

Mexico Country Profile

Geography

Mexico forms part of the northern American Continent, together with Canada and the United States of America. It is in the western hemisphere, west of the Greenwich meridian. In terms of geographical coordinates, the country's territory lies between meridians 118° 27' 24" W along the coast of Baja California on the Pacific Coast, and 86° 42' 36" W on the easternmost part, along Isla Mujeres in the Caribbean Sea; and between parallels 32° 43' 06" N on the northern border with the United States and 14° 32' 27" N to the south at the mouth of the Suchiate River on the border with Guatemala.

The total area of the country is 1964381.7 sq.km, of which 1959248.3 sq.km. are on the mainland and 5,133.4 sq. km. on islands. It is the fourteenth largest country in the world. In terms of population, Mexico is the eleventh most populated country with a population of 91.2 million at the end of 1995. The annual demographic growth rate of the country in 1995 was approximately 1.8%, showing a decreasing trend of the growth rate.

The population is concentrated in large urban centres and also scattered in smaller towns. In the first case, there are metropolitan cities such Mexico, Guadalajara and Monterrey which make up 2% of the national territory, yet 25% of the total population of the country lives in these cities. At the other extreme, a little over one-fourth of the population lives in rural communities having under 2,500 inhabitants, which was the case of over 95% of all towns in 1990.

From the ethnic point of view, population is about 60% mestizo (indian-spanish), 30% amerindian or predominantly amerindian, 9% caucasian or predominantly caucasian, and 1% others. Official language of the country is spanish, though about 7.4% of the population, children below 5 years of age or elders speak different native languages. Main religion is Roman Catholic, which accounts for 89%, while Protestants are 6% of total.

By age, the Mexican population is still young, despite the downward trend of the relative weight of the youngest age groups. Thus, in 1995, the proportion of people under 15 years of age was 35.0%, whereas in 1970, it was 46.2%. Similarly, the median age in 1995 was 21 years compared to 16 years in 1970. On the other hand, the proportion of individuals 65 years and older is still less, accounting for approximately 4.4% in 1995. Nevertheless, this figure is greater than that of 1970 when it was 3.7%.

Flora and Fauna

Mexico holds a high place worldwide in terms of fauna: it has the largest variety of reptiles in the world, with 717 of the 6,300 that have been classified, of which 574 are native to the country; it holds second place in diversity of mammals, with 449 of the 4,170 existing species, fourth place in amphibians, with 282 of the 4,184 known species, and twelfth place in birds, with 1,150 of the 9,198 types.

The country has a very wide range of vegetation zones; from places where there is almost no vegetation, as is the case in the most arid deserts and in permanently snow covered areas, to regions such as the Lacandon rain forest in the state of Chiapas, which is one of the most important and representative ecosystems of the humid tropic; its flora is rich in species, particularly fancy woods such as mahogany and red cedar.

Mexico holds fourth place worldwide in diversity of plant species, with 25,000 species registered out of the 250,000 that exist throughout the world, and from an estimated total of 30,000 species

which are believed to exist in the national territory. That would bring the country up to second place worldwide in terms of plant diversity.

Economy

Mexico's economy is a mixture of state-owned industrial facilities (notably oil), private manufacturing and services, and both large-scale and traditional agriculture. In the 1980s, Mexico experienced severe economic difficulties: the nation accumulated large external debts as world petroleum prices fell; rapid population growth outstripped the domestic food supply; and inflation, unemployment, and pressures to emigrate became more acute. Growth in gross domestic product, however, has recovered, rising from 1.4% in 1988 to 4% per year in the early 90's and to about 6% yearly in 96-98.

Mexico's Gross Domestic Product (GDP) amounted to 402,541.1 million dollars in 1997, making it the eleventh largest worldwide. The corresponding per capita GDP was about 4,410 dollars per year. The distribution of national income is markedly uneven in Mexico, both among regions and population, remaining one of the major problems to improve the economic and social performance of the country.

During 1997 the main economic sectors' share of GDP was as follows: 5.6% farming, livestock and fishing, 26% the industrial sector, of which manufacturing accounts for about 75%, and 62.8% services, one third of which consists of commerce, restaurants and hotels.

Physiography

The country's territory is very irregular and is characterised by mountains, plains, valleys and plateaus. The higher mountains in the country are its main volcanoes, the highest being the Pico de Orizaba with an altitude of 5,610 meters above sea level.

The great diversity of Mexico's relief makes it one of the world's most heterogeneous countries in terms of contrasting topographical characteristics and varieties; it also has a very wide range of natural resources. The different topographical conformations play an important role in the country's economic and social activities, since they influence climatic conditions, types of soils and vegetation, which in turn affect agricultural, livestock, forestry, industrial activities and human settlements.

Mexico's nearly 2 million sq. km area is almost equally divided by the Tropic of Cancer, so the country is in a zone of climatic transition with arid climates in the north, warm-humid and sub-humid in the south and temperate or cold in regions of greater elevation. The country's territory is one of the most complex in the world in terms of geological characteristics and one of the richest in variety of landscapes.

The National Institute of Statistics, Geography and Informatics (INEGI), of Mexican federal government, has divided the national territory into 15 physiographical areas.

Watersheds

There are three main watersheds in Mexico: the Western or Pacific Watershed, the Eastern or Atlantic Watershed (Gulf of Mexico and Caribbean Sea) and the Inland Watershed, where rivers do not empty out into the sea.

There are approximately 100 rivers in the Western or Pacific Watershed, the most important in terms of water flow being the Balsas, Colorado, Culliacan, Fuerte, Lerma-Santiago, Verde, and Yaqui Rivers.

The Eastern Watershed is made up of 46 main rivers, the most important being the Bravo, Coatzacoalcos, Grijalva, Panuco, Papaloapan and Usumacinta Rivers.

The Inland Watershed is made up of large closed basins. The Nazas-Aguanaval river system is the largest.

Main Rivers

Western Watershed	Eastern watershed	Inland watershed
1. Colorado	19. Bravo	38. Casas Grandes
2. Sonora	20. Conchos	39. Santa Maria
3. Yaqui	21. Salado	40. Del Camen
4. Mayo	22. Pesqueria	41. Nazas
5. Fuerte	23. San Femando	42. Aguanaval
6. Sinaloa	24. Soto La Marina	
7. Culiacán	25. Tamesi	
8. San Lorenzo	26. Panuco	
9. Acaponeta	27. Tuxpan	
10. San Pedro	28. Cazones	
11. Lerma-Santiago	29. Tecolutia	
12. Armeria	30. Jamapa	
13. Coahuayana	31. Papaloapan	
14. Balsas	32. Coatzacoalcos	
15. Papagayo	33. Uxpanapa	
16. Verde	34. Grijalva	
17. Tehuantepec	35. Usumacinta	
18. Suchiate	36. Candelaria	
	37. Hondo	

Climate

The country has a wide range of climates, which can be classified, in very general terms, as warm and temperate with regard to temperature; and humid, sub-humid, dry and very dry, depending on humidity levels.

Dry climates predominate in most of the country's central and northern areas, which cover 28.3% of the national territory. Such climates are characterised by wind circulation, which causes scant clouds and annual rainfall ranging between 300 and 600 mm; average temperatures range between 22° and 26° C in some regions and 18° to 22° C in others. In regions with very dry climate (20.8% of the country), the average annual rainfall goes from less than 100 to 300 mm and mean temperatures range between 18° and 22° C, and up to more than 26° C in some cases.

Warm climates are divided into warm humid and warm sub-humid. The former covers 4.7% of the national territory and is characterised by mean annual temperatures ranging between 22° and 26° C and annual rainfall of between 2,000 and 4,000 mm. Warm sub-humid climates are found in 23% of the country, with annual rainfall between 1,000 and 2,000 mm and temperatures ranging between 22° and 26° C and rising above 26° C in certain areas.

Rainfall and Droughts

Nearly in all regions of Mexico, most rain falls in summer (June-September) as short, heavy, afternoon showers. Towards the south, the rainy season begins earlier and lasts longer. Only in northwest of the peninsula of Baja California, most of the rain falls during the winter.

Derived of its geographical location, Mexico is strongly influenced by meteorological phenomena, especially tropical and extra-tropical cyclones, as well as convective events. These originate heavy rainstorms, runoffs and floods. Mainly affected areas are the coastal zones and the central portion of the country. However, the beneficial effects of these phenomena - being very relevant for replenishment of dams and then allowing irrigated agriculture and hydropower generation, among others -- usually outsize the economic damages from floods.

Droughts in Mexico considerably affect water supply of cities, agriculture, livestock and power generation. According to historical records, these phenomena occur with a frequency of one every ten years; its duration varies from one to three years. The more affected area is the northern portion of the country. During the last half century, there have been three major periods of drought in Mexico.

Agriculture

More than a quarter of Mexico's economically active population works in agriculture, livestock and forestry sector, and a similar percentage of total population lives in rural areas in small communities of less than 2,500 inhabitants. As such, agriculture is one of Mexico's most important economic sectors, though it accounts for only 6% of GDP.

Out of the nearly 196 million hectares of the country's total area, some 21 million hectares are used in agriculture, around 27 million hectares are covered mainly by pastures, 88 million sustain low bushes, 53 million hectares are covered by forests or tropical woods, and 7 million correspond to deserts, urban areas and water bodies. About 108 million hectares (55% of country's area) are exploited either in agricultural, livestock or forestry activities. Of this area, approximately 31 million hectares are considered as agriculture devoted lands, either on a permanent or occasional basis (in average, some 10 million hectares of this area remain uncultivated and are temporarily --and changeably -- mainly used for livestock); 68 million hectares are used mainly for cattle raising; and almost 9 million hectares consist of woods and tropical woods used for forestry purposes.

At present, nearly 21 million hectares --about 11% of the country's total area -- are currently under cultivation, including over six million hectares within irrigation systems.

Approximately 15 million hectares of the country's area has a high agricultural potential, while other 26 million hectares has medium quality. However, taking into account both water availability and productive capacity of soils, only an area of about 32 million hectares is suitable for agriculture.

Agricultural production in Mexico is extremely diverse, including products from many different climatic regions, and depends heavily on the intensity and regularity of rainfall. Main cropping season for rainfed agriculture is May-November (called spring-summer season), while in irrigated areas cropping seasons vary among regions and are less concentrated during the year. However, the so-called autumn-winter season, extending from October to April, is predominant in irrigated areas.

By far the six most important crops grown in Mexico are corn, beans, wheat, sugarcane, coffee and sorghum. The first two are staples of the traditional popular diet, with the result that approximately half of the land in cultivation is dedicated to corn and beans. Wheat and sugarcane are also widely consumed domestically, though not to the same degree. Coffee is the main export product and sorghum is used for feed in the rapidly growing poultry and pork industries.

Agricultural research is mainly developed in Mexico by a federal government agency, the National Institute of Forestry, Agricultural and Livestock Research (NIFALR), and by a number of universities and some other organisations.

After decades of being provided mainly by government agencies, agricultural extension services are at present in the hands of the private sector; however, federal and state governments still finance the services in a wide portion. Wealthy commercial farmers usually hire the services on their own.

Dryland agriculture and rainfed farming have long been practised in Mexico, mainly in north and northwest portions of the country and in the central high plateaus, although not on a very large scale.

The main organisations concerned with agricultural development in Mexico are the Ministry of Agriculture, Livestock and Rural Development, the Ministry of Agrarian Reform, the National Rural Bank, the National Water Commission and some other institutions of the federal government, and the states governments. The principal legal bodies that regulate their activities are the Federal Public Administration's Law, the Agricultural Development Law, the Agrarian Reform Law, the National Water Law, etc.

Development policies in agricultural sector have changed substantially over the last few years in Mexico. They have shifted from a wide governmental intervention in financing production, pricing and trading of main inputs and produces, among other subjects, to a more private sector managed and world market-oriented activity. Since 1995, through a new strategy, namely the Agricultural Alliance Programme, federal government efforts and specially investments in agricultural development are increasingly being tied to state governments and farmers investments; execution of development works are also being managed by farmers themselves to a large and increasing extent.

Irrigation Drainage and Flood Control

Total yearly average volume of rainfall in Mexico is about 1520 cubic kilometres. Of this figure, some 410 cu km becomes surface runoff; about 50 cu km infiltrates as renewable groundwater (including an estimate of 15 cu km of induced replenishment in the irrigation areas), and the remaining, some 1,060 cu km, evaporates.

Total abstraction for consumptive and non-consumptive uses of water is about 190 cu km/year, around 165 cu km of surface waters and some 25-cu km of groundwater.

Hydropower generation uses non-consumptively approximately 115 cu km of water, while consumptive uses amount to nearly 75 cu km. The main of these are agriculture, which accounts for more than 60 cu km (83% of total consumptive uses); domestic use with nearly 9 cu km; industrial use with some 2.5 cu km, and intensive aquaculture, accounting for a little more than 1 cu km.

According to prospective analysis conducted as part of the planning activities carried out by the National Water Commission (the National Waters Authority in Mexico), there is an irrigation potential of some 10 million hectares in the country, approximately 60% more than the area with irrigation facilities at present, which amounts to 6.2 million hectares. However, new irrigation projects are frequently expensive, or in many cases are located in regions where irrigation has only a supplementary character for agricultural production. Therefore, as mentioned later, investments in new irrigation systems are being slowly paced, and the majority of the unexploited irrigation potential is then likely to remain in that condition for a long time.

Of the 6.2 million hectares with irrigation facilities in Mexico, about 3.3 million hectares correspond to 80 bigger systems, namely irrigation districts. The remaining 2.9 million hectares are distributed among more than 30 thousand small size irrigation units. Approximately 4.2 million hectares are irrigated with surface waters, and the remaining, some 2 million hectares are served by groundwater pumping.

According to the Hydraulic Programme 1995-2000 of the Mexican Federal Government, during that period an additional area of about 104,000 hectares would be incorporated to irrigation, out of some 0.5 million hectares to be irrigated by some 50 big and small ongoing new projects.

The most important irrigation projects in Mexico are: Culiacán-Humaya-San Lorenzo Project, Yaqui River Project, Fuerte River Project, Colorado River Project, Lower Bravo River Project, Higher Lerma River Project, Lagunera Region Project, Guasave Project, Mayo River Project, Lazaro Cardenas Project, and Delicias Project. These projects range from some 250,000 hectares to around 80,000 hectares of irrigated area each one.

Irrigated area represents about 30% of total cultivated lands in Mexico, and accounts for nearly 50% of total value of production and two thirds of agricultural exports.

Total harvested area in irrigation lands in Mexico is about 5.5 million hectares in annual average, implying a mean cropping intensity of approximately 90%. Due to drought among other factors, during last years the number of cultivated lands under irrigation have fallen to nearly 50 million hectares per year. In the mid 90's, average water use efficiencies in irrigation systems were estimated to be around 65% for the conveyance and distribution efficiency, and nearly 70% for on farm efficiency, leading to an overall efficiency of about 45%.

Irrigation practices more commonly used are by large gravity methods of applying water, either by furrows or by flooding the fields. Only in nearly ten percent (about 0.6 million hectares) of the irrigated area, advanced methods of irrigation are used, the most popular being sprinklers, low pressure systems using multi-gated pipelines, and drip irrigation. As noted, an aggressive programme is being implemented to mechanise farm irrigation systems. This programme should allow to reach nearly 20% of total irrigated area to be pressurised for year 2000.

Water policy has changed over the time in Mexico. A very important event for the new policy implementation was the 1992 issue of the renewed federal National Waters" Law, and the

corresponding Regulations issued in 1994. These legal instruments, together with Mexican Constitution, are the main juridical basis for water and irrigation management in the country, and entitle the nation with the original property of practically all waters.

A crucial achievement following the new water policy has been the transfer of the biggest irrigation systems or irrigation districts (53% of total irrigated area), from federal government to water users associations (WUA's), which began in the early 90's. Smaller irrigation units have usually always been in the hands of WUA's in the country. Irrigation districts had been poorly maintained by decades, in spite of the great and costly efforts of federal agencies to maintain and rehabilitate these systems. After the transfer, there is a steady pace of better maintenance in the majority of the irrigation districts. At present, most irrigation systems are operated and maintained by WUA's or farmers themselves, with only O&M of head works and some main canals of big systems remaining in the hands of the federal agency in charge of irrigation projects, the National Water Commission (NWC). A variable portion of water charges collected by WUA's is allocated to NWC for operation and maintenance of the old works.

At present, there are approximately half a million hectares of soils significantly affected by salinity in irrigated areas in Mexico.

Financing new irrigation, drainage and flood control works, depends mainly on federal government in Mexico. However, there is also an important private and state governments investment participation, usually more frequent on groundwater irrigation systems.

Mexico and ICID

Mexico joined ICID in the year 1951. The Mexican National Committee has been actively participating in the events of ICID. The National Committee has successfully organised the third Pan American Regional Conference in 1992; 7th International Congress and 20th IEC meeting in 1969, and in each of the last three years an international symposium, with the participation of more than a thousand of water users from irrigation projects all around the country. Mr. Abelardo Amaya Brondo, Mr. Alberto Barnetche González, and Ing. Manuel Contijoch Escontria from the Mexican National Committee were Vice Presidents of ICID in the past. The Mexican National Committee is actively participated in ICID workbodies. This has the support of the Ministry of Agriculture, Livestock and Rural Development and the NWC, and counts on the active collaboration of the Civil Engineers' College, the Mexican Hydraulics Association, the National Association of Irrigation Users, the National Association of Irrigation Specialists, and the Mexican Association of Irrigation.

