Mexico City, Mexico
Disaster Risk Management Profile

Last Update July, 2006

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1. Introduction

Mexico City is one of the biggest cities in the world, and the largest urban area in Mexico. These characteristics have made it a true challenge in urban planning, and of course, the control and management of the risks the city faces. In just 4 % of the national territory, Mexico City has concentrated 18.34 million inhabitants, 24.35% of the national industry, 21.4% of the national economic division, and approximately 60% of the total investments and banking activities. However, the high concentration of population and economic activities in this City are not a recent phenomenon.

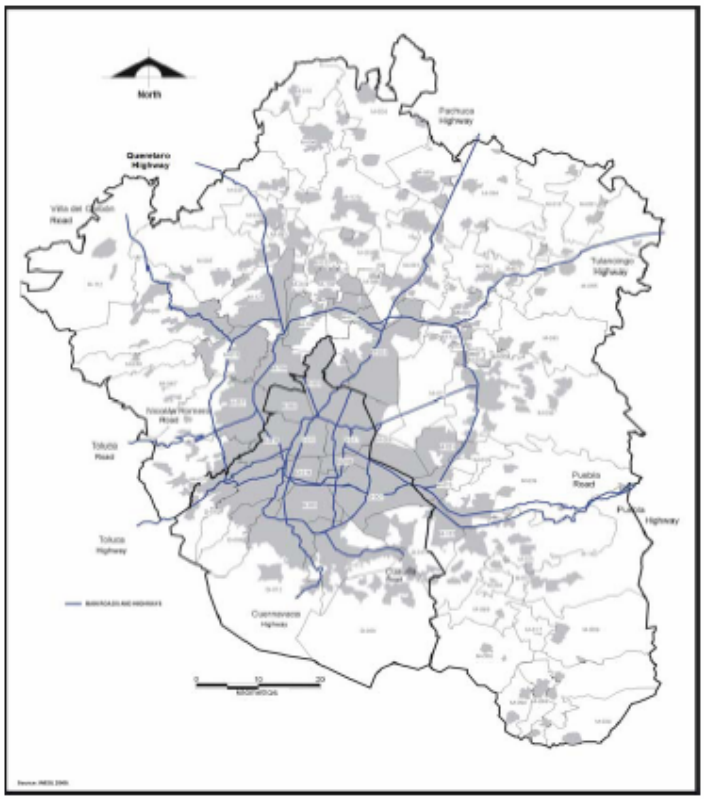
The pattern of urbanization of the city is dispersed and chaotic due to the absorption of many rural areas. This expansion has had high social and environmental costs which increase social inequalities and the uneven provision of infrastructure, services, and urban equipment.

In the middle of the XX century, the city experienced a growth without precedents; therefore, the territory was quickly occupied in order to satisfy the housing population's necessities. Therefore, authorities did not have the chance for planning the growth of the City. Before 1950`s, Mexico City was contained in some delegations of the Federal District (FD). Later, the urban stain included some bordering municipalities of the State of Mexico like Naucalpan, Tlanepantla, Ecatepec, and Chimalhuacán.

The restriction for making more buildings and houses in the FD accelerated the population growth in several municipalities of the State of Mexico; increasing the extension of the city very quickly. Consequently, this process of urbanization created a large and complex city since two different political units constitute it. According with the Declaratory of the Metropolitan Zone of the Mexico Valley in 2006, Mexico City comprises 16 delegations belonging to the FD and 59 municipalities from the State of Mexico; encompassing 7,738 km^2 (See map 1.1).[1]

[1] Federal District is integrated for the following 16 delegations: Azcapotzalco, Coyoacán, Cuajimalpa, Gustavo A. Madero, Iztacalco, Iztapalapa, Magdalena Contreras, Milpa Alta, Álvaro Obregón, Tláhuac, Tlalpan, Xochimilco, Benito Juárez, Cuauhtémoc, Miguel Hidalgo y Venustiano Carranza. On the other hand, cornurbated municipalities from the State of Mexico are: Acolman, Amecameca, Apaxco, Atenco, Atizapán de Zaragoza, Atlautla, Axapusco, Ayapango, Coacalco, Cocotitlán, Coyotepec, Cuautitlán de Romero Rubio, Chalco de Díaz Covarrubias, Chiautla, Chicoloapan, Chiconcuac, Chimalhuacán, Ecatepec de Morelos, Ecatzingo, Huehuetoca, Hueypoxtla, Huixquilucan, Isidro Fabela, Ixtapaluca, Jaltenco, Jilotzingo, Juchitepec, Melchor Ocampo, Naucalpan de Juárez, Nezahualcóyotl, Nextlalpan, Nicolás Romero, Nopaltepec, Otumba, Ozumba, Papalotla, La Paz, San Martín de las Pirámides, Tecámac, Temamatla, Tecamascalapa, Tenango del Aire, Teoloyucan, Teotihuacan, Tepetlaoxtoc, Tepetlixpa, Tepotzotlán, Tequixquiac, Texcoco,

MAP 1. Mexico City Limits



Source: Universidad Autónoma Metropolitana Azcapotzalco-CENVI, 2000

The concentration experienced by Mexico City has been explained by localization and agglomeration of the economy, because this city is the biggest regional market in the country. The larger the regional market, the more profitable for enterprises to locate there. These enterprises created many jobs, which attracted numerous migrants. Before the financial crises of 1995, Mexico City was the chief place where new companies and foreign investments were localized. After that, this region lost some competitiveness which caused some industries to redefine their location; reducing the city participation in the national employment from 48% in 1980 to 18.32% in 2003.

One of the most remarkable characteristics in Mexico City's economy is the transition from an industrial to a tertiary economy, where services and commerce almost concentrate 75% of the work force and generate 80.73% of the GDP in this entity. Although the decline in the industrial sector has been accompanied by an increase in the service sector, the capacity of the tertiary sector to increase the employment in order to absorb all the workers that come from the manufacturing activities has been limited; increasing informal activities and the risks the population experiences. Approximately 60% of Mexico City's population is considered poor; nevertheless, this entity produces more wealth and employment as compared to others. This

Tezoyuca, Tlalmanalco, Tlalnepantla, Tultepec, Tultitlán, Villa del Carbón, Zumpango, Cuautitlán Izcalli y Valle de Chalco Solidaridad (POZMVM, 2000).

means that the City has many problems with the income distribution. Most of the people living in poverty are located in new settlements situated in the municipalities of the States of Mexico.

Mexico City has a historical downtown which is recognized by UNESCO as a World Cultural Heritage; therefore, it has a huge potential in the tourism industry. In this area, there are many cultural and historical assets that have not been sufficiently exploited and internationally promoted. The major obstacle that tourism industry faces is the negative perception of insecurity, especially in the central delegations where the principal attractions are located.

The city has an inadequate transport infrastructure because there is not any spatial planning and a good transport system. This means that the time, distances, and costs for inter-city travel have increased significantly. Approximately 83% of almost 4 million trips in the city are undertaken in low capacity vehicles, resulting in overcrowd roads. Insecurity represents an important challenge for the authorities, since this negative image reduces direct investment and tourism. Also, one of the biggest challenges in this city is the definition of strategies with a metropolitan perspective that promotes coordination and cooperation within local city entities. When the authorities begin planning as a metropolitan region, many urban problems, including the management of risks, would be solved.

2. Demographic, Economic, Social and Cultural Characteristics

2.1 Demographic Characteristics

Mexico City currently has 18.4 million inhabitants, which is 18.9% of the national population. Although its population growth rates are now stable, since 1950`s they had been considerable high, even higher than the national rates (See table 2.1.1 and graph 2.1.1).

The highest population growth rate in the city was registered in the period 1940-1950, which was 5.85% per year. However, the maximum population concentration happened in the 1980`s when Mexico City represented 19.44% of the national population. After this year, the population is still increasing, but the rate has decreased.

For this reason, the city population proportion in the national context has been reduced; in 1990 it was of 18.8% and in 2000 of 18.4 percent. This reduction is explained by a decrease in productiveness and due to an expulsion of FD population to other cities. After the 1980`s, the growth rate of Mexico City has been lower than the national rates. This situation has not happened since the beginning of the XX century (See table 2.1.1 and graph 2.1.1).

In this context, it is possible to identify three demographic stages:

1. ***An expansion process*** that happened in the period 1930-1950, when the city experienced the highest growth rates of the century. This situation was caused by an industrialization process which increases the labor demand, and, also, the natural and social growth rates. In only thirty years the City populations was almost tripled.

2. ***A metropolitan process*** that started in the 1950`s and ended in 1980`s. During these three decades, the city population and its' physical expansion were quadrupled. The physical and population expansion was mainly located in the municipalities of the State of Mexico, producing a quick concentration. In spite of the deconcentration industrial policy, the city continued growing in size and surface area. This phenomena forced the authorities to implement some programs to reduce birth rates. These programs steadily reduce the natural growth rates during the following decades.

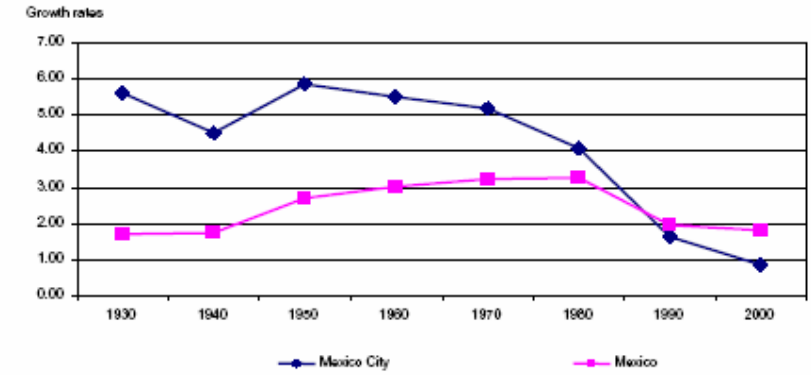
3. ***A stabilization of the growth rates*** occurred since 1995. The growing rates are less than one percent per year. Even though the city does not grow in its size, it continues growing in surface area. This represents a challenge to the authorities for urban planning and development in appropriate places to lessen environmental damages and reducing the costs of providing the necessary public services to the population.

Table 2.1.1
Population growth in Mexico City, 1930-2000
(habitants)

	Mexico City		Nacional		
Year	**Population**	**Rate of Growth**	**Population**	**Rate of Growth**	**Share of National Population**
1930	1,048,970	5.60	16,552,722	1.72	6.34
1940	1,644,921	4.50	19,653,552	1.73	8.37
1950[a]	2,952,199	5.85	25,789,626	2.72	11.45
1960[b]	5,125,447	5.52	34,923,129	3.03	14.68
1970[c]	8,623,157	5.20	48,225,238	3.23	17.88
1980[d]	12,994,450	4.10	66,846,833	3.27	19.44
1990[e]	15,274,256	1.62	81,249,645	1.95	18.80
2000[f]	18,396,677	0.84	97,361,711	1.81	18.90

Source: INEGI, Population Census, 1930-2000. .
a. Mexico City included fourteen delegations of the FD (EXCEPT: Cuajimalpa, Tlalpan, Xochimilco, Tláhuac y Milpa Alta) and the municipality of Tlanepantla.
b. The City added the delegations of Cuajimalpa, Tlalpan and Xochimilco, and the municipalities of Chimalhuacan, Ecatepec and Naucalpan.
c. The City comprised the delegation of Tláhuac and the municipalities of Atizapán, Cuautitlán, La Paz, Tultitlán, Coacalco, Huixquilucan and Nezahualcoyotl.
d. Mexico City was formed by the delegation of Milpa Alta and the municipalities of Atenco, Cuautitlán Izcalli, Chicoloapan, Chiautla, Chalco, Chinconcuac, Ixtapaluca, Nicolás Romero, Tecámac y Texcoco.
e. The City was integrated by the municipalities of Alcoman, Melchor Ocampo, Teoloyucan, Tepozotlán, Tezoyuca, Tultepec y Valle de Chalco Solidaridad.
f. The City was conformed by 16 delegations and 59 municipalities of the State of Mexico.

Graph 2.1.1 Growth rates of Mexico City, 1930-2000



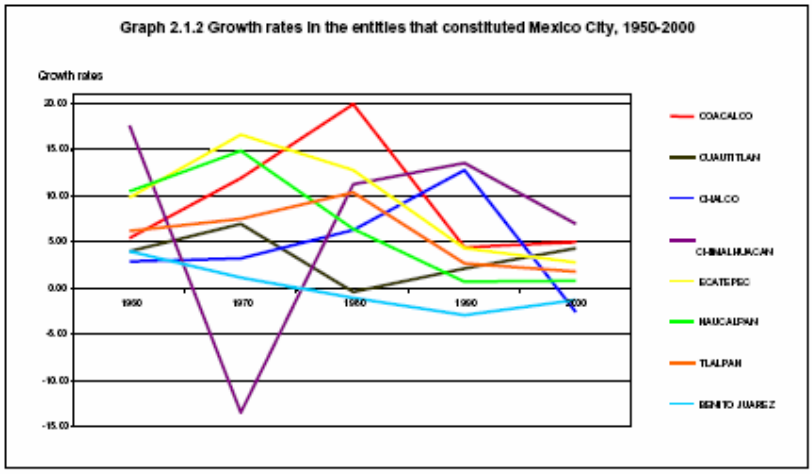
Source: INEGI, *Population Census, 1930-2000.*

As it has already been mentioned, the population of Mexico City is still increasing, but its growth rate has slowed dramatically; showing a clear process of deceleration of its demographic activities. In 1950, the city growth rate was 5.85% per year, but it decreased to 0.84% per year in 2000. However, the dynamic of population growth within the delegations

and municipalities that conforms this city is very different because some of them have high growth rates and others have negative growth rates. In general, in the last decade the FD had a very slow population growth, while the municipalities of the State of Mexico have a considerable expansion.

The municipalities located to the east and north of the State of Mexico present a considerably high tendency of growth; therefore, they will require considerable investments in infrastructure and equipment. This is current situation in the municipalities of Coacalco, Tultitlán, Tultepec, Chimalhuacán, and Iztapaluca, which have growth rates higher than five percent. The delegations of Cuajimalpa, Milpa Alta, Xochimilco, and Tlahuac are in a same predicament, but their growth rates are near four percent. It is important to mention that in these localities, environment plays an important role in soil conservation and recharge the aquifers, so the growth of the city continues to be on areas that should be protected.

On the other hand, the areas that have negative growth rates are: the municipality of Chalco, the delegations of Azcapotzalco and Iztacalco, and the central delegations (Benito Juárez, Cuauhtemoc, Miguel Hidalgo, and Venustiano Carranza). In this context, DF since the 1980`s became a population's ejector instead of being a population's attractor. Just in a decade, the central delegations had lost more than 1.2 million inhabitants. This phenomenon is trying to be solved by some re-densification policies like the "Bando dos". Finally, the entities that have stabilized their population are: Nezahualcoyotl, Tlanepantla, Coyoacán, and Gustavo A. Madero. They were some of the first territorial units constituted in Mexico City, so it is expected that the other entities follow a similar growth pattern (See graph 2.1.2).



Source: INEGI, *Population Census, 1950-2000.*

There is a close relation between the demographic growth of the city and its physical expansion; nevertheless, the reduction of the demographic growth has been accelerated more than the physical growth rate. In 1950, Mexico City had a population approximately of 3 million habitants distributed in 22,989 ha, so it had a density of 128 habitants/ha. Between the 1950`s and 1970`s, the city had considerably high population growth rates, so the urban area increased to 68,260 ha. Because the physical growth of the city was larger than its demographic growth, the density per habitant was reduced to 126 habitants/ha. Until that moment, Mexico City continued being concentrated and with a high density, but some

municipalities of the State of Mexico was already part of the city (See table 2.1.2 and graph 2.1.3).

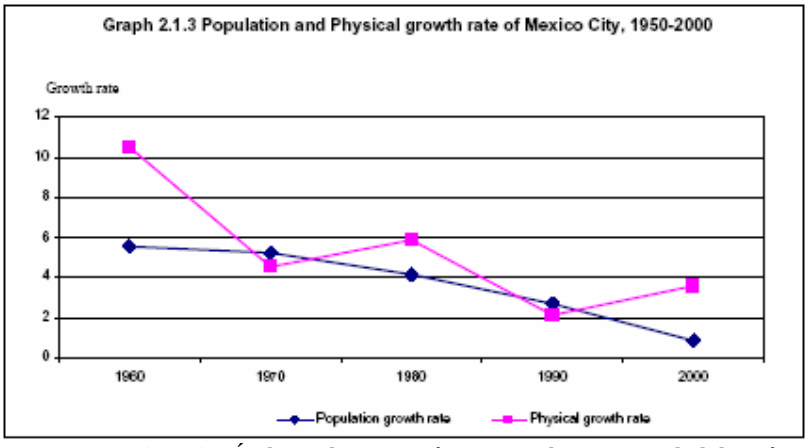
Since the 1980`s the physical growth of the City incorporated many municipalities of the State of Mexico due to an industrial decentralization policy implemented in the DF. Consequently, in 10 years, the urban area increased to 130,549 ha with a growth rate per year of 10.4%. In the 1990`s, the physical and population growth rate decreased significantly. While the population had a growth of 0.84%, the physical growth rate of the city was 3.56%. As a result of the higher reduction in the population growth in comparison with the physical growth, the density during this decade decreased to 104 habitants/ha (See table 2.1.2 and graph 2.1.3).

Table 2.1.2

Physical expansion of Mexico City, 1950-2000

Year	Population (habitants)	Population growth rate	City extensión (ha)	Physical growth rate	Density
1950	2,952,199	5.85	22989	-	128
1960	5,125,447	5.52	47070	10.47	109
1970	8,623,157	5.20	68260	4.50	126
1980	12,994,450	4.10	107973	5.82	120
1990	15,274,256	2.64	130549	2.10	117
2000	18,396,677	0.84	176965	3.56	104

Source: Garza, Gustavo (2000), "Ámbitos de expansión territorial" in *La Ciudad de México en el fin del segundo milenio,* Mexico, GDF/COLMEX. INEGI (2000), *XII Population Census.*



Source: Garza, Gustavo (2000), "Ámbitos de expansión territorial" in *La Ciudad de México en el fin del segundo milenio,* Mexico, GDF/COLMEX. INEGI (2000), *XII Population Census.*

The city expansion is explained by the immigration from the FD to the State of Mexico, but this immigration is done by middle and low income population as a result of differences in the cost of living between the FD and the State of Mexico. The concentration of low income residents in certain parts of Mexico City is linked to the problems for having access to services and having an adequate infrastructure. This absence increases the risks faced by these groups.

Estimates predict that the population of the 59 municipalities of the State of Mexico will reach 12.7 million in 2020, so its weight in the city will be 56.5%, while in the DF it will be of 40%. Evidently, the differential growth and weight of these two administrative units will have

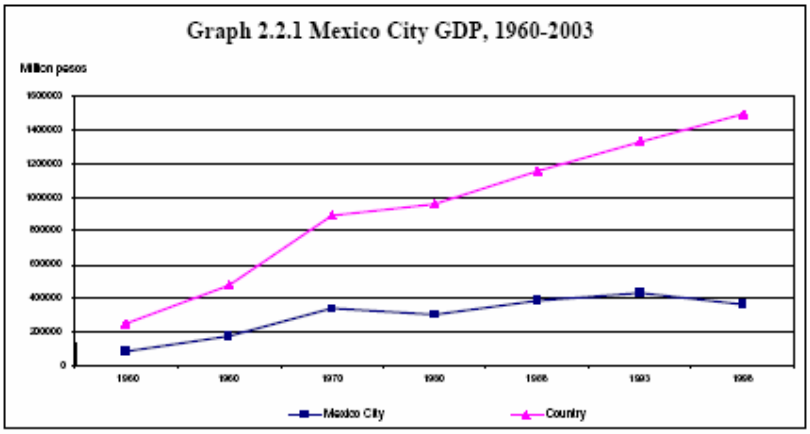
important political consequences for the region. Authorities need to develop some mechanism to improve the organization and control of the settlement areas. Reforms of articles 27 and 115 of the Political Constitution of Mexico and of the General Law on Human Settlements promoted a more decentralized economic, social, and political system, but this system is very fragmented instead of following a coordinated system of urbanization and a process of planning.

2.2 Economic Characteristics

Mexico City has been classified as a global city because it offers high level services. It occupies the 21st place among the cities of the world that provided these kinds of services. It is near Brussels, Madrid, and Sao Paulo. It occupies the position of 63 among 66 OCDE cities of the world with a GDP per habitant of 13,470 dollars/year (OECD, 2004).

Since the 1950`s it has been the most important city in the country. In 2003, the GNP produced by the city was of 1,538 trillion pesos; approximately 24.35% of the total GNP. However, the proportion of it in the GNP has been decreasing gradually since 1980 when its contribution to the national product was 40% (See graph 2.2.1).

The economy of Mexico City is in an important transition, as many other countries in the world, because commerce and service sectors recently represent the most important activities instead of the industrial sectors. However, the inability of its tertiary sector for absorbing the work force that comes from the industries is forcing the workers to look for employment in the informal sector.



Sources: INEGI, Economic Census, 1981, 1989, 1994, 1999 and 2004.

Mexico City in 2003 concentrated 360,865 economic units (12.01% of the national units) and 2.97 million workers (18.32% of national employments) who get 30.48% of the national compensations. This amount was of 255 thousand million pesos. The added value was of 857,326 million pesos (26.65% of the national added value). In the case of the investment, it represented 18.03% of the total investment which was of 61,898 million pesos; while the fixed asset in this entity was of 666,453 million pesos (18.43% at national level) (See table 2.2.1).

Table 2.2.1
Economic characteristics of Mexico City, 2003
(thousand pesos)

Concept	Mexico City	Country	Share of the City	Share of the Country
Economic Units	360,865	3005157	12.01	87.99
Occupied Personnel	2,974,987	16,239,536	18.32	81.68
Remunerations	255,310,155	837,755,265	30.48	69.52
GDP	1,538,115,250	6,317,178,777	24.35	75.65
Added Value	857,326,333	3,217,290,004	26.65	73.35
Investment	61,898,789	343,312,356	18.03	81.97
Fixed Assets	666,453,211	3,615,275,200	18.43	81.57

Source: INEGI, Economic Census, 2004.

In 2003, the economic sector that concentrated the majority of the production of the city is the tertiary (80.73%), then the secondary (19.19%), and finally, the primary (0.08%). In the tertiary sector, the financial services (25.30%), the information services (13.16%), the production services (7.28%), and the transport and communications services (7.12%) were the most important in the Mexico City. In the case of the secondary sector, the most important activity was the manufacturer industry (16.93%) (See table 2.2.2).

Considering the personnel occupied by sector in 2003, the tertiary sector concentrated 80.79% of the personnel occupied in the city. The secondary sector has 18.88% of the labor force and the primary sector just 0.34%. The subsector that concentrates almost 18% of the labor force in the city was the retail commerce; even though, this activity hardly contributes to the generation of GDP and added value. The other subsectors that have a considerable concentration of personnel occupied are: manufacturer industry (15.38%), the professional and educational services (9.88%), the financial and insurance services (9.58%), and the production services (9.57%). It is important to mention that the financial services with just 10% of the city workers generates one fourth of the city GDP (See table 2.2.2).

The sectors that are strategic for increasing the GNP and the employment in Mexico City are: the professional and educational services and the tourism services. In these sectors, the city has the human capital, the infrastructure, and the knowledge to make them an important source of incomes (See table 2.2.2).

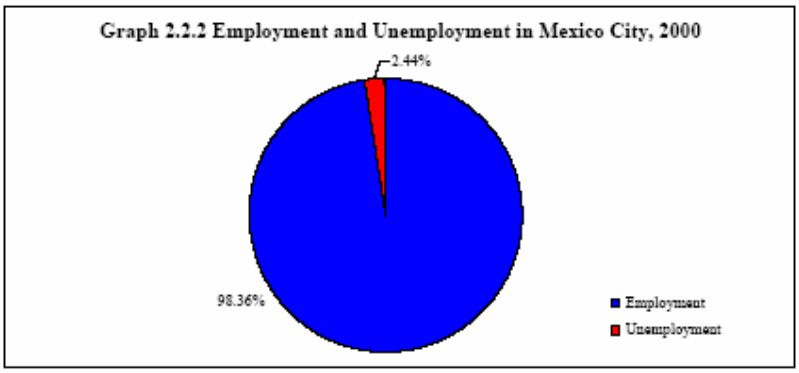
Table 2.2.2
Economic Sectors in Mexico City, 2003
(millon pesos)

Concept	GDP	Share of the City	Occupied Personnel	Share of the City
Mexico City	**1,538,115.25**	**100**	**2,974,987**	**100**
Primary Sector	**1,225.83**	**0.08**	**10,085**	**0.34**
Agricultura	6.99	0	502	0.02
Mining and petroleum extraction	1,218.84	0.08	9,583	0.32
Secondary Sector	**295,138.59**	**19.19**	**561,537**	**18.88**
Construction	34,690.36	2.26	104,130	3.5
Manufacturing Industry	260,448.23	16.93	457,407	15.38
Tertiary Sector	**1,241,750.84**	**80.73**	**2,403,365**	**80.79**
Wholesale Comerse	97,799.72	6.36	187,265	6.29
Retail Comerse	83,266.54	5.41	535,581	18
Transport and Comunications Services	109,493.63	7.12	151,677	5.1
Information Services	202,346.55	13.16	134,697	4.53

Financial and Insurance Services	389,207.28	25.3	284,887	9.58
Rent Services	21,791.35	1.42	39,765	1.34
Production Services	111,954.69	7.28	284,701	9.57
Profesional and Educational Services	78,973.23	5.13	293,796	9.88
Health Services	12,231.69	0.8	64,193	2.16
Amenities	6,062.55	0.39	26,254	0.88
Tourist Services	32,074.23	2.09	208,625	7.01
Electricity, Water and Gas	75,326.66	4.9	45,831	1.54
Other Services	21,222.72	1.38	146,093	4.91

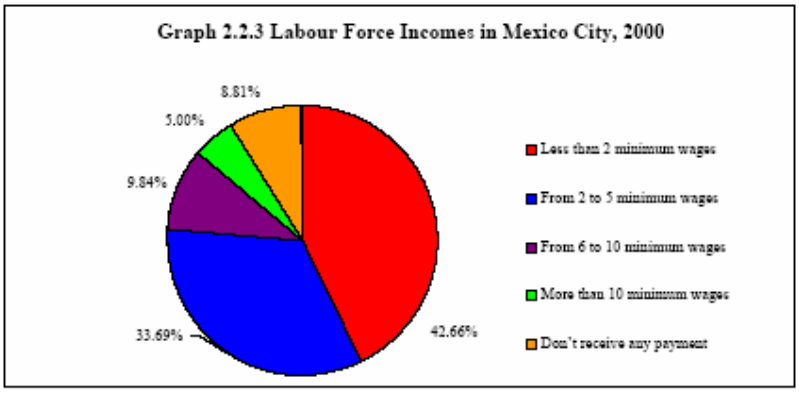
Source: INEGI, Economic Census, 20004.

Of the total labor force in Mexico City, 98.35% has is employed, whereas only 2.44% is unemployed (See graph 2.2.2). Although Mexico City has the smallest unemployment rate in the world, many of its employees receive low wages and do not work the complete labor day. Actually, many persons worked in the informal sector in order to earn the enough money for surviving. These facts explain why the Mexico City labor force has a low productivity.



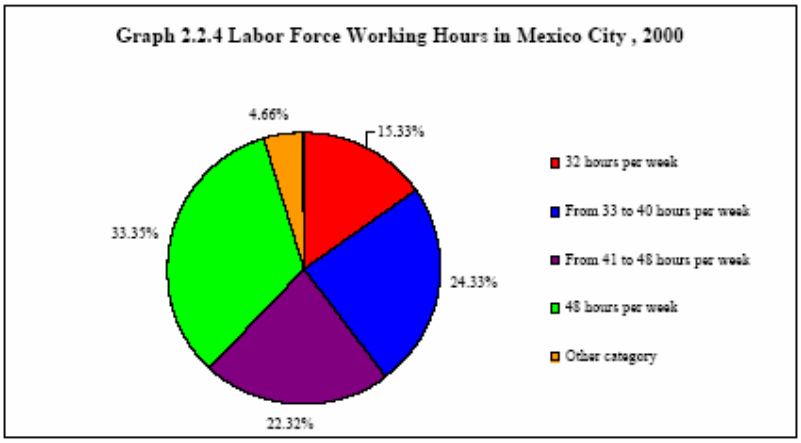
Source: INEGI, XII Population Census, 2000.

Approximately, 42.66% of the city workers earn less than two minimum wages (less than 8 dollars/day), 33.69% earn between 2 and 5 minimum wages, 9.84% earn from 6 to 10 minimum wages, and just 5% receive more than 10 minimum wages. The rest of the labor force (8.81%) does not obtain any salary for their work. It is clear, that the unemployment rate is underestimated since it is equal to 2.44% of the total labor force. This fact is a huge problem because near 40% of the workers experience troubles for satisfying their basic needs (See graph 2.2.3).



Source: INEGI, XII Population Census, 2000.

On the other hand, 39.66% of the city employees worked less than 40 hours a week and 22.32% worked between 41 and 48 hours. This means that more than 60% of the labor force did not work the complete labor day and just 33.35% worked 48 hours per week (the complete labor day) (See graph 2.2.4).



Source: INEGI, XII Population Census, 2000.

2.3 Social Characteristics

2.3.1 Housing

Each Mexican has the Constitutional right to have a worthy and proper housing, because housing represents a families´ patrimony. However, since the application of the neo-liberal model to Mexican economy, the government delegated housing promotion to the private sector. As a result, it stopped building houses and now its function is limited to residential financing. But the lack of population access to the housing market has brought a bigger social inequality, as well as, the proliferation of irregular settlements around the city, which inhabitants are more vulnerable because these settlements are located in risky locations.

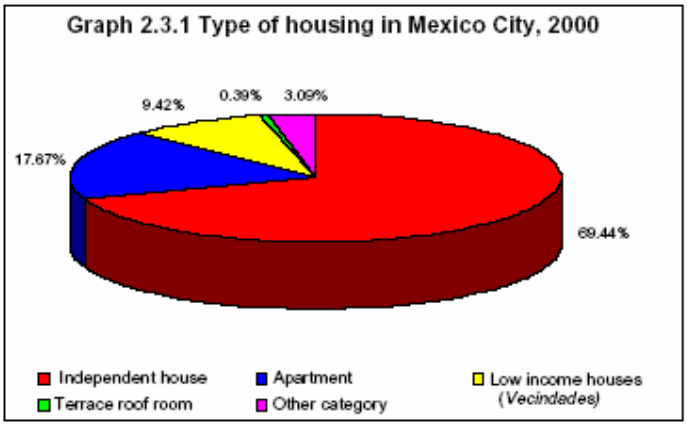
In Mexico City there are 4.2 million houses, of which 49.96% are located in the FD and 50.04% in the municipalities of the State of Mexico. In these houses 19.4 million habitants are settled. City occupant average ascends to 4.37 and as a result of a bigger population concentration in the State of Mexico. In this entity inhabitant per house is higher than the city average, since it is 4.67 inhabitants per house, while in the Federal District it is of 4.07 inhabitants/house (See table 2.3.1)

Table 2.3.1
Mexico City occupants and housing Stock, 2000
(Houses/Inhabitants)

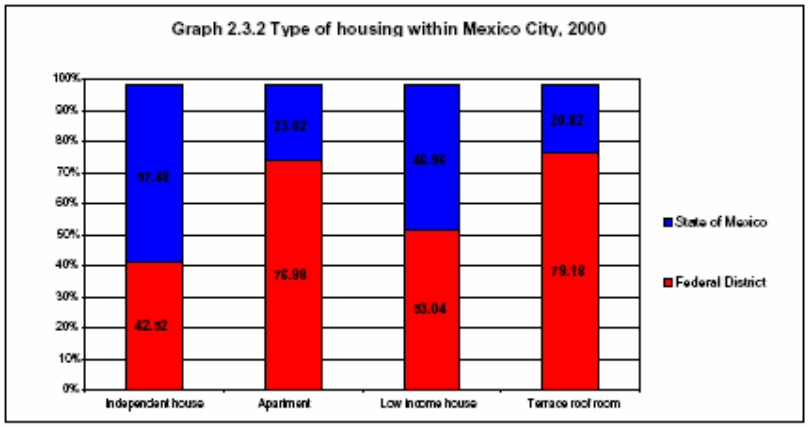
				Housing Share		
	Mexico City	**FD**	**State of Mexico**	**Mexico City**	**FD**	**State of Mexico**
Houses	**4,202,049**	2,104,755	2,108,294	100.00	49.96	50.04
Occupants	**18,396,677**	8,561,469	9,835,208			
Inhabitants/house	**4.37**	**4.07**	**4.67**			

Sources: INEGI, XII Population Census, 2000.

Of the total housing, 69.44% are independent houses, 17.67% apartments in buildings, and 9.42% low income houses (*vecindades*). Therefore, the city morphology is more horizontal than vertical. However, the FD concentrates most of the city buildings. The apartments in this entity represent 76.98% of the total housing. It also has the majority of the low income houses (*vecindades)*. On the other hand, most of the independent houses are located in the State of Mexico (57.48%) (See graphs 2.3.1 and 2.3.2).



Source: INEGI, XII Population Census, 2000.

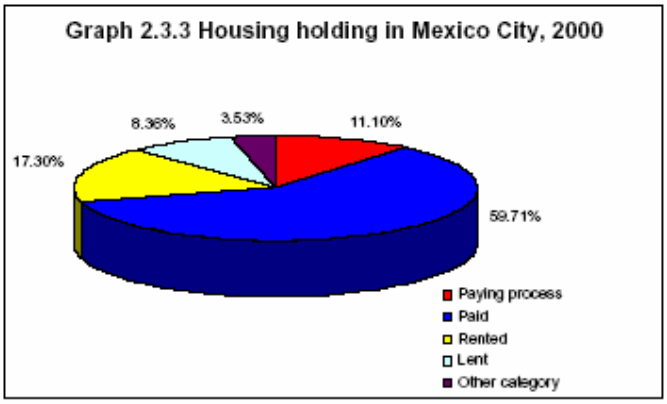


Source: INEGI, XII Population Census, 2000.

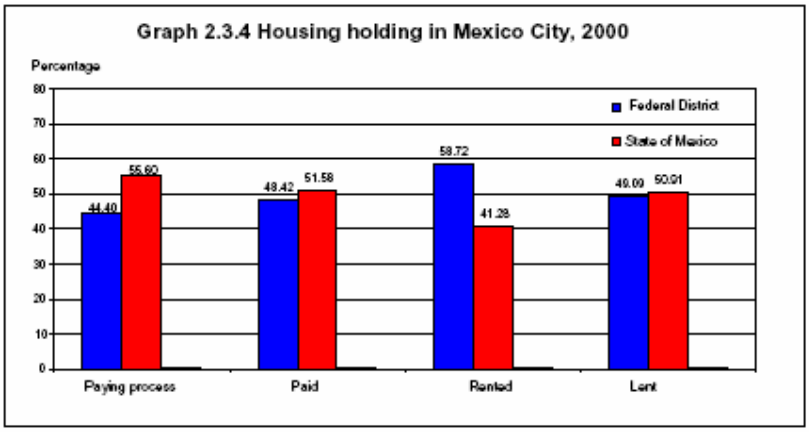
According to the housing holding, 3.1 millions inhabitants own their houses (73.67%) and 1.08 millions do not own homes (25.82%). Of the total city housing, 11.10% is in a payment process, 59.71% is completely paid, 17.30% is rented, and 8.36% is lent. (See graph 2.3.3)

Most of city housing in a payment process is located in the State of Mexico (55.27%), and the same thing happens with paid houses (51.35%). On the other hand, most of the rented houses are in the FD (57.46%), while those that are lent are concentrated in the State of Mexico (57.08%) (See graph 2.3.4).

Evidently, the housing sale market is larger than the rented housing market. This can be explained because the population considers their houses as a family patrimony. The growing demand of houses in the city has been provoking an increase in the physical surface of the city.



Source: INEGI, XII Population Census, 2000.



Source: INEGI, XII Population Census, 2000.

Considering the building materials of houses in Mexico City, in 16.36% of them the roof was built with not with durable materials like cardboard or metallic sheets; in 2.53% the walls were built adobe, wood, and cardboard sheets, and in 64.02% the floors do not have any kind of cover. Approximately 47.22% of the houses in the city (2 million houses) were built with durable materials. Therefore, they have roofs and walls made of concrete, and floors with some kind cover. Just 0.39% of the houses were built with long-lasting materials, and the majority of the houses (52.39%) were built with at least roofs, walls, or floors made of durable materials (See table 2.3.2).

Table 2.3.2 Building materials in the Mexico City houses, 2000 (quantity of houses)

Part of the house	Material	Mexico City	Percentage
Roof, Walls and Floor	Durable Materials	1,988,958	47.22
	At least one Durable Building Material	2,206,397	52.39
	No Durable Materials	16,348	0.39
	Total	4,211,703	**100.00**

Source: INEGI, XII Population Census, 2000.

On the other hand, 93.16% of the houses have a radio, 96.01% a TV, 54.79% a VCD, 80% a refrigerator, 64.72% a washing machine, and 55.92% telephone service. It is surprising that the telephone service has a low coverage and almost a fifth of the total houses in the

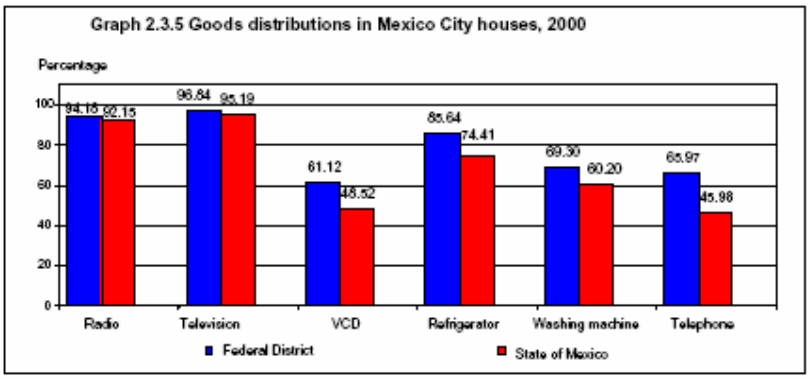
city do not have a refrigerator in order to preserve food in an appropriate state (See table 2.3.3).

The houses located in the FD have a bigger quantity of goods than the average of city. Almost 70% of the houses have telephone service, 85.65% have a refrigerator, 61.12% have a VCD, 96.28% have a TV, and 94.18% have a radio. FD residents live with much comfort, as they posses a bigger quantity of goods than Mexico State municipalities. However, this advantage decreases when we consider environmental quality, noise, traffic, insecurity among others (See graph 2.3.5).

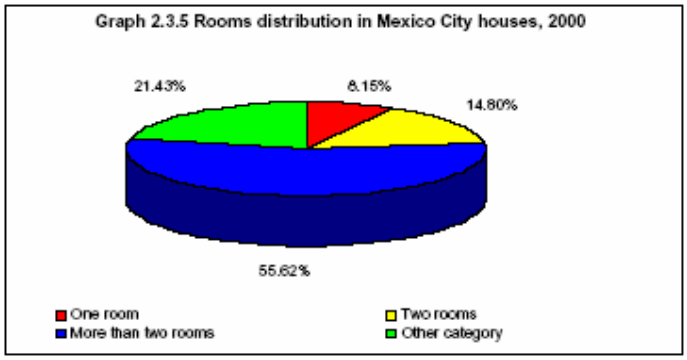
Table 2.3.3 Goods in Mexico City houses, 2000

Concepto	Mexico City	Share of the city
Viviendas con radio	**3,923,496**	93.16
Viviendas con televisión	**4,043,548**	96.01
Viviendas con VCD	**2,307,560**	54.79
Viviendas con refrigerador	**3,369,407**	80.00
Viviendas con lavadora	**2,726,016**	64.72
Viviendas con teléfono	**2,355,070**	55.92
Total de viviendas	**4,211,703**	**100.00**

Source: INEGI, XII Population Census, 2000.



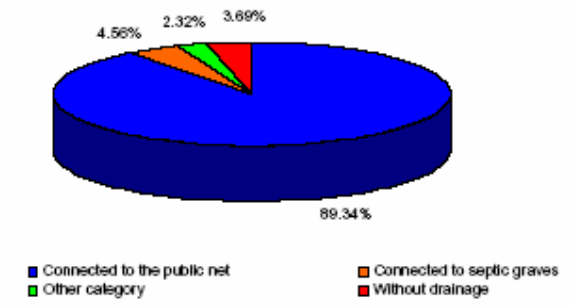
Source: INEGI, XII Population Census, 2000.



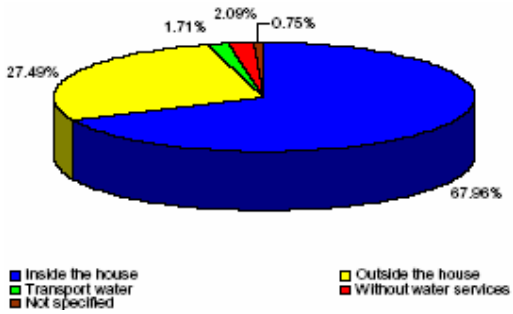
It is important to mention that 8.15% of the total houses has only one room, 14.80% has two rooms, and 55.62% has more than two rooms. Therefore, more than a half of city houses have the kitchen separated from bedrooms and family members do not sleep together (See graph, 2.3.5). In FD 60.33% of the houses are more than two rooms and in the State of Mexico this proportion is 50.88%.

Mexico City is one of the cities in the country with higher concentration of public services and infrastructure. Almost 96% of the houses located in this city have drainage, but only 89.43% of them are connected to the public net and 4.56% of them use septic graves. In the case of fresh water services, 95.45% of the houses have this service, but just 67.96% of them have this service inside. Approximately 2% of the houses built water from pipes in order to satisfy its demand and 2.09% of them do not have access to this resource. Finally, 99.34% of the houses have electricity. It is important to mention, that 92.76% of the houses in the city have all these services, 6.83% of them have at least one of the mentioned services and just 0.08% of the houses do not have any of them. In this context, Mexico City's sewage system requires more attention for increasing its covering. Even though almost 100% of its residents have all the public services (See graphs 2.3.6, 2.3.7, 2.3.8 and 2.3.9).

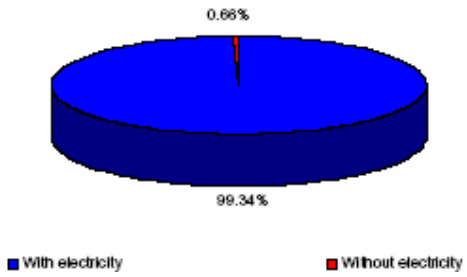
Graph 2.3.6 Drainage



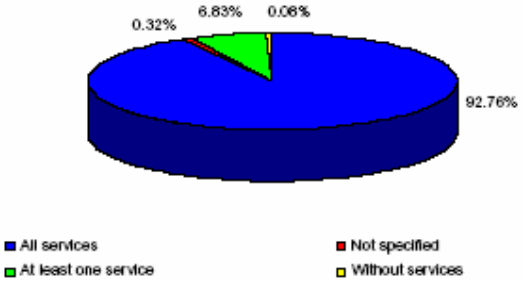
Graph 2.3.6 Water Services



Graph 2.3.6 Electricity

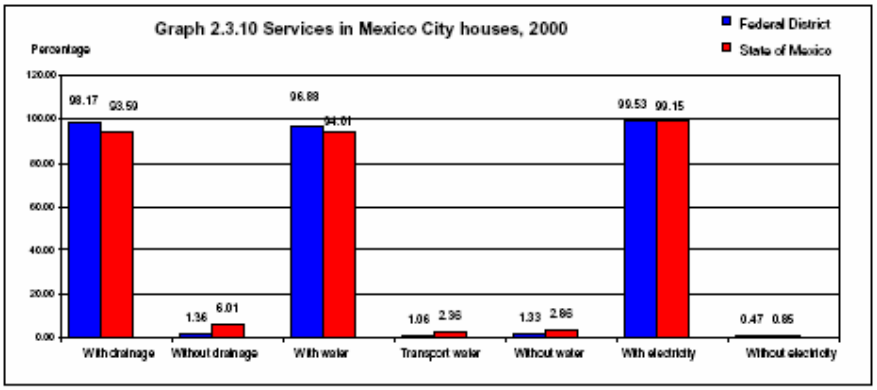


Graph 2.3.6 Services



Public Services in Mexico City homes
Source: INEGI, XII Population Census, 2000

In the FD, 98.17% of the houses have drainage, 96.88% water services, and 99.53% electricity. Moreover, the covering of these services is larger than the city average. In the case of the State of Mexico, 93.59% of the houses have drainage, 94.01% water services, and 99.15 % electricity, which is near to the city average (See graph 2.3.10).



Source: INEGI, XII Population Census, 2000.

2.3.2 Education

Mexico City, compared with the other cities in the country, has higher levels of education and it also concentrates most of the educative and research facilities. Its rate of illiteracy reaches 3.76% of the population that are older than 15 years, but 4.55% of this sector do not receive school instruction, 10.16% do not finish primary education, 31.82% do not study high school, 59.82% of the population older than 18 years do not attend college, and 83.11% do not have university studies (See table 2.3.4).

In this context, even if the city has low rates of illiteracy, it is troublesome that low level of education that its residents have. Additionally, its more worrying this situation because Mexico City is one the cities with higher levels of education along the country. Evidently, the problem related with education requires to be assisted urgently as an average its residents study only six years.

Table 2.3.4 Education in Mexico City, 2000 (habitants)

Population	Population	
Older than 15 years	12,546,489	
Older than 18 years	11,507,115	**City Share**
Illiteracy	471,946	3.76
Without instruction	570,500	4.55
Without primary education	1,274,461	10.16
Without secondary education	3,992,920	31.82
Without college	6,883,562	59.82
Without university	1,942,978	16.89
Scholar years average	6 años	

Source: INEGI, XII Population Census, 2000.

In the city there are concentrated 124 facilities of higher education which are concentrated in the delegations of Cuauhtémoc, Miguel Hidalgo, Benito Juárez, Gustavo A. Madero, Azcapotzalco, Tlalpan, and Coyoacán (62 units), as well as, in the municipalities of Ecatepec, Cuautitlán Izcalli, Naucalpan, Tlalnepantla, Texcoco, and Netzahualcóyotl (27 facilities). Within the other entities, these facilities do not exist or they are dispersed. As a result, for promoting higher levels of education, it is necessary to increase the location of new facilities mainly to the north, northwest, and east of the city.

2.3.3 Health

Only 47.54% of population in Mexico City have the right to receive health services; approximately 76% of them have access to IMSS (Mexican Institute of Social Security) , 19% to ISSSTE (Institute of Social Security and Services for State Workers), and 5.13% of them receive medical attention from other institutes (mainly private hospitals)[2] (See table 2.3.5). Almost half of the residents in the city do not have the right to receive health services from governmental institutions. Therefore, the unequal distribution of this service is a matter that needs fast and efficient solutions.

[2] IMSS = Instituto Mexicano del Seguro Social
ISSTE= Instituto de Seguridad y Servicios Sociales de los Trabajadores del Estado

Table 2.3.5 Health in Mexico City, 2000

Population	Ciudad de México	City Share
Total population	**18,396,677**	**100.00**
With the right to receive health services	**8,745,288**	**47.54**
IMSS health services	6,634,992	75.87
ISSSTE health services	1,662,073	19.01
Other institutions	448,223	5.13
Without the right to receive health services	**8,847,205**	**48.09**
Not specified	804,184	4.37

Source: INEGI, XII Population Census, 2000.

Even this situation, Mexico City concentrates the most specialized hospitals in the country, therefore, many persons of different states come to the capital in order to receive medical care. In this city there are 116 hospitals, 68 of them are general and 48 specialized. These facilities are located mainly in the delegations of Cuauhtémoc, Miguel Hidalgo, Benito Juárez, Gustavo A. Madero, Azcapotzalco, Tlalpan, and Iztapalapa (75 units) and in the municipality of Naucalpan (6 units). The 35 remaining hospitals are dispersed in another 9 delegations and 8 municipalities. The rest of them, situated at north, northeast, and east of the city, do not have this kind of facilities which are deficit in the supply of this service.

2.3.4 Poverty and Marginalization

Poverty, using an income method designed by Sedesol (Social Development Ministry), is classified as: alimentary, capacities, patrimonial. The alimentary poverty is the one in which the income per habitant can not afford feeding necessities. In this case, the income is between 1.5 and 2.0 dollar/person/day. The capacities poverty is defined as the one in which the income per habitant can not afford feeding, health nor education, because the income fluctuates between 1.8 and 2.4 dollar/person/day. Finally, the patrimonial poverty is the one in which the income per habitant can not afford feeding, health, education, dress, housing and transportation. This income is between 2.8 and 4.1 dollars/person/day.

Poverty is a serious social phenomenon in Mexico City because in 2000 almost 94.56% of the city population had some signs of poverty. The city had 9.7 million persons with patrimonial poverty, of which 4.7 millions are in capacities poverty, and 3.0 millions in an alimentary poverty. This means that in the city 52.7% are considered poor and 16.3% of the 18.4 million residents can not feed themselves (see table 2.3.6). [3]

Table 2.3.6 Alimentary, Capacities and Patrimonial Poverty

Poverty classification	Population (in millions)	Percentage
Patrimonial	9.7	52.7
Capacities	4.7	25.54
Alimentary	3.0	16.3
Total	**17.4**	**94.56**

Source: Boltvinik, Julio (2002), *Pobreza en la Ciudad de México,* Newspaper La Jornada, January 25th.

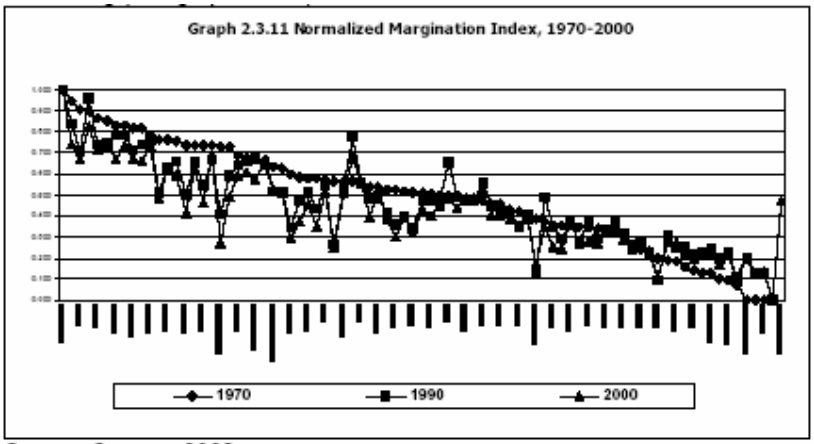
Among the most extreme manifestations in poverty are indigent and children that live and work on the streets. They are under extreme poverty conditions, unemployed, ill, and

[3] Boltvinik, Julio (2002), *Pobreza en la Ciudad de México,* Newspaper La Jornada, January 25th.

without house neither family. In this situation are approximately 160 thousand people, of which men represent 80% of the total, of which old men make up 50%.[4]

According with the Margination Index designed by Conapo (National Population Council), entities that are considered less marginalized are: FD, State of Mexico, Nuevo León, and Baja California. On the other hand, the entities are more marginalized are: Oaxaca, Chiapas, and Guerrero. For this reason, as Mexico City is integrated by FD and some municipalities of the State of Mexico, it is one of the less marginalized cities in the country, in contrast with the previous model used. However, inside the city, there are considerable differences.

The Margination Index has decreased from 0.250 in 1970 to 0.193 in 2000. This means that in general, the distance in this index among delegations and municipalities has been reducing (See graph 2.3.11).



Source: Conapo, 2002.

In 2000, delegations and municipalities with the smallest margination were: Benito Juárez, Coyoacán, Miguel Hidalgo, Cuauhtémoc, Coacalco of Berriozábal, Cuautitlán Izcalli, Tlalnepantla de Baz, and Cuautitlán. These entities have the least grade of marginalization in the country even though some of them have greater inhabitant concentrations. On the other hand, the municipality in the city with the highest margination is Villa del Carbón. Entities with a medium margination are: Ecatzingo, Isidro Fabela, Atlautla, Axapusco, Otumba, Nopaltepec, and Hueypoxtla (See table 2.3.7 and Map 2).

The Margination Index looks for spatial distribution of poverty. This index integrates the education, housing, and revenues dimension, considering the population's percentage that does not have access to some goods and essential services. It identifies five blocks of margination: very high, high, medium, low, and very low.

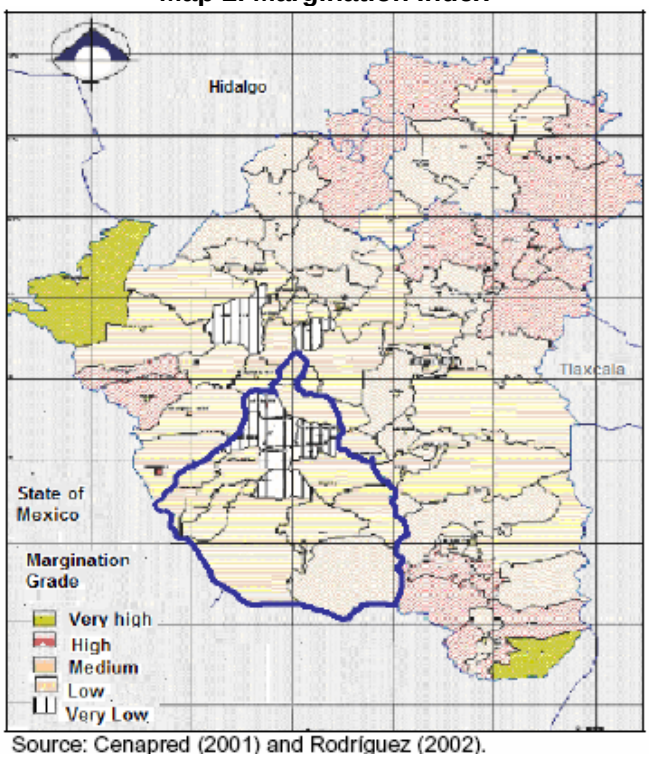
[4] Evangelista, Elí (2000), "Indigentes", en *Memoria del Foro Retos y perspectivas de la Ciudad de México*, Senado de la República, PUEC, UNAM, México.

Table 2.3.7 Margination, some delegations & municipalities in Mexico City, 2000

Entity	State	Margination Index	Nacional Ranking (approximately 2500 entities)
Benito Juárez	DF	-2.4485	1
Coyoacán	DF	-2.1904	4
Coacalco	Méx	-2.1368	6
Miguel Hidalgo	DF	-2.1368	7
Cuauhtémoc	DF	-2.09	8
Naucalpan de Juárez	Méx	-1.7301	74

Sources: CONAPO (2000), Margination Index.

Map 2. Margination Index



Source: Cenapred (2001) and Rodríguez (2002).

2.4 Cultural Characteristics

Mexico City has an enormous wealth and diversity in its cultural patrimony. This represents an important potential for the cultural identity of inhabitants, as well as for tourist development. Even though, the lack of integration of this patrimony in the land use management makes it extremely vulnerable to the urbanization process.

Patrimonial centers of the city, not only the Historical Center, have suffered a complex process that combines change of land uses and depopulation. Additionally, the tertiary process in the economy finds in the historical central areas privileged spaces. This situation has provoked that many building with residence and industrial uses now has commercial ones. As a result, the future of the patrimonial areas and cultural capital is a big challenge in the next years. To face it, it is required effective protective actions.

According with General Conference of the UNESCO, Mexico has 20 cultural monuments: Nine are historical centers, seven are archaeological places, two are places of natural beauty, and one is a mix of a place and a monument. Three of these humanity monuments are located inside the city: the Prehispanic city of Teotihuacán, Mexico City's Historical Center, and fourteen monasteries of XVI century located near Popocatépetl volcano.

These monuments are protected by the Federal Law of Monuments and Archaeological, Artistic, and Historical Areas. In its 5th article, this law establishes that edifications considered as monuments had to be recognized by presidential ordinance, which are published in the Official Newspaper.

INAH (National Institute of Anthropology and History) considered that Mexico City has 4,184 historical monuments, but only 332 have been recognized by presidential ordinance. It is important to mention, its Historical Center contains 40% of the total monuments of FD. In spite of many programs of reconstruction (especially after the 1985 earthquake that damaged a large part of the city), the Historical Downtown of Mexico City still represents a socio-spatial dynamic characterized by depopulation, physical deterioration, and the loss of many of its central functions.

The Historical Downtown is of great importance since it is the symbolic center, not only of the metropolis, but also for the country and has an immensely rich cultural, historical, and architectonical heritage. On one hand, delegations Cuauhtémoc, Miguel Hidalgo, Álvaro Obregón, Tlalpan, and Coyoacán are considered the richest places in relation to cultural patrimony. On the other hand, Cuajimalpa, Iztacalco, and Tláhuac do not have any patrimonial monument.

3. Governance

Mexico is a federal republic with a representative and democratic system of government. Power is divided into three levels: the central government; 32 federal entities integrated by 31 states, and one Federal District and 2,469 municipalities. National politics was controlled by one party until the election in 2000. Therefore, one party controlled all levels of government for 71 years since the creation of the National Revolutionary Party (PNR) in 1929, which later become the Institutional Revolutionary Party (PRI).

Municipalities still depend of federal and state authorities, so they have a limited autonomy. Nevertheless, some modifications were made in 1983 to the 115th article of the constitution. Legally, municipalities have no legislative function and can only make regulations within the framework of state and federal laws. They are responsible for the provision of many public services such as drinking water, sewage, and public security, but they do not have power to collect taxes. As a matter of fact, tax rates have to be approved by the state legislature and this level controls municipalities' incomes and expenses. However, as a result of the 1983 reform, their legal authority was reinforced, conferring them some regulatory powers without requiring prior agreement from the state legislature. The lack of a real autonomy requires reinforcing the cooperation mechanism among different levels of government, and of course between different political units.

The process of decentralization that has been experienced in the country, which goals are to increase political and economic autonomy for state and local governments, has been crucial implications for city governance. Until 1993 the FD administrator was designed by the Federal President and as a result of a Constitutional Amendment, in 1997 the head of the Federal District government was elected for the fist time. During this time, coordination between FD and State of Mexico was considered an internal agreement process between PRI´s members, so it was not too difficult to reach agreement between these entities and among all government levels, but today the situation has changed.

Mexico City has become a complex administrative organization integrated by five governmental units: the Federal District and its 16 delegations, the State of Mexico with their 59 municipalities, and the federal government. Historically, the federal government has always played an important role as it does today. Evidently, because different units are governed by different legal statutes and by different parties (with different ideologies and interest), an effective management of the metropolitan region has not been reached. Moreover, the FD is legally a distinct entity, because it is not considered as a state or a municipality and its financial and political decisions depend on the federal government.

The Federal District can made agreements without the authorization of both Federal President and Legislative Power, so cooperation between it and the states is not as straightforward as it is between two states with similar legal and financial frameworks. The assignments and responsibilities of the FD and its delegations are very different from the ones that have states and municipalities. Nevertheless, these entities have recognized that in order to solve many problems they face like water supply, garbage disposition, transportation, unemployment, illegal land occupancy, and many others, they need for coordination at the metropolitan level. This is evident in the planning bodies, commissions, committees, and councils that currently exist between the DF, the State of Mexico, and the Federal government. However, all these action have not created the coordination that is needed.

3.1 Institutional Reforms for Coordination

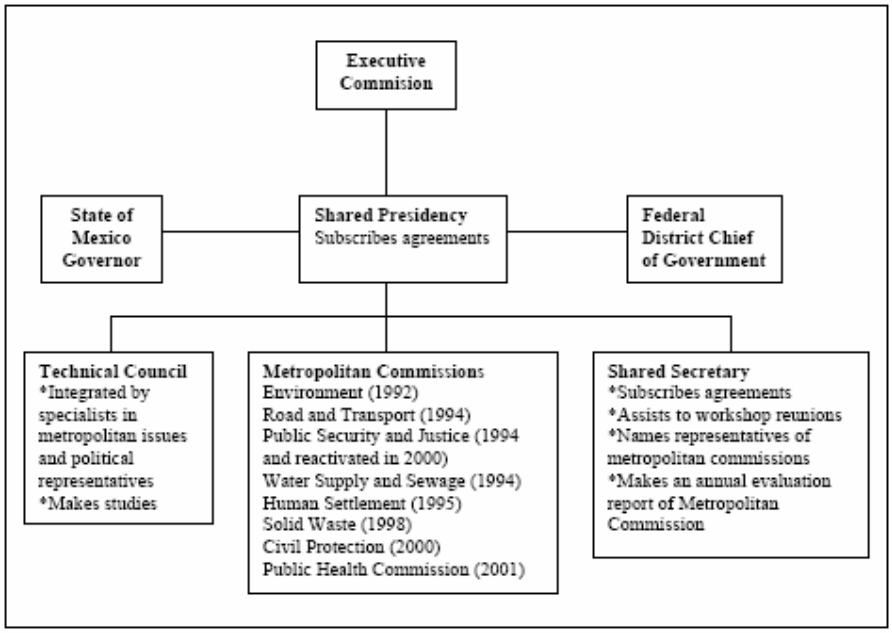
The first federal initiative for promoting cross-jurisdictional cooperation was the foundation of the Conurbation Commission of the Center of the Country (CCC) in the late seventies. This action was caused by the amazing expansion of the city urban area, which started to be closer to other cities located around it like Pachuca, Toluca, Puebla, and Cuernavaca. Even this commission was dissolved some years later. It represented an important effort for trying to build coordination among these entities because there was no legal basis for cross-jurisdictional coordination.

The CCC was replaced by many sector-specific metropolitan commissions at the end of the eighties. These commissions were created through some agreements between the FD, the State of Mexico, and the Federal government with the goal of solving troubles in areas like transport, environment, water supply, health, and security. The coordination efforts and the success each commissions have had mixed results. For instance, the Environmental Metropolitan Commission has been successful in implementing programs such as “One day without car,” “Vehicular Technical Control,” and several more, which reduced the pollution in the Valley of Mexico, mainly the amount of plumb, NOx, SOx, and CO_2 contained in the air. But the majority of these commissions do not have any agreement nor implemented any action. This concerns the government and in a new effort to create coordination in order to control the city expansion, FD, the State of Mexico, and the Federal government signed an agreement with the Social Development Ministry to create the Human Settlements Metropolitan Commission (COMETAH) in 1995.

In March 1998, as a result of a bilateral agreement on coordination between the FD and the State of Mexico, the Executive Commission of Metropolitan Coordination was created. This commission is controlled by the Governor of the Sate of Mexico and his counterpart, the Chief of Government of the Federal District. Its main activity is to evaluate and monitor plans, programs, and actions undertaken in the metropolitan territory.

This commission is still working for increasing the coordination between the different government levels and different political units. The recently institutional framework related to metropolitan coordination is the following: (See figure 1)

Figure 1. Institutional Framework related to Metropolitan Coordination



3.2 Legal Reforms for Coordination

The efforts for increasing the coordination between different government levels and different political units caused the legal framework be modified. The Congress approved the General Law on Human Settlements (LGAH), which has been the main regulation to manage the metropolitan areas since the seventies, and until the end of the seventies. This law provides the legal basis for the establishment of cooperation institutions in the metropolitan level.

The General Settlements General Law defines what will be considered a conurbation and how these areas are going to be planned. When two or more urban centers situated within municipal territories of two or more states form a physical or demographic continuity; the Federation, the States, and the municipalities will plan and regulate this conurbation in a coordinated and joined way. In order to approve this Law, the Legislative Power modified the Constitution, adding some fractions to the 115th article in which conurbations were recognized. The results of these reforms and many others to the legal framework, as in the CCC, have not brought coordination expected among political entities, so the last effort done

for the authorities was the publication of the Metropolitan Area of the Valley of Mexico Planning Program (POZMVM) in 1998 and actualized at the end of the year 2005, and also the creation of a Metropolitan Fund for to distribute monetary resources among delegations and municipalities.

POZMVM is the intermediate ordinance between the urban development regulations contained in the National Programme of Urban Development and Territorial Planning (PNDNPT) and several urban programs established by the authorities of the FD and the State of Mexico. Its goal is to become a framework for the city coordination in the spatial and economic aspects. It is important to mention that POZMVM is in a continuous evaluation, so it will have many modifications during the following years.

It is important to mention that a regional trust fund (Fidecentro) was been created in order to promote investments in infrastructure, public services, public transportation systems, water system, education, health, and industry. The fund has 1,400 million dollars available for the metropolitan projects. Nowadays, there are five road construction projects including an outer beltway around the FD and connected to the States of Tlaxcala, Mexico, and Puebla.

There are also projects to construct a multimodal transportation system and to improve water management system in the City.

Other instruments for financing investments in metropolitan areas area are the Metropolitan Fund, the Trust for the Historical Center in the FD, The Environmental Trust, and Trust 1929. The Trust for the Historical Center in the FD has been created to promote, manage, and co-ordinate the recovery, protection, and conservation of the historical center. The Environmental Trust tries to enhance and protect air quality. Finally, Trust 1929 is responsible for administering several metropolitan projects regarding drinking water, drainage, and residual water treatment; agreeing credits with international organizations like: Inter-American Development Bank, Japanese Bank of International Cooperation, and National Water Commission among others.

3.3 Financial Reform for Coordination

Within the city there are five different fiscal regimes that operate simultaneously. Each one of them, correspond to different government entities and they have different fiscal regimes: federal, state, and municipal/delegation levels. As we have already mention, FD is legally different form any of the states, so the delegations in comparison with municipalities.

States, and also municipalities, have very little tax power; therefore, they have a huge dependence to federal transfers. In the same situation are the FD and its delegations. The increasing dependence of these entities to the federal budget was the result of the Fiscal Coordinating Law approved in 1980, because, according with it, tax collection is reserved for federal government. In 2000, the federal government collected around 75% of all tax revenue in Mexico City from Income Tax (ISR), Value Added Tax (IVA), and Special Tax on Products and Services (IESPS).

As a result, state and municipal revenues are underexploited because their poor tax administration system. For instance, municipalities have a very low collection rate of taxes related to old cadastral registers which was their main income for several years. This lack of incomes have caused that municipalities do not have enough resources for financing infrastructure and improving public services.

FD receives transfers from Ramo 28 (unconditional transfers) and 25 funds (conditional transfers), and the State of Mexico receives transfers from Ramo 28 and Ramo 33. However, there is a considerable difference between the fiscal capacity of the FD and the municipalities of the State of Mexico because the FD receives transfers from the federal government, but unlike the states it also has substantial own-tax revenue sources because many important enterprises are registered in this entity for their tax payment; even though, they develop their activities in other places.

There have been several metropolitan or urban planning initiatives for creating coordination. Nevertheless, there is a sense that all the efforts have not been enough to create coordination and a "metropolitan culture." Some of the reasons for these situations are because the units do not act under a common shared metropolitan vision, which generates confusion in the pursued objectives, the implementation of coordinated actions have not been evaluated nor monitored, there is a financial disequilibrium, and units do not have a legal and institutional compatible framework.

4. Vulnerability in Mexico City

Mexico City is highly vulnerable as a result of their huge population and economic activities concentration. There is no doubt of the importance of institutional and academic planning for the reduction of its vulnerability and risk exposure. For this reason it is necessary to understand that risk and disaster occurrence are not extraordinary events in the city's functioning. It is the result of a historical process which make certain groups of people less capable to face risks and disasters. In this sense, risk and vulnerability in any city are socially built, and, therefore, they are not external factors to the urban process.

On the other hand, the city vulnerability refers to the susceptibility to suffer destructive effects associated with risks and dangers and coping capacities. Mexico City's vulnerability has been increasing for the last years due to the expansion of the urban settlements in risky areas, the environmental devastation, the deterioration of life levels, the economic activities concentration that requires dangerous substances, and growing complexity of transportation process.

If the actual way of living does not change, the accumulation and diversification of risks and dangers will grow in the city because the weak planning, irregular territorial occupation, urban growth, climatic change, and poverty contribute to increase the probability of occurrence of disasters independently of their spatial scale. It is important to mention that vulnerability and risks in the city are not determined by its size, since they are caused by the urban process of expansion, which are characterized by its fragmentation.

4.1 Mexico City Natural Hazards

As we have already mentioned, Mexico City concentrates approximately one fourth of the national product, more than 18% of the national population, one third of the commerce and services employment, and almost half of the total direct investment.

Mexico City and the states of Mexico, Morelos, Hidalgo, Puebla, and Tlaxcala belong to the Center Region according with the Development National Plan 2001-2006. This region registered in the period 1970-1999, 46% of the total 27,002 deaths associated with diverse disasters, being the region with the biggest disasters occurrence.

This situation is caused because more than 40% of total region population is settled in seismic areas and 64% of them are in risk because they live in the influence area of the volcanic mountain range. Almost 64% of Mexico City's population are exposed to volcanic disasters, as they are located closed to Popocatépetl volcano, and 65% of the population in

the same situation (Cenapred, 2001: 65-72). The entities that constitute the Center Region are part of the "C" zone, which correspond to a medium seismic activity considering the earthquake occurrence between 1921 and 2001. However, since the FD has the highest building and population density and the highest economic, financial, cultural, and political activities, it is considered the entity that faces the biggest seismic hazard in the country (Cenapred, 2001: 37 to 49).

On the other hand, the Basin of the Valley of Mexico belongs to the Hydrologic Region XIII. This region is conformed by the FD, 59 municipalities of the State of Mexico, Administrative, 39 of the State of Hidalgo, and four of the State of Tlaxcala (Semarnat, 2002b: 65). This region experience water scarcity and, because of the aquifers over-exploitation, many areas of Mexico City are sinking[5], which produces damages in the urban infrastructure and in buildings which are difficult to measure. Additionally, the City faces a high risk of exposure to floods because most of the drainage infrastructure is 50 years old and has many breaks, and it is incapable to move out the sewage. The hydraulic vulnerability in the Valley of Mexico represents a socioeconomic problem since the economic and demographic growth of the city exceeds the water management and its availability (Semarnat, 2002b: 67-68).

In spite of the city location, because it is far from the regions more affected by tropical hurricanes, it is susceptible to be affected by rains, floods, and landslides. Approximately 430 thousand inhabitants of the DF and 1.3 millions inhabitants of the State of Mexico are affected every year for the consequences of the hurricanes (Cenapred, 2001: 131).

In the City approximately 625 ha of forest are lost due to urbanization and soil erosion (POZMVM, 1998: 80). Even most of the Mexicans do not think that they are expose to frosts and snowfall, they are highly exposed at the South West of the FD (Cenapred, 2001: 115 and 117).

4.2 Mexico Man-Made Hazards

Since Mexico City concentrates most of the industries and population of the country, it has the higher ecological risk. On it are located almost 27% of the industries which represents the main health risks (Segob, 2002: 14).

Regarding the national pollutant emissions that comes form fixed sources, Mexico City is producing almost 80% of the total suspended particles, 81% of sulfur dioxide, 79% of nitrogen oxide, and 54% of hydrocarbons. Therefore, it is one of the most air polluted cities in the country. Moreover, economic and social activities are limited by supply and quality of water, which have caused many diseases among the population, and as after a process for making the water drinkable, it still has fecal bacteria (Semarnat, 2002a: 27 y 38).

The Federal government estimates that every year produced in the country are 12.7 millions tons of industrial wastes, of which near 4.5 millions tons come from Mexico City, mainly form the FD. The most common industrial wastes are solids, liquids, oils, solvents, and mud. Besides, from 1990 to 1997, the country experienced 1,094 chemical accidents in fixed sources, but more than 36% of them were located in the capital, mainly in the State of Mexico. The substances that caused the majority of the accidents were: gas, gasoline, diesel, and gunpowder (Cenapred, 2001: 191).

In the case of accidents that occurred on the highways, in 2001 4,797 accidents represented 13.5% of the total for the country, with 589 deaths and 3,913 injuries. Actually, some of the

[5] The FD and municipalities of Texcoco, Chicoloapan, Cuautitlán, Tultitlán, Tepotzotlán, Teoloyucan, Ecatepec, Coacalco, Zumpango, Chalco and Amecameca are affected by the land collapse.

municipalities of the State of Mexico have the highest number of highways accidents (Cenapred, 2001: 207).

It is important to mention, the Ministry of Government (Segob) considers that the facilities the public company Mexican Petroleum (Pemex) are elements of risk as they are located within the urban zones (Segob, 1994).

4.3 Mexico City Vulnerability

Vulnerability is a dynamic process and not a static one because it has structural features, associated with diverse components like poverty, quality of life, levels of income, the state of the nature, and the climate change.

Vulnerability has evolved with the metropolis. For this reason it is necessary to keep in the changing character of the spatial and temporal vulnerability's factors related to its magnitude and intensity. The appropriation processes of the land and the constitution of a metropolitan area have been crucial in the evolution of the urban vulnerability, because, on one hand, the concentration of economic activities and the growing unemployment have increased the informal activities, and, on the other hand, the urbanization process has been characterized by a physical growth of the city without any defined structure nor planning.

As we have mentioned, physical and demographic growth of Mexico City has peculiar characteristics and it has been very dynamic by consolidating the city as the main city of the country, since the life conditions and several indicators (education, incomes, public services, and others) are higher than any other city a long the country. Nevertheless, its expansion also has been done through irregular settlement located at the metropolitan periphery, particularly on: ravines, hills, rivers, lacustrine areas, mined areas, and industrial areas. Evidently, low income groups are the most vulnerable to different kinds of dangers, as their precarious conditions of life increase their propensity to suffer diverse effects and damages for landslides, floods, buildings collapse, house losing, unemployment, and troubles with health (POZMVM, 1998: 72-74).

Although vulnerability is not just caused by the mentioned factors, poverty forces people to be located in more dangerous areas, areas with slopes and lack of infrastructure, because they are cheaper. In the case of the medium income sectors, they live in relative more secure conditions with the exception of those who are settled in transition areas or in zone that can have land collapse and floods. In general, as we have mentioned, vulnerability and risk patterns have evolved as a result of the territorial displacements of the capital, migration within the metropolitan area, land appropriation and transformation, environmental degradation, demographic transition, among others. However, it has been verified that, in general, the delegations and municipalities, which face higher vulnerability, have more precarious conditions of life and people are poorer. In this sense, the reduction of the vulnerability in Mexico City requires changes in the structural characteristics.

4.3.1 Scale of disasters

Mexico City has experienced several disasters that show its high vulnerability. In the city two "big disasters" have occurred: the explosions of gas LP warehouse in San Juan Ixhuatepec (municipality of Tlanepantla) in 1984 and the earthquake of 1985 at the capital. Both caused national and international shock, and it became evident the magnitude of risks faced by the city.

Regarding to the scale of "medium disasters", the most outstanding cases are: the flood of the Residence Unit East Army at the delegation of Iztapalapa in 1998 and the overflowing of the sewage channel named the Company in 2000, which affected dozens of colonies in the

municipalities of Valley de Chalco Solidaridad, Ixtpaluca, and La Paz. These disasters pressured authorities to maintain and verify the hydraulic infrastructure conditions for moving out pluvial water and sewage.

Finally, "micro-disasters" have less visible social effects at metropolitan level. As a result, they are considered as local or daily problems. For example, every year there are hundreds of deaths and inured persons for car accidents, explosions, fires, land collapses, and landslides.

In the two following sections diverse dangers are analyzed considering the interrelation among socioeconomic, technical, cultural, and political components of vulnerability with the risk conditions and factors.

4.3.2 Risks Associated to Natural Phenomena

In the first place, we have the threat of geological origin. The earthquakes, mainly originated in the Pacific Region, have larger destructive effects in the areas located at the alluvial plains of the Valley of Mexico because of the old lake underground soil.

The earthquakes with a magnitude of 6 M Richter or more, which are produced by the movements of Cocos and North America Plates, are the cause, in the recent history, of the biggest human, material, and economic devastation, mainly in the delegations Cuauhtémoc, Venustiano Carranza, Benito Juárez, Álvaro Obregón, and Miguel Hidalgo, in which the intensity of the earthquakes will probable reach the highest values of the scale of Mercalli.[6] In the same situation are the municipalities of Atenco, Coacalco, Ecatepec, Chimalhuacán, Nezahualcóyotl, Chalco, Nextlalpan, Texcoco, Tultepec, Villa del Carbón, among others (See Map 3 and Table 4.3.2).

Dangers related to landslides represent a higher risk at the delegations Magdalena Contreras, Álvaro Obregón, Cuajimalpa, and Gustavo A. Madero because some settlements are located in mountainous areas with deteriorated environments. In the same situations are the municipalities of Ixtapaluca, Jaltenco, Texcoco, Nicolás Romero, Ecatepec, Naucalpan, Tlanepantla, and Atizapán de Zaragoza (See Map 3 and Table).

Some mined areas are irregularly occupied, and others have residence units. Therefore, these areas are highly exposed to land collapses and landslides. The entities which are most affected by this danger are Álvaro Obregón, Cuajimalpa, Miguel Hidalgo, Iztapalapa, Tlalnepantla, Atizapán, Ecatepec, Naucalpan, and Huixquilucan. Nevertheless, the danger related to the collapse of the floor is extended in practically the whole city (See Map 3 and Table 4.3.2).

On the other hand, among the hydrometeorology threats, the floods represent a bigger risk due to the presence of intense or long lasting rains, some deficiencies in drainage and the location of human settlements in low areas of the Valley of Mexico. The most affected entities due to floods are: Tláhuac, Iztapalapa, Xochimilco, Cuauhtémoc, Venustiano Carranza, Iztacalco, Benito Juárez, Tláhuac, Iztapalapa, Xochimilco, Valle de Chalco Solidaridad, Nezahualcóyotl, Ecatepec, Cuautitlán, Zumpango, Chiconcuac, Chiautla, Jaltenco, Melchor Ocampo, Nextlalpan, Papalotla, and Chimalhuacán (See Map 3 and Table 4.3.2).

For the extraction of underground water Mexico City has experienced many problems for land collapses, which has affected the supply water and drainage nets. Until several decades ago, the drainage extracted out of the city the pluvial waters using the force of

[6] This scale measure the magnitude of the damages registered caused by an earthquake.

gravity, but at the present, it is necessary to pump sewage and pluvial waters. As a result, if the pumping system fails, the central delegations of the FD will have a huge flood, causing several economic, material, and human loses. Additionally, there are problems of land collapsing and crackings in the south-east of the FD, particularly in the delegations of Xochimilco and Tláhuac, and in several municipalities to the east and north-west of the city. The landslides and collapses caused for rains are common in the rough areas occupied by irregular settlements which do not have the enough technology or resources for reduce their vulnerability.

4.3.3 Risks Associated to Social Phenomena

According with the POZMVM, risk social factors are related to the functioning of the city related to both the equipment and infrastructure and the lack of services that leave the population defenseless (POZMVM, 1998: 94).

The air accidents, of low occurrence probability are, however, of very high risk, because the fall of an airplane in densely populated area or when the airplane is taking off or landing would be catastrophic. This is the reason why authorities have imposed rigorous security measures in order to reduce the possibilities of the occurrence of such type of accidents. On the other hand, the terrestrial accidents in communication roads are common in the city. For example, in 1999 there were 1,354 deaths in the FD and 1,524 at the municipalities of the State of Mexico (INEGI, 2001a).

Explosions and fires in the electric power system can happen, and they are mainly related to storms or for deficiencies in the electric infrastructure. Floods can be caused for failures in the pumping system of the drainage. If these were combined with intense pluvial precipitation, the result would be disastrous. Another problem with the drainage is its chronic locked in practically all the nets of the city. This problem is provoked for the accumulation solid wastes and garbage deposited a long the nets, which reduces the capacity of the drainage system to extract the sewage out of the city. In the case of drinkable water, risks exist for the interruption of the water supply and for the water pollution. In both cases, these problems cause sanitary epidemics and gastrointestinal infections.

Many underground nets and warehouses of toxic and explosive substance are located near human settlements, and, therefore, the failure of the security systems in order to maintain the amount of hydrocarbons can produce huge disasters. It is calculated that approximately 184 thousand daily barrels of toxic and explosive substances are distributed a long 178 kilometers of underground nets, and 400 million cubic feet of gas travel in a 416 kilometers nets. These nets are concentrated in several areas of the city like Azcapotzalco, Ecatepec, Naucalpan, and Tlalnepantla. Evidently, the risk faced by the population of these entities is important. In the same situation are the warehouses and the distribution nets of the public enterprise Mexican Petroleum. These facilities are located mainly in Álvaro Obregón, Iztacalco, and Tlalnepantla, and they have an installed capacity of hundred of thousands of barrels constituting an important danger. We just have to keep in mind the disaster happened in San Juan Ixhuatepec in 1984 and the subsequent accidents in the same place in 1990 and in 1996.

Additionally, many high risk industries, which are considered in this way because they use materials and substances that can produce fires, explosions and toxic emission, are concentrated in the delegations of Azcapotzalco, Benito Juárez, Coyoacán, Gustavo A. Madero, Iztapalapa, and Miguel Hidalgo, as well as, in the municipalities of Cuautitlán Izcalli, Ecatepec, Naucalpan, and Tlalnepantla. This territorial pattern is closely related to the one observed in the industrial location of the chemical branch, in which case they are also included two more entities: Cuauhtémoc and Nezahualcóyotl (See Map 3 and Table 4.3.2).

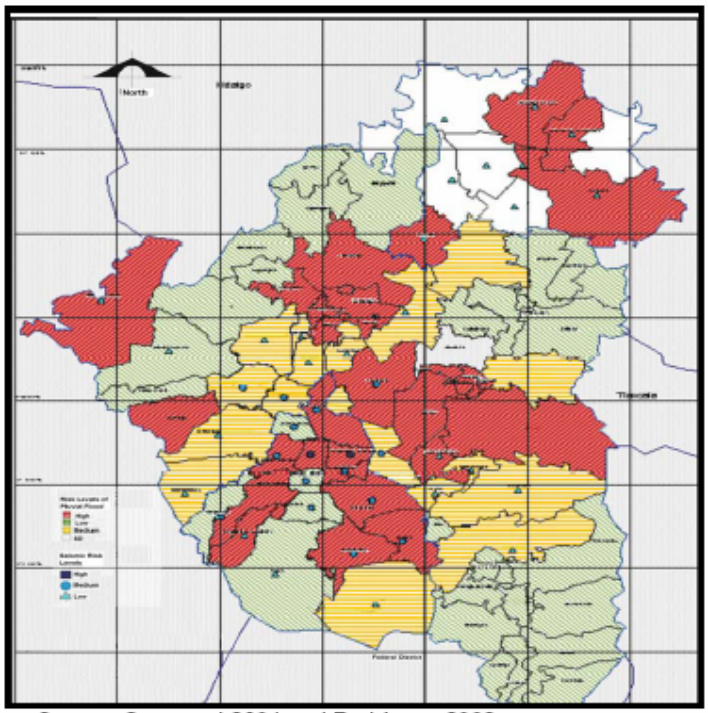
Table 4.3.2a Mexico City Risk Levels based on natural and man-made
See Table 4.3.2b on Annex 1 for details on the State of Mexico

Entity	Seismic	Rain	Pluvial Flood	Land collapse	High Risk Industries
Federal District					
Álvaro Obregón	Medium	High	High	High	Medium
Azcapotzalco	Medium	Low	Low	Low	High
Benito Juárez	Medium	Medium	Low	Low	High
Coyoacán	Medium	Medium	Low	Low	High
Cuajimalpa	Low	High	Low	Medium	Low
Cuauhtémoc	High	Medium	High	Medium	Medium
Gustavo A. Madero	Medium	High	High	Medium	High
Iztacalco	Medium	Low	High	Low	Medium
Iztapalapa	Medium	High	High	High	High
Magdalena Contreras	Low	High	High	Medium	Low
Miguel Hidalgo	Medium	Medium	High	Medium	High
Milpa Alta	Low	Medium	Médium	Low	Low
Tláhuac	Medium	Medium	High	Medium	Medium
Tlalpan	Low	High	Low	Low	Medium
Venustiano Carranza	High	Medium	High	Low	Medium
Xochimilco	Medium	High	High	High	Medium

W. I. = Without information

Source: Metropolitan Commission of Control and Prevention for Air Pollution (1992), Metropolitan Studies Group (1993), Civil Protection Council at FD (1997), Human Settlement Metropolitan Commission (2002) and Rodríguez (2002).

Map 3. Mexico City Risk Levels based on natural and social dangers



Source: Cenapred 2001 and Rodríguez 2002.

4.3.4 Forecast of Mexico City Vulnerability

It is expected that city vulnerability will grow in the following years, unless the authorities defines and implement some strategies and preventive policies for its reduction and the disaster prevention. The growing vulnerability in Mexico City is explained mainly for the increase in the human settlements located in dangerous areas and also for the interaction among the vulnerability and risk mentioned factors as over-exploitation of aquifers, landslides, building collapse, environment deterioration, lack and deficiencies of infrastructure, among others.

It is evident that the distribution of the risk conditions is differentiated along the territory of the city, producing different patterns of territorial occupation. In practically all the city, risks associated with social dangers will continue being present, since there is a lack of social conscious for preventing these dangers. Some of the risks related to social dangers are fires, explosions, toxic substances, inadequate disposition of corrosive, explosive, toxic, infectious, or biological materials.

In the case of the DF, vulnerability patterns have changed. The central city is exposed to seismic risk, and it will maintain a migratory condition of very high expulsion. These delegations have better life conditions in comparison with the rest of the FD, for they have a higher quality of housing and education, and higher incomes. Entities like Álvaro Obregón, Gustavo A. Madero, Cuajimalpa, and Iztapalapa are exposed to bigger risks of landslides and hillsides, and they have a heterogeneous migratory condition and a low quality of life in contrast to the central city.

On the other hand, the population in the FD is getting old faster in the central delegations and in the first contour municipalities than in the periphery. That is why peripheries experience larger growth rates and bigger demands of employment, housing, infrastructure and equipment; therefore, they are more exposed to risks for being settled in dangerous areas where floods, landslides, hill slides, and land collapse can happen.

If there is no consensus for metropolitan planning in order to design and implement strategies for vulnerability reduction, the disasters reduction and prevention mechanism will go on being based on political criteria and for short term. This is the main reason that explains why people will continue settling in dangerous areas. Due to poverty growth among citizens, many areas of the city will be more deteriorated and new areas will be joined to the urban fabric. The new areas are characterized for being more vulnerable to sanitary, socioeconomic, environmental, and social problems.

Although vulnerability has an important territorial component, in the city converge multiple process (economic, demographic, housing, environmental, and climatic) that need to be taken into consideration for reducing vulnerability, which is a very complex phenomenon.

The main identified factors that limit the reduction of risk-exposure and vulnerability are:

1. The increasing, discontinuous, disjointed, and extensive urban expansion which occupies and destroys the environment, the forest, and the aquifers recharge areas. Evidently the land occupation and use are done at high social, economic, and environmental costs, which are producing hydrological and resources demand unbalances.
2. The lack of a good land planning and the low power authorities have to carry out this plan have caused the urban expansion to go on in dangerous areas which are exposed to floods, land collapses, landslides, among others.
3. There are problems in the definition of property rights and obligations between private and public agents involved in the urban development, since the urban process has been

done at the limit of the legality. Many urban zones are legalized irregular settlements and there is a lack of social control of government in the definitions of land uses.

4. The increase of unemployment within Mexico City has decreased the quality of life, incomes, and the informal economic activities, thus making the population more vulnerable.
5. There is a low public participation of the population, since many citizens are indifferent or do not know public mechanisms implemented for reducing their vulnerability and risk-exposure. For implementing a social participation planning, new modalities of institutional organization that be adequate for negotiation, reaching agreements and executing programs is needed.
6. It is required that authorities do holistic diagnosis for knowing the magnitude of risks-exposure and vulnerability in the FD that they plan to reduce. Therefore, it is pertinent to build dynamic information systems based not only in geographical information. They should include statistical and qualitative information that consider people's perception and forecast of damage magnitudes (deaths, injured persons, housing, and infrastructure loses, among other economic, material, and human loses).
7. It is very important to identify risks and disasters in different territorial and temporary scales as they are dynamic process.
8. The legislation, traditionally designed by the public institutions to face vulnerability, has been restricted to natural hazard civil protection, and it does not integrate all sectors involve; as a result, there is not an articulation of different laws and regulations regarding urban development, health, transport, and environment. As a matter of fact, the strategies and programs definition and implementation with an integral vision are not legally defined; they are the result of voluntary agreements. Evidently, any planning process has confronted interests that caused conflicts among agents. These conflicts limit institutions, authorities, and agents to reach agreements.
9. There is not a governmental coordination between FD and the State of Mexico for defining and implementing mechanisms that allow a territorial articulation. This articulation will solve many urban problems which require metropolitan strategies, programs, and plans. Mexico City has experienced a lack of resources for financing metropolitan infrastructure projects for the social benefit. Although the city has some funds, they have not been used in any project yet. Evidently, the metropolitan coordination is limited and there is a lack of agreements among the entities.
10. Mexico City authorities, as a result of coordination efforts, have formed several metropolitan commissions.[7] In the case of Cometravi (Metropolitan Commission for Transportation and Roads), it has a work group for accidents prevention.

5. Earthquake on September 1985

It was 7:30 A.M. on the 19th of September 1985, when an 8.2 M earthquake hit Mexico City. Nobody knows how many people died, but calculations range from 20,000 to 35,000. Three thousand buildings collapsed and many thousands were found overnight living on the streets. The most affected part was its historical center, where the population was predominantly poor and most tenants lived in deteriorated buildings.

Many people were afraid of being expelled to the periphery. Thus, a huge social movement began to emerge and at the same time Mexico City started living a political crisis. People did

not follow the leaders of the PRI (the so-called official party) who lost its power for organizing the masses, and the new leaders had to appear as independent to get any credibility. People from the rest of the metropolitan region poured into the center to help in all sort of tasks.

After the earthquake, people demanded the government to expropriate the buildings that were in ruins and developed housing projects in the center. Many social organizations started movements to create pressure. On the 11th of October, President De la Madrid issued a decree through which more than four thousand buildings were expropriated in order to conduct a housing program "Popular Residence Renovation." Also, a new social pact was agreed. Those people injured by the earthquake did not accept the proposals for the reconstruction using bank credits, because that would be hard to pay for poor tenants. The conflict was aggravated because the initial response of the government displayed an authoritarian attitude of the old political style. In March 1986, a new team was appointed to conduct the negotiations with a different approach, two months later an agreement called "concentration agreement" was signed between the government and many social organizations. The political meaning of this agreement was very important because it was the fist time a post revolutionary government was recognized as legitimate interlocutors social organizations that were not part of the PRI. This was source of a new form of legitimacy.

There was a turning point in the city's political system, even if it is difficult to specify the impact in the political system of the earthquake. One year after the earthquake, the Representative Assemble was created and for the first time in the history of the Federal District, there was a mechanism for the representation of the capital's citizens.

The Assembly power increased in 1996 when it became a Legislative Assembly, gaining an important role in the process of lawmaking for the city. Finally, in 1997, the first Chief of Government was elected and President Ernest Zedillo conceded to the triumph of Cuauhtémoc Cárdenas. Before, the President of the Republic ruled the city through an appointed functionary.

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Annex 1

Table 4.3.2b Mexico City Risk Levels based on natural and man-made hazards

Entity	Seismic	Rain	Pluvial Flood	Land collapse	High Risk Industries
Mexico State					
Acolman			High	Medium	
Atenco			High	Medium	
Atizapán de Zaragoza	Medium	Medium	Medium	High	Medium
Coacalco de Berriozábal	Low	Low	Medium	Low	Medium
Cuautitlán	Low	Medium	Medium	Low	Medium
Cuautitlán Izcalli	Low	Low	Medium	Medium	High
Chalco	Low	Medium	Medium	Low	Low
Chiautla			High	Medium	
Chicoloapan	Low	Medium	Medium	Low	Low
Chiconcuac			High	Medium	
Chimalhuacán	Low	Medium	High	Low	Medium
Ecatepec	Medium	High	High	Medium	High
Huixquilucan	Low	Medium	Medium	Medium	Medium
Ixtapaluca	Low	Medium	Medium	Low	Medium
Jaltenco			High	Medium	
Melchor Ocampo			High	Medium	
Naucalpan de Juárez	Low	Medium	Medium	Medium	High
Nextlalpan			High	Medium	
Nezahualcóyotl	Medium	High	Medium	Low	Medium
Nicolás Romero	Low	Low	Low	Medium	Low
Papalotla			High	Medium	
La Paz	Low	Medium	Medium	Medium	Low
Tecámac	Low	Medium	Medium	Low	Low
Teoloyucan			High	Medium	
Teotihuacan			Low	Low	
Tepetlaoxtoc			Medium	Low	
Tepotzotlán			Low	Low	
Texcoco			High	Medium	
Tezoyuca			High	Medium	
Tlalnepantla	Medium	Medium	Medium	Medium	High
Tultepec			High	Medium	
Tultitlán	Low	Medium	Medium	Low	Medium
Valle de Chalco Solidaridad	Low	High	High	Medium	S. D.
Zumpango		Medium	High	High	
Amecameca			Low	Low	
Apaxco			Low	Low	
Atlautla			Low	Low	
Axapusco			Low	Low	
Ayapango			Low	Low	
Cocotitlán			Low	Low	
Coyotepec			Low	Low	
Ecatzingo			Low	Low	
Huehuetoca			Low	Low	
Hueypoxtla			Low	Low	
Isidro Fabela			Low	Low	

Jilotzingo			Low	Low	
Juchitepec			Low	Low	
Nopaltepec			Low	Low	
Otumba			Low	Low	
Ozumba			Low	Low	
San Martín de las Pirámides			Low	Low	
Temamatla			Low	Low	
Temascalapa			Medium	Medium	
Tenango del Aire			Low	Low	
Tepetlixpa			Low	Low	
Tequixquiac			Low	Low	
Tlalmanalco			Low	Low	
Villa del Carbón			Low	Low	

W. I. = Without information

Source: Metropolitan Commission of Control and Prevention for Air Pollution (1992), Metropolitan Studies Group (1993), Civil Protection Council at FD (1997), Human Settlement Metropolitan Commission (2002) and Rodríguez (2002).