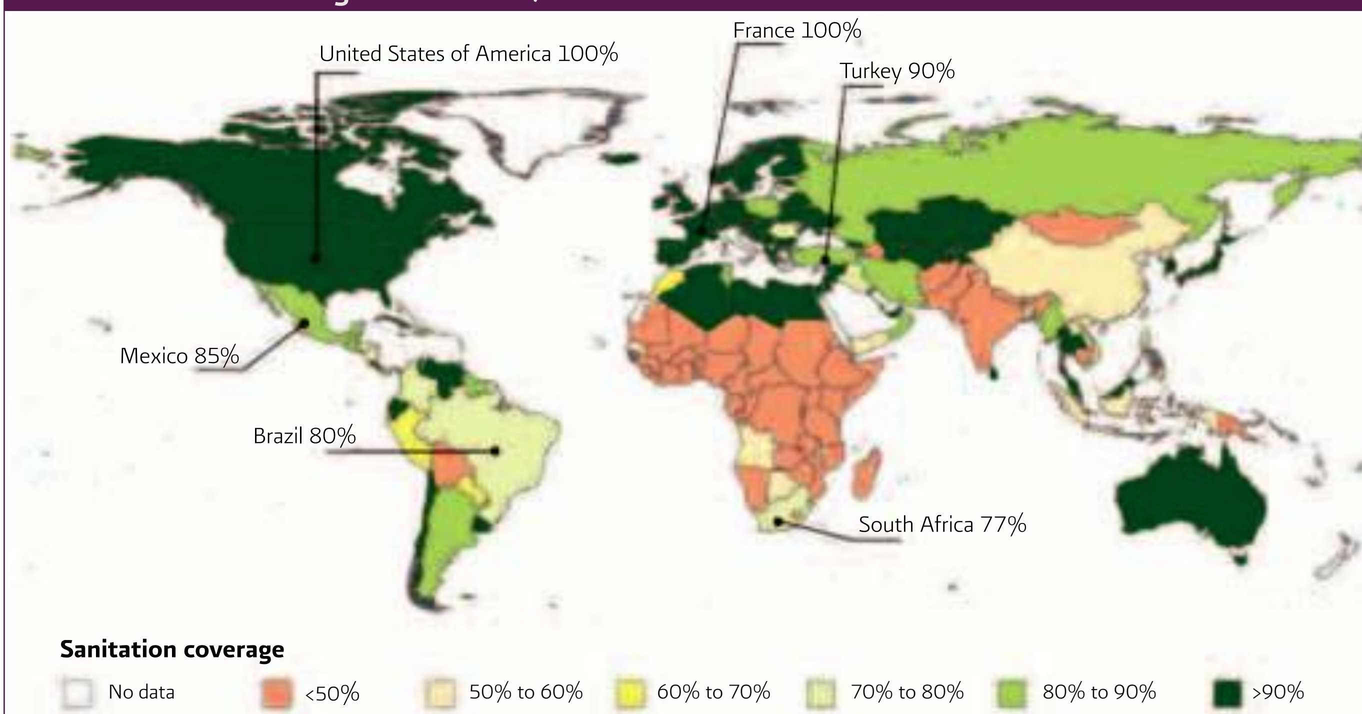
According to the definitions of the MDGs, in 2008 Mexico had a drinking water coverage of 94% (96% urban and 87% rural), as well as 85% in improved sanitation (90% urban and 68% rural). The situation worldwide can be appreciated in M8.2 and M8.3, and in T8.E and T8.F on the DVD.

M8.2 Drinking water coverage in the world, 2008



Note: The definition of improved drinking water supply sources is employed, corresponding to MDG target 7.C.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
United Nations. UNICEF-WHO *Joint Monitoring Programme on water supply and sanitation. Progress on drinking water and sanitation.* UNICEF, New York and WHO, Geneva, 2010 (Data from 2008).

M8.3 Sanitation coverage in the world, 2008



Note: The definition of improved sanitation services is employed, corresponding to MDG target 7.C.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
United Nations. UNICEF-WHO *Joint Monitoring Programme on water supply and sanitation. Progress on drinking water and sanitation.* UNICEF, New York and WHO, Geneva, 2010 (Data from 2008).

R8.2 Evolution in MDG target 7.C in Mexico

Year	Drinking water			Sanitation		
	Urban	Rural	Total	Urban	Rural	Total
1990	94	64	85	80	30	66
2008	96	87	94	90	68	85

Mexico presents a significant evolution in terms of sanitation in the period from 1990 to 2008.

In global terms in that period, 37.23 million Mexicans were connected to improved sanitation services, as well as 31.15 million who benefited from improved drinking water supply sources.

Source: UNICEF-WHO. *Joint Monitoring Programme on water supply and sanitation. Progress on sanitation and drinking water. 2010 Update.* 2010

On the DVD, you will find the data related to this theme in the corresponding spreadsheets (in Spanish only):
- **TM(Agua_y_sanitation).**

Drinking water and sanitation tariffs

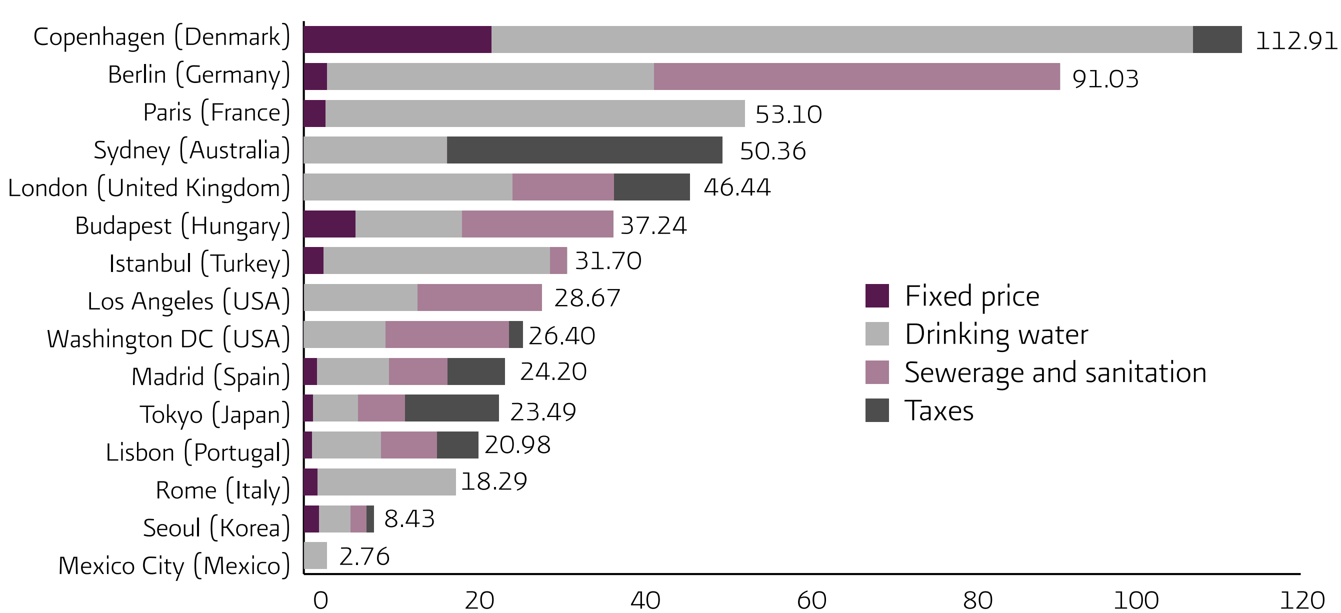
It may be considered that drinking water, sewerage and sanitation services are funded through Tariffs, Transfers and Taxes (known collectively as the 3Ts). There is no uniformly applied definition on the costs derived from service provision, entailing that the relationship between tariffs and costs is also variable. In some regions, the aim is for the tariffs to recover the total cost of the service. In others, the tariffs recover variable percentages of the cost.

In G8.7 the drinking water and sanitation tariffs, as well as the taxes associated with this service, are indicated for selected world cities, for a domestic consumption of 15 m^3 per month.

Water and health

Estimations from the World Health Organization (WHO) indicate that every year in the world approximately 1.5

G8.7 Domestic drinking water and sanitation tariffs and taxes associated with the service in selected world cities (tariffs in pesos/m^3, for a consumption of 15 m^3/month)



Note: Values in pesos. The exchange rate used to calculate the table: 1 dollar = 13 pesos.
Source: CONAGUA. Deputy Director General's Office for Planning. 2010. Produced based on:
GWI. *Global Water Tariff Survey 2008.* Consulted on: www.globalwaterintel.com/survey2008.xls
For the case of Mexico: CONAGUA, Deputy Director General's Office for Drinking Water, Sewerage and Sanitation. 2010.

million children die from diarrheal diseases[7], of a total of 2.5 billion cases every year among children. These child deaths occur mainly in developing countries, which represents a significant burden on the scarce resources for public health. Additionally, this type of diseases has a negative impact on child nutrition.

Children are one of the most affected groups by polluted water, inadequate sanitation and poor hygiene habits

Among these diarrheal diseases are cholera, typhoid fever and dysentery; all of them associated with the "fecal-oral" means of transmission. The majority of the deaths resulting from these diseases could be avoided through better access to drinking water, sewerage and sanitation services, since it is estimated that 88% of the cases of diarrhea are caused by polluted water, inadequate sanitation and poor hygiene habits[8].

It is estimated that improving sewerage and sanitation could reduce by 2.2 million the number of children that die every year. That improvement would also reduce the cost in public health, lost productivity through diseases and premature deaths. It has been estimated that on average, investments in improving drinking water and sanitation would have investment returns in the range of 2 to 7% of GDP, depending on the national context[9].

7 UN-Water. *Global Annual Assessment of Sanitation and Drinking Water, 2010.* Consulted on: http://whqlibdoc.who.int/publications/2010/9789241599351_eng.pdf (15/12/2010).

8 UNEP-UN Habitat. *Sick Water? The central role of wastewater management in sustainable development.* 2010. Consulted on: http://www.unwater.org/downloads/sickwater_unep_unh.pdf (15/12/2010).

9 UN-Water. *Op. cit.*

Annexes

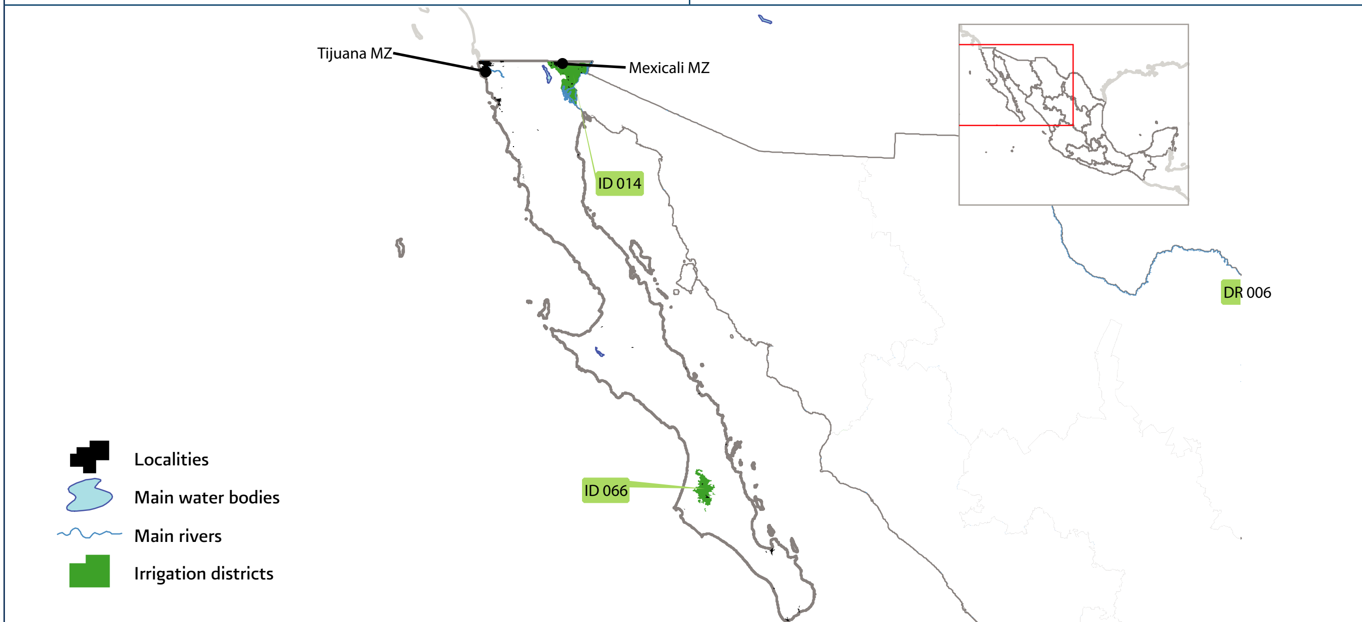
Hydrological-Administrative Region: I. Baja California Peninsula
River Basin Organization with its Headquarters in: Mexicali, Baja California

Contextual data

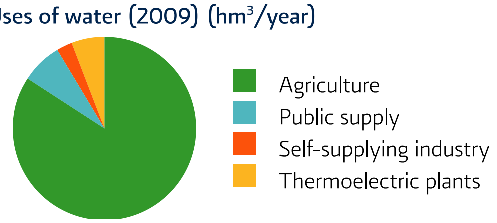
Number of municipalities	10	
Total population 2009	3 781 528	inhabitants
Urban	3 489 255	inhabitants
Rural	292 273	inhabitants
Total population 2030	5 915 393	inhabitants
Irrigation Districts	2	
Surface area	246 906	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	169	mm
Mean surface runoff	3 367	hm^3/year
Number of aquifers	87	
Mean aquifer recharge	1 300	hm^3/year
Per capita renewable water resources, 2009	1 234	m^3/inhabitant/year
Per capita renewable water resources, 2030	789	m^3/inhabitant/year
Degree of water stress, 2009	73.3%	(High)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	2 879	1 528	1 351
Public supply	247	103	145
Self-supplying industry	95	72	23
Thermoelectric plants	199	0	199
Total	3 420	1 702	1 718
Instream uses			
Hydropower plants (volume declared)	0		

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	92.9	89.0
Urban	95.0	92.2
Rural	69.7	55.3

Municipal treatment plants (as of December 2009)

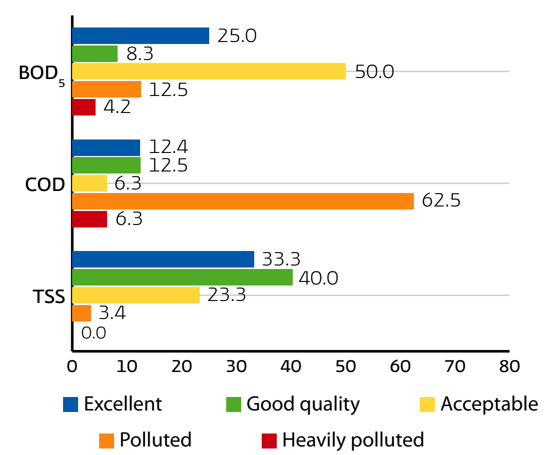
	Drinking water	Wastewater
Number in operation	41	54
Installed capacity (m^3/s)	12.22	8.68
Flow treated (m^3/s)	6.66	6.68

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	22
COD	22
TSS	54

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Tijuana and Nuevo rivers.

Note: The projection considers the population interpolated as of December 31 of the year in question.

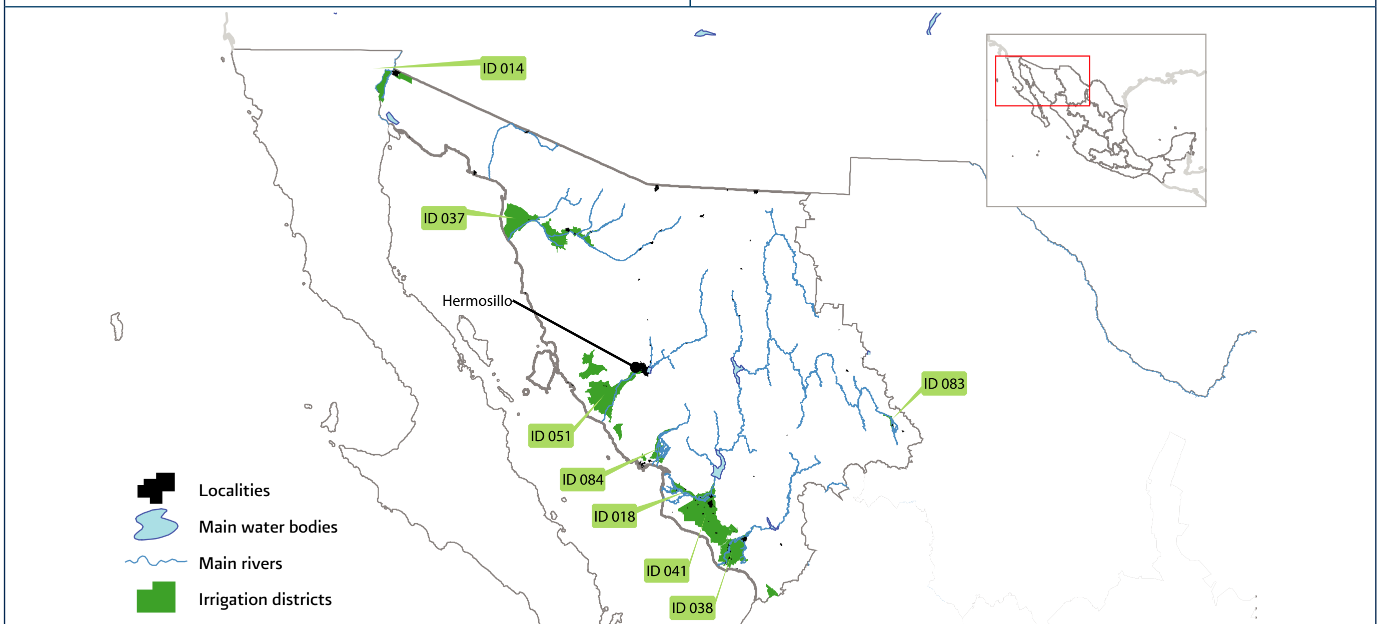
Hydrological-Administrative Region:II. Northwest
River Basin Organization with its Headquarters in: Hermosillo,Sonora

Contextual data

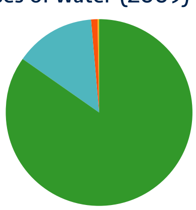
Number of municipalities	79	
Total population 2009	2 615 193	inhabitants
Urban	2 214 379	inhabitants
Rural	400 814	inhabitants
Total population 2030	2 910 425	inhabitants
Irrigation Districts	7	
Surface area	502 281	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	445	mm
Mean surface runoff	5 074	hm^3/year
Number of aquifers	63	
Mean aquifer recharge	3 426	hm^3/year
Per capita renewable water resources, 2009	3 250	m^3/inhabitant/year
Per capita renewable water resources, 2030	2 920	m^3/inhabitant/year
Degree of water stress, 2009	90.6%	(High)



Uses of water (2009) (hm^3/year)



Agriculture
Public supply
Self-supplying industry
Thermoelectric plants

Offstream uses	Total	Surface water	Groundwater
Agriculture	6 540	4 016	2 525
Public supply	1 064	608	456
Self-supplying industry	91	4	88
Thermoelectric plants	7	7	0
Total	7 703	4 634	3 068
Instream uses			
Hydropower plants (volume declared)		3 128	

Coberturas (2005) (%)

	Drinking water	Sanitation
Regional	94.8	84.1
Urban	96.6	92.0
Rural	85.4	43.7

Municipal treatment plants (as of December 2009)

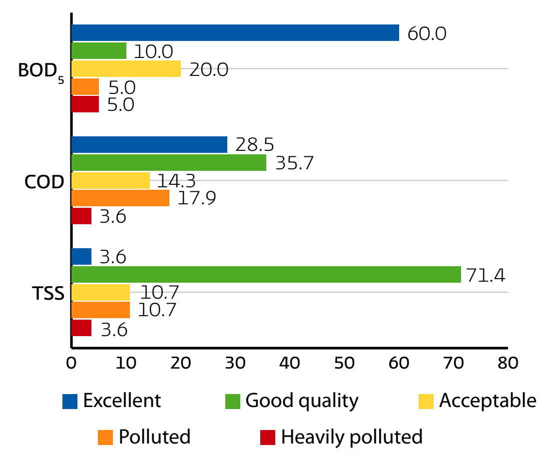
	Drinking water	Wastewater
Number in operation	24	100
Installed capacity (m^3/s)	4.13	4.8
Flow treated (m^3/s)	2.14	2.92

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	34
COD	62
TSS	62

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Dren Las Animas.

Note: The projection considers the population interpolated as of December 31 of the year in question.

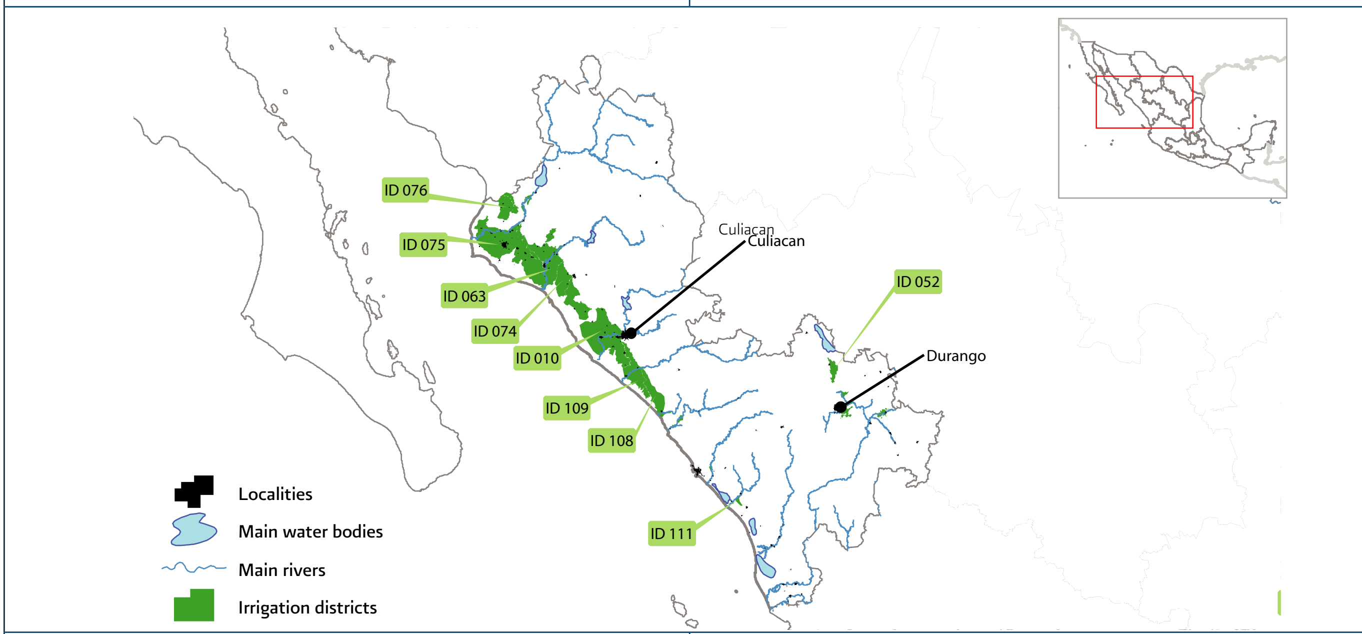
Hydrological-Administrative Region: III. Northern Pacific
River Basin Organization with its Headquarters in: Culiacan, Sinaloa

Contextual data

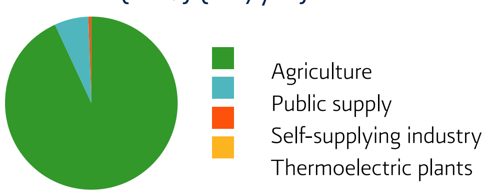
Number of municipalities	51	
Total population 2009	3 959 757	inhabitants
Urban	2 648 340	inhabitants
Rural	1 311 417	inhabitants
Total population 2030	3 794 715	inhabitants
Irrigation Districts	9	
Surface area	789 034	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	747	mm
Mean surface runoff	22 364	hm^3/year
Number of aquifers	24	
Mean aquifer recharge	3 267	hm^3/year
Per capita renewable water resources, 2009	6 473	m^3/inhabitant/year
Per capita renewable water resources, 2030	6 754	m^3/inhabitant/year
Degree of water stress, 2009	40.6%	(High)



Uses of water (2009) (hm^3/year)



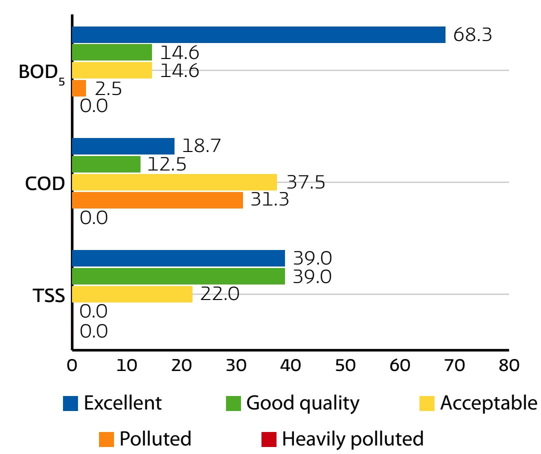
Offstream uses	Total	Surface water	Groundwater
Agriculture	9 714	8 743	971
Public supply	639	305	334
Self-supplying industry	57	38	19
Thermoelectric plants	0	0	0
Total	10 411	9 087	1 324
Instream uses			
Hydropower plants (volume declared)		11 405	

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	41
COD	17
TSS	41

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: 0.

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	89.0	82.6
Urban	97.9	95.0
Rural	71.9	58.9

Municipal treatment plants (as of December 2009)

	Drinking water	Wastewater
Number in operation	154	282
Installed capacity (m^3/s)	9.28	9.01
Flow treated (m^3/s)	7.75	7.04

Note: The projection considers the population interpolated as of December 31 of the year in question.

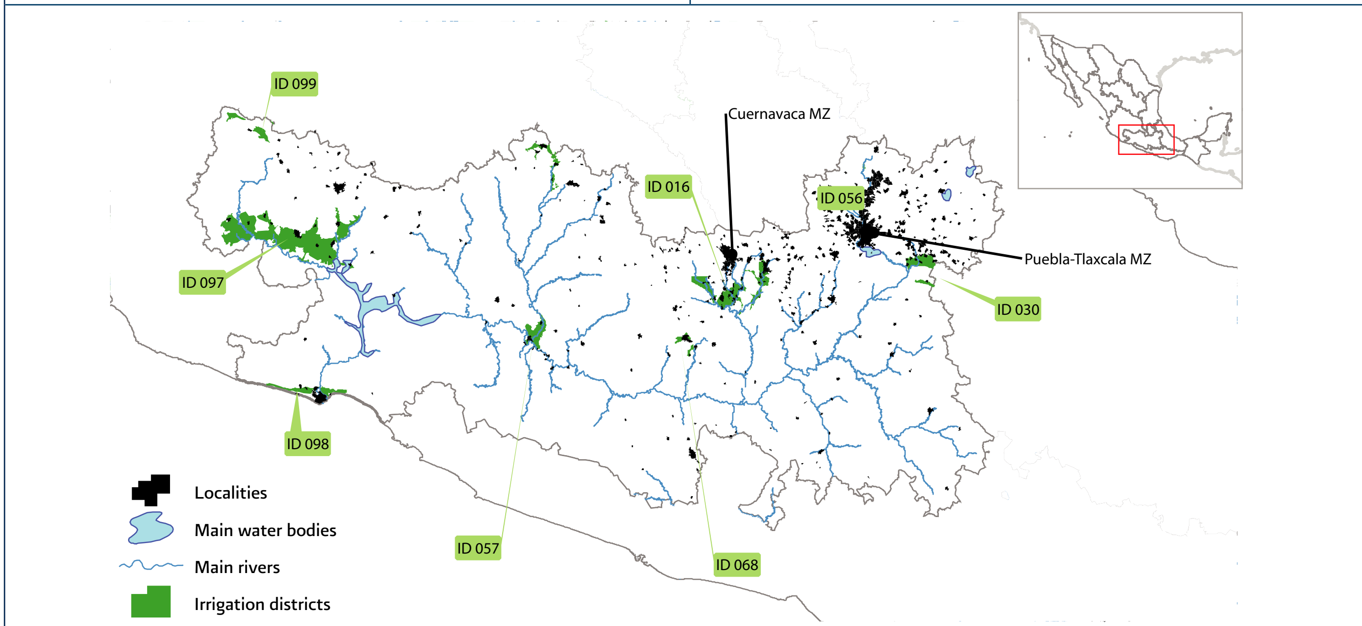
Hydrological-Administrative Region: IV. Balsas
River Basin Organization with its Headquarters in: Cuernavaca, Morelos

Contextual data

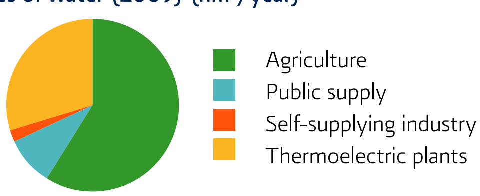
Number of municipalities	422	
Total population 2009	10 624 805	inhabitants
Urban	7 538 316	inhabitants
Rural	3 086 489	inhabitants
Total population 2030	11 127 421	inhabitants
Irrigation Districts	9	
Surface area	225 511	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	963	mm
Mean surface runoff	17 057	hm^3/year
Number of aquifers	46	
Mean aquifer recharge	4 623	hm^3/year
Per capita renewable water resources, 2009	2 040	m^3/inhabitant/year
Per capita renewable water resources, 2030	1 948	m^3/inhabitant/year
Degree of water stress, 2009	49.4%	(High)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	6 306	5 227	1 079
Public supply	1 009	414	595
Self-supplying industry	220	119	101
Thermoelectric plants	3 170	3 122	48
Total	10 704	8 881	1 823
Instream uses			
Hydropower plants (volume declared)		28 060	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	84.4	81.4
Urban	91.2	91.7
Rural	69.2	57.9

Municipal treatment plants (as of December 2009)

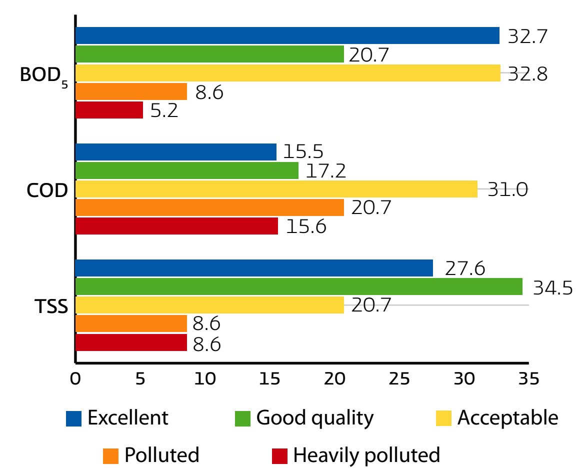
	Drinking water	Wastewater
Number in operation	20	162
Installed capacity (m^3/s)	22.76	8.22
Flow treated (m^3/s)	17.28	6.1

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	84
COD	84
TSS	84

Distribution (%) of monitoring sites according to the indicator and classification



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.

Note: The projection considers the population interpolated as of December 31 of the year in question.

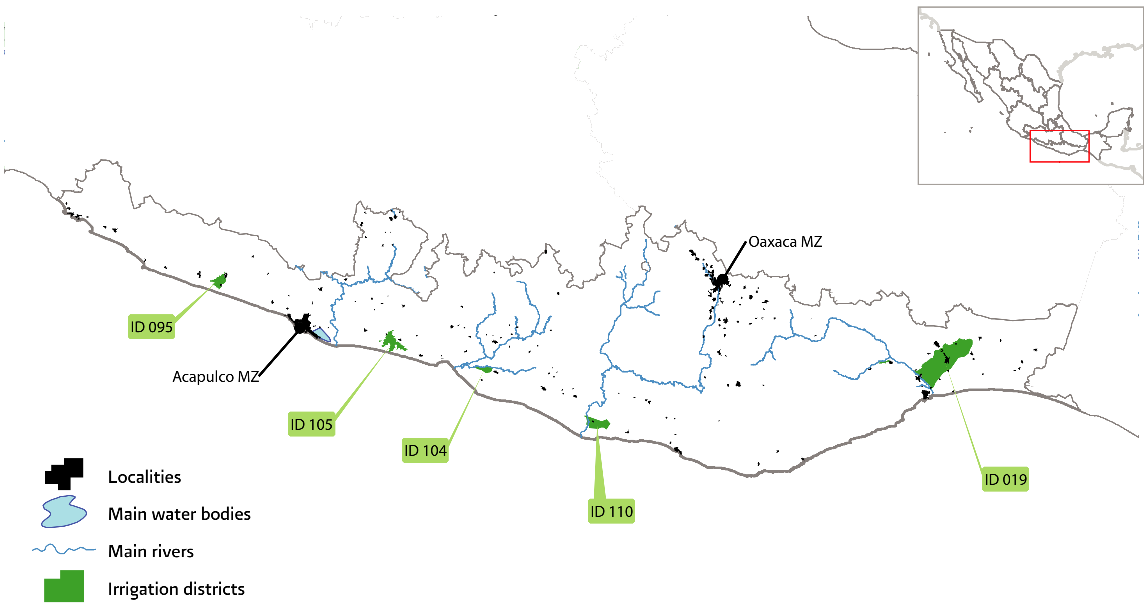
Hydrological-Administrative Region: V. Southern Pacific
River Basin Organization with its Headquarters in: Oaxaca, Oaxaca

Contextual data

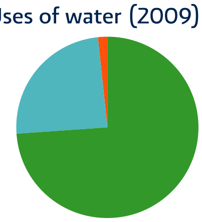
Number of municipalities	363	
Total population 2009	4 127 573	inhabitants
Urban	2 416 949	inhabitants
Rural	1 710 624	inhabitants
Total population 2030	4 021 577	inhabitants
Irrigation Districts	5	
Surface area	75 389	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	1 187	mm
Mean surface runoff	30 800	hm^3/year
Number of aquifers	35	
Mean aquifer recharge	2 024	hm^3/year
Per capita renewable water resources, 2009	7 952	m^3/inhabitant/year
Per capita renewable water resources, 2030	8 162	m^3/inhabitant/year
Degree of water stress, 2009	4.2%	(No stress)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	1 008	776	232
Public supply	335	129	206
Self-supplying industry	20	0	20
Thermoelectric plants	0	0	0
Total	1 363	905	457
Instream uses			
Hydropower plants (volume declared)		2 063	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	73.5	63.3
Urban	83.6	83.5
Rural	59.6	35.5

Municipal treatment plants (as of December 2009)

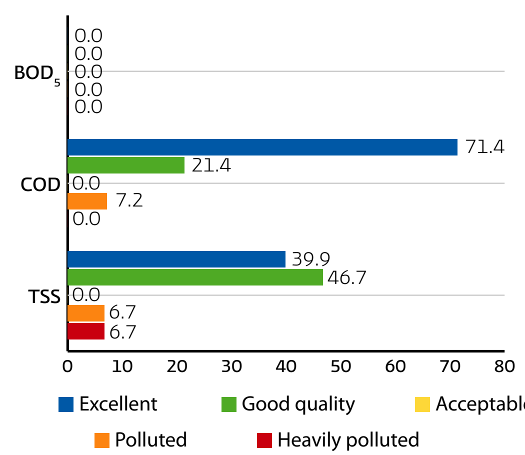
	Drinking water	Wastewater
Number in operation	8	86
Installed capacity (m^3/s)	3.18	4.56
Flow treated (m^3/s)	2.59	3.39

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	
COD	25
TSS	25

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Verde River.

Note: The projection considers the population interpolated as of December 31 of the year in question.

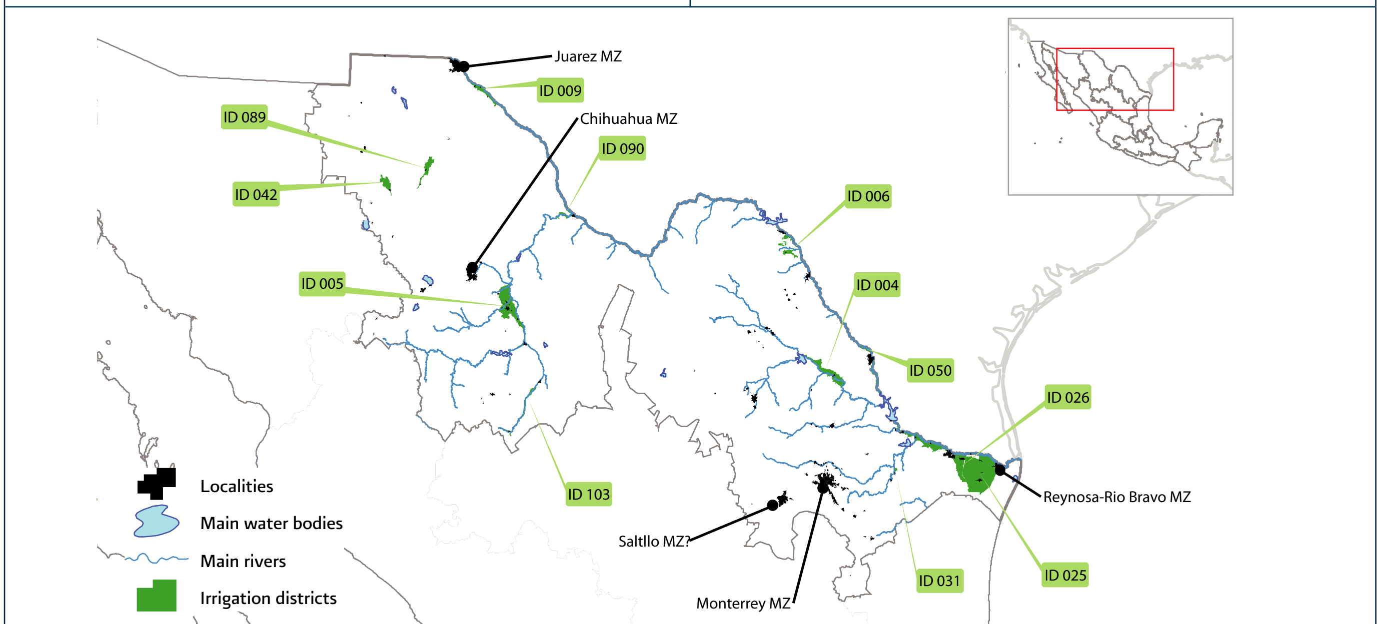
Hydrological-Administrative Region: VI. Rio Bravo
River Basin Organization with its Headquarters in: Monterrey, Nuevo Leon

Contextual data

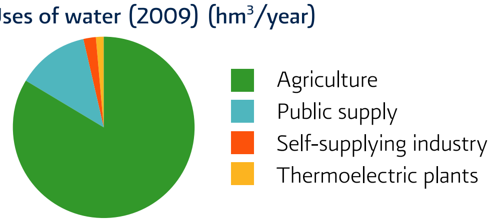
Number of municipalities	141	
Total population 2009	10 982 077	inhabitants
Urban	10 300 799	inhabitants
Rural	681 279	inhabitants
Total population 2030	13 251 755	inhabitants
Irrigation Districts	12	
Surface area	554 597	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	438	mm
Mean surface runoff	6 857	hm^3/year
Number of aquifers	100	
Mean aquifer recharge	5 306	hm^3/year
Per capita renewable water resources, 2009	1 107	m^3/inhabitant/year
Per capita renewable water resources, 2030	918	m^3/inhabitant/year
Degree of water stress, 2009	76.0%	(High)



Uses of water (2009) (hm^3/year)



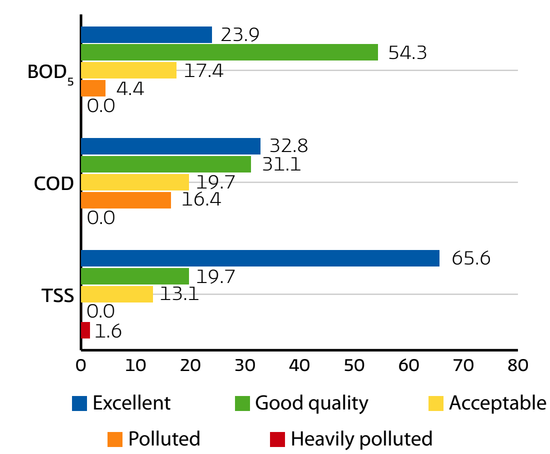
Offstream uses	Total	Surface water	Groundwater
Agriculture	7 736	4 246	3 491
Public supply	1 183	548	634
Self-supplying industry	213	12	201
Thermoelectric plants	112	53	59
Total	9 243	4 859	4 384
Instream uses			
Hydropower plants (volume declared)		2 960	

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	78
COD	93
TSS	93

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Rio Grande.

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	96.1	93.8
Urban	97.9	95.8
Rural	71.6	65.0

Municipal treatment plants (as of December 2009)

	Drinking water	Wastewater
Number in operation	60	205
Installed capacity (m^3/s)	26.3	28.84
Flow treated (m^3/s)	15.9	21.68

Note: The projection considers the population interpolated as of December 31 of the year in question.

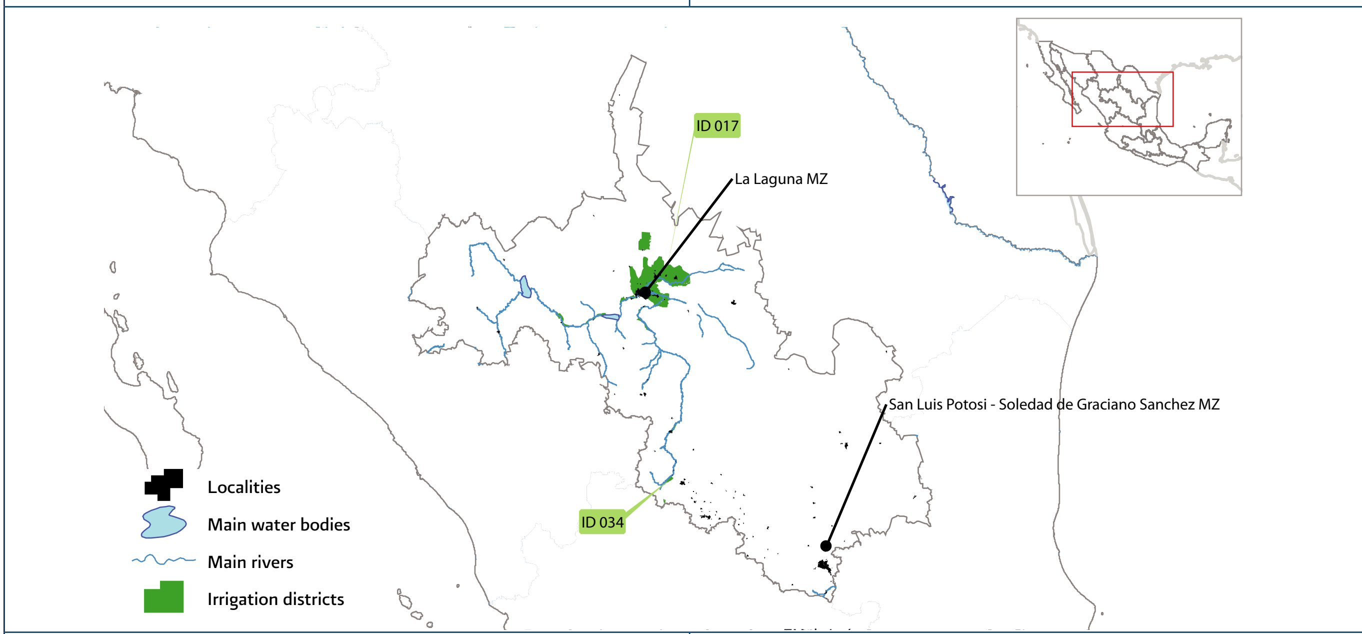
Hydrological-Administrative Region: VII. Central Basins of the North
River Basin Organization with its Headquarters in: Torreon, Coahuila de Zaragoza

Contextual data

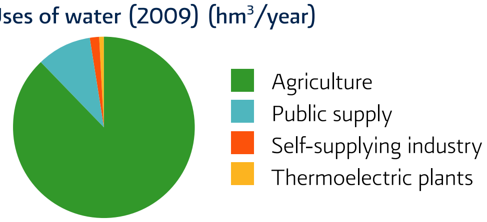
Number of municipalities	83	
Total population 2009	4 186 376	inhabitants
Urban	3 076 853	inhabitants
Rural	1 109 523	inhabitants
Total population 2030	4 568 007	inhabitants
Irrigation Districts	1	
Surface area	116 577	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	430	mm
Mean surface runoff	5 506	hm^3/year
Number of aquifers	68	
Mean aquifer recharge	2 392	hm^3/year
Per capita renewable water resources, 2009	1 887	m^3/inhabitant/year
Per capita renewable water resources, 2030	1 729	m^3/inhabitant/year
Degree of water stress, 2009	48.7%	(No stress)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	3 383	1 243	2 140
Public supply	371	7	364
Self-supplying industry	64	1	63
Thermoelectric plants	28	0	28
Total	3 846	1 251	2 595
Instream uses			
Hydropower plants (volume declared)		0	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	93.3	85.6
Urban	98.8	95.6
Rural	79.1	59.9

Municipal treatment plants (as of December 2009)

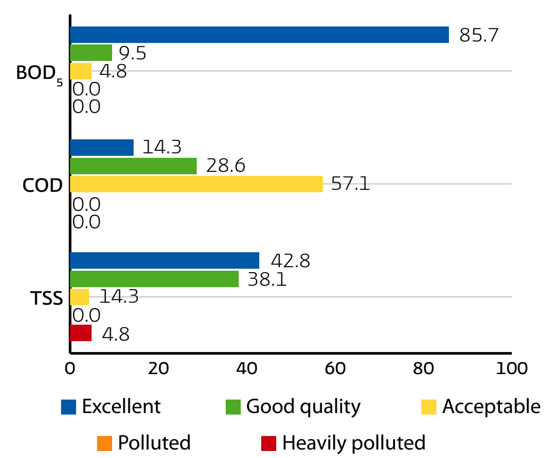
	Drinking water	Wastewater
Number in operation	67	124
Installed capacity (m^3/s)	.56	5.79
Flow treated (m^3/s)	.4	4.5

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	20
COD	20
TSS	20

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Aguanaval River.

Note: The projection considers the population interpolated as of December 31 of the year in question.

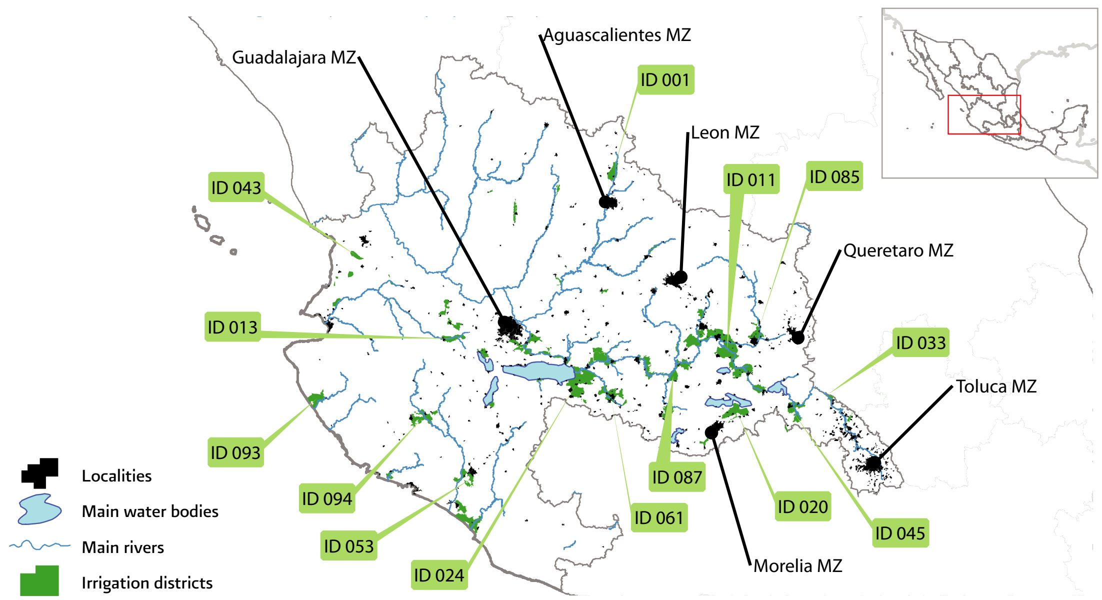
Hydrological-Administrative Region: VIII. Lerma-Santiago-Pacific
River Basin Organization with its Headquarters in: Guadalajara, Jalisco

Contextual data

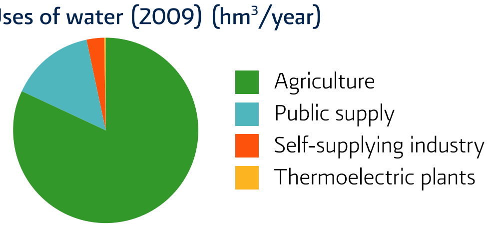
Number of municipalities	329	
Total population 2009	20 974 080	inhabitants
Urban	16 461 649	inhabitants
Rural	4 512 432	inhabitants
Total population 2030	23 511 810	inhabitants
Irrigation Districts	14	
Surface area	499 237	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	816	mm
Mean surface runoff	26 431	hm^3/year
Number of aquifers	127	
Mean aquifer recharge	8 102	hm^3/year
Per capita renewable water resources, 2009	1 646	m^3/inhabitant/year
Per capita renewable water resources, 2030	1 469	m^3/inhabitant/year
Degree of water stress, 2009	41.9%	(High)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	11 891	6 580	5 311
Public supply	2 121	675	1 446
Self-supplying industry	446	77	369
Thermoelectric plants	21	0	21
Total	14 479	7 332	7 147
Instream uses			
Hydropower plants (volume declared)		9 031	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	93.4	90.1
Urban	96.1	96.2
Rural	84.3	69.3

Municipal treatment plants (as of December 2009)

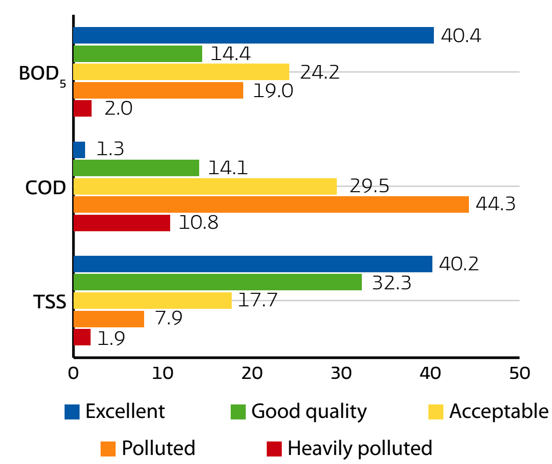
	Drinking water	Wastewater
Number in operation	112	513
Installed capacity (m^3/s)	19.95	23.97
Flow treated (m^3/s)	12.48	18.58

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	150
COD	150
TSS	172

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Mezapa Stream, Lake Cuitzeo, Almoloya del Rio Lagoon; Aguascalientes, Laja, Lerma, San Juan de los Lagos, Tamazula, Turbio, Tuxcacuesco and Verde rivers.

Note: The projection considers the population interpolated as of December 31 of the year in question.

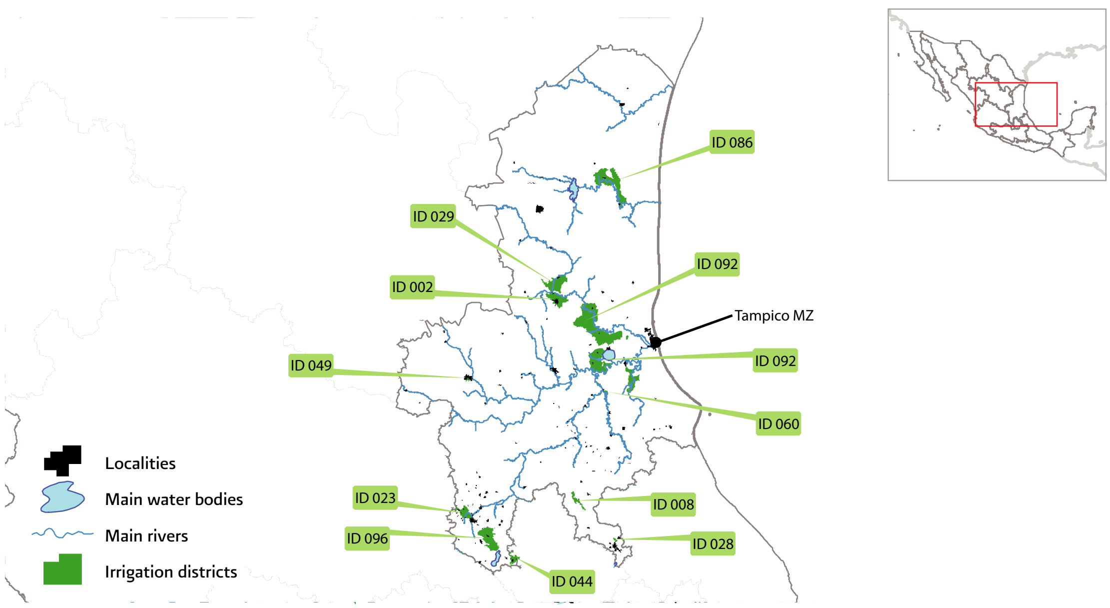
Hydrological-Administrative Region: IX. Northern Gulf
River Basin Organization with its Headquarters in: Ciudad Victoria, Tamaulipas

Contextual data

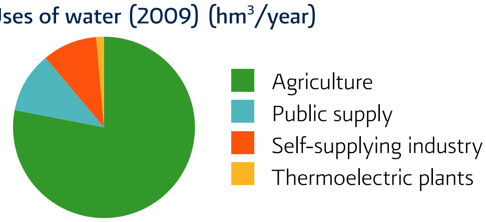
Number of municipalities	154	
Total population 2009	4 968 766	inhabitants
Urban	2 534 427	inhabitants
Rural	2 434 339	inhabitants
Total population 2030	5 099 143	inhabitants
Irrigation Districts	13	
Surface area	265 594	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	914	mm
Mean surface runoff	24 227	hm^3/year
Number of aquifers	40	
Mean aquifer recharge	1 338	hm^3/year
Per capita renewable water resources, 2009	5 145	m^3/inhabitant/year
Per capita renewable water resources, 2030	5 013	m^3/inhabitant/year
Degree of water stress, 2009	19.0%	(Low)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	3 794	2 952	842
Public supply	528	368	161
Self-supplying industry	466	426	40
Thermoelectric plants	66	60	6
Total	4 854	3 806	1 048
Instream uses			
Hydropower plants (volume declared)		1 441	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	80.9	65.3
Urban	96.6	88.2
Rural	65.3	42.5

Municipal treatment plants (as of December 2009)

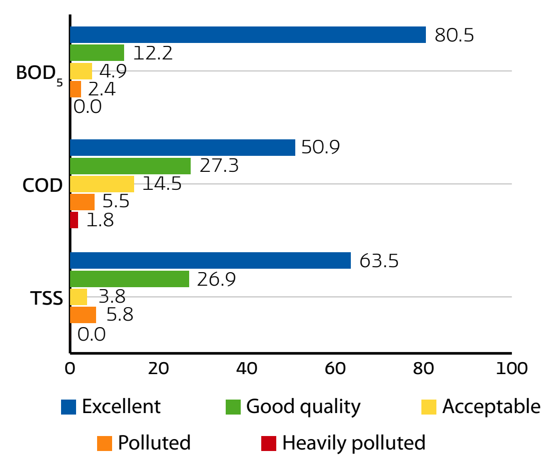
	Drinking water	Wastewater
Number in operation	43	104
Installed capacity (m^3/s)	6.66	3.39
Flow treated (m^3/s)	5.89	2.54

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	42
COD	45
TSS	58

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: San Juan del Rio river.

Note: The projection considers the population interpolated as of December 31 of the year in question.

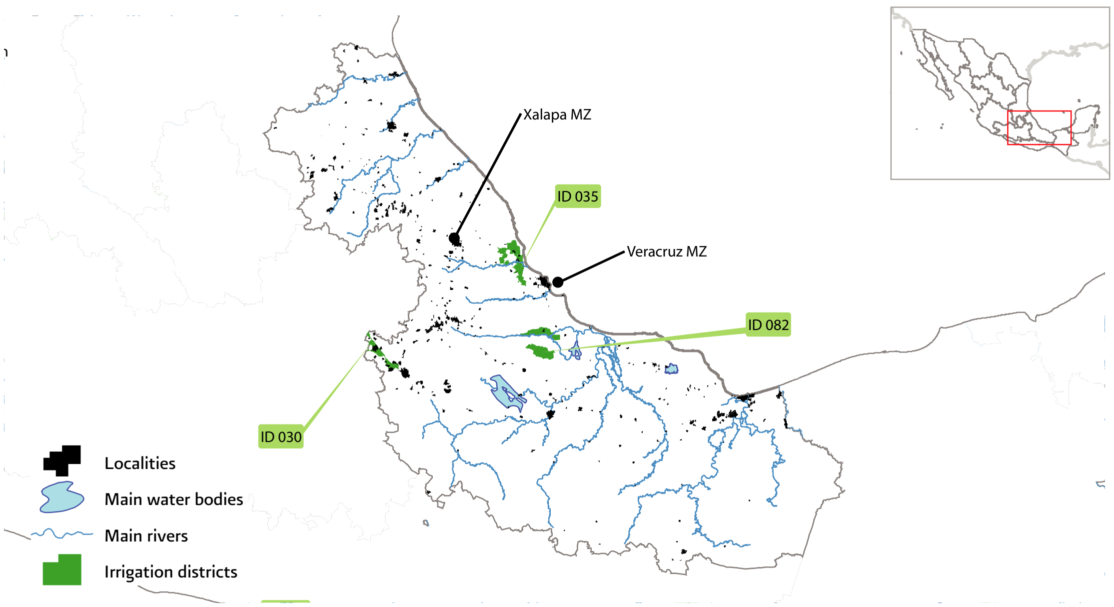
Hydrological-Administrative Region: X. Central Gulf
River Basin Organization with its Headquarters in: Xalapa, Veracruz de Ignacio de la Llave

Contextual data

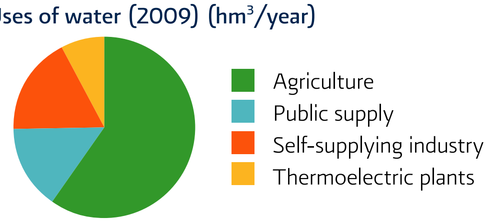
Number of municipalities	445	
Total population 2009	9 647 742	inhabitants
Urban	5 547 958	inhabitants
Rural	4 099 784	inhabitants
Total population 2030	9 925 044	inhabitants
Irrigation Districts	2	
Surface area	43 508	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	1 558	mm
Mean surface runoff	91 606	hm^3/year
Number of aquifers	22	
Mean aquifer recharge	4 260	hm^3/year
Per capita renewable water resources, 2009	9 937	m^3/inhabitant/year
Per capita renewable water resources, 2030	9 659	m^3/inhabitant/year
Degree of water stress, 2009	5.2%	(Low)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	2 974	2 406	569
Public supply	744	476	268
Self-supplying industry	878	776	102
Thermoelectric plants	377	370	7
Total	4 973	4 028	945
Instream uses			
Hydropower plants (volume declared)		13 674	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	77.2	74.8
Urban	89.7	92.1
Rural	61.2	52.7

Municipal treatment plants (as of December 2009)

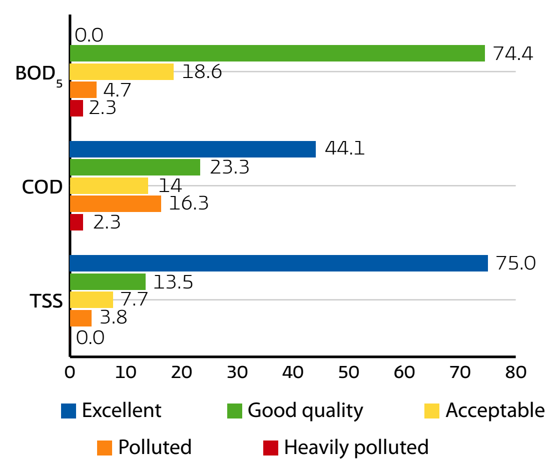
	Drinking water	Wastewater
Number in operation	9	140
Installed capacity (m^3/s)	6.64	6.72
Flow treated (m^3/s)	4.15	4.06

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	54
COD	48
TSS	54

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: El Diamante Stream.

Note: The projection considers the population interpolated as of December 31 of the year in question.

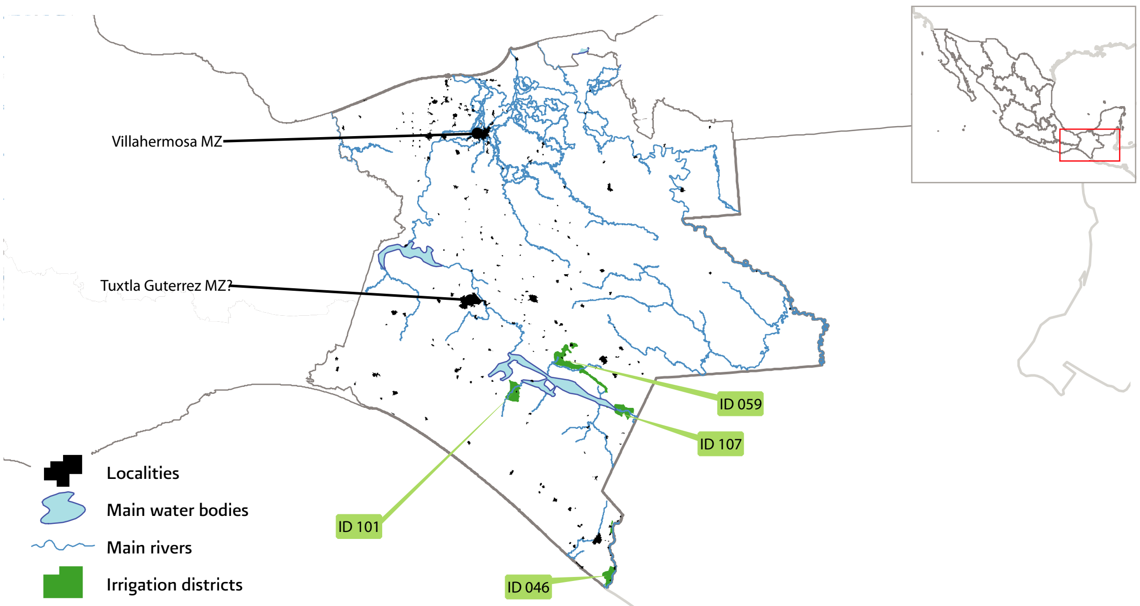
Hydrological-Administrative Region: XI. Southern Border
River Basin Organization with its Headquarters in: Tuxtla Gutierrez, Chiapas

Contextual data

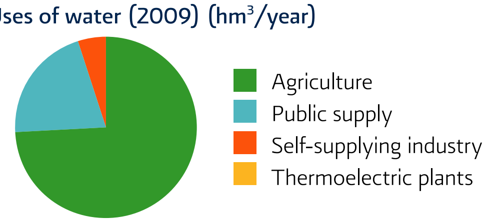
Number of municipalities	138	
Total population 2009	6 618 463	inhabitants
Urban	3 357 041	inhabitants
Rural	3 261 423	inhabitants
Total population 2030	7 497 619	inhabitants
Irrigation Districts	4	
Surface area	36 399	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	1 846	mm
Mean surface runoff	139 739	hm^3/year
Number of aquifers	23	
Mean aquifer recharge	18 015	hm^3/year
Per capita renewable water resources, 2009	23 835	m^3/inhabitant/year
Per capita renewable water resources, 2030	21 041	m^3/inhabitant/year
Degree of water stress, 2009	1.4%	(No stress)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	1 639	1 216	423
Public supply	459	328	130
Self-supplying industry	104	46	58
Thermoelectric plants	0	0	0
Total	2 203	1 591	612
Instream uses			
Hydropower plants (volume declared)		64 305	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	74.4	80.7
Urban	87.0	95.4
Rural	61.8	66.1

Municipal treatment plants (as of December 2009)

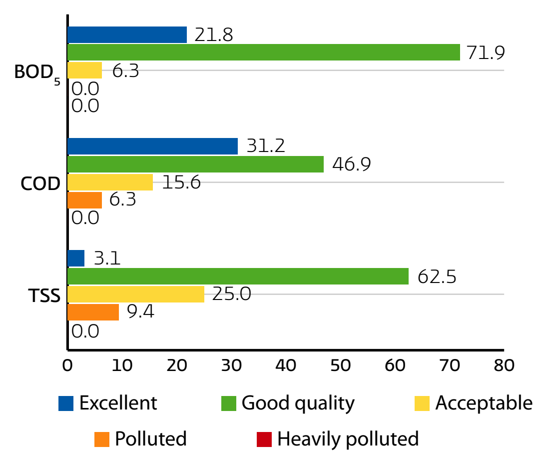
	Drinking water	Wastewater
Number in operation	49	102
Installed capacity (m^3/s)	16.13	3.35
Flow treated (m^3/s)	10.63	2.37

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	36
COD	36
TSS	36

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: 0.

Note: The projection considers the population interpolated as of December 31 of the year in question.

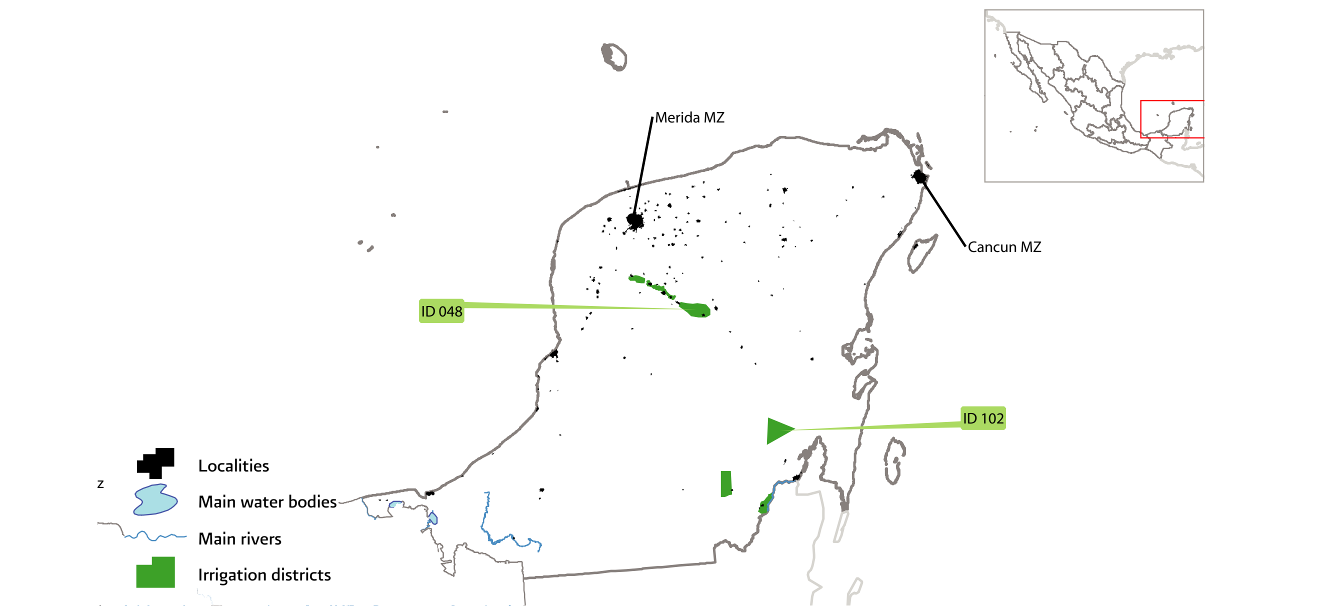
Hydrological-Administrative Region: XII. Yucatan Peninsula
River Basin Organization with its Headquarters in: Merida, Yucatan

Contextual data

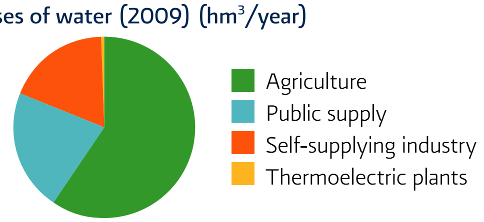
Number of municipalities	125	
Total population 2009	4 064 141	inhabitants
Urban	3 375 752	inhabitants
Rural	688 389	inhabitants
Total population 2030	5 807 391	inhabitants
Irrigation Districts	2	
Surface area	36 871	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	1 218	mm
Mean surface runoff	4 330	hm^3/year
Number of aquifers	4	
Mean aquifer recharge	25 316	hm^3/year
Per capita renewable water resources, 2009	7 294	m^3/inhabitant/year
Per capita renewable water resources, 2030	5 105	m^3/inhabitant/year
Degree of water stress, 2009	9.2%	(No stress)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	1 631	72	1 559
Public supply	588	0	588
Self-supplying industry	503	0	503
Thermoelectric plants	9	0	9
Total	2 731	72	2 659
Instream uses			
Hydropower plants (volume declared)		0	

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	94.1	76.3
Urban	95.4	83.8
Rural	88.5	43.7

Municipal treatment plants (as of December 2009)

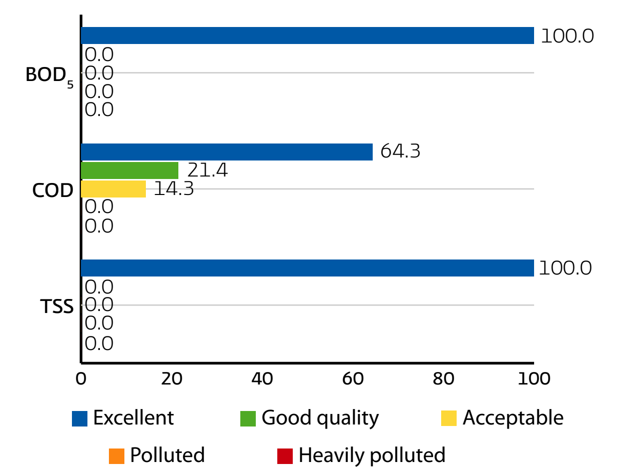
	Drinking water	Wastewater
Number in operation	1	72
Installed capacity (m^3/s)	.01	2.65
Flow treated (m^3/s)	.01	1.9

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	20
COD	20
TSS	20

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: 0.

Note: The projection considers the population interpolated as of December 31 of the year in question.

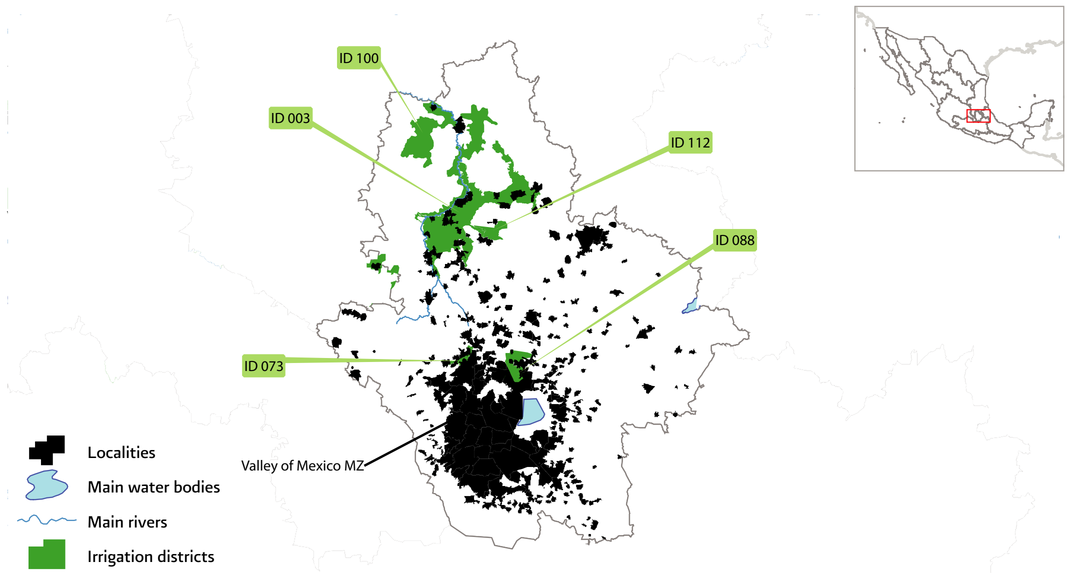
Hydrological-Administrative Region: XIII. Waters of the Valley of Mexico
River Basin Organization with its Headquarters in: Mexico City (Federal District)

Contextual data

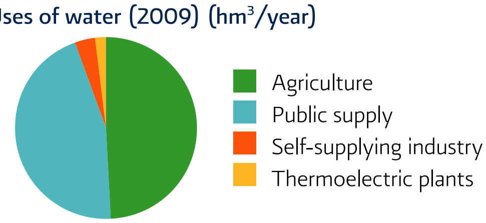
Number of municipalities	116	
Total population 2009	21 422 957	inhabitants
Urban	20 560 481	inhabitants
Rural	862 476	inhabitants
Total population 2030	23 673 230	inhabitants
Irrigation Districts	5	
Surface area	104 998	hectares

Renewable water resources (2009)

Normal annual precipitation 1971-2000	606	mm
Mean surface runoff	1 174	hm^3/year
Number of aquifers	14	
Mean aquifer recharge	2 339	hm^3/year
Per capita renewable water resources, 2009	164	m^3/inhabitant/year
Per capita renewable water resources, 2030	148	m^3/inhabitant/year
Degree of water stress, 2009	132.6%	(High)



Uses of water (2009) (hm^3/year)



Offstream uses	Total	Surface water	Groundwater
Agriculture	2 299	1 916	383
Public supply	2 107	349	1 758
Self-supplying industry	162	44	118
Thermoelectric plants	90	22	68
Total	4 658	2 331	2 326
Instream uses			
Hydropower plants (volume declared)	19		

Coverage (2005) (%)

	Drinking water	Sanitation
Regional	96.5	97.2
Urban	97.0	98.1
Rural	85.4	78.0

Municipal treatment plants (as of December 2009)

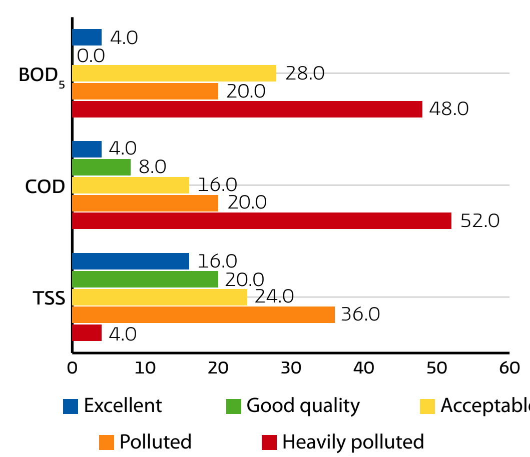
	Drinking water	Wastewater
Number in operation	43	85
Installed capacity (m^3/s)	5.27	10.89
Flow treated (m^3/s)	4.17	6.35

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	24
COD	24
TSS	25

Distribution (%) of monitoring sites according to the indicator and classification



Water bodies with sites classified as heavily polluted by BOD_5, COD and/or TSS: Western Drainage Canal, Dendho and Santo Tomas; Central Outlet Discharge, Grand Canal, Tlamaco-Juando weir; Churubusco, de la Compania, de las Avenidas, de los Remedios, San Buenaventura and San Juan Teotihuacan rivers.

Note: The projection considers the population interpolated as of December 31 of the year in question.

1. Aguascalientes

Contextual data

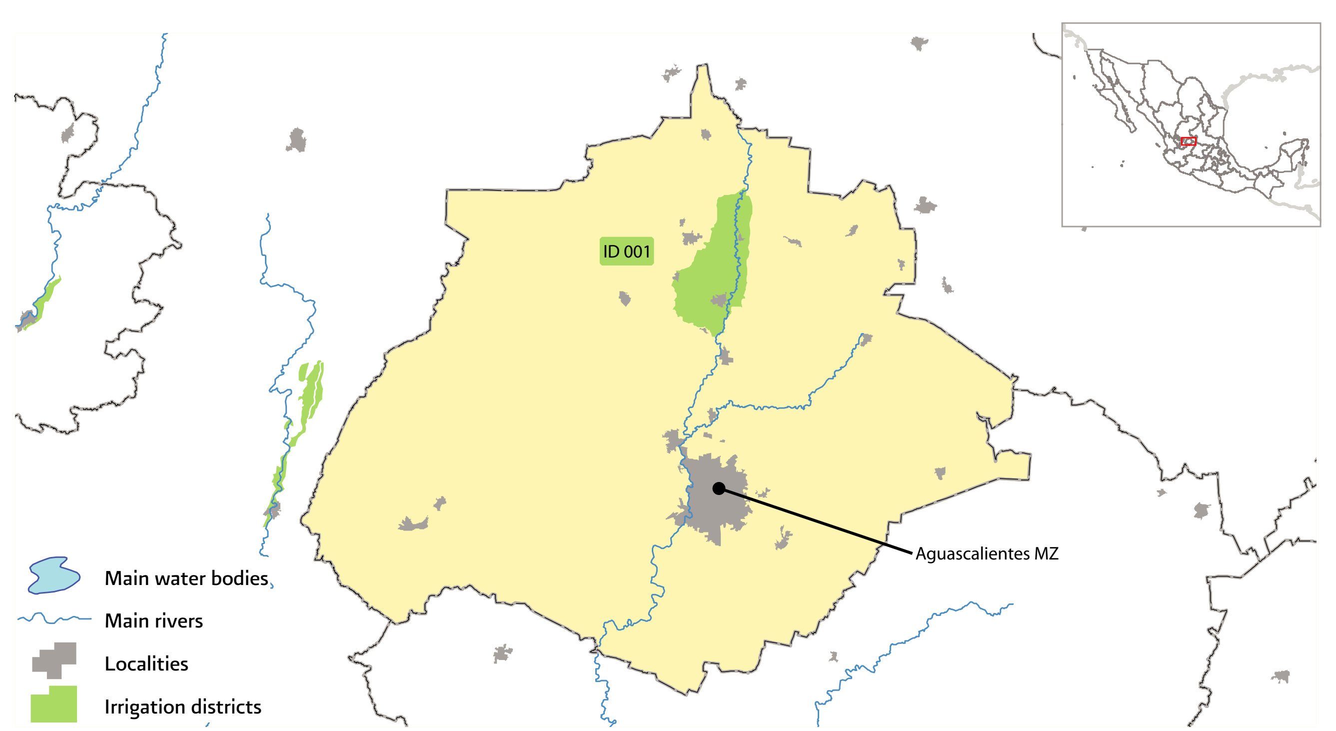
Number of municipalities	11	
Total population 2009	1 150 625	inhabitants
Urban	937 700	inhabitants
Rural	212 926	inhabitants
Population in 2030	1 460 232	inhabitants
Normal annual precipitation 1971-2000	508	mm

Treatment plants (as of December 2009)

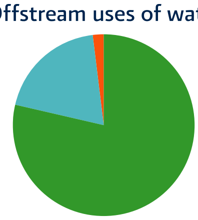
Municipal treatment plants

Number in operation	3	
Capacity installed	0.044	m^3/s
Flow treated	0.026	m^3/s

Wastewater	Municipal	Industrial
Number in operation	117	53
Capacity installed (m^3/s)	4.099	0.254
Flow treated (m^3/s)	3.354	0.120



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	487	175	312
Public supply	119	0	119
Self-supplying industry	12	2	10
Thermoelectric plants	0	0	0
Total	618	177	441

Coverage (2005) (%)

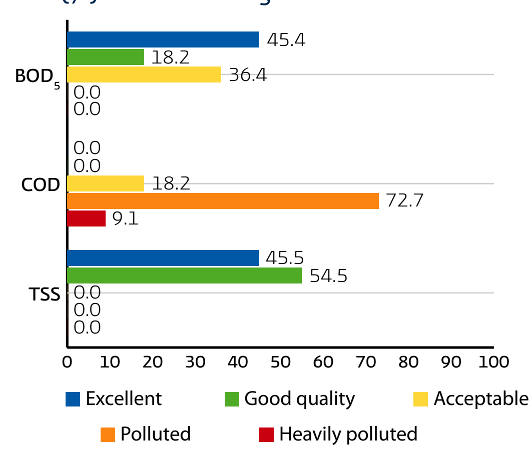
	Drinking water	Sanitation
Regional	97.8	96.9
Urban	99.2	98.8
Rural	92.0	88.4

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	13
COD	13
TSS	13

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

2. Baja California

Contextual data

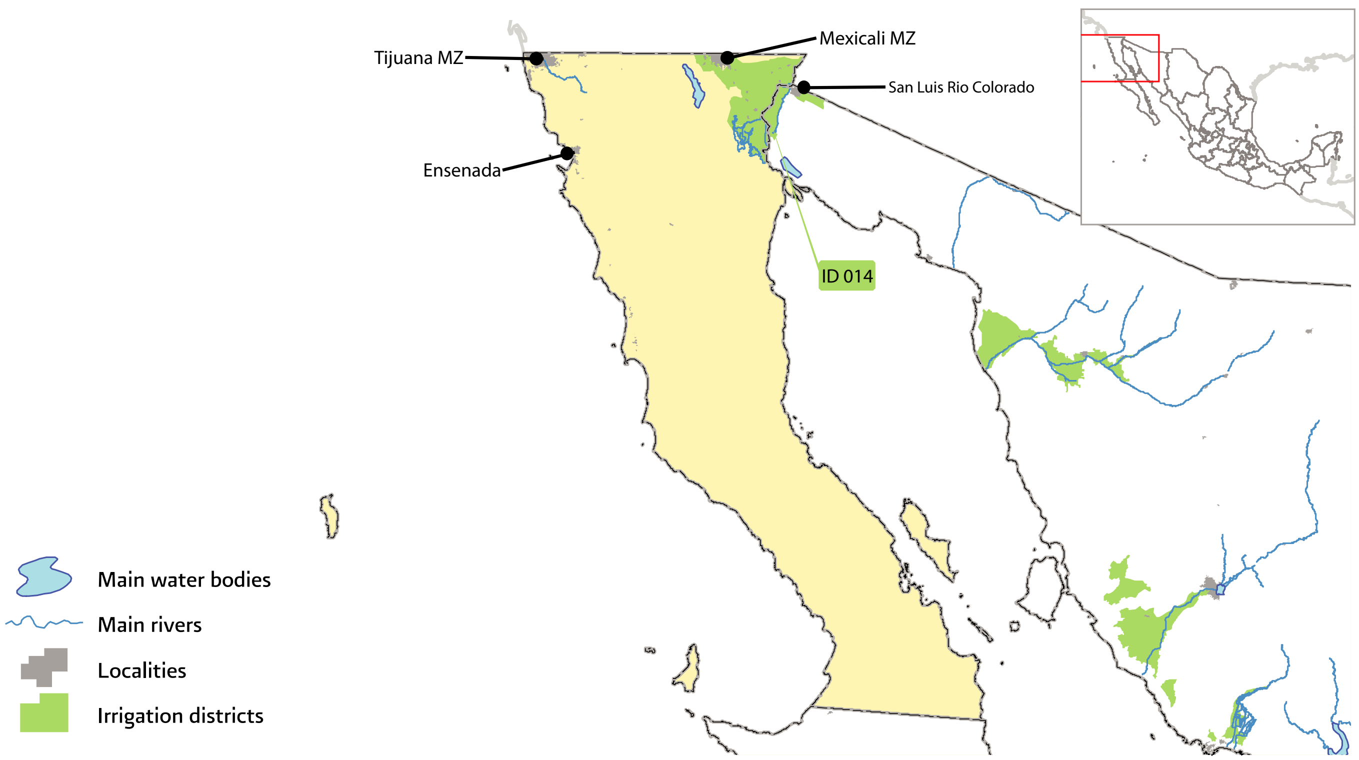
Number of municipalities	5	
Total population 2009	3 209 233	inhabitants
Urban	2 997 303	inhabitants
Rural	211 930	inhabitants
Population in 2030	5 082 349	inhabitants
Normal annual precipitation 1971-2000	177	mm

Treatment plants (as of December 2009)

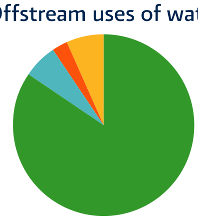
Municipal treatment plants

Number in operation	26	
Capacity installed	12.006	m^3/s
Flow treated	6.448	m^3/s

Wastewater	Municipal	Industrial
Number in operation	31	61
Capacity installed (m^3/s)	7.234	0.482
Flow treated (m^3/s)	5.620	0.000



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	2 546	1 498	1 047
Public supply	186	100	86
Self-supplying industry	82	69	13
Thermoelectric plants	195	0	195
Total	3 008	1 667	1 341

Coverage (2005) (%)

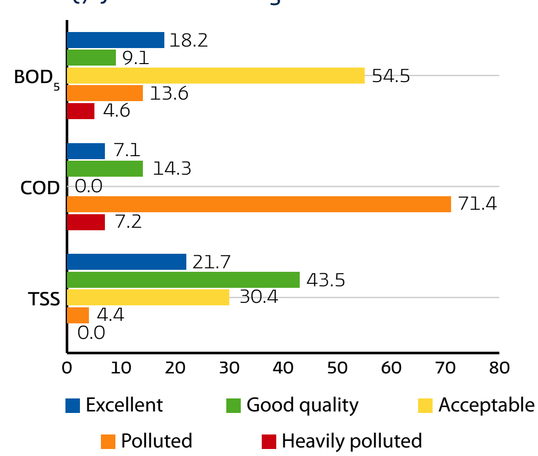
	Drinking water	Sanitation
Regional	93.8	88.9
Urban	95.9	91.8
Rural	67.5	51.7

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	20
COD	20
TSS	20

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

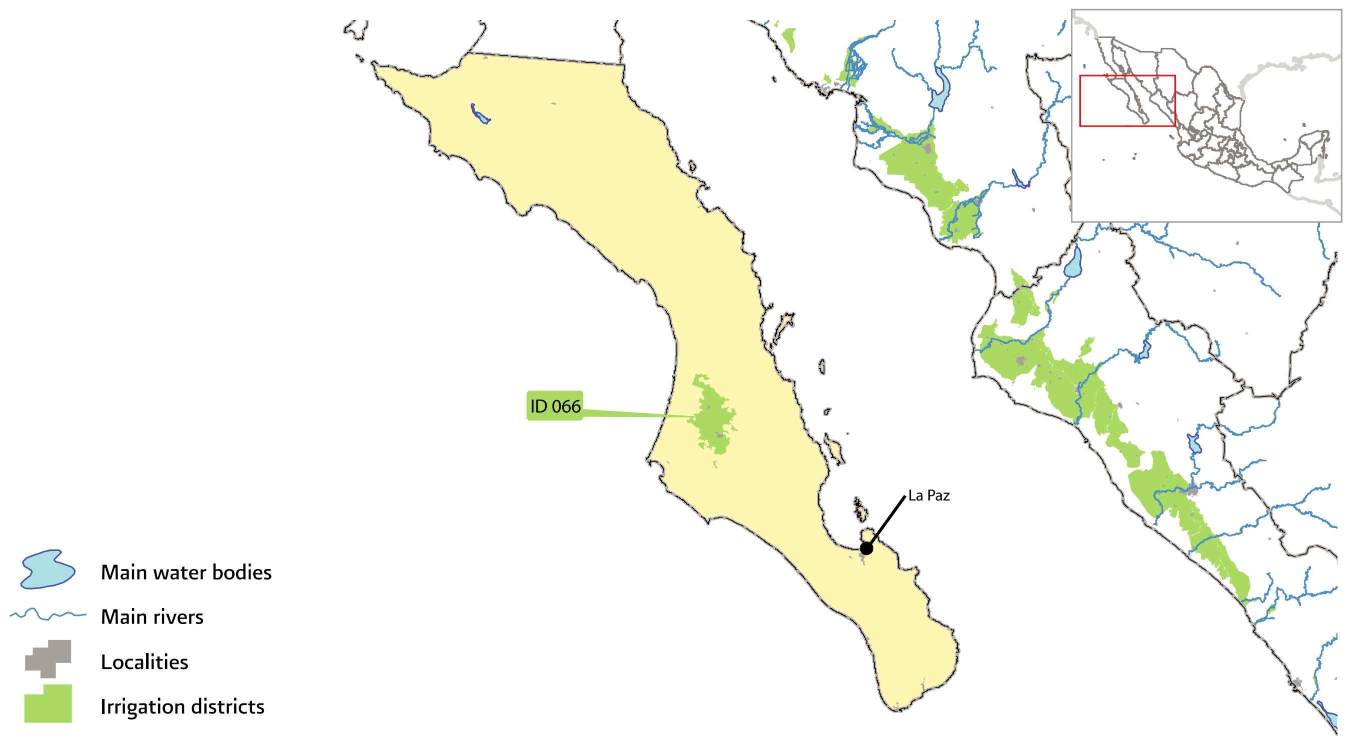
Contextual data

Number of municipalities	5	
Total population 2009	572 295	inhabitants
Urban	491 952	inhabitants
Rural	80 343	inhabitants
Population in 2030	833 044	inhabitants
Normal annual precipitation 1971-2000	160	mm

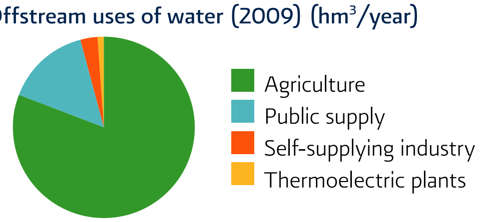
Treatment plants (as of December 2009)

Municipal treatment plants		
Number in operation	15	
Capacity installed	0.215	m^3/s
Flow treated	0.215	m^3/s

Wastewater	Municipal	Industrial
Number in operation	23	7
Capacity installed (m^3/s)	1.447	0.008
Flow treated (m^3/s)	1.063	0.008



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	333	29	303
Public supply	61	3	59
Self-supplying industry	13	3	10
Thermoelectric plants	4	0	4
Total	412	35	376

Coverage (2005) (%)

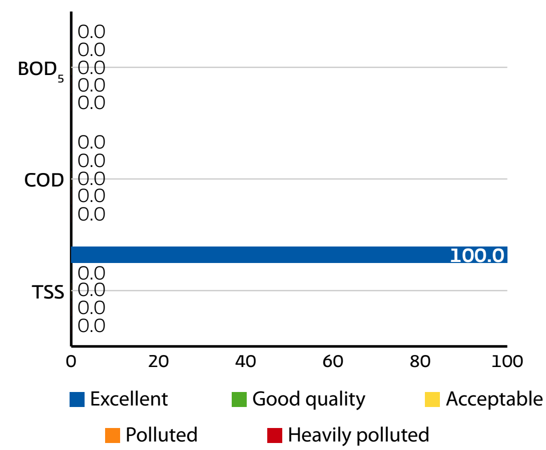
	Drinking water	Sanitation
Regional	87.7	89.7
Urban	89.9	94.3
Rural	75.3	64.6

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	0
COD	0
TSS	32

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

4. Campeche

Contextual data

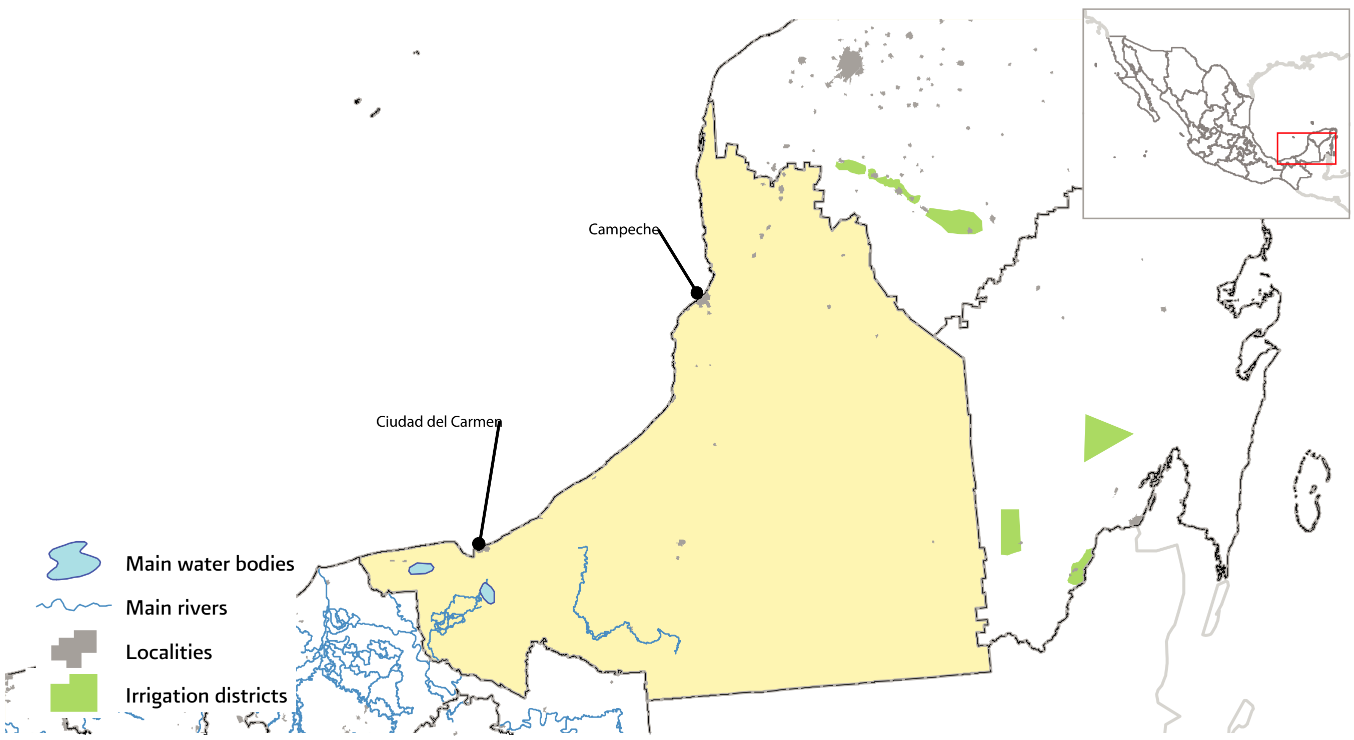
Number of municipalities	11	
Total population 2009	800 582	inhabitants
Urban	602 049	inhabitants
Rural	198 533	inhabitants
Population in 2030	968 665	inhabitants
Normal annual precipitation 1971-2000	1 337	mm

Treatment plants (as of December 2009)

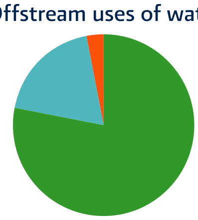
Municipal treatment plants

Number in operation	2	
Capacity installed	0.025	m^3/s
Flow treated	0.023	m^3/s

Wastewater	Municipal	Industrial
Number in operation	21	49
Capacity installed (m^3/s)	0.141	0.498
Flow treated (m^3/s)	0.097	0.159



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	584	110	474
Public supply	141	0	141
Self-supplying industry	21	0	21
Thermoelectric plants	0	0	0
Total	745	110	635

Coverage (2005) (%)

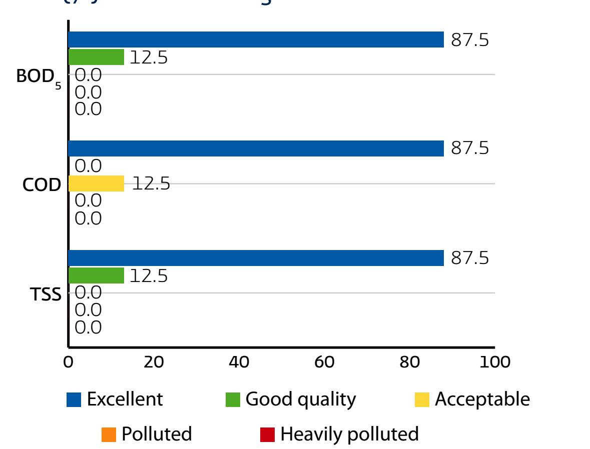
	Drinking water	Sanitation
Regional	88.4	78.4
Urban	90.9	89.1
Rural	81.1	48.1

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	9
COD	9
TSS	9

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

5. Coahuila de Zaragoza

Contextual data

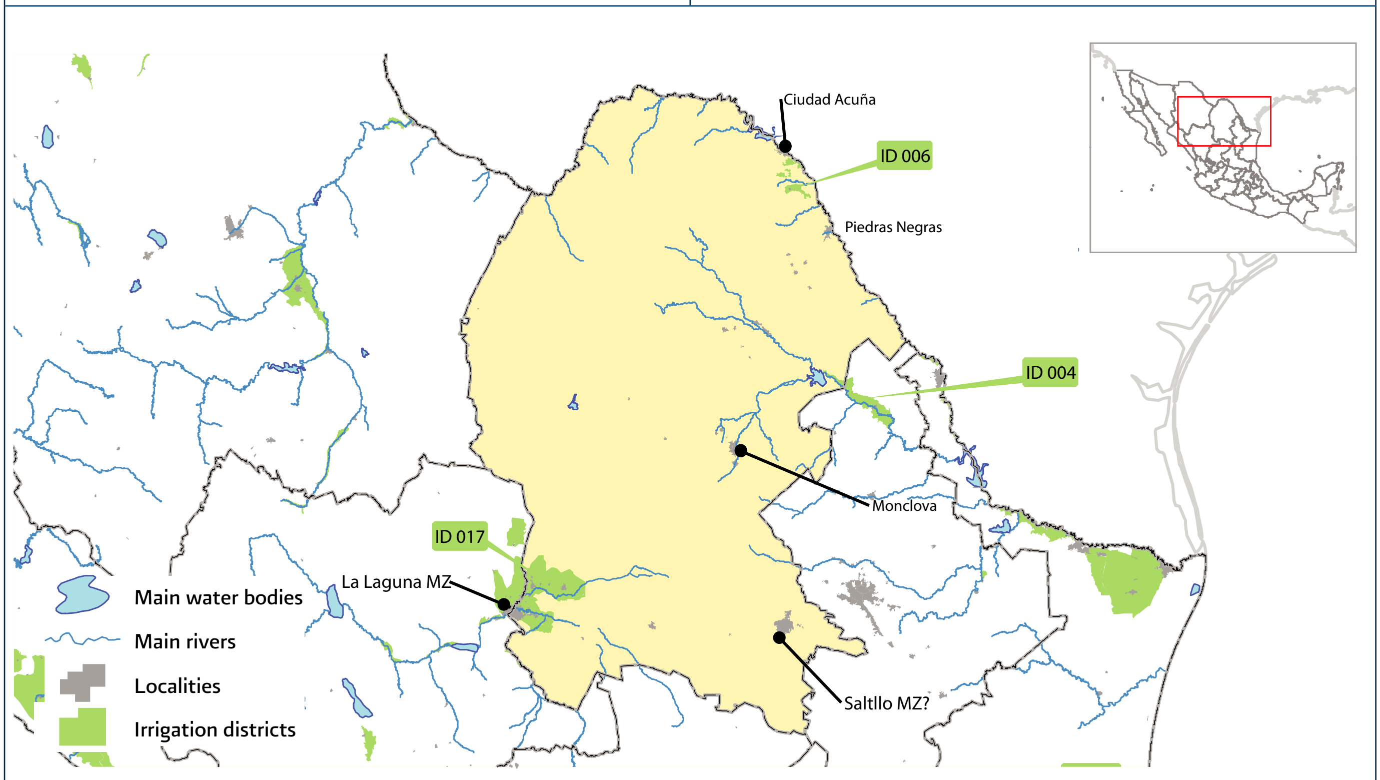
Number of municipalities	38	
Total population 2009	2 642 065	inhabitants
Urban	2 384 623	inhabitants
Rural	257 442	inhabitants
Population in 2030	3 059 206	inhabitants
Normal annual precipitation 1971-2000	386	mm

Treatment plants (as of December 2009)

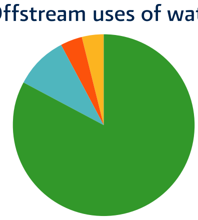
Municipal treatment plants

Number in operation	18	
Capacity installed	2.132	m^3/s
Flow treated	1.707	m^3/s

Wastewater	Municipal	Industrial
Number in operation	23	47
Capacity installed (m^3/s)	5.207	6.176
Flow treated (m^3/s)	4.026	3.038



Offstream uses of water (2009) ($hm^3/year$)



	Total	Surface water	Groundwater
Agriculture	1 626	835	791
Public supply	187	18	169
Self-supplying industry	73	1	72
Thermoelectric plants	75	47	27
Total	1 961	901	1 060

Coverage (2005) (%)

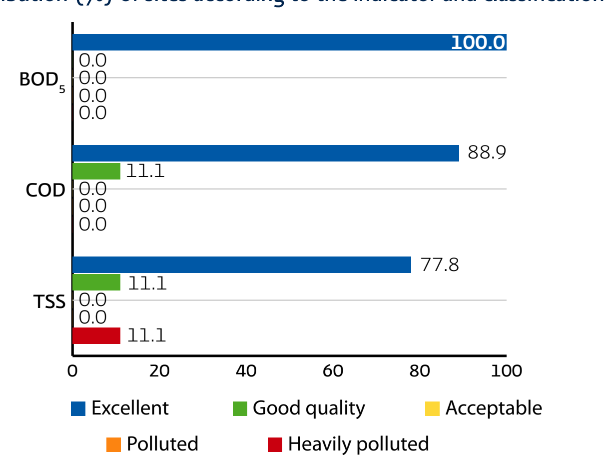
	Drinking water	Sanitation
Regional	97.3	91.5
Urban	98.7	94.7
Rural	84.8	62.7

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	9
COD	17
TSS	17

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

6. Colima

Contextual data

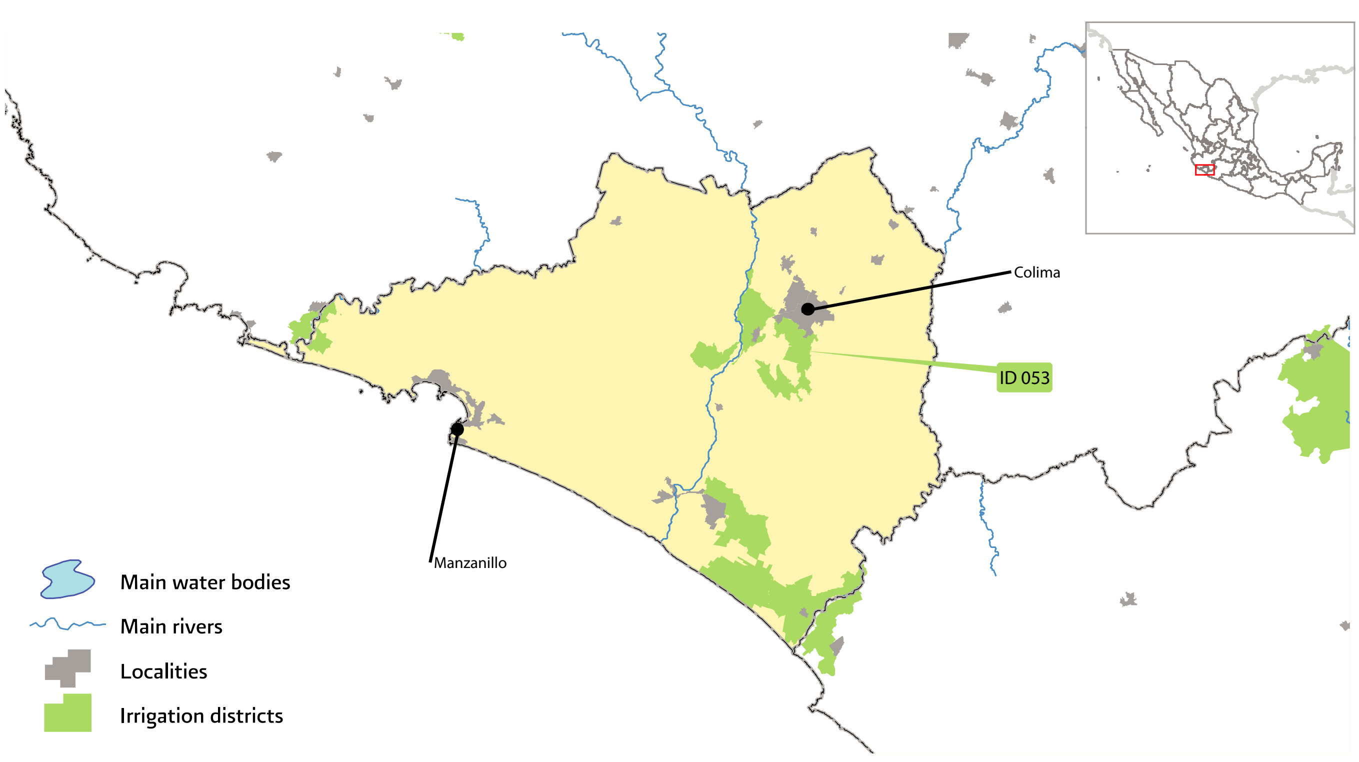
Number of municipalities	10	
Total population 2009	604 730	inhabitants
Urban	532 410	inhabitants
Rural	72 320	inhabitants
Population in 2030	734 269	inhabitants
Normal annual precipitation 1971-2000	935	mm

Treatment plants (as of December 2009)

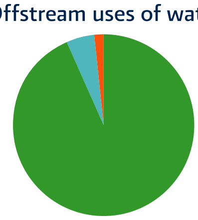
Municipal treatment plants

Number in operation	33	
Capacity installed	0.011	m^3/s
Flow treated	0.005	m^3/s

Wastewater	Municipal	Industrial
Number in operation	69	20
Capacity installed (m^3/s)	1.593	0.663
Flow treated (m^3/s)	1.146	0.287



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 576	1 337	239
Public supply	85	39	46
Self-supplying industry	25	4	20
Thermoelectric plants	0	0	0
Total	1 685	1 380	305

Coverage (2005) (%)

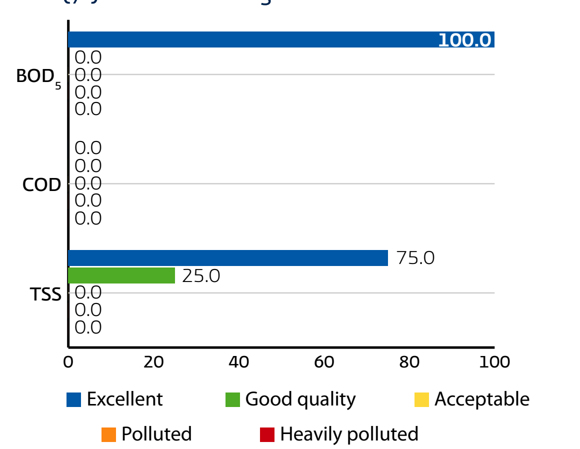
	Drinking water	Sanitation
Regional	97.8	98.2
Urban	99.1	98.8
Rural	88.7	94.2

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	16
COD	0
TSS	16

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

Contextual data

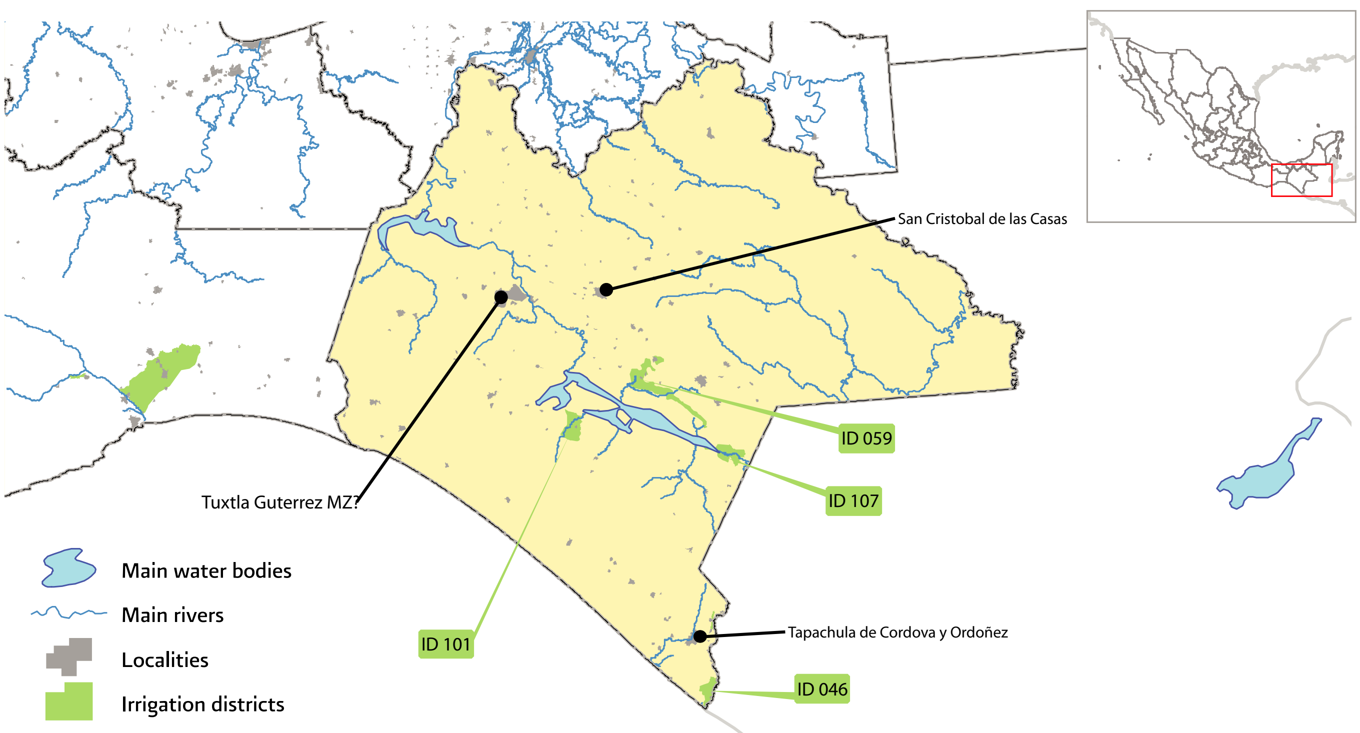
Number of municipalities	118	
Total population 2009	4 530 268	inhabitants
Urban	2 203 769	inhabitants
Rural	2 326 499	inhabitants
Population in 2030	5 297 905	inhabitants
Normal annual precipitation 1971-2000	1 768	mm

Treatment plants (as of December 2009)

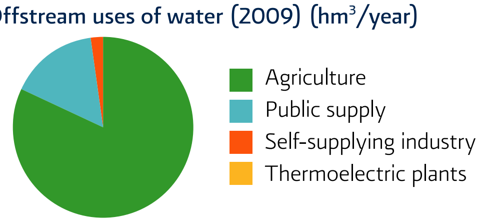
Municipal treatment plants

Number in operation	4	
Capacity installed	4.500	m^3/s
Flow treated	2.510	m^3/s

Wastewater	Municipal	Industrial
Number in operation	28	67
Capacity installed (m^3/s)	1.417	0.883
Flow treated (m^3/s)	0.969	0.610



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 408	1 057	351
Public supply	273	223	50
Self-supplying industry	35	2	33
Thermoelectric plants	0	0	0
Total	1 716	1 281	435

Coverage (2005) (%)

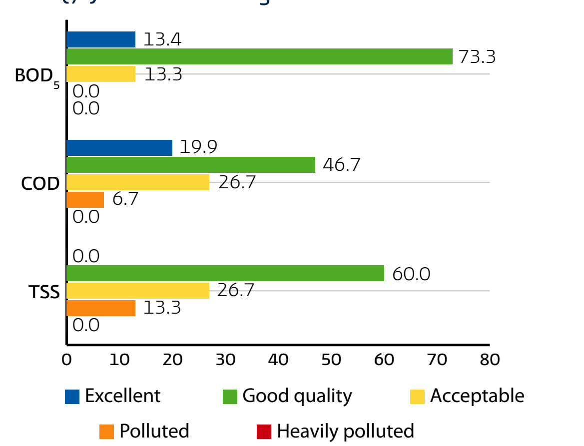
	Drinking water	Sanitation
Regional	73.5	74.7
Urban	86.2	94.1
Rural	61.9	57

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	19
COD	19
TSS	19

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

8. Chihuahua

Contextual data

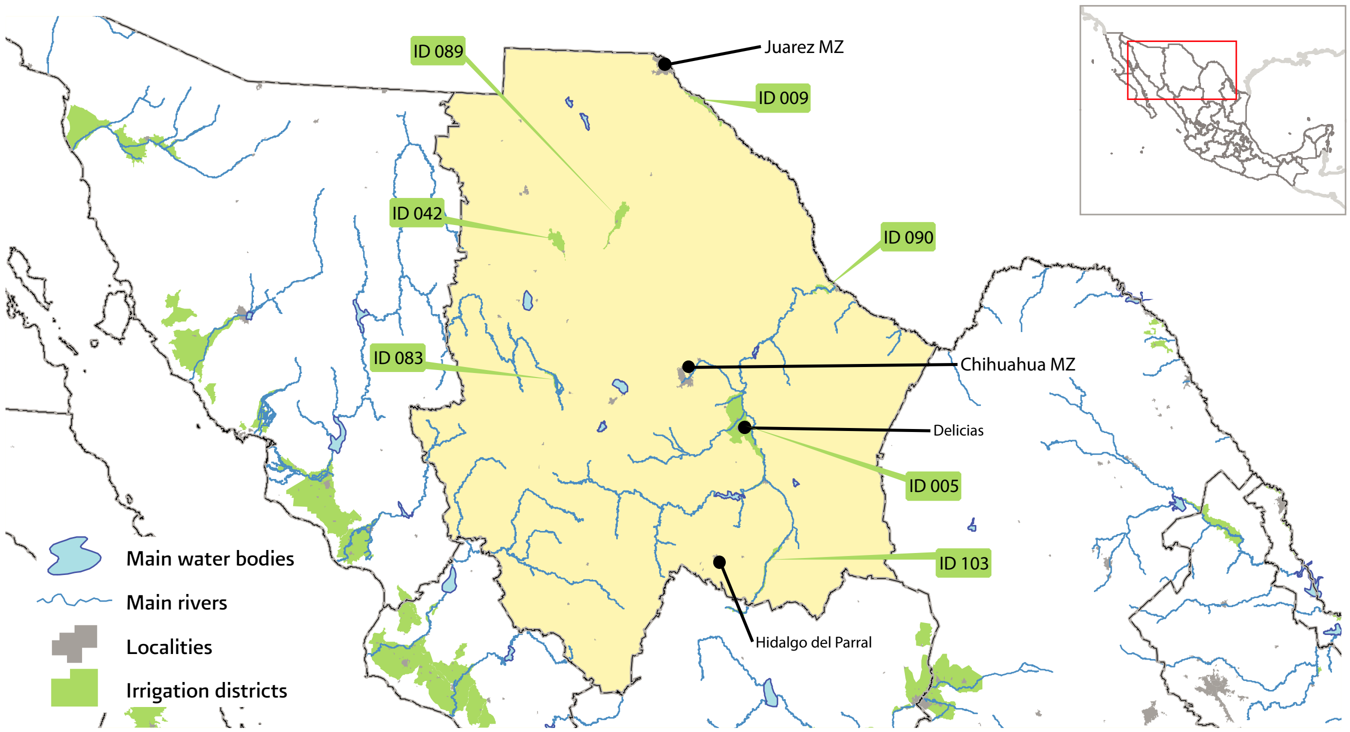
Number of municipalities	67	
Total population 2009	3 406 832	inhabitants
Urban	2 903 491	inhabitants
Rural	503 341	inhabitants
Population in 2030	3 843 745	inhabitants
Normal annual precipitation 1971-2000	459	mm

Treatment plants (as of December 2009)

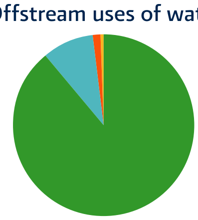
Municipal treatment plants

Number in operation	5	
Capacity installed	0.710	m^3/s
Flow treated	0.420	m^3/s

Wastewater	Municipal	Industrial
Number in operation	140	8
Capacity installed (m^3/s)	9.000	0.467
Flow treated (m^3/s)	5.937	0.311



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	4 590	1 904	2 686
Public supply	476	51	425
Self-supplying industry	58	6	52
Thermoelectric plants	28	0	28
Total	5 151	1 960	3 191

Coverage (2005) (%)

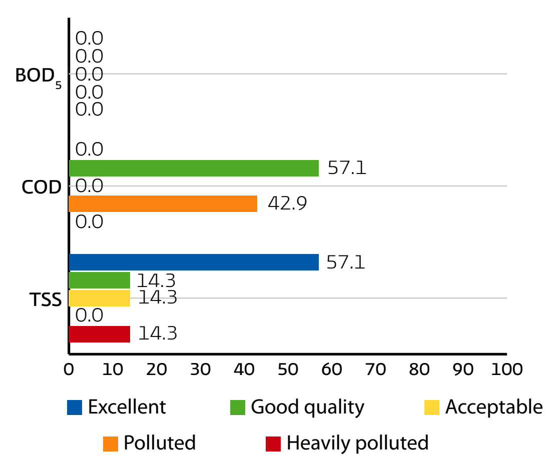
	Drinking water	Sanitation
Regional	92.9	89.8
Urban	98.1	96.5
Rural	65.6	54.4

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	0
COD	7
TSS	7

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

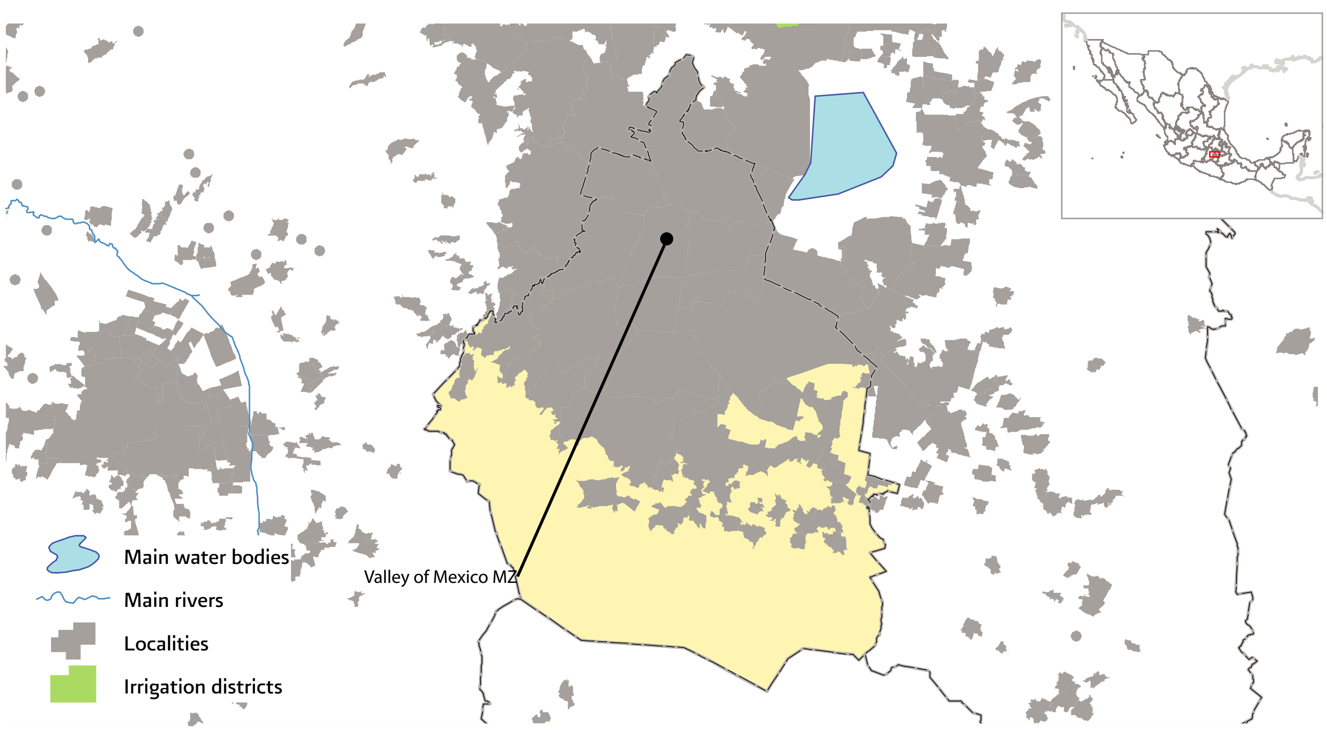
9. Mexico City

Contextual data

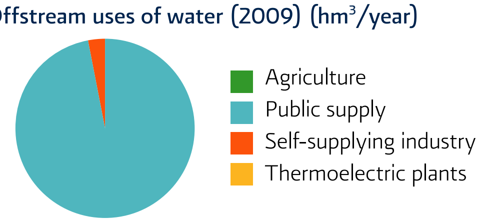
Number of municipalities	16	
Total population 2009	8 844 334	inhabitants
Urban	8 811 461	inhabitants
Rural	32 874	inhabitants
Population in 2030	8 587 531	inhabitants
Normal annual precipitation 1971-2000	863	mm

Treatment plants (as of December 2009)

Municipal treatment plants		
Number in operation	38	
Capacity installed	3.789 m^3/s	
Flow treated	2.935 m^3/s	
Wastewater	**Municipal**	**Industrial**
Number in operation	28	200
Capacity installed (m^3/s)	6.771	0.798
Flow treated (m^3/s)	3.330	0.339



Offstream uses of water (2009) (hm³/year)



	Total	Surface water	Groundwater
Agriculture	1	1	1
Public supply	1 090	309	781
Self-supplying industry	32	0	32
Thermoelectric plants	0	0	0
Total	1 123	310	813

Coverage (2005) (%)

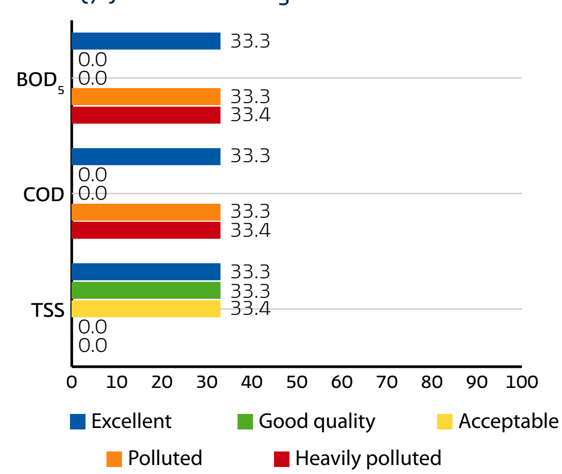
	Drinking water	Sanitation
Regional	97.6	98.6
Urban	97.8	98.6
Rural	41.7	86.6

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	3
COD	3
TSS	3

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

10. Durango

Contextual data

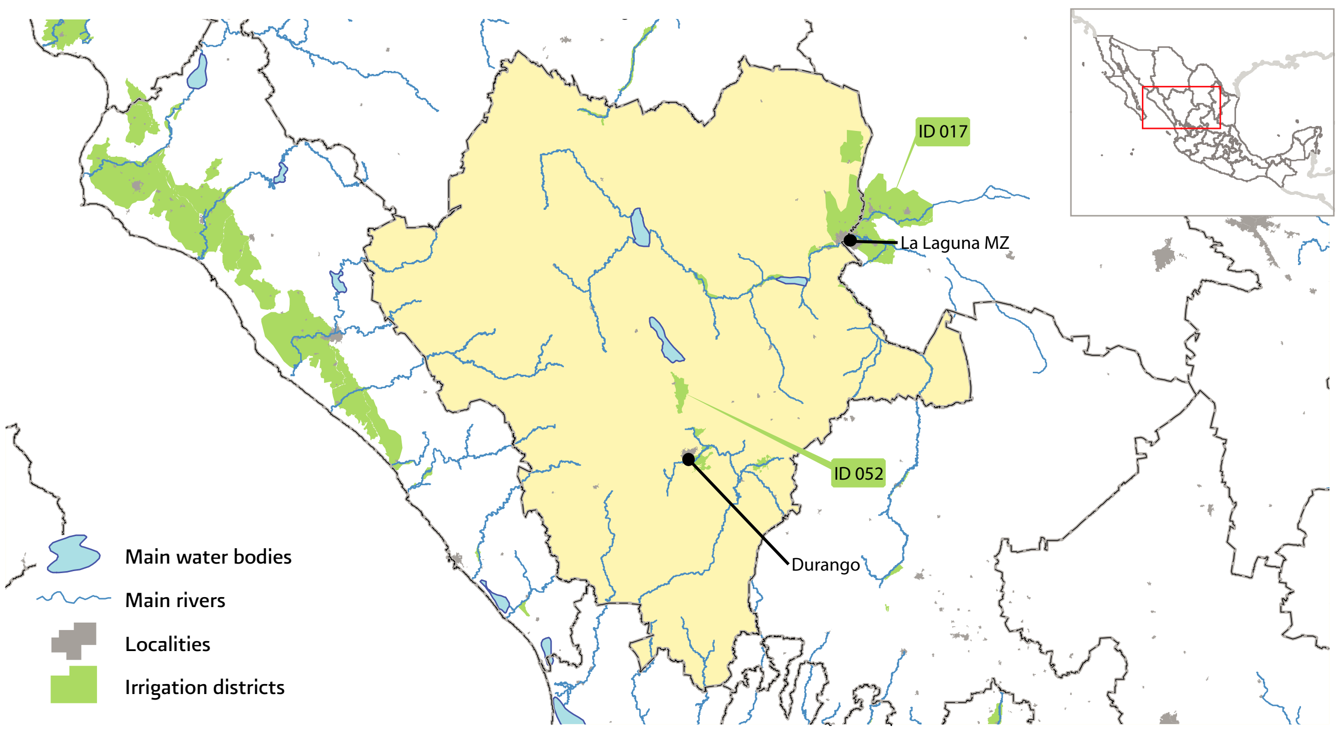
Number of municipalities	39	
Total population 2009	1 553 053	inhabitants
Urban	1 069 203	inhabitants
Rural	483 850	inhabitants
Population in 2030	1 582 932	inhabitants
Normal annual precipitation 1971-2000	574	mm

Treatment plants (as of December 2009)

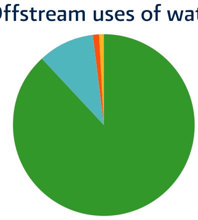
Municipal treatment plants

Number in operation	33	
Capacity installed	0.030	m^3/s
Flow treated	0.022	m^3/s

Wastewater	Municipal	Industrial
Number in operation	174	42
Capacity installed (m^3/s)	4.157	0.834
Flow treated (m^3/s)	3.208	0.469



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 369	732	638
Public supply	153	12	140
Self-supplying industry	18	2	16
Thermoelectric plants	12	0	12
Total	1 552	746	806

Coverage (2005) (%)

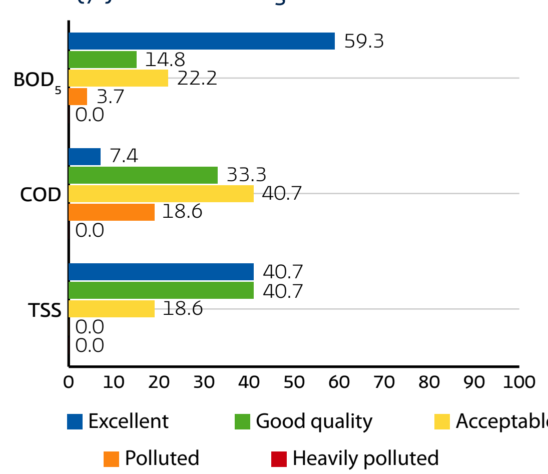
	Drinking water	Sanitation
Regional	90.9	82.6
Urban	98.9	95.4
Rural	74.8	56.9

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	26
COD	26
TSS	26

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

Contextual data

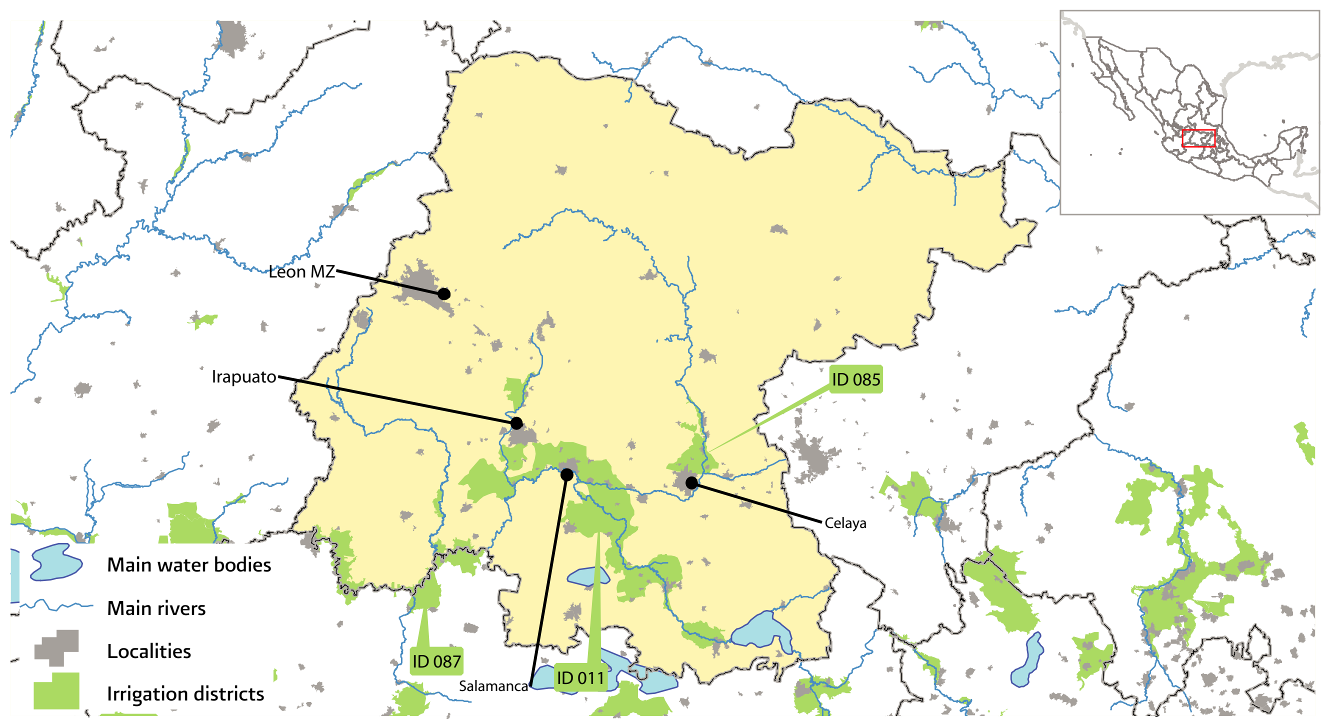
Number of municipalities	46	
Total population 2009	5 055 976	inhabitants
Urban	3 582 725	inhabitants
Rural	1 473 251	inhabitants
Population in 2030	5 278 030	inhabitants
Normal annual precipitation 1971-2000	595	mm

Treatment plants (as of December 2009)

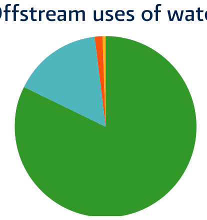
Municipal treatment plants

Number in operation	28	
Capacity installed	0.405	m^3/s
Flow treated	0.343	m^3/s

Wastewater	Municipal	Industrial
Number in operation	60	45
Capacity installed (m^3/s)	5.875	0.398
Flow treated (m^3/s)	4.416	0.180



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	3 444	1 326	2 119
Public supply	651	94	558
Self-supplying industry	60	0	60
Thermoelectric plants	21	0	21
Total	4 177	1 420	2 757

Coverage (2005) (%)

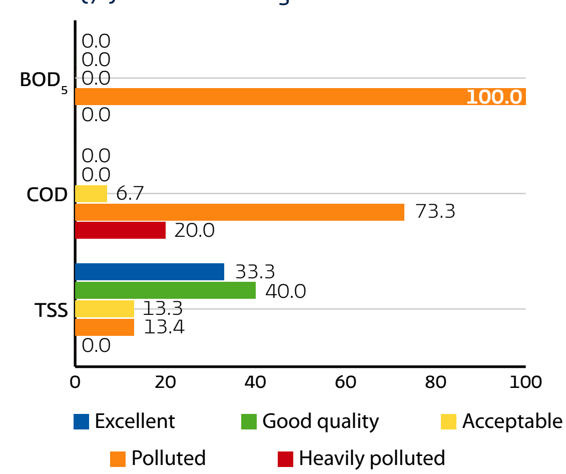
	Drinking water	Sanitation
Regional	93.4	85.8
Urban	96.8	96.6
Rural	85.7	61.1

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	1
COD	24
TSS	23

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

12. Guerrero

Contextual data

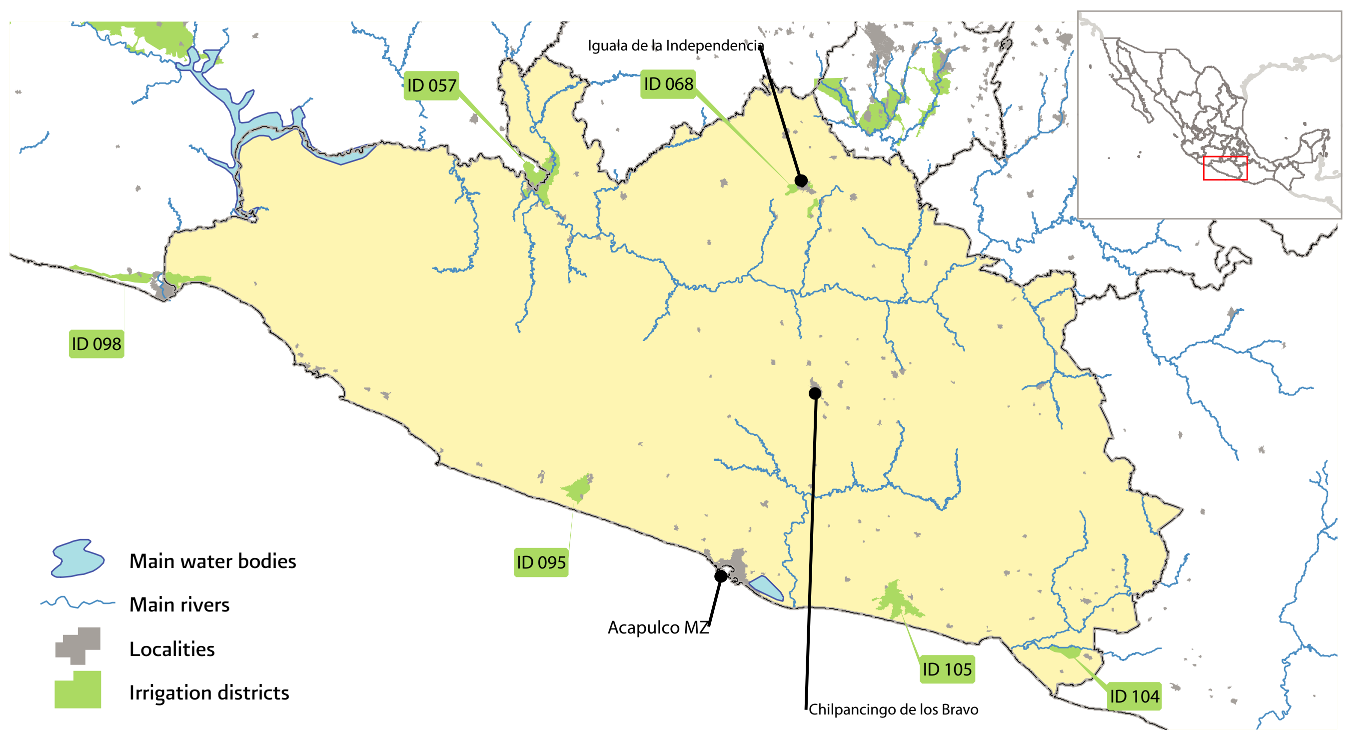
Number of municipalities	81	
Total population 2009	3 137 481	inhabitants
Urban	1 792 742	inhabitants
Rural	1 344 740	inhabitants
Population in 2030	2 887 844	inhabitants
Normal annual precipitation 1971-2000	1 196	mm

Treatment plants (as of December 2009)

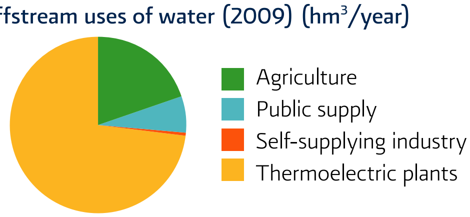
Municipal treatment plants

Number in operation	11	
Capacity installed	3.278	m^3/s
Flow treated	2.973	m^3/s

Wastewater	Municipal	Industrial
Number in operation	47	7
Capacity installed (m^3/s)	3.501	15.333
Flow treated (m^3/s)	2.695	0.026



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	850	772	77
Public supply	289	139	150
Self-supplying industry	16	0	16
Thermoelectric plants	3 122	3 122	0
Total	4 277	4 034	243

Coverage (2005) (%)

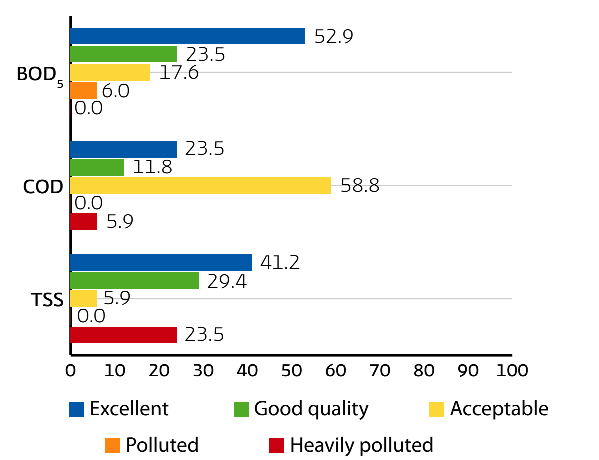
	Drinking water	Sanitation
Regional	68.0	64.2
Urban	81.3	85
Rural	50.4	36.6

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	14
COD	14
TSS	14

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

13. Hidalgo

Contextual data

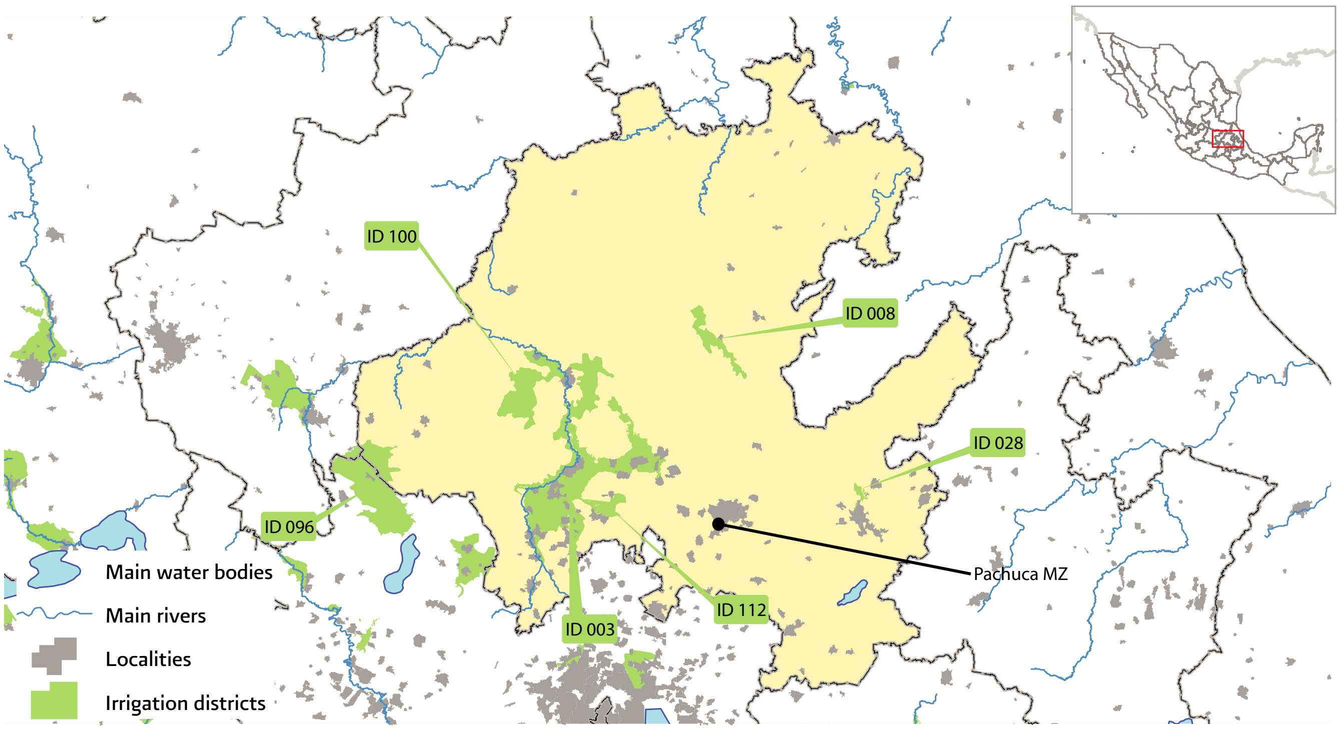
Number of municipalities	84	
Total population 2009	2 427 585	inhabitants
Urban	1 310 841	inhabitants
Rural	1 116 744	inhabitants
Population in 2030	2 573 581	inhabitants
Normal annual precipitation 1971-2000	829	mm

Treatment plants (as of December 2009)

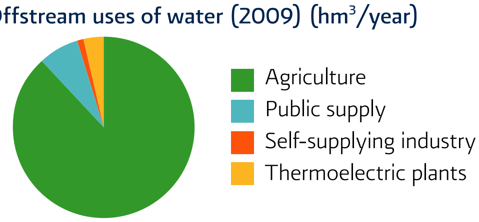
Municipal treatment plants

Number in operation	2	
Capacity installed	0.130	m^3/s
Flow treated	0.130	m^3/s

Wastewater	Municipal	Industrial
Number in operation	12	41
Capacity installed (m^3/s)	0.330	3.487
Flow treated (m^3/s)	0.289	2.996



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	2 080	1 881	199
Public supply	171	46	125
Self-supplying industry	22	13	9
Thermoelectric plants	83	22	61
Total	2 356	1 962	393

Coverage (2005) (%)

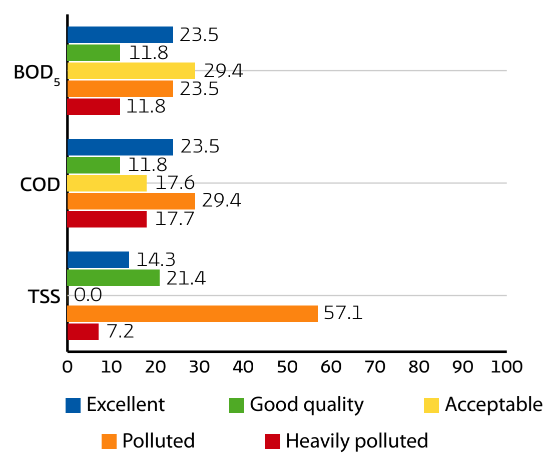
	Drinking water	Sanitation
Regional	87.2	79.1
Urban	96.3	94.8
Rural	77.5	62.1

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	15
COD	16
TSS	17

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

14. Jalisco

Contextual data

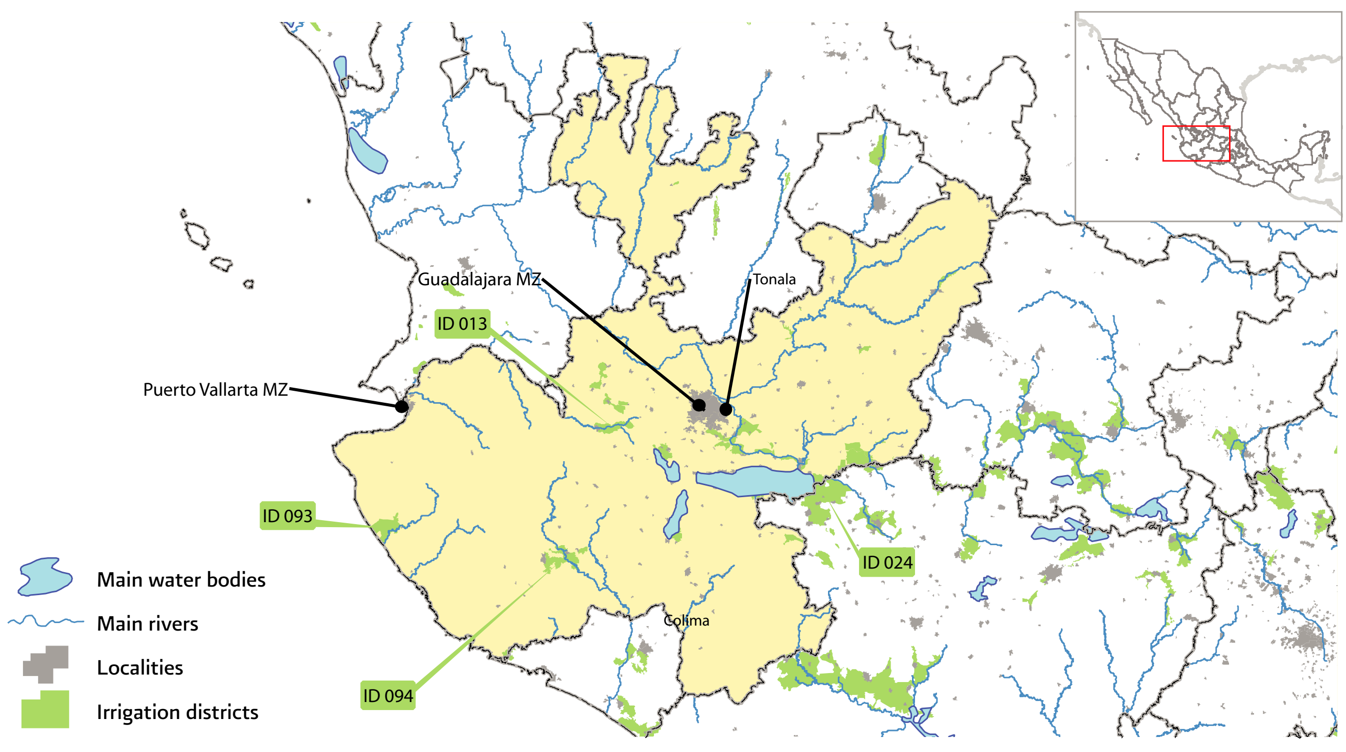
Number of municipalities	125	
Total population 2009	7 043 575	inhabitants
Urban	6 135 550	inhabitants
Rural	908 025	inhabitants
Population in 2030	7 799 254	inhabitants
Normal annual precipitation 1971-2000	889	mm

Treatment plants (as of December 2009)

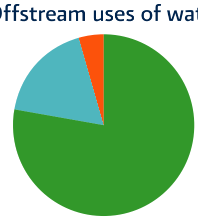
Municipal treatment plants

Number in operation	24	
Capacity installed	16.197	m^3/s
Flow treated	9.490	m^3/s

Wastewater	Municipal	Industrial
Number in operation	122	36
Capacity installed (m^3/s)	4.202	1.512
Flow treated (m^3/s)	3.530	1.512



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	3 171	1 716	1 455
Public supply	724	389	335
Self-supplying industry	170	21	149
Thermoelectric plants	0	0	0
Total	4 065	2 126	1 939

Coverage (2005) (%)

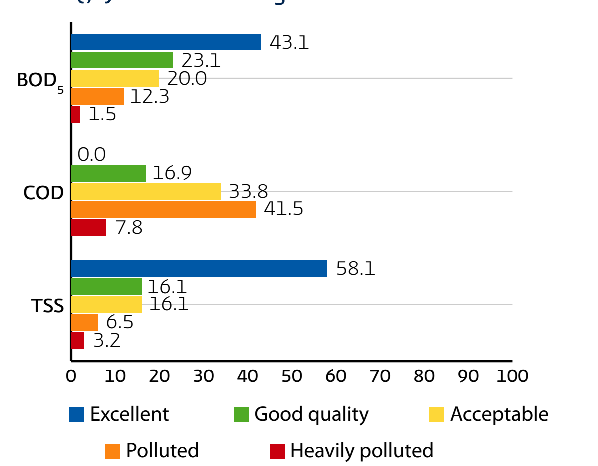
	Drinking water	Sanitation
Regional	93.3	95.8
Urban	95.8	98.2
Rural	77.9	81

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	56
COD	56
TSS	56

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

15. State of Mexico

Contextual data

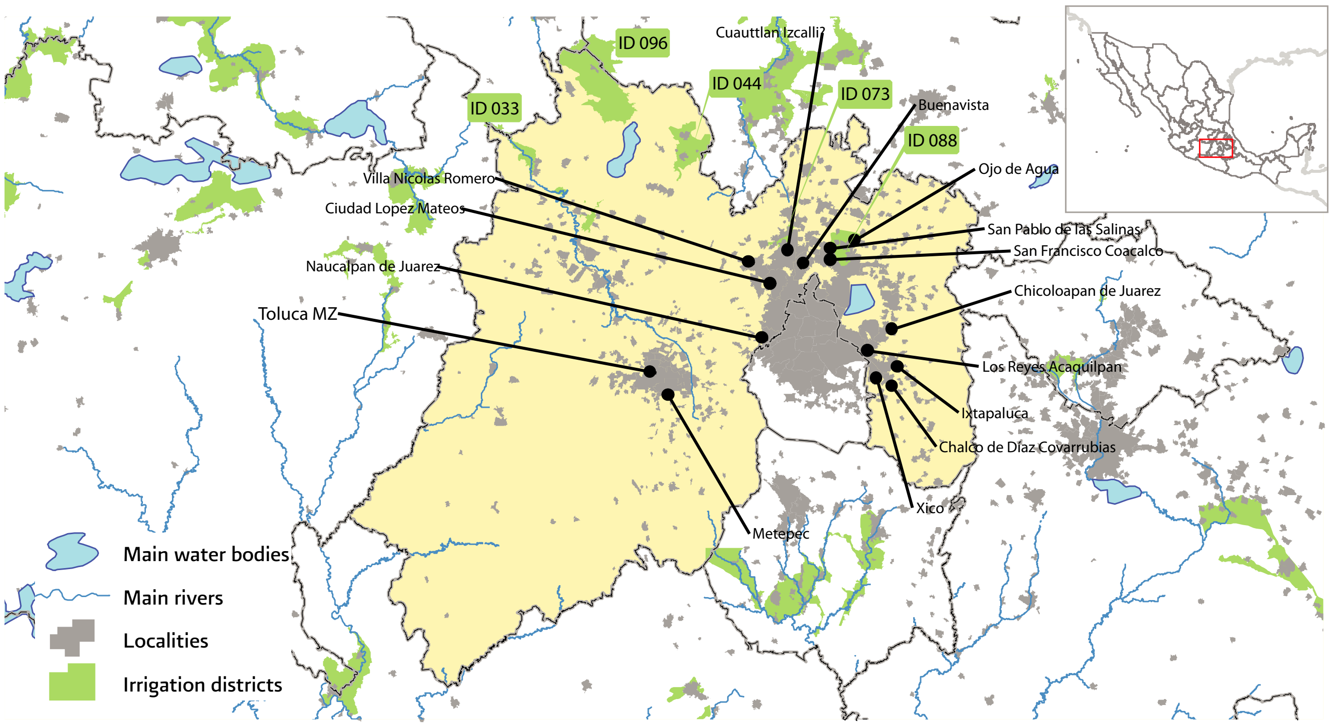
Number of municipalities	125	
Total population 2009	14 934 468	inhabitants
Urban	13 072 748	inhabitants
Rural	1 861 720	inhabitants
Population in 2030	18 114 304	inhabitants
Normal annual precipitation 1971-2000	847	mm

Treatment plants (as of December 2009)

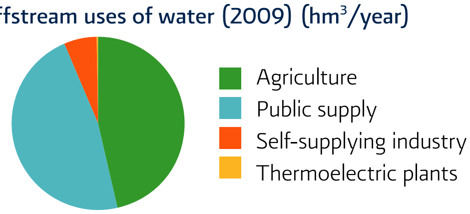
Municipal treatment plants

Number in operation	11	
Capacity installed	22.164	m^3/s
Flow treated	16.739	m^3/s

Wastewater	Municipal	Industrial
Number in operation	78	315
Capacity installed (m^3/s)	7.090	4.836
Flow treated (m^3/s)	5.190	3.275



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 270	869	401
Public supply	1 280	283	996
Self-supplying industry	167	38	129
Thermoelectric plants	7	0	7
Total	2 723	1 190	1 533

Coverage (2005) (%)

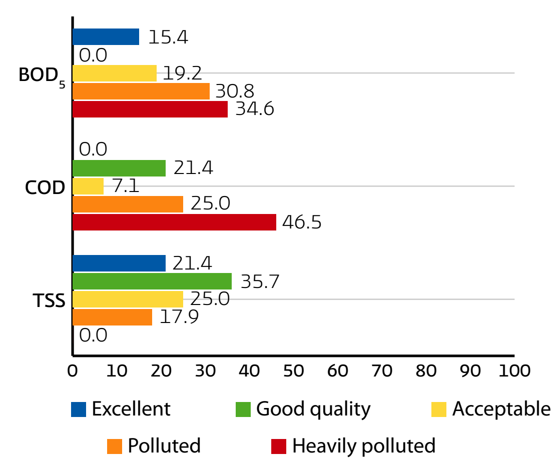
	Drinking water	Sanitation
Regional	93.2	91.2
Urban	95.6	96
Rural	77.4	59.9

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	28
COD	28
TSS	28

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

16. Michoacan de Ocampo

Contextual data

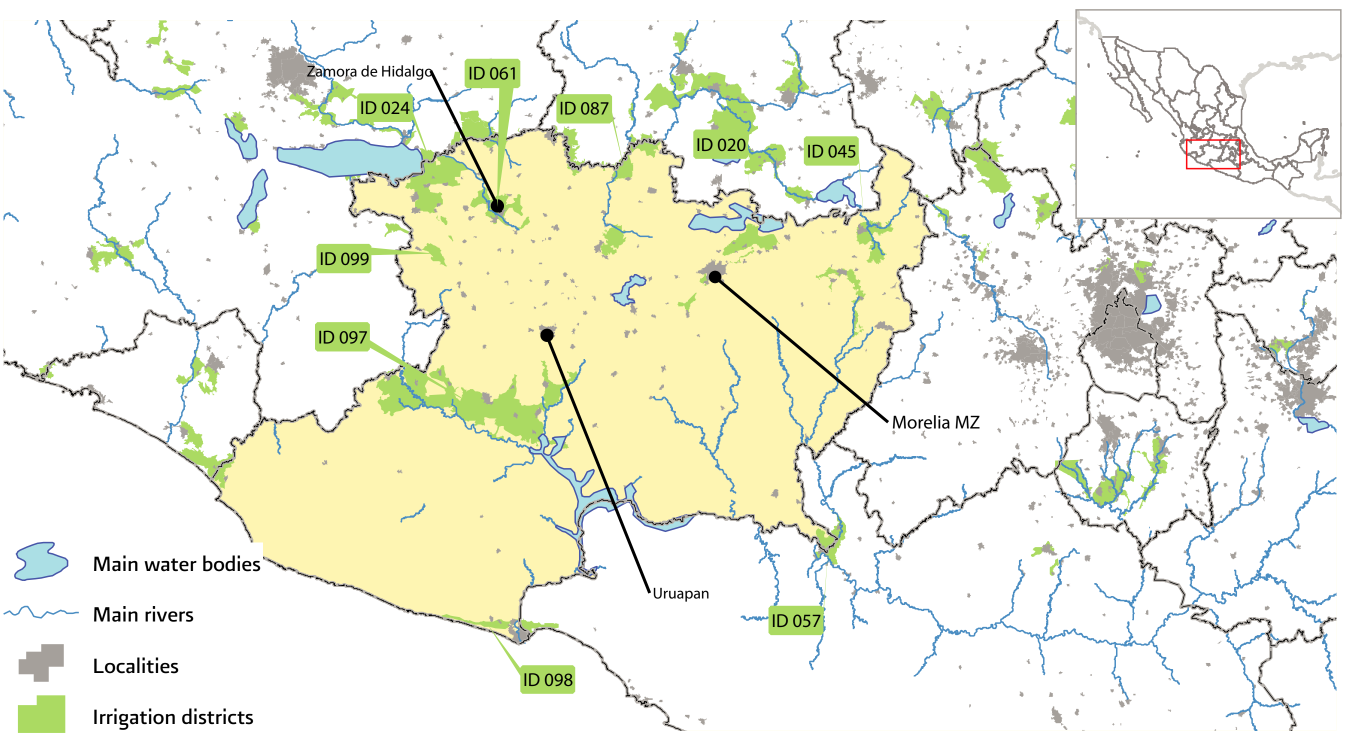
Number of municipalities	113	
Total population 2009	3 956 693	inhabitants
Urban	2 704 087	inhabitants
Rural	1 252 606	inhabitants
Population in 2030	3 538 187	inhabitants
Normal annual precipitation 1971-2000	910	mm

Treatment plants (as of December 2009)

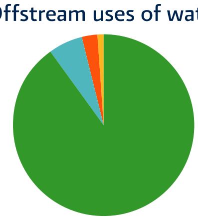
Municipal treatment plants

Number in operation	5	
Capacity installed	3.025	m^3/s
Flow treated	2.495	m^3/s

Wastewater	Municipal	Industrial
Number in operation	25	76
Capacity installed (m^3/s)	3.583	2.833
Flow treated (m^3/s)	2.793	0.626



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	4 629	3 674	955
Public supply	313	180	132
Self-supplying industry	144	115	29
Thermoelectric plants	48	0	48
Total	5 134	3 970	1 165

Coverage (2005) (%)

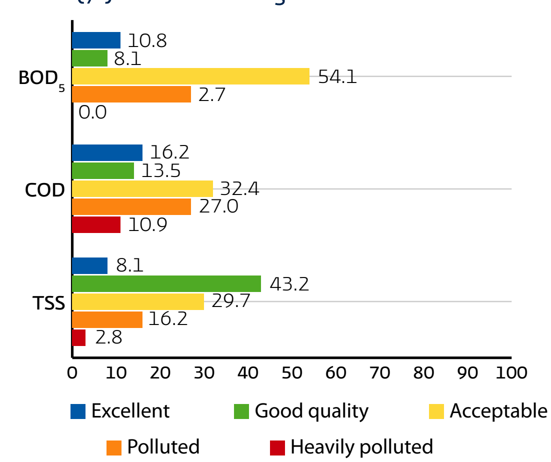
	Drinking water	Sanitation
Regional	89.4	84.2
Urban	95.1	93
Rural	77.7	66.1

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	45
COD	45
TSS	45

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

Contextual data

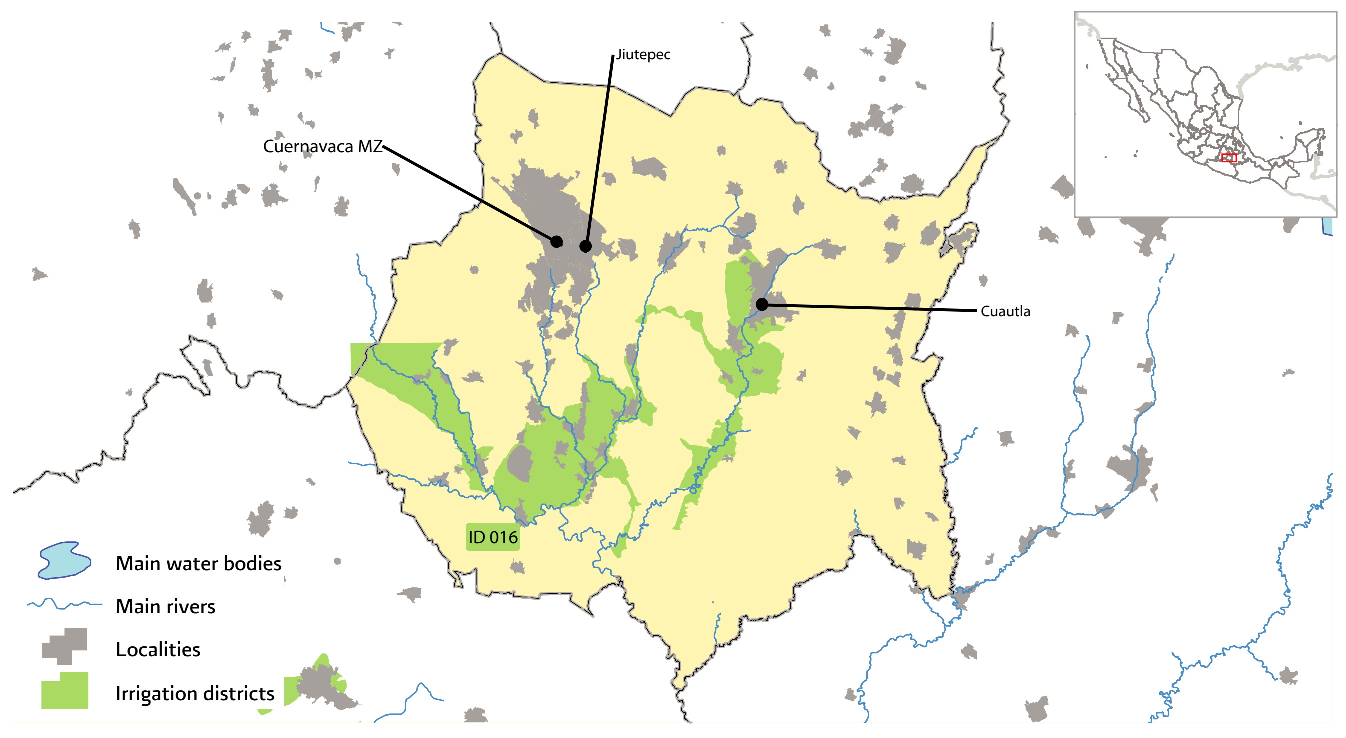
Number of municipalities	33	
Total population 2009	1 681 096	inhabitants
Urban	1 453 175	inhabitants
Rural	227 921	inhabitants
Population in 2030	1 858 697	inhabitants
Normal annual precipitation 1971-2000	976	mm

Treatment plants (as of December 2009)

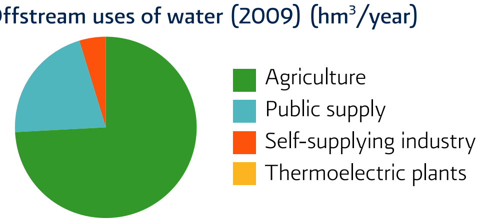
Municipal treatment plants

Number in operation	0	
Capacity installed	0.000	m^3/s
Flow treated	0.000	m^3/s

Wastewater	Municipal	Industrial
Number in operation	38	81
Capacity installed (m^3/s)	1.905	1.224
Flow treated (m^3/s)	1.366	0.763



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	938	842	96
Public supply	266	25	242
Self-supplying industry	57	27	30
Thermoelectric plants	0	0	0
Total	1 261	893	368

Coverage (2005) (%)

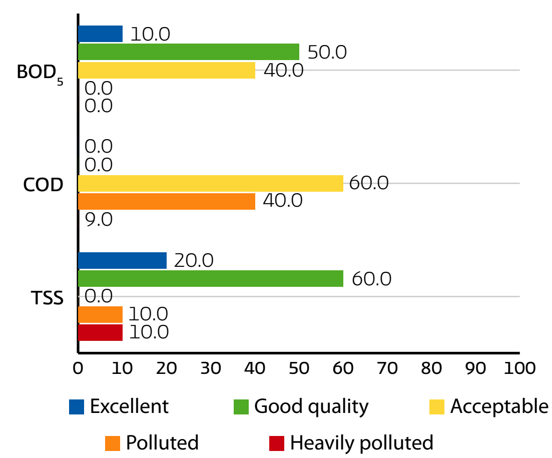
	Drinking water	Sanitation
Regional	91.6	92.6
Urban	94.8	95.1
Rural	72.4	77.2

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	22
COD	22
TSS	22

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

18. Nayarit

Contextual data

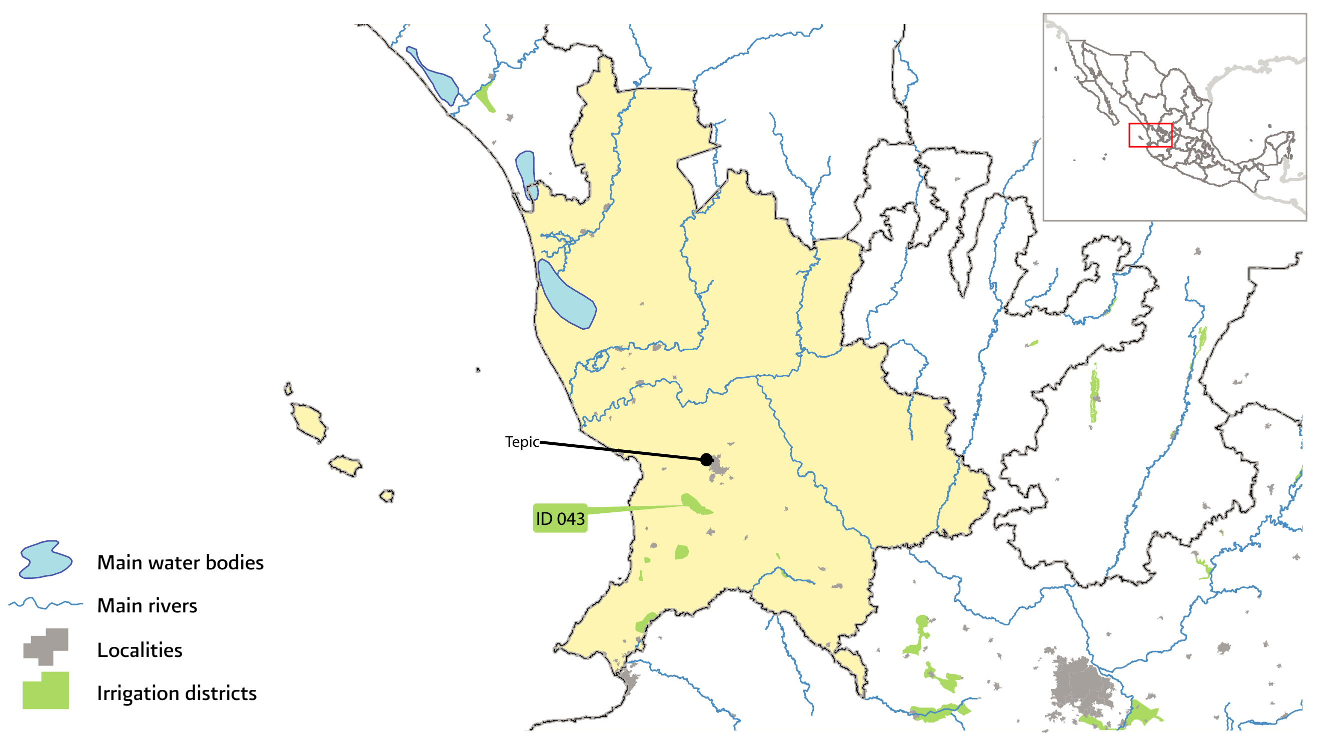
Number of municipalities	20	
Total population 2009	970 727	inhabitants
Urban	659 500	inhabitants
Rural	311 227	inhabitants
Population in 2030	987 760	inhabitants
Normal annual precipitation 1971-2000	1 193	mm

Treatment plants (as of December 2009)

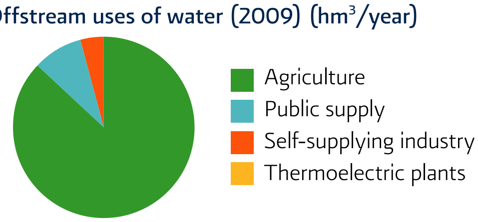
Municipal treatment plants

Number in operation	0	
Capacity installed	0.000	m^3/s
Flow treated	0.000	m^3/s

Wastewater	Municipal	Industrial
Number in operation	63	4
Capacity installed (m^3/s)	2.294	0.163
Flow treated (m^3/s)	1.428	0.163



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 057	967	89
Public supply	107	20	87
Self-supplying industry	50	20	30
Thermoelectric plants	0	0	0
Total	1 213	1 008	205

Coverage (2005) (%)

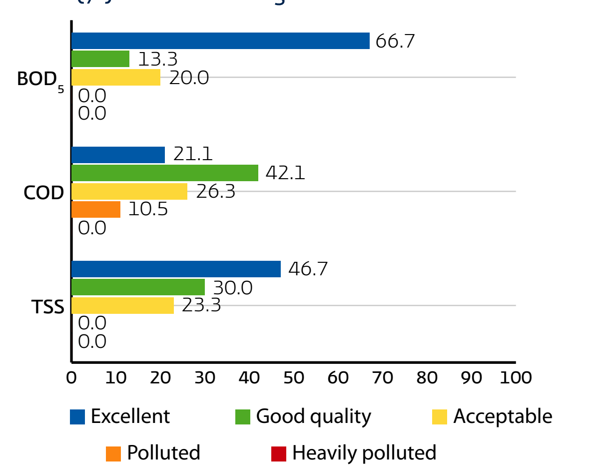
	Drinking water	Sanitation
Regional	91.4	90.9
Urban	96.5	97.7
Rural	81.2	77.6

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	30
COD	20
TSS	30

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

Contextual data

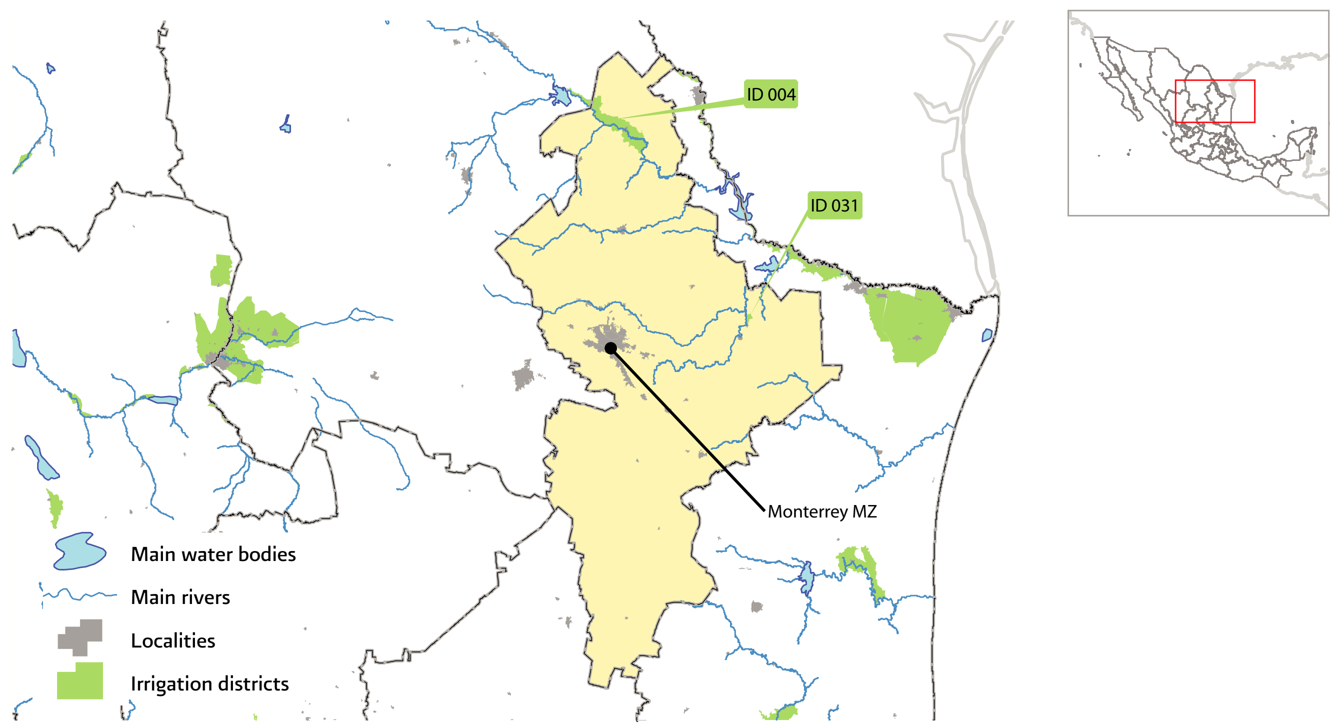
Number of municipalities	51	
Total population 2009	4 475 052	inhabitants
Urban	4 236 665	inhabitants
Rural	238 387	inhabitants
Population in 2030	5 406 220	inhabitants
Normal annual precipitation 1971-2000	589	mm

Treatment plants (as of December 2009)

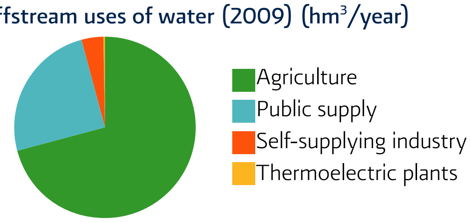
Municipal treatment plants

Number in operation	12	
Capacity installed	14.571	m^3/s
Flow treated	7.251	m^3/s

Wastewater	Municipal	Industrial
Number in operation	61	84
Capacity installed (m^3/s)	13.249	4.131
Flow treated (m^3/s)	10.877	3.000



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 459	812	647
Public supply	512	356	156
Self-supplying industry	83	0	83
Thermoelectric plants	1	0	1
Total	2 054	1 168	886

Coverage (2005) (%)

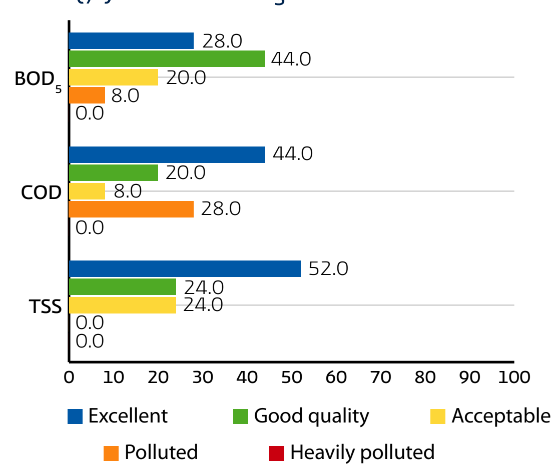
	Drinking water	Sanitation
Regional	95.6	95.3
Urban	97.7	97.5
Rural	60.5	57.8

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	49
COD	49
TSS	49

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

20. Oaxaca

Contextual data

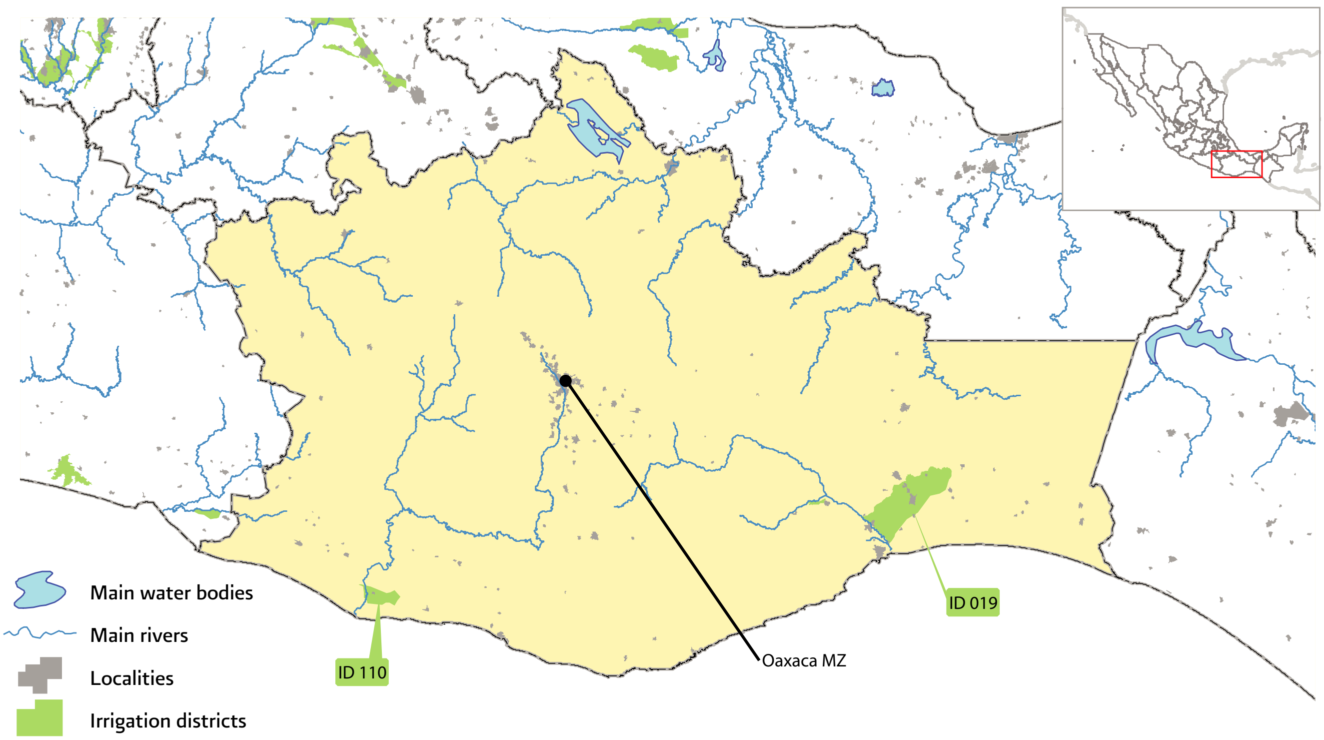
Number of municipalities	570	
Total population 2009	3 549 706	inhabitants
Urban	1 693 252	inhabitants
Rural	1 856 454	inhabitants
Population in 2030	3 402 505	inhabitants
Normal annual precipitation 1971-2000	1 183	mm

Treatment plants (as of December 2009)

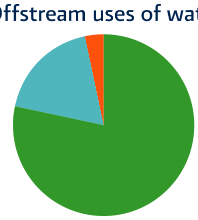
Municipal treatment plants

Number in operation	6	
Capacity installed	1.291	m^3/s
Flow treated	0.771	m^3/s

Wastewater	Municipal	Industrial
Number in operation	66	15
Capacity installed (m^3/s)	1.510	1.221
Flow treated (m^3/s)	0.986	0.901



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	875	658	217
Public supply	204	80	123
Self-supplying industry	35	8	27
Thermoelectric plants	0	0	0
Total	1 114	747	367

Coverage (2005) (%)

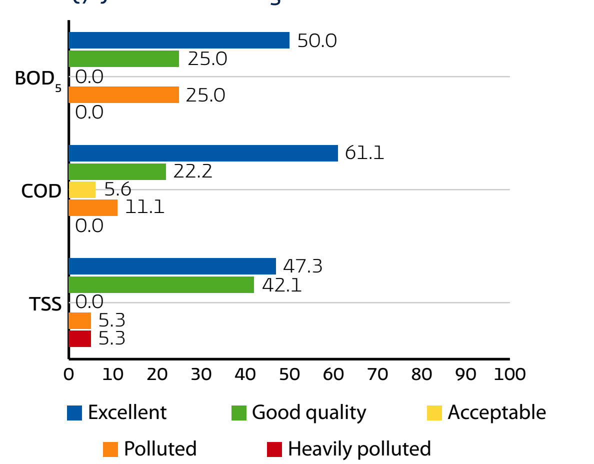
	Drinking water	Sanitation
Regional	73.3	60
Urban	84.7	84
Rural	63.4	39.2

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	4
COD	29
TSS	29

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

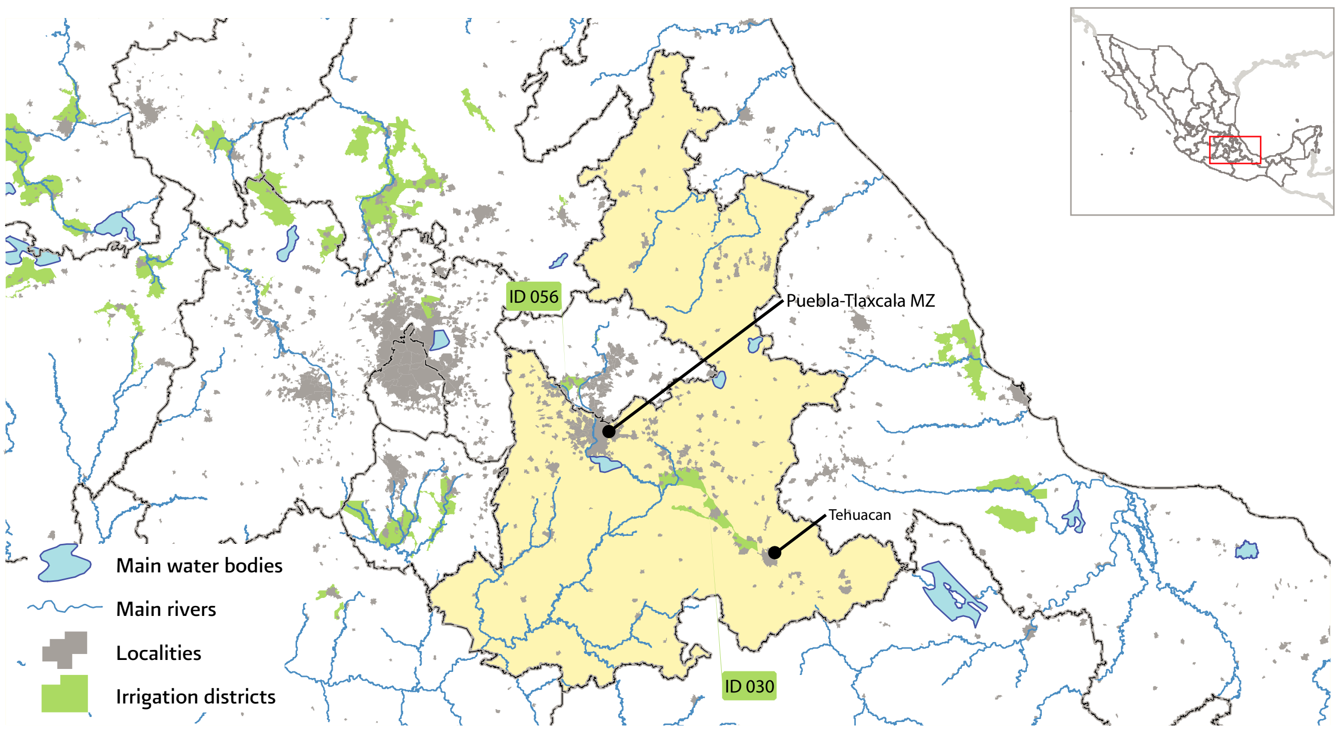
Contextual data

Number of municipalities	217	
Total population 2009	5 678 445	inhabitants
Urban	4 100 469	inhabitants
Rural	1 577 977	inhabitants
Population in 2030	6 536 966	inhabitants
Normal annual precipitation 1971-2000	1 040	mm

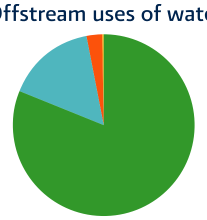
Treatment plants (as of December 2009)

Municipal treatment plants		
Number in operation	4	
Capacity installed	0.715	m^3/s
Flow treated	0.545	m^3/s

Wastewater	Municipal	Industrial
Number in operation	72	116
Capacity installed (m^3/s)	3.152	2.988
Flow treated (m^3/s)	2.545	2.718



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 962	1 192	770
Public supply	385	142	243
Self-supplying industry	65	14	51
Thermoelectric plants	6	0	6
Total	2 418	1 348	1 070

Coverage (2005) (%)

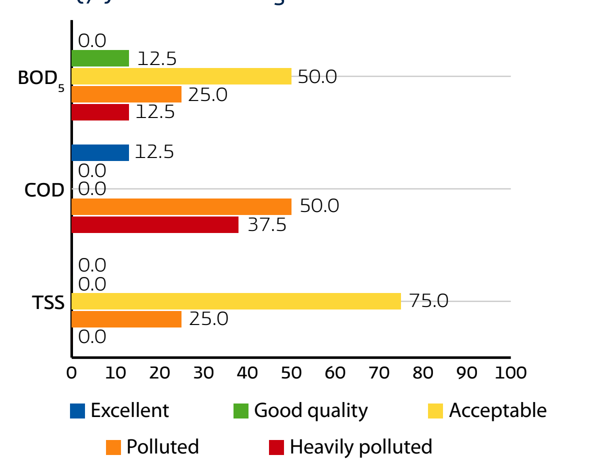
	Drinking water	Sanitation
Regional	85.4	79
Urban	90.3	89.9
Rural	74.0	53.6

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	11
COD	11
TSS	11

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

22. Queretaro

Contextual data

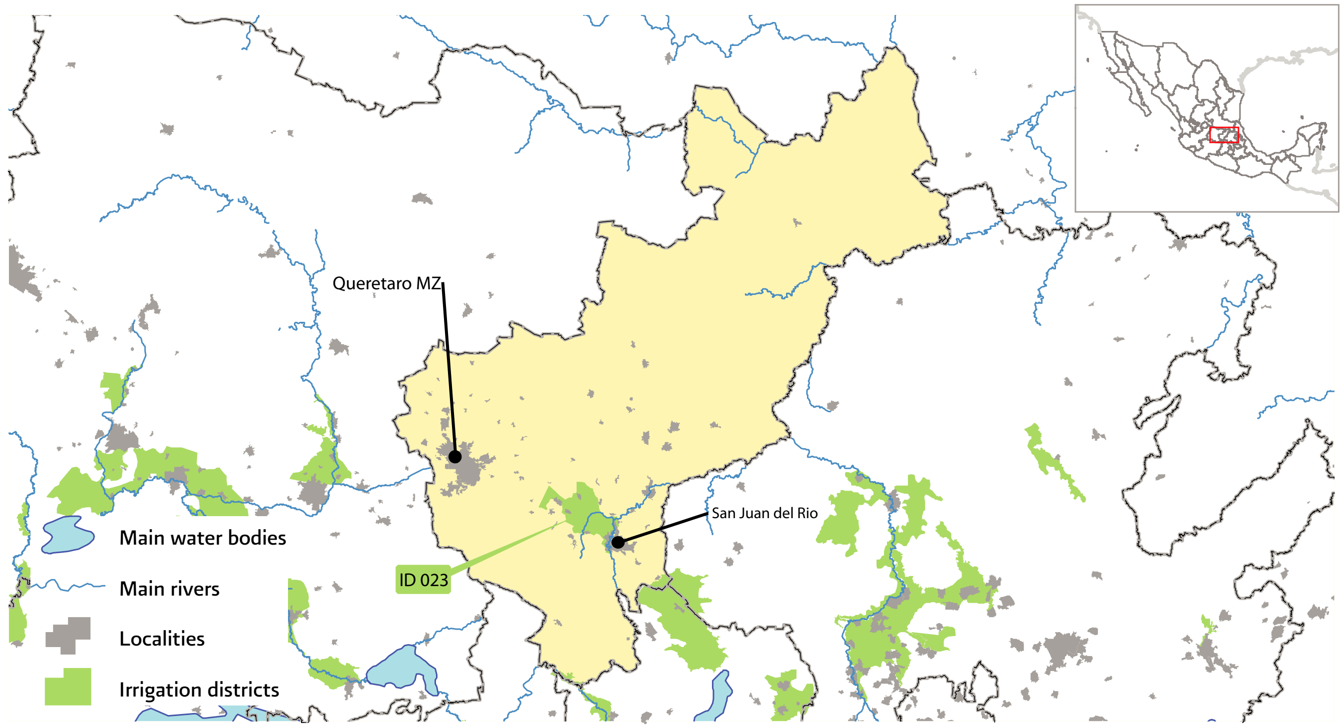
Number of municipalities	18	
Total population 2009	1 735 761	inhabitants
Urban	1 249 310	inhabitants
Rural	486 451	inhabitants
Population in 2030	2 306 838	inhabitants
Normal annual precipitation 1971-2000	736	mm

Treatment plants (as of December 2009)

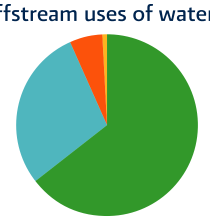
Municipal treatment plants

Number in operation	6	
Capacity installed	0.269	m^3/s
Flow treated	0.212	m^3/s

Wastewater	Municipal	Industrial
Number in operation	75	120
Capacity installed (m^3/s)	1.202	1.194
Flow treated (m^3/s)	0.800	0.509



Offstream uses of water (2009) ($hm^3/year$)



	Total	Surface water	Groundwater
Agriculture	659	170	488
Public supply	294	151	143
Self-supplying industry	61	1	60
Thermoelectric plants	6	0	6
Total	1 020	322	697

Coverage (2005) (%)

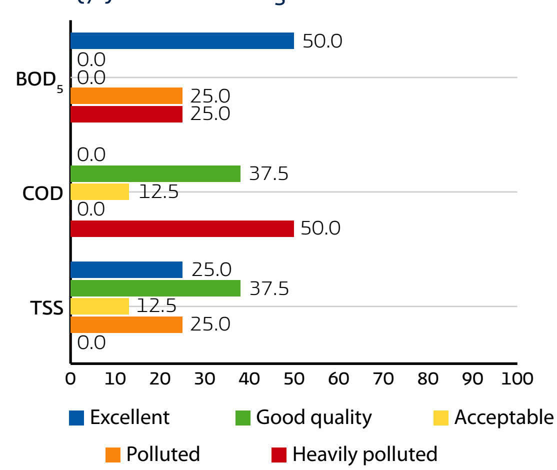
	Drinking water	Sanitation
Regional	93.7	85.6
Urban	97.9	95.1
Rural	84.3	64.1

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	8
COD	8
TSS	8

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

23. Quintana Roo

Contextual data

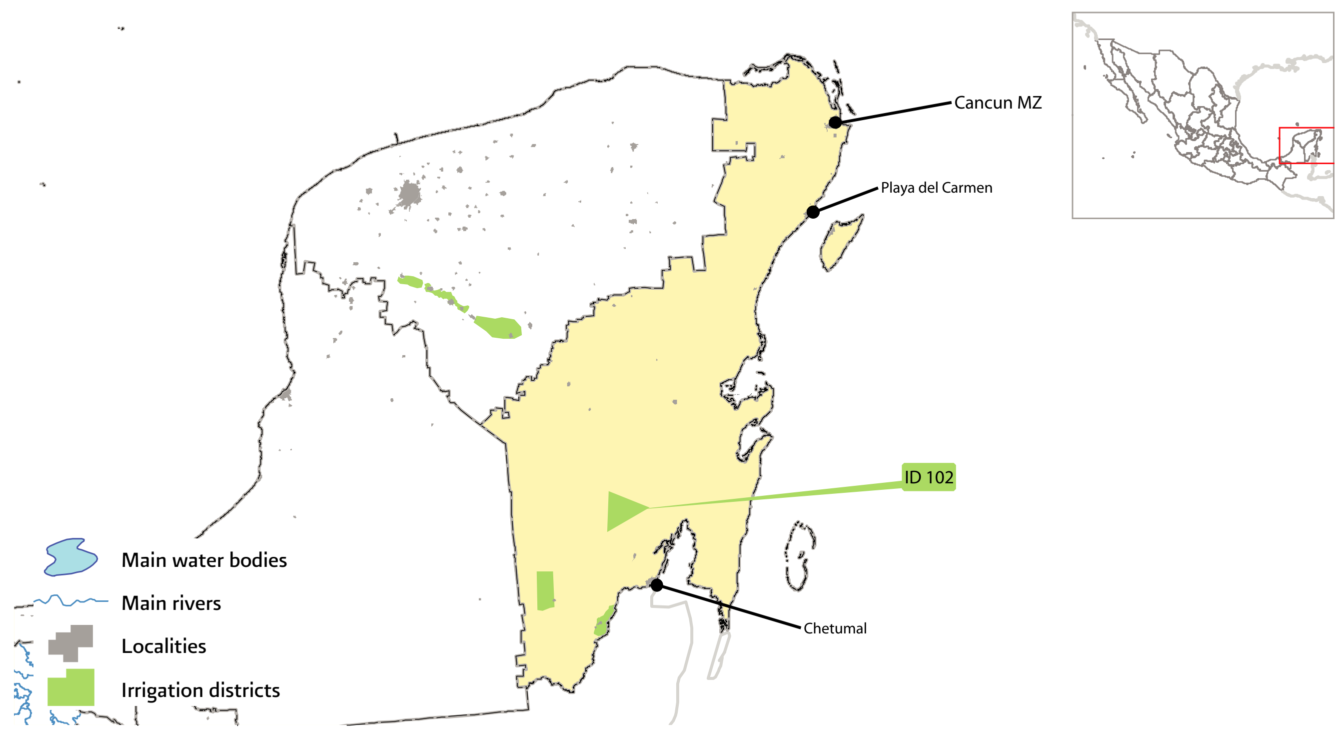
Number of municipalities	9	
Total population 2009	1 337 942	inhabitants
Urban	1 165 791	inhabitants
Rural	172 151	inhabitants
Population in 2030	2 454 389	inhabitants
Normal annual precipitation 1971-2000	1 237	mm

Treatment plants (as of December 2009)

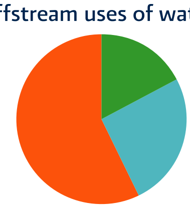
Municipal treatment plants

Number in operation	0	
Capacity installed	0.000	m^3/s
Flow treated	0.000	m^3/s

Wastewater	Municipal	Industrial
Number in operation	31	2
Capacity installed (m^3/s)	2.212	0.011
Flow treated (m^3/s)	1.725	0.005



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	138	1	137
Public supply	202	0	202
Self-supplying industry	452	0	452
Thermoelectric plants	0	0	0
Total	792	1	791

Coverage (2005) (%)

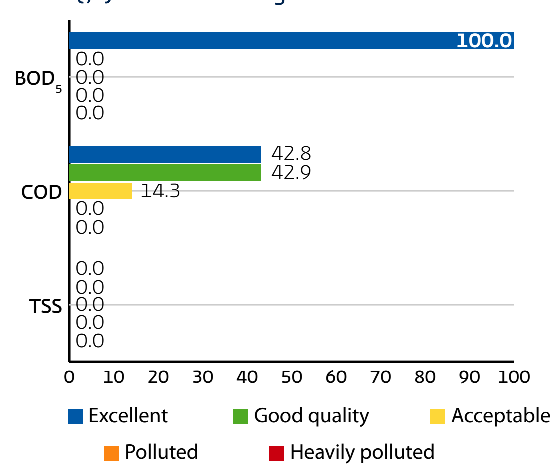
	Drinking water	Sanitation
Regional	94.5	89.5
Urban	96.1	95.9
Rural	85.8	53.9

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	12
COD	12
TSS	12

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

24. San Luis Potosi

Contextual data

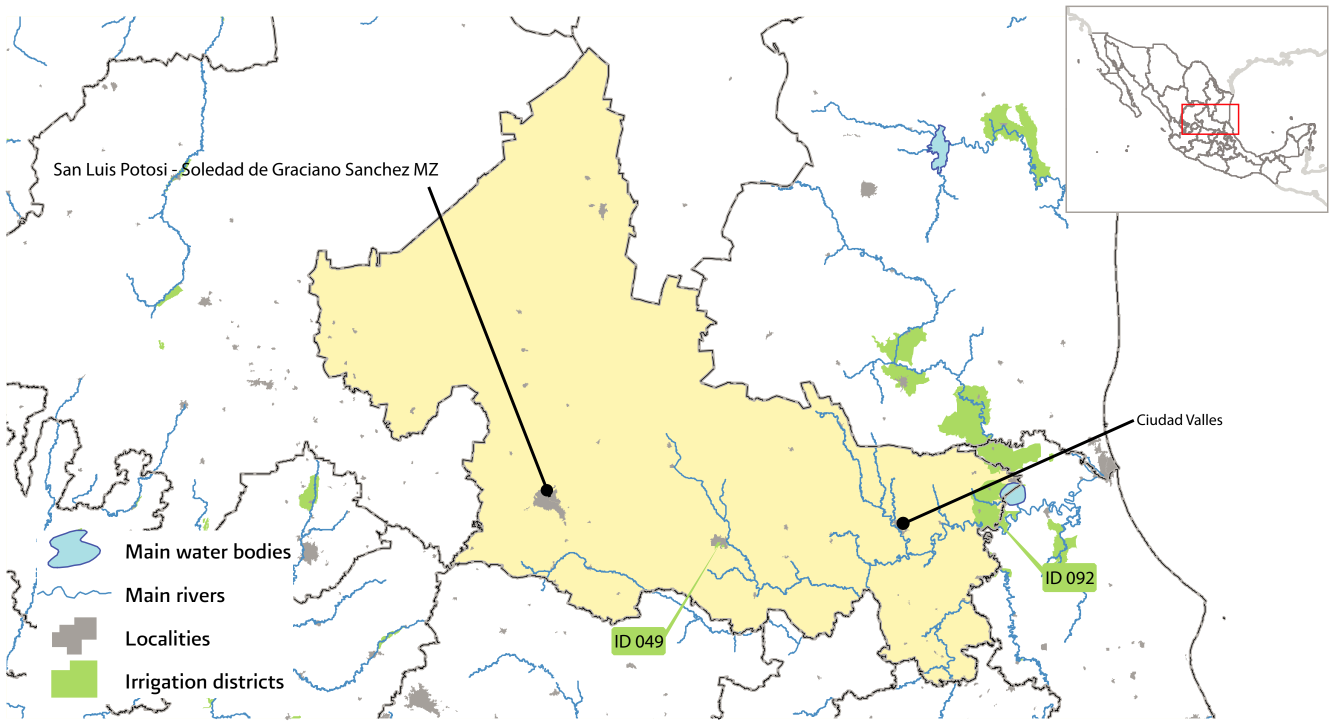
Number of municipalities	58	
Total population 2009	2 490 231	inhabitants
Urban	1 590 250	inhabitants
Rural	899 982	inhabitants
Population in 2030	2 598 934	inhabitants
Normal annual precipitation 1971-2000	699	mm

Treatment plants (as of December 2009)

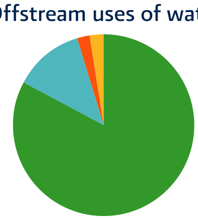
Municipal treatment plants

Number in operation	14	
Capacity installed	1.315	m^3/s
Flow treated	0.957	m^3/s

Wastewater	Municipal	Industrial
Number in operation	30	81
Capacity installed (m^3/s)	2.334	1.331
Flow treated (m^3/s)	1.906	1.184



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 131	574	557
Public supply	171	29	143
Self-supplying industry	30	8	22
Thermoelectric plants	31	14	17
Total	1 363	625	739

Coverage (2005) (%)

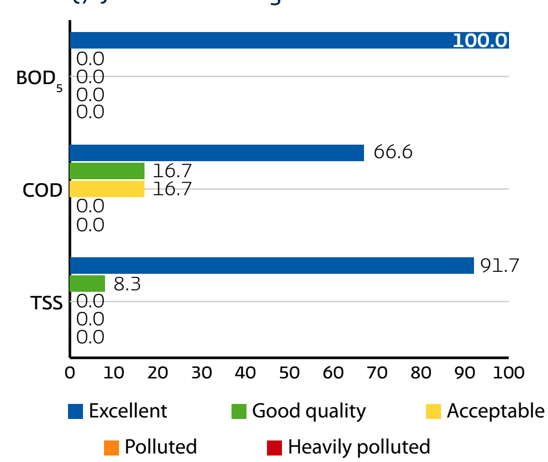
	Drinking water	Sanitation
Regional	82.7	74.2
Urban	97.5	93.2
Rural	58.2	42.8

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	12
COD	12
TSS	12

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

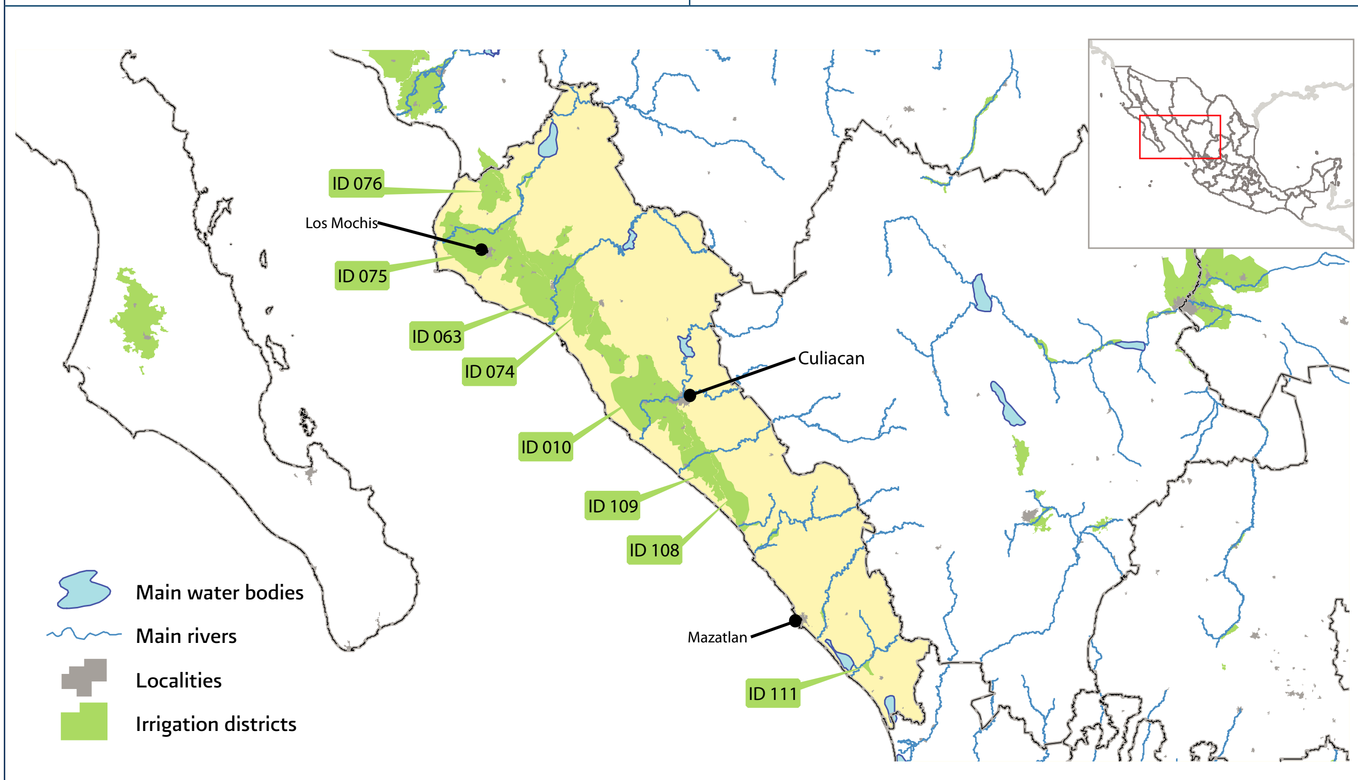
Contextual data

Number of municipalities	18	
Total population 2009	2 654 201	inhabitants
Urban	1 895 810	inhabitants
Rural	758 391	inhabitants
Population in 2030	2 612 436	inhabitants
Normal annual precipitation 1971-2000	730	mm

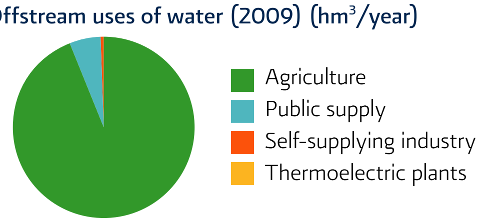
Treatment plants (as of December 2009)

Municipal treatment plants		
Number in operation	142	
Capacity installed	9.267	m^3/s
Flow treated	7.744	m^3/s

Wastewater	Municipal	Industrial
Number in operation	162	89
Capacity installed (m^3/s)	5.497	3.208
Flow treated (m^3/s)	4.574	0.800



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	8 635	7 967	669
Public supply	508	280	229
Self-supplying industry	43	35	8
Thermoelectric plants	0	0	0
Total	9 186	8 281	905

Coverage (2005) (%)

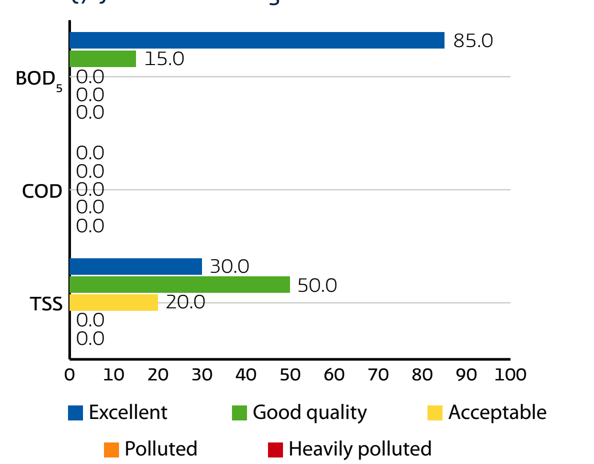
	Drinking water	Sanitation
Regional	93.1	86.4
Urban	98.3	94.8
Rural	80.6	66.3

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	20
COD	0
TSS	20

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

26. Sonora

Contextual data

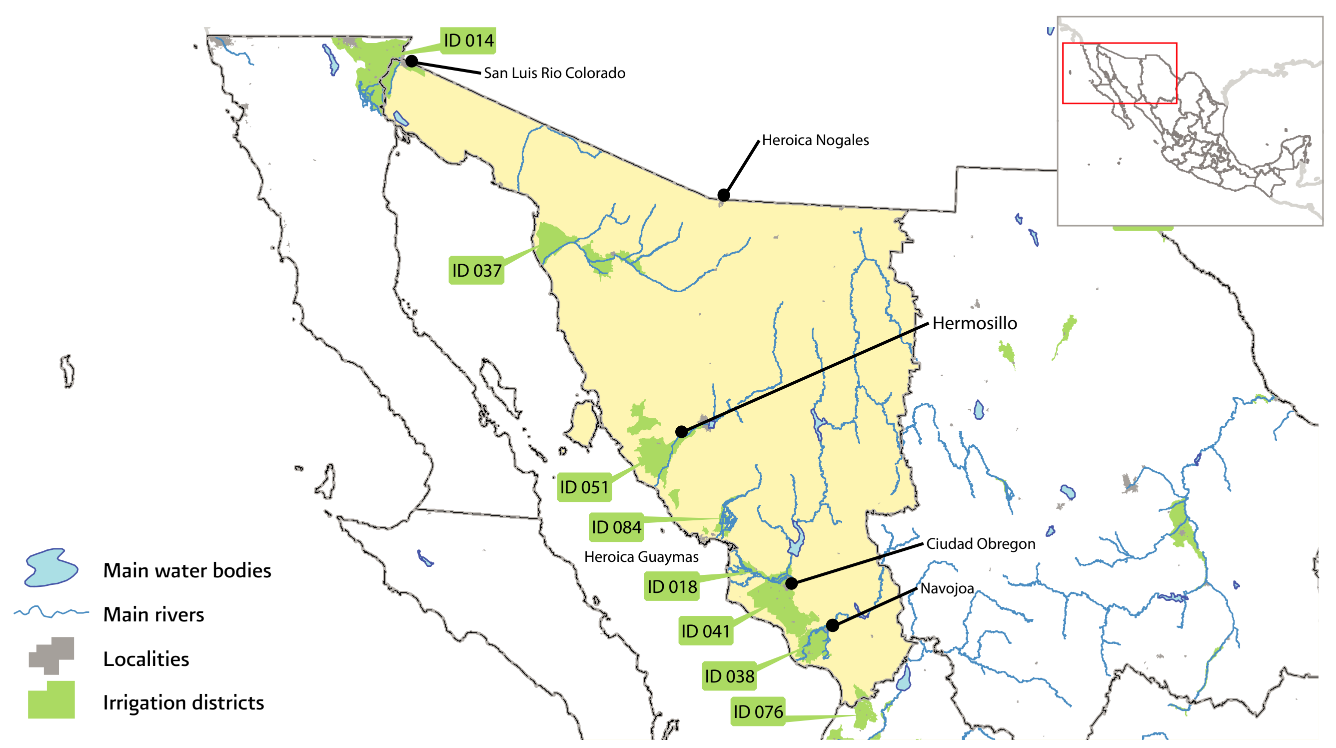
Number of municipalities	72	
Total population 2009	2 521 601	inhabitants
Urban	2 178 998	inhabitants
Rural	342 603	inhabitants
Population in 2030	2 845 433	inhabitants
Normal annual precipitation 1971-2000	419	mm

Treatment plants (as of December 2009)

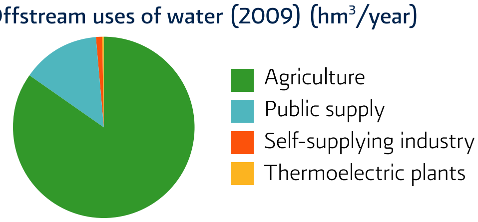
Municipal treatment plants

Number in operation	24	
Capacity installed	4.130	m^3/s
Flow treated	2.138	m^3/s

Wastewater	Municipal	Industrial
Number in operation	83	25
Capacity installed (m^3/s)	4.672	0.424
Flow treated (m^3/s)	2.826	0.222



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	6 376	3 976	2 400
Public supply	1 042	596	446
Self-supplying industry	90	3	87
Thermoelectric plants	7	7	0
Total	7 515	4 582	2 932

Coverage (2005) (%)

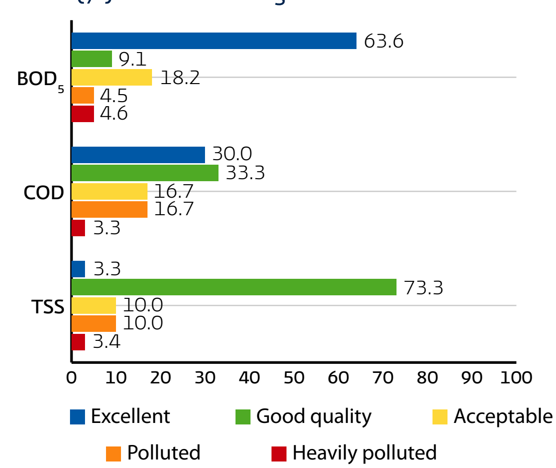
	Drinking water	Sanitation
Regional	95.2	85.4
Urban	96.6	92.3
Rural	87.0	44.3

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	36
COD	64
TSS	64

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

Contextual data

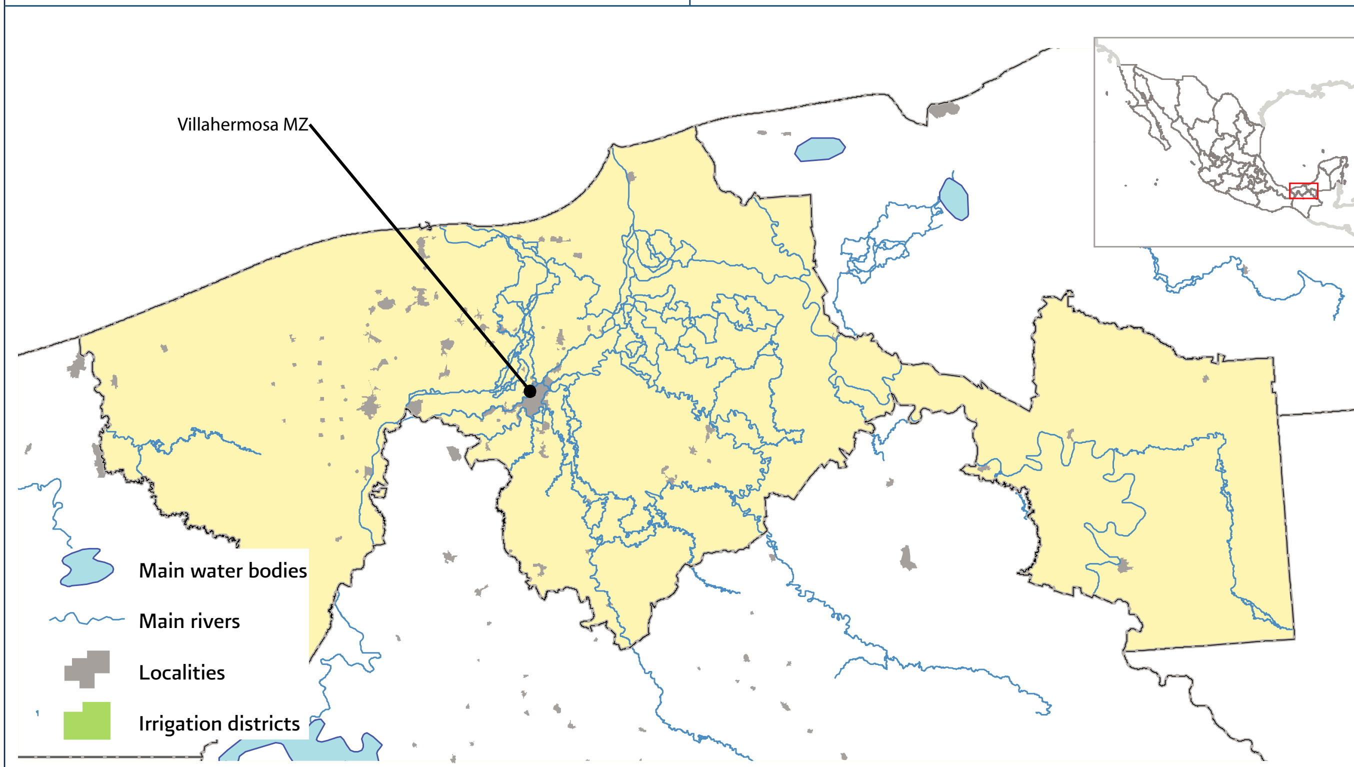
Number of municipalities	17	
Total population 2009	2 055 571	inhabitants
Urban	1 132 785	inhabitants
Rural	922 787	inhabitants
Population in 2030	2 168 004	inhabitants
Normal annual precipitation 1971-2000	2 095	mm

Treatment plants (as of December 2009)

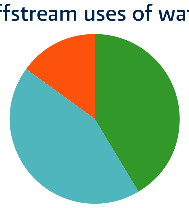
Municipal treatment plants

Number in operation	44	
Capacity installed	11.605	m^3/s
Flow treated	8.100	m^3/s

Wastewater	Municipal	Industrial
Number in operation	73	124
Capacity installed (m^3/s)	1.930	1.055
Flow treated (m^3/s)	1.396	0.644



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	175	120	55
Public supply	184	105	79
Self-supplying industry	63	44	18
Thermoelectric plants	0	0	0
Total	422	270	152

Coverage (2005) (%)

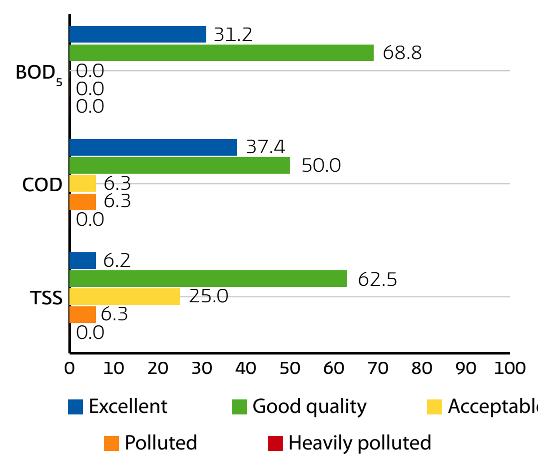
	Drinking water	Sanitation
Regional	76.4	93.4
Urban	88.7	97.8
Rural	61.5	88.1

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	16
COD	16
TSS	16

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

28. Tamaulipas

Contextual data

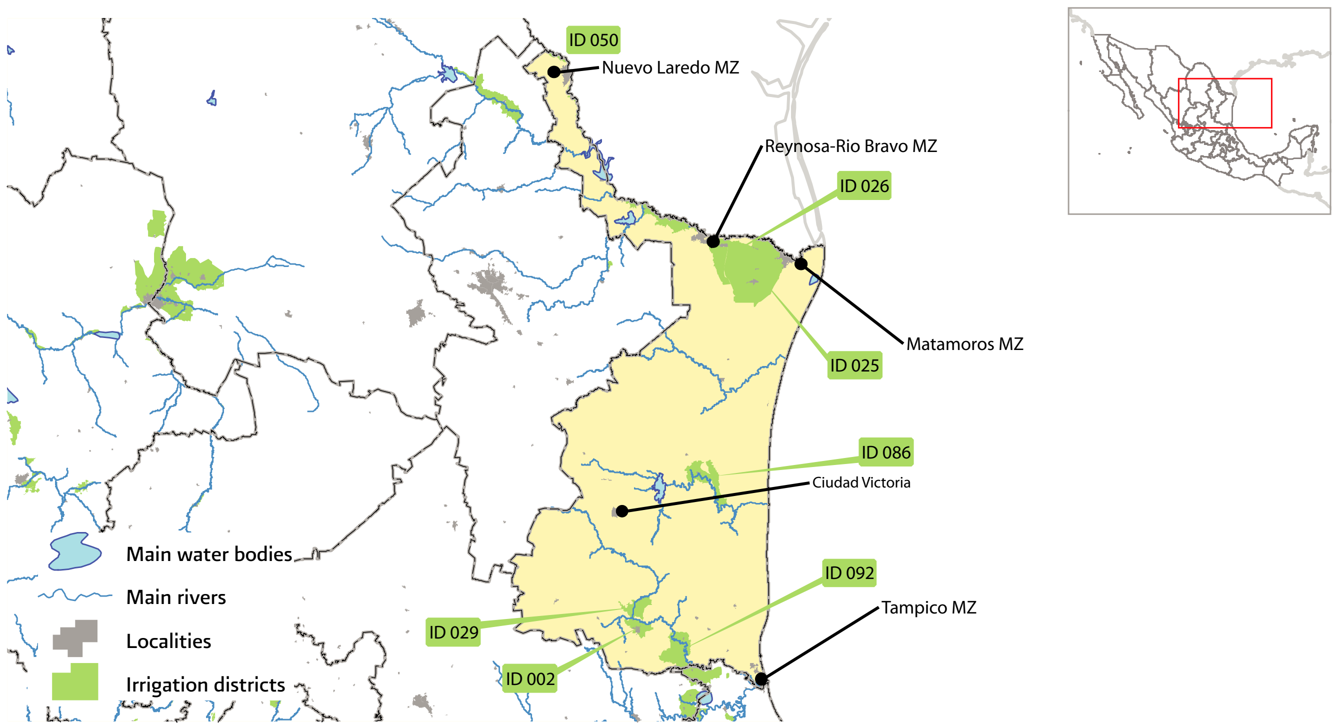
Number of municipalities	43	
Total population 2009	3 211 662	inhabitants
Urban	2 830 588	inhabitants
Rural	381 074	inhabitants
Population in 2030	3 829 639	inhabitants
Normal annual precipitation 1971-2000	760	mm

Treatment plants (as of December 2009)

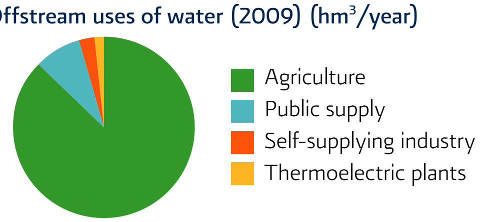
Municipal treatment plants

Number in operation	54	
Capacity installed	14.345	m^3/s
Flow treated	11.438	m^3/s

Wastewater	Municipal	Industrial
Number in operation	42	52
Capacity installed (m^3/s)	6.114	3.942
Flow treated (m^3/s)	4.321	2.841



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	3 373	3 036	337
Public supply	319	277	42
Self-supplying industry	109	99	10
Thermoelectric plants	54	51	3
Total	3 854	3 463	392

Coverage (2005) (%)

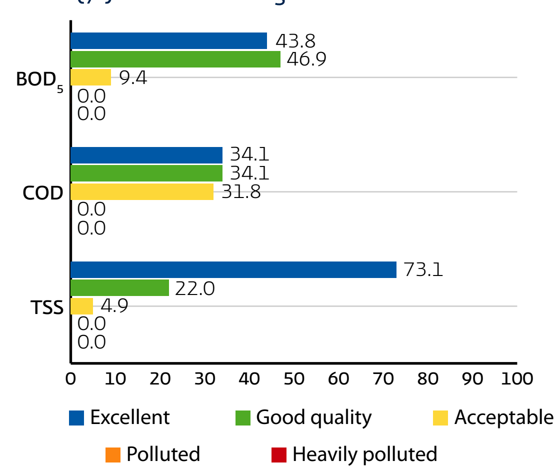
	Drinking water	Sanitation
Regional	94.7	82.4
Urban	97.8	90.5
Rural	74.3	27.7

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	32
COD	33
TSS	44

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

Contextual data

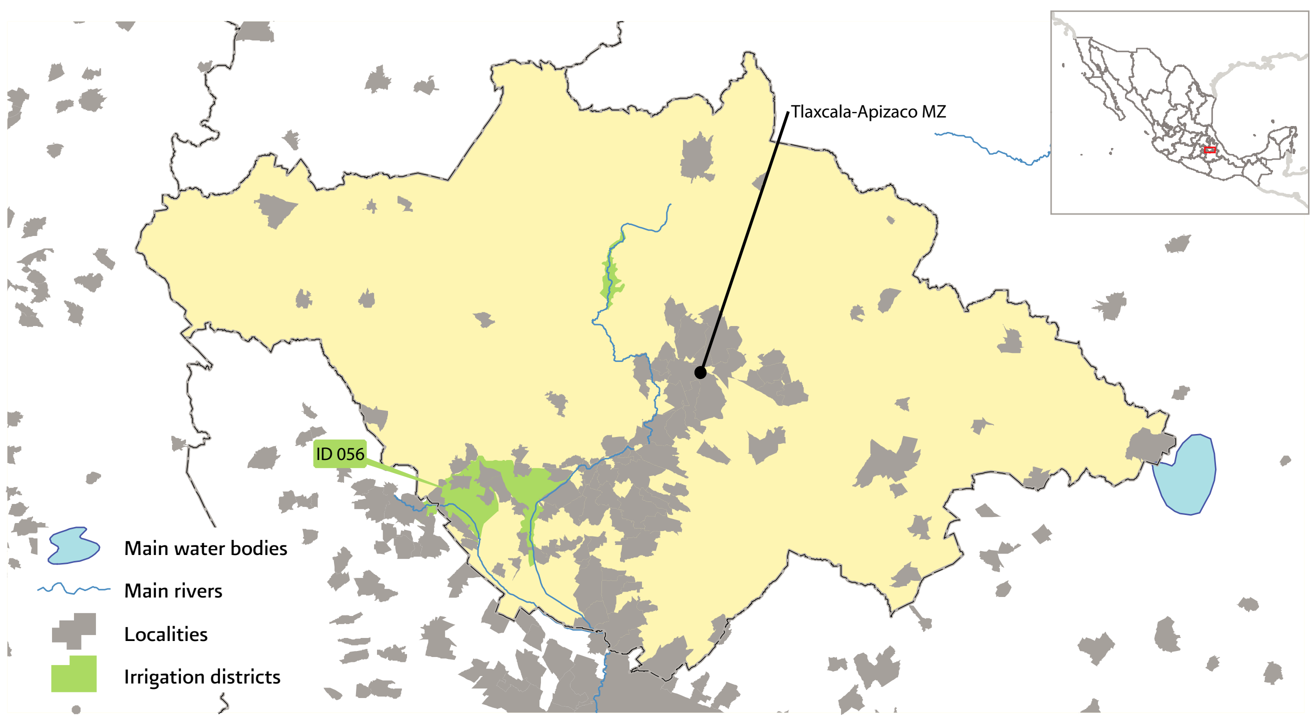
Number of municipalities	60	
Total population 2009	1 142 249	inhabitants
Urban	912 336	inhabitants
Rural	229 913	inhabitants
Population in 2030	1 408 991	inhabitants
Normal annual precipitation 1971-2000	700	mm

Treatment plants (as of December 2009)

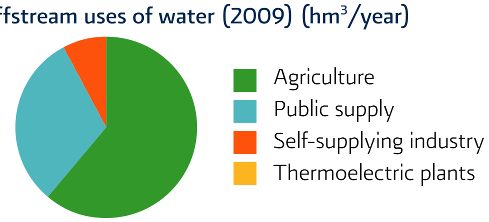
Municipal treatment plants

Number in operation	0	
Capacity installed	0.000	m^3/s
Flow treated	0.000	m^3/s

Wastewater	Municipal	Industrial
Number in operation	55	108
Capacity installed (m^3/s)	1.296	0.226
Flow treated (m^3/s)	0.891	0.196



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	150	58	92
Public supply	76	7	69
Self-supplying industry	19	0	19
Thermoelectric plants	0	0	0
Total	245	65	180

Coverage (2005) (%)

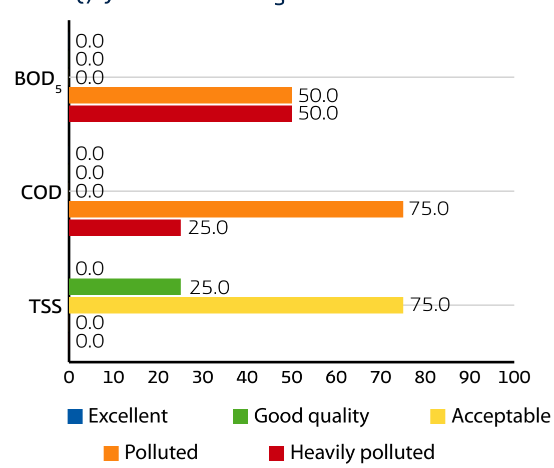
	Drinking water	Sanitation
Regional	97.3	90.6
Urban	97.9	92.8
Rural	95.3	82.8

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	10
COD	10
TSS	10

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

30. Veracruz de Ignacio de la Llave

Contextual data

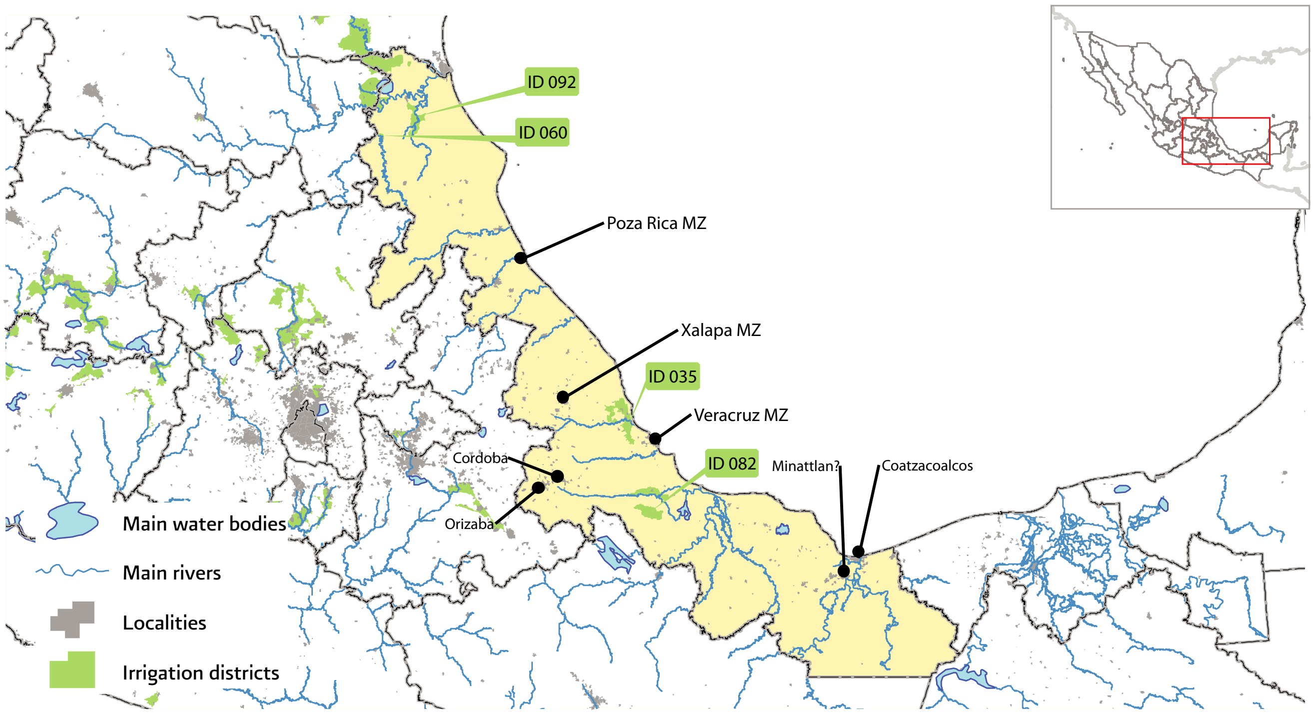
Number of municipalities	212	
Total population 2009	7 286 793	inhabitants
Urban	4 473 266	inhabitants
Rural	2 813 527	inhabitants
Population in 2030	7 373 459	inhabitants
Normal annual precipitation 1971-2000	1 617	mm

Treatment plants (as of December 2009)

Municipal treatment plants

Number in operation	13	
Capacity installed	6.912	m^3/s
Flow treated	4.394	m^3/s

Wastewater	Municipal	Industrial
Number in operation	105	166
Capacity installed (m^3/s)	6.800	11.621
Flow treated (m^3/s)	4.093	8.686



Offstream uses of water (2009) (hm^3/year)

	Total	Surface water	Groundwater
Agriculture	2 629	2 302	327
Public supply	569	350	218
Self-supplying industry	1 152	1 079	73
Thermoelectric plants	370	370	1
Total	4 720	4 100	620

Coverage (2005) (%)

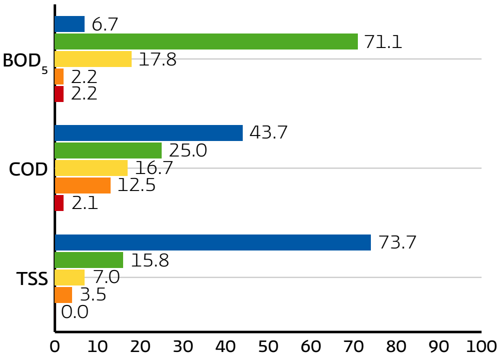
	Drinking water	Sanitation
Regional	76.3	77.7
Urban	89.2	93.3
Rural	56.7	54

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	56
COD	50
TSS	59

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

Contextual data

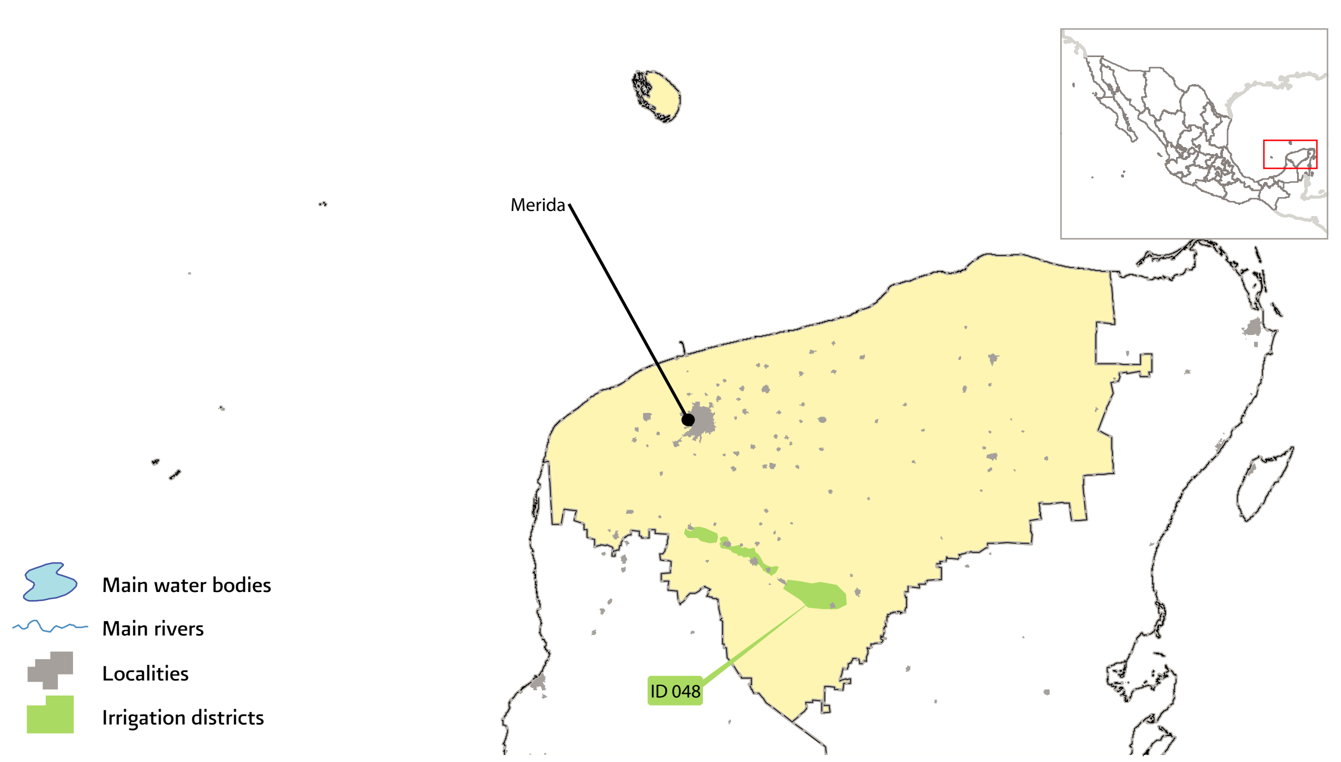
Number of municipalities	106	
Total population 2009	1 933 900	inhabitants
Urban	1 610 972	inhabitants
Rural	322 928	inhabitants
Population in 2030	2 391 751	inhabitants
Normal annual precipitation 1971-2000	1 062	mm

Treatment plants (as of December 2009)

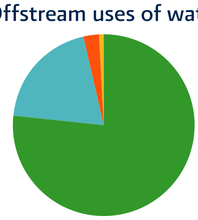
Municipal treatment plants

Number in operation	0	
Capacity installed	0.000	m^3/s
Flow treated	0.000	m^3/s

Wastewater	Municipal	Industrial
Number in operation	20	36
Capacity installed (m^3/s)	0.301	0.114
Flow treated (m^3/s)	0.082	0.071



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	957		957
Public supply	246	0	246
Self-supplying industry	36	0	36
Thermoelectric plants	9	0	9
Total	1 248		1 248

Coverage (2005) (%)

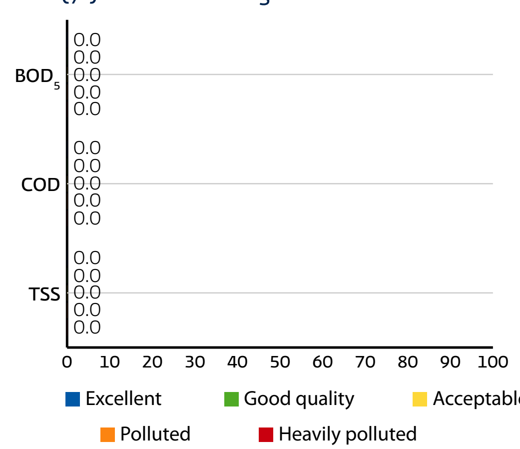
	Drinking water	Sanitation
Regional	96.1	68.2
Urban	96.7	74.9
Rural	93.7	36.5

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	0
COD	0
TSS	0

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 of the year in question.

32. Zacatecas

Contextual data

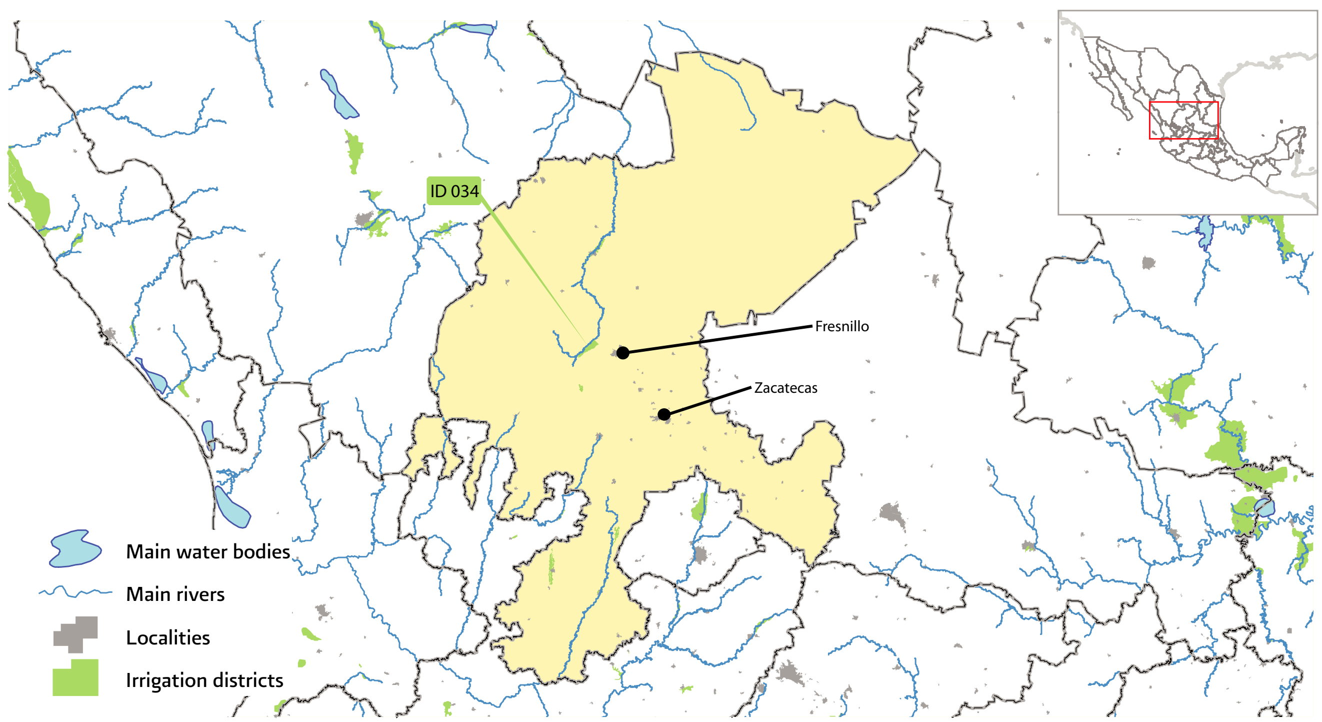
Number of municipalities	58	
Total population 2009	1 378 730	inhabitants
Urban	806 382	inhabitants
Rural	572 349	inhabitants
Population in 2030	1 280 431	inhabitants
Normal annual precipitation 1971-2000	463	mm

Treatment plants (as of December 2009)

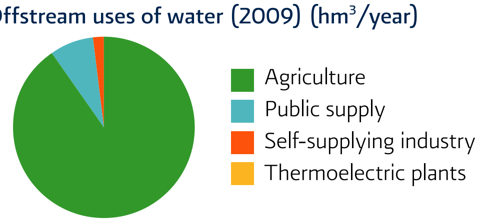
Municipal treatment plants

Number in operation	54	
Capacity installed	0.010	m^3/s
Flow treated	0.010	m^3/s

Wastewater	Municipal	Industrial
Number in operation	55	9
Capacity installed (m^3/s)	0.748	0.156
Flow treated (m^3/s)	0.645	0.044



Offstream uses of water (2009) (hm^3/year)



	Total	Surface water	Groundwater
Agriculture	1 319	329	989
Public supply	113	6	107
Self-supplying industry	26	1	25
Thermoelectric plants	0	0	0
Total	1 457	336	1 121

Coverage (2005) (%)

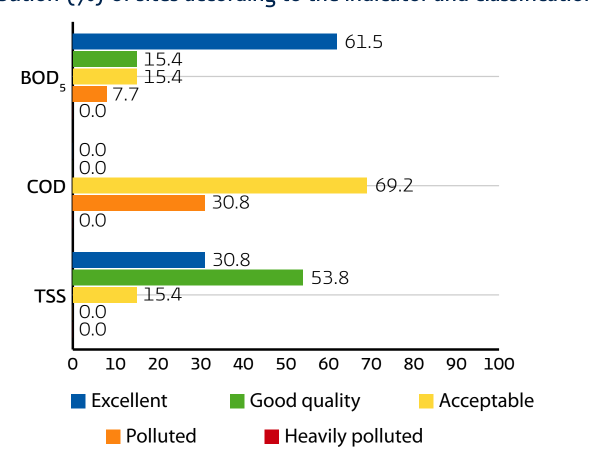
	Drinking water	Sanitation
Regional	92.8	84.2
Urban	98.6	96.1
Rural	85.2	68.4

Surface water quality (2009)

Number of monitoring sites according to the water quality indicator

BOD_5	13
COD	13
TSS	13

Distribution (%) of sites according to the indicator and classification



Note: The projection considers the population interpolated as of December 31 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)	Inflows (+) or outflows (-) to/ 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	1 864	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	21
11. Presidio-San Pedro	51 717	818	7 956		7 956	19
12. Lerma-Santiago	132 916	723	13 637		13 637	58
13. Huicicila River	5 225	1 387	1 277		1 277	6
14. Ameca River	12 255	1020	2 236		2 236	9
15. Jalisco Coast	12 967	1 175	3 684		3 684	11
16. Armeria-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	1 234	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	2 347	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	1 427	14 306		14 306	12
28. Papaloapan	57 355	1460	49 951		49 951	18
29. Coatzacoalcos	30 217	1 946	39 482		39 482	15
30. Grijalva-Usumacinta	102 465	1709	73 466	44 080	117 546	83
31. Yucatan West	25 443	1 229	591		591	2
32. Yucatan North	58 135	1091	0		0	0
33. Yucatan East	38 308	1 243	1 125	864	1 989	1
34. Closed Catchments of the North	90 829	404	1 701		1 701	22
35. Mapimi	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**	**329 217**	**49 313**	**378 530**	**722**

Note: The information refers to the mean data determined based on the most recent studies carried out.
Source: CONAGUA. Deputy Director General's Office for Technical Affairs..

Annex D. Bibliographic reference

Chapter 1

- [a] Source: CONABIO. Catálogo de metadatos geográficos
  Consulted on: http://www.conabio.gob.mx/informacion/metadata/gis/zeem4mgw.xml?_httpcache=yes&_xsl=/db/metadata/xsl/fgdc_html.xsl&_indent=no (15/10/2010)
  INEGI. *Anuario estadístico de los Estados Unidos Mexicanos 2009*. México 2010.
- [b] Note: For the years 1950 to 2010, the population was interpolated up to December 31 each year, based on data from the Censuses.
  The rural population is considered as being those living in localities of less than 2,500 inhabitants, whereas the urban population is considered as living in localities of 2,500 inhabitants or more.
  The population projected to 2010 takes into account CONAPO's growth rates.
  Source: CONAGUA. Deputy Director General's Office (DDGO) for Planning. 2010. Produced based on: INEGI. *Censos Generales y Conteos de Población y Vivienda.*
- [c] Note: The different Census years are shown, the "Conteos" from 1995 and 2005.
  Source: For the values on the population in the Guadalajara Metropolitan Zone 1940-1980: Arroyo Alejandre, Jesús. 1994. Zona metropolitana de Guadalajara / la transición del crecimiento poblacional, Demos, No. 007, January 1994.
  For the values on the population in the Guadalajara Metropolitan Zone 1990 - 2005: SEDESOL, INEGI and CONAPO. Delimitación de las zonas metropolitanas de México 2005. México, 2007.
  For los values on the population in the State of Jalisco in the period: Consejo Estatal de Población Jalisco. Población total y tasa de crecimiento promedio anual, 1895-2005. 2009.
  For the values on the population in the Guadalajara Metropolitan Zone 2010 and the values on the State of Jalisco: CONAPO. Proyecciones de población 2006 - 2030, Estadísticas de Agua en México 2010.
- [d] Source: CONAGUA.DDGO for Planing. 2010. Produced based on: CONEVAL. *Los Mapas de Pobreza en México. 2007* | CONAGUA. *Estadísticas del Agua en México 2010-Tablas Maestras de Coberturas de Agua Potable y Drenaje 1990-2005.* 2010 | CONAGUA. Hipercubos de información municipal. 2008.
- [e] Note: The GDP per Hydrological-Administrative Region was calculated based on the EGDP for 2008 and the Gross Censual Added Value from the 2004 Economic Censuses.
  The calculations of renewable water resources refer to historical values according to the availability of hydrological studies.
  The population in 2009 was calculated based on the CONAPO's 2006-2030 projections. Population as of the month of December. Source: For the calculation of renewable water resources: CONAGUA. DDGO for Planning. 2010. Produced based on: CONAGUA. DDGO for Technical Affairs. 2010 | INEGI. *Sistema de Cuentas Nacionales de México. Producto Interno Bruto por Entidad Federativa, 2003-2008.* Base 2003.

Chapter 2

- [a] Source: CONAGUA. DDGO for Technical Affairs. 2010.
- [b] Source: CONAGUA. Coordination of the National Meteorological Service (CNMS). 2010.
- [c] Source: CONAGUA. CNMS . 2010.
- [d] Note: Number of events by municipality.
  Source: CONAGUA. DDGO for Planning. 2010. Produced based on: Área de Estudios Económicos y Sociales of the CENAPRED, with information from the Official Government Gazette. Consulted on: http://atl.cenapred.unam.mx/metadataexplorer/EES/ BDDEDD.html (15/10/2010).
- [e] Note: Number of events by municipality.
  Source: CONAGUA. DDGO for Planning. 2010. Produced based on: Área de Estudios Económicos y Sociales, of the CENAPRED, with information from the Official Government Gazette. Consulted on: http://atl.cenapred.unam.mx/metadataexplorer/EES/ BDDEDD.html (15/10/2010).
- [f] Source: CONAGUA. DDGO for Technical Affairs. 2010.
- [g] Note: The values indicated are as of December 31 each year.
  Source: DDGO for Technical Affairs. 2010.
- [h] Source: CONAGUA. DDGO for Technical Affairs. 2010.
- [i] Source: SEMARNAT. CONAGUA. PROFEPA. SEMAR. SECTUR. COFEPRIS. Programa Playas Limpias, México, 2009.

Chapter 3

- [a] Note: The data corresponds to volumes allocated as of December 31, 2009.
  Agriculture Includes the agricultural, livestock, aquaculture, multiple and "others" headings of the REPDA classification. Also includes 1.30 km^3 of water corresponding to Irrigation Districts that are awaiting registration.
  Public supply includes the public urban and domestic headings of the REPDA classification.
  Self-supplying industry includes the industrial, agro-industrial, service and trade headings of the REPDA classification.
  Source: CONAGUA. Deputy Director General's Office for Water Management. 2010.

Chapter 4

- [a] Note: 1 hm^3 = 1 million cubic meters.
  NPE: Normal Pool Elevation.
  Source: CONAGUA. Director General's Office for Planning. 2010. Produced based on: CONAGUA: Deputy Director General's Office for Technical Affairs. 2010.
- [b] Note: The X axis shows agricultural years. The agricultural year in Mexico includes the period from October to September the following year.

1 km^3 = 1 000 hm^3 = 1 billion m^3.

Source: DDGO for Hydro-Agricultural Infrastructure. 2010.

- [c] Note: The X axis shows agricultural years. The agricultural year in Mexico includes the period from October to September the following year.

  The gross volume corresponds to that used in the vegetative cycle, explaining why it does not match the annual volumes used. Source: CONAGUA. DDGO for Hydro-Agricultural Infrastructure. 2010.
- [d] Note: The populations are at the time of the Censuses.

  Source: CONAGUA. DDGO for Planning. 2010. Produced based on : CONAGUA. *Análisis de la Información del Agua de los Censos y Conteos 1990 a 2005.* Septiembre de 2007 | INEGI. *Conteos y Censos Generales de Población y Vivienda.*
- [e] Note: The populations are at the time of the Censuses.

  Source: CONAGUA. DDGO for Planning. 2010.Produced based on: CONAGUA. *Análisis de la Información del Agua de los Censos y Conteos 1990 a 2005.* Septiembre de 2007 | INEGI. *Conteos y Censos Generales de Población y Vivienda.*
- [f] Note: The populations are at the time of the Censuses.

  Source: CONAGUA. DDGO for Planning. 2010 Produced based on: CONAGUA. *Cubos portátiles de información. 2010. Población, Vivienda y Agua, Usos del Agua e Hipercubo* | CONAGUA. *Análisis de la Información del Agua de los Censos y Conteos 1990 a 2005.* Septiembre de 2007 | INEGI. *Conteos y Censos Generales de Población y Vivienda.*
- [g] Note: The populations are at the time of the Censuses.

  Source: CONAGUA. DDGO for Planning. 2010.Produced based on: CONAGUA. *Cubos portátiles de información. 2010. Población, Vivienda y Agua, Usos del Agua e Hipercubo* | CONAGUA. *Análisis de la Información del Agua de los Censos y Conteos 1990 a 2005.* Septiembre de 2007 | INEGI. *Conteos y Censos Generales de Población y Vivienda.*
- [h] Source: CONAGUA. DDGO for Drinking Water, Sewerage and Sanitation. 2010.
- [i] Fuente: CONAGUA. DDGO for Drinking Water, Sewerage and Sanitation. 2010.
- [j] Note: For 2009 the total flow treated was 88.13 m3/s.

  Source: CONAGUA. DDGO for Drinking Water, Sewerage and Sanitation. 2010.
- [k] Source: CONAGUA. DDGO for Planning. 2010. Produced based on: CONAGUA. DDGO for Technical Affairs. 2010.

Chapter 5

- [a] Source: CONAGUA. DDGO for Administration. 2010.
- [b] Note: The conversion to constant 2009 prices was carried out based on the average National Consumer Price Index from the months of January to December each year.
- [c] Note: The conversion to constant 2009 prices was carried out based on the average National Consumer Price Index from the months of January to December each year.

  Source: CONAGUA. DDGO for Administration. 2010.
- [d] Source: CONAGUA. DDGO for Planning. Produced based on: CONAGUA. Coordination for Emergency Attention and River Basin Councils . 2010.

Chapter 6

- [a] Note: The data for 2010 includes the period from 01/01/2010 to 02/12/2010.

  Source: *SEMARNAT. Base de datos estadísticos del Sistema Nacional de Información Ambiental y de Recursos Naturales – Módulo Temático – Dimensión Ambiental – Recursos Forestales – Daños a los bosques – Incendios - Incendios forestales: Superficie afectada.* Consulted on: http://dgeiawf.semarnat.gob.mx:8080/ibi_apps/WFServlet?IBIF_ex=D3_RFORESTA05_02&IBIC_user=dgeia_mce&IBIC_pass=dgeia_mce (31/12/2010).

Chapter 7

- [a] 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 degree of water stress is 40%, derived from the criteria of considering the degree of stress above 40% as high.

  Source: Boxes T3.6 and T7.1.
- [b] Note: Data on population interpolated on December 31 each year.

  Each year, with the information available, the value on renewable water is updated, which is then taken as constant until the following update.

  Source: CONAGUA. DDGO for Planning. 2010. Produced based on: CONAPO. *Proyecciones de la Población de México. 2005- 2050.* México, 2007 | CONAGUA. DDGO for Technical Affairs. 2010.
- [c] Source: CONAGUA. DDGO for Planning. 2010. Produced based on: CONAPO. *Proyecciones de la población de México 2005-2050.* 2007 | CONAGUA. DDGO for Technical Affairs. 2010.

Chapter 8

- [a] Source: CONAGUA. DDGO for Planning. 2010. Produced based on: Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat, *World Population Prospects: The 2008 Revision and World Urbanization Prospects: The 2009 Revision.* Consulted on: http://esa.un.org/wup2009/unup/ (15/10/2010).
- [b] Source: CONAGUA. DDGO for Planning. Produced based on: International Federation of the Red Cross and Red Crescent Societies (IFRC). *World Disasters Report 2010.* Consulted on : http://www.ifrc.org/Docs/pubs/disasters/ wdr2010/WDR2010-full.pdf (21/Oct/2010)
- [c] Note: Combustible renewables and waste include liquid and solid biomass, biogas, industrial and municipal waste.

  Source: IEA. *Key World Energy Statistics 2010.*

  Consulted on: http://www.iea.org/publications/free_new_Desc.asp?PUBS_ID=1199 (27/09/2010).

Annex E. Glossary of terms

Allocation. A deed granted by the Federal Executive Branch to municipalities or states or Mexico City in order to use the nation's waters, destined for public urban or domestic water services, in which case it is termed in Spanish an "asignación", or for the use of the nation's water resources 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 for- mations 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 infras- tructure. [h]

Availability zone. For the purpose of the payment of duties for the use of the nation's water resources, 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.

Degree of 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 avai- lability of water.

Drinking water and sanitation system. A series of infrastruc- ture and actions that allow public drinking water and sanitation services to be provided, including sanitation, which contemplates the piping, treatment, removal and discharge of wastewater. [a]

Drinking water coverage. The percentage of the population li- ving in private homes with running water within the home, on the grounds, or from 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 char- ged to taxpayers for the use of the nation's water resources, as well as wastewater discharges and for the use of inherent goods associated with water.

Federal zone. Ten-meter wide strips adjacent to channels, cu- rrents or reservoirs which belong to the nation, measured hori- zontally 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 soil humidity and that is used for rainfed crops and general vegetation.

Gross Domestic Product. The total value of the 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 artifi- cially withdrawn from a hydrogeological unit for various uses. [b]

Hurricane. A tropical cyclone in which the maximum sustained wind speed 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 the management of water resources.

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 longitu- dinal units, which is applied to a crop so that it may meet its physiological needs throughout its growth cycle, in addition to soil evaporation.

Mean natural availability. The total volume of renewable sur- face water and groundwater that occurs naturally in a region.

Mean natural surface runoff. The part of mean historical pre- cipitation that occurs in the form of flows into a watercourse.

Mean recharge. The mean annual volumen of water that re- charges an aquifer.

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, it coincides with 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 set of physical, chemi- cal and biological parameters, and of their maximum permitted levels in wastewater discharges, determined by the CONAGUA or by the corresponding River Basin Organization, for each user, for a specific use or user group of a specific receiver body, with the purpose of conserving and controlling water quality, in ac- cordance with the National Water Law and the By-Laws derived from that Law. [a]

Perennial crops. Crops whose maturing 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 water resources, 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. [a]

Physically irrigated area. An area that is watered at least once in a given period of time.

Precipitation. Water in liquid or solid form, coming from the atmosphere, and which is deposited 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 deposit, reservoir, channel, salt-water zone or national good into which wastewater is discharged, as well as the grounds into which this water is filte- red or injected, when it can pollute the soil, subsoil or aquifers. [a]

Renewable water resources. The maximum amount of water that can feasibly be used every year. Renewable water resour- ces are calculated as the annual unaltered surface runoff, plus the mean annual aquifer recharge, plus water inflows from other regions or countries, minus the water outflows 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.

Sanitation. The collection and transportation of wastewater and the treatment of this wastewater as well as of the by-products generated through these activities, in such a way that its release produces a minimal impact in the environment. [e]

Sanitation coverage. The percentage of the population living in private homes, whose housing has a drain connected to the public sewerage network, a septic tank, a river, lake or sea, or a gulley or crack. This information is determined by means of Censuses carried out by the INEGI and estimates from the CONAGUA for intermediate years.

Surface water withdrawal. The volume of water that is artifi- cially 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 sanita- tion services. [f]

Technified Rainfed District. A geographical area intended for agricultural activities but which lack 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 – also known as drainage districts – is mitigated, or in conditions of scarcity, rain and humidity are used with greater efficiency on agricultural grounds. [a]

The nation's water resources. 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 re- servoir can store at the Normal Pool Elevation (NPE).

Total recharge. The volume of water that enters a hydrogeolo- gical 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.

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 total quantity of water employed in the pro- ductive process for the elaboration of a product. Wastewater. Water of mixed composition coming from dischar- ges 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 total quantity of water used by each per- son 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 utility. A body in charge of drinking water supply and sanitation in a locality. [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 the 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 of terms is a compilation from diverse sources, with the aim of illustrating the different components employed in this document. They do not therefore constitute legally-binding definitions.

Source:

[a] National Water Law. 2004.

[b] Official Mexican Standard NOM-011-CONAGUA-2000, Conservation of water resources – which establishes the specifica- tions and the method to determine the mean annual availability of the nation's water resources. 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 future (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-CONAGUA-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 was- tewater. 2009.

Annex F. Abbreviations and acronyms

Abbreviations and acronyms	
AECID	Spanish Agency for International Development Cooperation
BANOBRAS	National Bank of Public Works and Services
BANSEFI	National Bank of Savings and Financial Services
BOD_5	5-day Biochemical Oxygen Demand
CDI	National Commission for the Development of IAH 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 the 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
DF	Federal District (Mexico City)
DOF	Official Government Gazette
DPL	Development Policy Loan
ENOE	National Inquiry of Occupation and Employment
FAO	Food and Agriculture Organization of the United Nations

Abbreviations and acronyms	
FCAS	Spanish Fund for Cooperation on Water and Sanitation
FONADIN	National Infrastructure Fund
FONDEN	National Natural Disaster Fund
DPL	Development Policy Loan (Préstamo de Desarrollo de Políticas Públicas)
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GIS	*Geographical Information System*
GWI	Global Water Intelligence
IADB	Inter-American Development Bank
IAH	International Association of Hydrogeologists
IBRD	International Bank for Reconstruction and Development
IBWC	International Boundary and Water Commission
ICOLD	International Commission on Large Dams
ID	Irrigation District
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
JBIC	*Japan Bank for International Cooperation*
LAN	National Water Law
LFC	*Luz y Fuerza del Centro (Central Electricity Company)*
LFD	Federal Duties Law
MASL	Meters above sea level
MDGs	Millennium Development Goals
MLN	*Most Likely Number*
MT	Master Table
MZ	Metropolitan zone

Abbreviations and acronyms	
NADBANK	North American Development Bank
NADM	North American Drought Monitor
NAICS	North American Industry Classification System
NASA	National Aeronautics and Space Administration
NMX	Mexican Standard
NOM	Official Mexican Standard
NPE	Normal Pool Elevation
PATME	Program for the Improvement of Efficiency in the Drinking Water and Sanitation Sector
PI	Private Initiative
PND	National Development Plan
PNH 2007-2012	2007-2012 National Water Resources Program
PREMIA	Project to Strengthen Integrated Water Management
PROFEPA	Attorney General's Office for Environmental Protection
PROMAGUA	*Program for the Modernization of Water Utilities*
PROSIBA	*Integrated Sanitation Program in the Acapulco Bay*
PROSSAPYS II	*Program for the Sustainability of Drinking Water and Sanitation Services in Rural Communities*
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

Abbreviations and acronyms	
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
SPE	Surcharge Pool Elevation
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
UNEP	United Nations Environment Programme
UNESCO	United Nations Education, Science and Culture Organization
UNICEF	United Nations Children's Fund
UNISDR	United Nations International Strategy for Disaster Reduction
UNSD	United Nations Statistics Division
VMMZ	Valley of Mexico Metropolitan Zone
WB	World Bank
WCIF	Water Conservation Investment Funds (from NADBANK)
WHO	World Health Organization
WMO	World Meteorological Organization
WQI	*Water Quality Index*
ZOFEMATAC	*Federal Land Maritime Zone and Coastal Environment*

Annex G. Units of measurement and explanatory notes

Due to the rounding 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 to the representation of the number through formatting tools, and not to the number itself.

The units used in this document are expressed ac- cor- ding 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.

Basic units, derived or conserved for their use from the 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 = 0.0394 in
t	metric ton	1 t = 1 000 kg
W	watt	1 W = 1 m2 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	mili	10^{-3}

Units not included in the NOM-008-SCFI-2002

Symbol	Unit	Equivalences
AF	acre-foot	1 AF = 1233 m^3
cfs	cubic feet per second	1 cfs = 0.0283 m^3/s
ft	foot	1 ft = 0.3048 m
gal	galon	1 gal = 3.785 L
hab	inch	Not applicable
in	inhabitants	1 in = 25.4 mm
MAF	million acre-feet	1 MAF = 1.23 km^3
msnm	meters above sea level	Not applicable
pesos	Mexican pesos	1 Mexican peso = 0.0743 US dollar = 0.0535 Euros *
ppm	parts per million	1 ppm = 0.001 g/L
USD	US dollar	1 US dollar = 12.3496 Mexican pesos *

*The exchange rate was considered on 31/12/2010.
Source: Bank of México. Statistics – Exchange market – Exchange rate. Consulted on: http://www.banxico.org.mx/sistemafinanciero/estadisticas/mercado-cambiario/tipos-cambio.html. (22/01/2011). (22/01/2011).

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

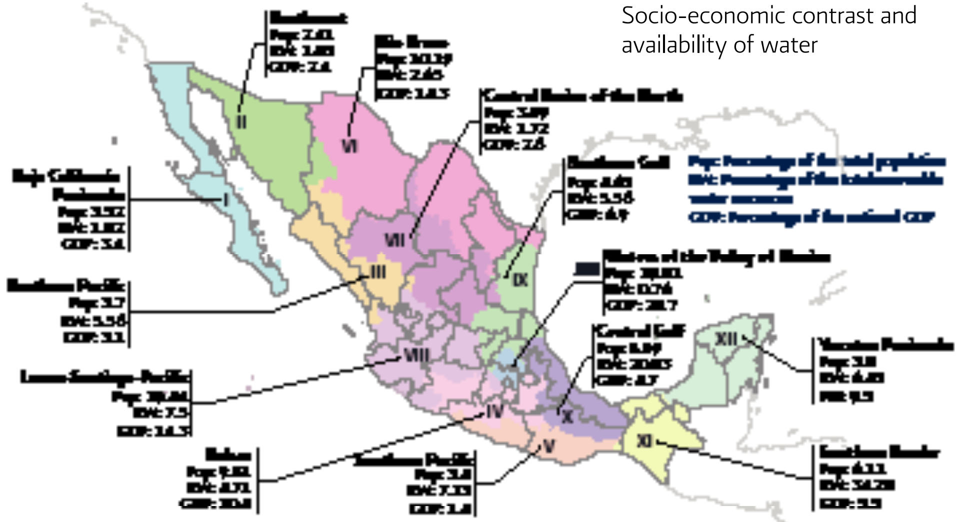
This book was created in InDesign and Illustrator CS5,
with the type font Presidencia in its different sizes and values.

Statistics on Water in Mexico 2011

Below is a summary of the publication, made up of some of its graphs, maps and diagrams that illustrate the aspects of water stress, the current state of resources as well as the actions undertaken, highlighting in this respect the 2030 Water Agenda, which seeks to put together a long-term institutional coalition to overcome the sector's backlogs and consolidate a sustainable water policy.

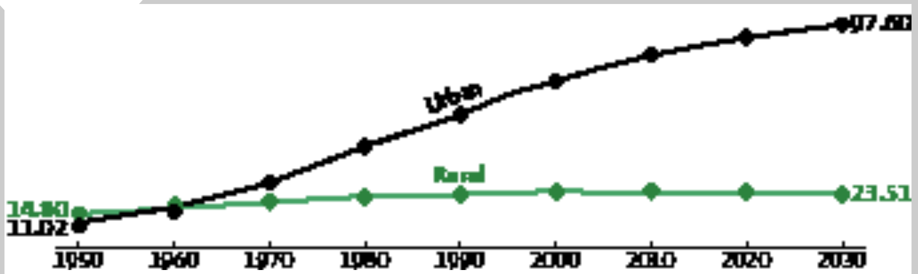
We hope that by reading this summary you will have a general overview of the situation regarding water in Mexico and the strategies undertaken to address the issue. Further details on the different aspects that constitute the printed publication are available on the DVD, which contains the databases, dynamic tables, graphs and maps.

Socio-economic contrast and availability of water

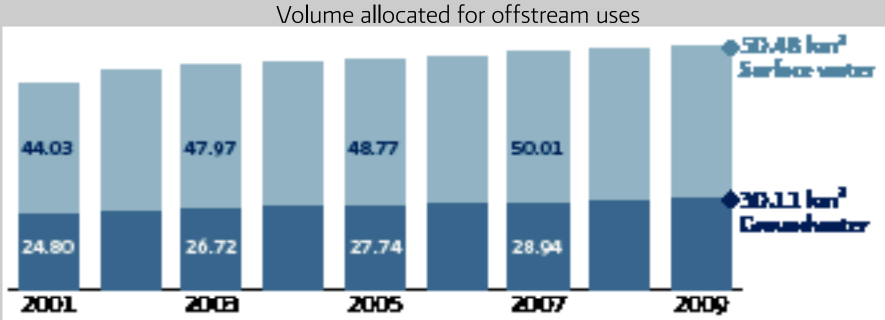


Degree of water stress

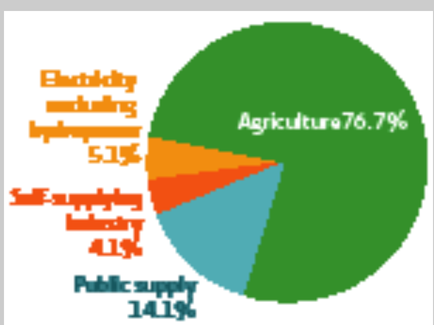
Mexico's rural and urban population (millions of inhabitants)



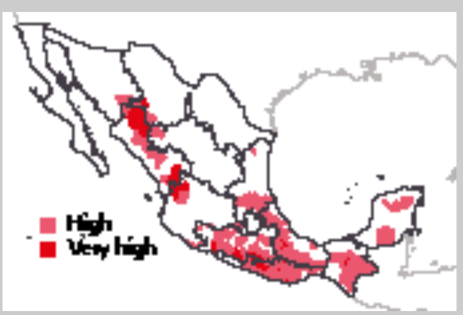
Volume allocated for offstream uses



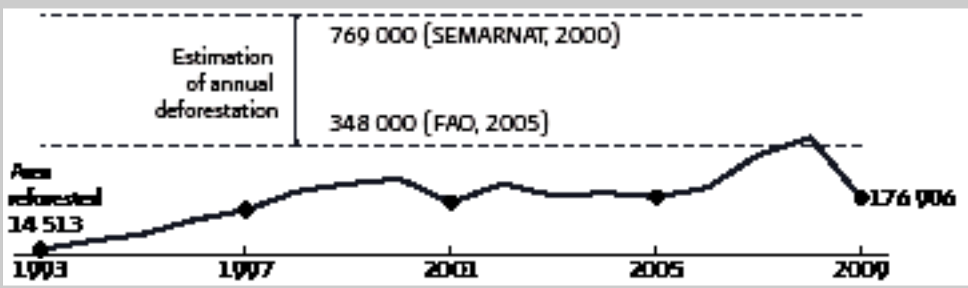
Distribution of volumes for offstream uses



Municipalities with the highest poverty

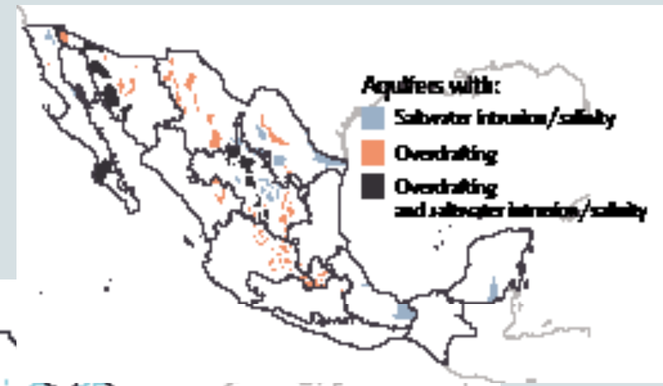


Reforestation and deforestation



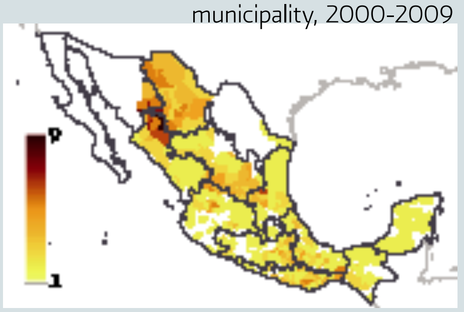
Current situation

Degree of water stress



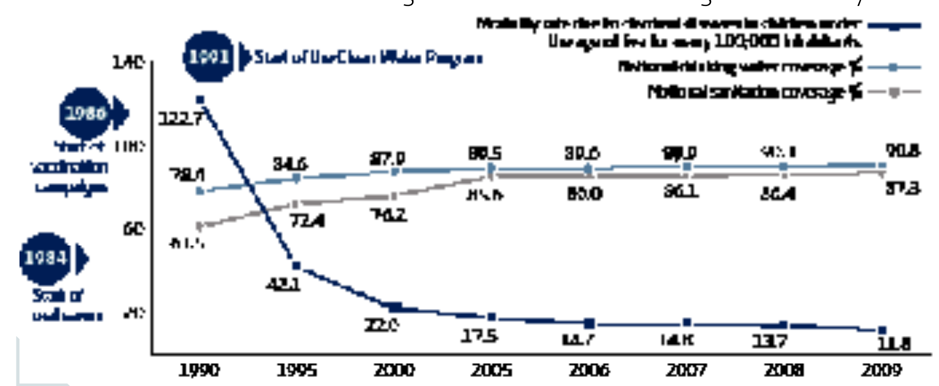
Number of cyclone, rain or flood declarations by municipality, 2000-2009

Number of drought declarations by municipality, 2000-2009



Actions undertaken

Drinking water and sanitation coverage and mortality rate



Water management 2009

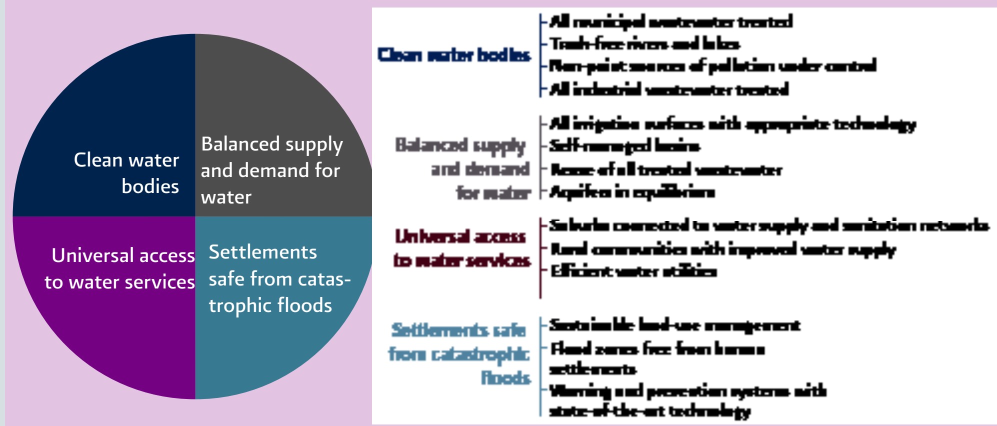
- 361,960 allocation or assignation deeds
- 14,067 discharge permits
- 100,647 federal zone permits
- 3,102 material extraction permits
- Prohibition zone and surface and groundwater reserves
- Publication of availabilities of catchments and aquifers
- 7,938.5 million pesos. Income from the use of the nation's water resources
- 2,777.5 million pesos. Income from other concepts

Participation mechanism

- 26 River Basin Councils
- 30 River Basin Commissions
- 29 River Basin Committees
- 81 Technical Groundwater Committees
- 36 Clean Beach Committees

Infrastructure	Number	Values in 2009
Large dams	100	118,061 hm^3 (capacity at the NPE)
Remaining dams	4,362+	31,939 hm^3 (capacity at the NPE)
Irrigation Districts irrigated	85	462,665 users, 2.6 million hectares
Technified rainfed districts	23	119,956 users, 2.9 million hectares
Municipal water treatment plants	631	90.04 m^3/s treated
Municipal wastewater treatment plants	2,029	88.13 m^3/s treated of 237.5 m^3/s generated
Industrial wastewater treatment plants	2,186	36.7 m^3/s treated of 190.4 m^3/s generated
Reuse of wastewater		160 m^3/s
Emergency attention centers	16	
Protection infrastructure	822+	

Strategic directions of the 2030 Water Agenda



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