Service Provision Governance in the Peri-urban Interface of Metropolitan Areas Research Project

AN OVERVIEW OF THE WATER SUPPLY AND SANITATION SYSTEM AT METROPOLITAN AND PERI-URBAN LEVEL: THE CASE OF MEXICO CITY

DRAFT FOR DISCUSSION

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About the project

This report is one of several outputs from the project *Service provision governance in the peri-urban interface of metropolitan areas*. This is a three-year project run by the Development Planning Unit, University College London in collaboration with a number of institutions from developing countries and with support from the UK Government's Department for International Development (DFID).

The purpose of the project is to improve guidance on governance and management of water and sanitation in the peri-urban interface (PUI) of metropolitan areas, in order to increase access by the poor and promote environmental sustainability. Presently there is a gap in the operating knowledge of implementing agencies on the specific problems that arise in the PUI. A premise of the project is that greater knowledge of the social, environmental and governance issues arising from changes in the management of water supply and sanitation in the PUI, and more specifically of the impact on these of different and changing regulatory frameworks, would be beneficial not only for the poor but also for these agencies and other local agents.

The project examines the cases of five metropolitan areas, each with different and changing service management regimes influencing the governance of basic service provision: Chennai (India), Dar es Salaam (Tanzania), Cairo-Giza (Egypt), Caracas (Venezuela) and Mexico City.

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Acronyms

AMCM	Metropolitan Area of Mexico City
ZMVM	Metropolitan Zone of the Valley of Mexico
CADF	Federal District Water Commission
DF	Federal District
DGCOH	General Direction of Construction and Hydraulic Works
EDOMEX	Mexico State
WSS	Water and Sanitation System
AGEBs	Basic Geostatistic Areas
MUP	Urban People's Movement
PRI	Institutional Revolutionary Party
PAN	National Action Party
PRD	Party of the Democratic Revolution
EAP	Economically Active Population
CNA	National Water Commission
SRH	Secretary of Hydraulic Resources
DIF	Integral Family Development (Children's Services)
SACM	Mexico City Water Systems
CESAC	Citizen Attention and Service Centers

1. INTRODUCTION

As in other Latin American cities, Mexico City's population increased and its process of urbanization was accelerated with the policy of industrialization promoted during the early twentieth century. The development of the urban system had the same characteristics as many other third world countries, producing an important increase in the urban population, at the same time as increasing the country's industrialization.

Because this process was concentrated in the capital of the country, the population of the Federal District increased more in proportion to the other states in Mexico, between 1940 and 1980 having the largest population in the country, followed by Mexico State. This growth occurred according to industrial growth policies in the first stage, which made a territorial expansion towards rural areas in the north of the city and later with the tertiarization and depletion of these lands, growth began later in the southern zones. This is how Milpa Alta became the last borough to be incorporated into the metropolitan system of the Federal District in 1980.

With the final limits of the Federal District marked, in 1985 the population of Mexico State outgrew the Federal District's population, in part because the damage caused by earthquakes that year caused many families to emigrate to the outskirts of the city.

The unmeasured growth of the population in Mexico City has made it into an over populated area with many social deficiencies, the manifestation of which is a lack of housing resulting in land invasions[1] that many times do not have the necessary infrastructure.

This situation, expressed and expanded in all the boroughs of the Federal District, has a very particular expression in the case of Milpa Alta, since here, urban-rural characteristics still predominate which in other boroughs have already disappeared. The case of Milpa Alta gives us the opportunity to access a wide heterogeneity of conditions in which settlements are made, at the same time as providing knowledge on multiple formal and informal strategies of institutionalization of determined organizing practices around the access and supply of basic services. These practices involve interaction between distinct social actors at local and metropolitan levels and the presence of conflicts on many levels.

In addition to this, there is an intense socio-economic relationship between the population of the Milpa Alta borough and other metropolitan areas; the high poverty and marginality of this space and the characteristics of its water and sanitation system which confronts serious difficulties, in spite of being an important zone of water supply for the D.F. and an ecological reserve for the conservation of the region's aquifers.

From the Milpa Alta borough we have selected two communities in particular, San Bartolomé Xicomulco and San Salvador Cuauhtenco. These two communities express the social, organizational and institutional complexity of the administration and access to resources of the poorest population in the Federal District.

The goal of this report is to display a general diagnosis of our case study relating to the forms of governance in administering water and sanitation services in a peri-urban zone of the Federal District, which is the case of the communities of San Bartolomé Xicomulco and San Salvador Cuauhtenco in the Milpa Alta borough. To achieve this we will develop an initial contextualization of the situation at the level of the geographic and political-administrative region in which these communities lie—the Federal District and the Metropolitan Area of Mexico City—, in order to then highlight the specificities of our case study at

[1] These invasions are carried out by independent organizations as well as official ones. Social movements also arise around the improvement of poor neighborhoods without access to basic services (Garza/Schteingart , 1994: 596).

the level of the borough and communities, which will give us the possibility to explore the different strategies of the communities that struggle to obtain permanently a good quality of life, as well as the response of the corresponding authorities and institutions.

2. CHARACTERIZATION OF THE METROPOLITAN AREA AND REGION

2.1. Population Growth

Between 1940 and 1970 an elevated population growth occurred in Mexico City. This increase was caused by elevated rates of natural growth as well as by rural-urban migration, which responded to industrialization as well as to changes in agricultural activity. In those thirty years, the urban population increased by almost five times and grew from 26% to almost 50% of the national population.[2] This population growth coincided with growth in economic activity and the first phase of the model of import substitution. In those years what is known as the megalopolization process also began, characterized by the gradual absorption of urban and suburban nucleuses, conforming a whole full of complex social structures and relationships, giving origin to the interrelationship between various urban centers (Mexico City, Toluca, Cuernavaca, Puebla) (See Charts 1 and 2 and Graph 1.)

This affected the limits of Mexico City as well as its Metropolitan Zone. In 1950 a first territorial marking existed which coincided with the urban and industrial growth of the northern zone, where the population was beginning to relocate (Annex Map 1). By 1960, firm steps were taken towards uniting the metropolitan zones of Mexico City and Toluca, which would give way to the first Latin American megalopolis. With it, a larger spatial conglomeration of economic activities and population was created, bringing with it an extremely complex social problem related to settlement issues and the needs of consumption of different social strata. In this way, by the 1960s 3 boroughs of the south and southeast were incorporated into the metropolitan area: Cuajimalpa, Tlalpan and Xochimilco. By 1970, following the pattern of growth toward the south, Tlahuac borough was incorporated. (See Annex Maps 2 and 3).

Beginning in 1980 the rhythm of the economy declined; the tertiary sector activities, which group informal labor or labor connected with underemployment, increased; the population and urban growth of the city did not occur with the same speed as in earlier stages, however, there were still people expelled from the central zone of the city to peripheral parts (Chart 3).

In this period an important expansion of the metropolitan area was made to incorporate one more borough, Milpa Alta, characterized by its rural and indigenous population, and ten municipalities from Mexico State: Cuautitlán Itzcalli, Atizapán, Villa Nicolás Romero, Tecámac, Atenco, Chiautla, Chicoloapan, Texcoco, Ixtapaluca, and Chalco. (Schteingart, Marta. El Colegio de México, 1989) (See Annex Map 4).

[2] In the 1950s, the center of the city was the zone that concentrated the largest quantity of population, in what are currently the boroughs of Benito Juárez, Venustiano Carranza, Cuauhtémoc and Miguel Hidalgo, with 75% of the total DF population. In the following decade a process of relocation of this zone began due to the change of the residential pattern of sectors of the bourgeoisie, long residents of the center, and an expulsion of workers, artisans or service employees because of renter pressures, construction of public works and new residential units. The center zone was deconcentrated and the surrounding boroughs grew rapidly. The process of relocation to the periphery was accentuated over later decades. (Massolo, 1992: 144)

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Regarding the social expressions generated by the impact of this economic growth and the contradictions it generated in the structure of urban environment, during this period several different forms of conflictivity and urban struggle systematically occurred.[3] From 1973 to 1976 important movements arose in the metropolitan area of Mexico City and the country, among others, the movement of the October 2 Camps in the boroughs of Ixtacalco and Iztapalapa, Cerro del Judío, Padierna, Ajusco, Pedregal de Santo Domingo, etc. These movements achieved forms of important organization with high social participation, provoking a strong response against them from the State.[4]

After this date and up until 1979 the movements were kept isolated, some organizations dissintegrated, adopting new forms of organization and negotiation with the State.[5] It was in 1980 when important steps were taken to constitute a coordinating institution for the organizations of the urban people's movement: The National Provisional Coordinator of People's Movements, antecessor of the National Coordinator of the Urban People's Movement (MUP) which began in 1981 in Durango.[6]

By the early 1990s there were important MUP organizations in the Mexico Valley. In the Federal District, in the following boroughs: Álvaro Obregón (8 organizations), Azcapotzalco (1 organization), Coyoacán (8 organizations), Cuauhtémoc (2 organizations), Cuajimalpa (1 organization), Iztacalco (1 organization), Iztapalapa (11 organizations), Magdalena Contreras (2 organizations), Gustavo a Madero (1 organization), and Tlalpan (19 organizations). In the suburban municipalities of Mexico State: Tultitán (1 organization), Ecatepec (5 organizations), Nezahualcóyotl (5 organizations), and Naucalpan (7 organizations) (MUP, s/r).

2.2. Urban-Rural Relations

As can be observed, during these years the growth of the city happened at the expense of the rural areas of the D.F. and Mexico State. Little by little, the needs of the urban zone doubled and were satisfied by using resources from the country.

[3] It is important to note that the urban processes unleashed by dependent capitalism and its contradictions are not a sufficient explanation for the appearance of urban social movements. There is no direct connection between an accelerated urban process and an explosive social response. These factors cannot explain the organic structure or the orientation and political culture of these movements, the reason for their origins in some areas of the city and not others, etc.

[4] In this respect Pedro Moctezuma notes that in September 1976 there was a subtle modification of governmental policies that had maintained a discrete tolerance of irregular settlements and an "opening" towards independent movements. Other policies were adopted that were marked by massive evacuations and repression against independent popular movements. This is explained by important changes in the correlation of forces of the bourgeoisie which were reflected in the State and manifested in the decline of real wages, concessions to the exporting bourgeoisie, among other things. (Moctezuma, 1987:137).

[5] Regarding the composition of the MUP, Ramírez Sáinz (1992), notes that "...it is composed of groups, organizations, coalitions, and fronts, of neighbors, renters, petitioners or cooperativists who demand the necessary conditions for reproduction of their members (land, housing, infrastructure and urban services), the recognition of their organizations and citizen rights, and participation in decisions on city and national urban policy." In the same respect, Ferrera Araujo (1994) states that the MUP is not one movement, since in its interior there are many kinds of conflicts, in different geographic places and of varied intensity; the member organizations represent a wide range, with people from one place or inhabitants of hundreds of places in several cities of the country. For the author, the common denominator is their independence regarding the area of direct influence of the State and the PRI.

About identity and the class composition of the movements, it is important to mention what Ziccardi points out (in Ferrera, Rodriguez and Tello, 1982), noting that they do not have a class identity, but a group identity –we could point out a social and collective identity –, given the heterogeneity in the composition of social urban movements, where there is no one position on production. However, the author notes that there is a group identity, because of the precariousness of housing, the absence of collective services and equipment, a minimum margin of subsistence, in many cases, the illegal occupation of lands, fiscal abuses, systematic corruption, etc.

[6] For a more detailed development of these movements, see Perló. "Notas sobre la articulación entre el movimiento obrero y los movimientos sociales urbanos: Un análisis comparativo a nivel latinoamericano", mimeo. (cited by these authors); Moctezuma, P, 1987; Bohórquez, G., 1989; Gómez-Hermosillo, R.; Perló, M and Schteingart, M., 1984.

Regarding the population dynamics by area, urban and rural, the behavior is similar to that previously described, for the DF as well as for suburban municipalities in Mexico State. By 1950, the urban population of the DF constituted 98% of the total population of the AMCM, but beginning in 1960, a process began of relative decrease (94.5% in 1960, 72.7% in 1970 and 66.0% in 1980), as can be observed in graph 1; this was accentuated by the earthquake in 1985, with a current relationship of inverse growth.

The population growth in urban areas of suburban municipalities of EDOMEX presented an important increase in 1970; by 1980 the urban component, those who resided in communities of more than 2500 inhabitants, constituted 80% of the total population, 84% in 1990 and 86% in the 2000 census (See chart 4).

Relative population growth in the DF with regards to the ZMVM presents a similar behavior to the entire ZMVM, with the difference that here the trend towards a relative descent, begun in the 1950s, is more drastic. It is a different situation which presents itself in the suburban municipalities of EDOMEX. An increase in the population is observed beginning that year, but it is between 1960 and 1970 when the largest population growth occurs. One could say that there is a change in the pattern of growth begun in 1930, when the largest concentration of population in the AMCM was in the DF—up until 1960 (90% on average that year, 78% in 1970, 65% in 1980, 54.32% in 1990 and 47.87% in 2000)—; while the population in EDOMEX in 1960 only represented 9% of the total population of the metropolitan zone, progressively increasing—beginning that year—to 22% and 35% by 1970 and 1980 respectively and 45.32% and 52.13% in 1990 and 2000.

2.3 Trends in Development

This pattern of growth is fundamentally due to industrialization policies in the first place and to the tertiarization of the economy in the second place.

Between 1930 and 1950, 100% of the EAP employed in branches of the metropolitan zone was concentrated in the DF. From 1960 on, the DF began to share part of this population with EDOMEX, and especially with suburban municipalities.[7] This is how the EAP in the Federal District descended from 58% in 1980 to 50% in 1990 and 44.5% in 2000 (See chart 5).

Some data which show these transformations are the following: the capital city's EAP in the industrial sector grew from 30.6% of the population in 1940 to 38.5% in 1970, and decreased from 43.1% in 1990 to 35.6% in 2000. The service sector is the only one which increased its participation significantly, going from 28.9% to 36.5%. In this way, the EAP concentrated in activities of transportation and commerce became based on industrial activities and services[8]. At present, these services are growing significantly in the branch of communication and finances in the DF.

The spatial change of some productive activities and the growing dynamic of others—measured by the percentage of employed workers—along with the changes described show, in general, how the changes in the model of industrial development affected urban organization of the AMCM. It is clear that beginning in 1960, a process of decentralization or industrial displacement towards Mexico State began, which brought as a consequence the activation of other branches of economic activity such as transportation, commerce and services.

[7] See also De Oliveira, O. y García, B., 1987: 593.

[8] See also De Oliveira, O. y García, B., 1987.

2.4 Industry

An element which shows the general development followed in these stages is the level of industrial concentration in Mexico City, which highlights the capital city's place in the total gross manufacturing product in comparison to the rest of the country.

As a display of this concentration, it is important to mention that in 1930, the country had 46,830 industrial establishments; of which only 3,180 were located in the Metropolitan Area of Mexico City, representing only 6.79%. As the process of industrialization in Mexico City advanced, the concentration increased, reaching a total of 38,492 establishments in 1980, representing 28.1%. This trend continued, reaching 22.6% in 1988 and 16.8% in the entire Mexican Republic.

From 1940[9] to 1980 the participation of the AMCM in the gross value of production grew uninterruptedly: 28.5% in 1930, 32.1% in 1940, 40.0% in 1950, 47.1% in 1960, 46.8% in 1970, and from then on it began to decrease in value, becoming 43.4% in 1980, 32.5% in 1988 and 28.8% in 1993. This concentration of industry in Mexico City made it possible in 1980 for one city alone in the national urban system to produce almost half of the total industrial products of the Republic, now losing that capacity and transferring it to Mexico State (See Chart 3).

From 1950 to 1970, the industrial concentration is notable, particularly in Mexico City. According to the industrial aggregate value, the participation of Mexico City in industry, in 1950, was 43.6%, it grew to 47.1% in 1960 and by the late 1960s it became 48.6%. The result of this process of concentration consolidated during this period is a super concentration of production by 1970: 18 286 million pesos in Mexico City, with 19 337 million pesos in the rest of the country.[10]
This industrial concentration has had an additional consequence, expressed beginning in the 1970s, which consists in the need for territorial expansion of the capital, including exploitation of natural resources and labor force in other regions of the country. The trend is to make up socio-economic regions around already existing conditions, a phenomenon called megalopolization. [11]

In this way, the rhythm of concentration of Mexico City was reduced over the period 1960-1970 since its level only grew 1.5% in the period. It is important to remember that from 1950 to 1960 there was a growth of 3.5%, 3.8% between 1940 and 1950 and 3.6% between 1930 and 1940. Parallel to the decrease in growth of the relative importance of Mexico City, there was an increase in participation in the geo-economic region. There is a tendency to conform, seemingly, a new environment of concentration in the country. The region Center-West, constituted by the entities of Queretaro, Mexico, Federal District, Morelos, Hidalgo, Tlaxcala and Puebla, constitutes the immediate zone of influence of Mexico City.

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[9] In the 1940s, the industrial plant was settled mainly in the traditional area of Mexico City, the first 12 boroughs and surrounding areas. The 12 boroughs made up what is called Mexico City until 1970. On this date, four boroughs are added which together with the 12 already existing recomposed the political division of the Federal District. The first boroughs hark back to the 18th century in the Borbonic reforms when the city was divided for administrative reasons. (Cfr. Daniel Hiernaux. El Colegio de México, 1989: 239.)

[10] To have an idea of what this industrial concentration means, a quote from the authors: "…the increase in gross industrial production in the city between 1960-1970 is equal to the total industrial production in 1970, that is, the production that the 10 cities that follow the capital in industrial importance achieved along their entire historical development: Monterrey, Guadalajara, Toluca, Puebla, Torreón, Monclova, Veracruz, Chihuahua, Querétaro and Ciudad Sahagún" : 585. For a more developed analysis of the phenomenon of industrial concentration from a wide perspective, in which this phenomenon is analyzed in regards to dependent capitalism, see Garza, Gustavo. "Estructura y dinámica industrial del área urbana de la ciudad de México", in Demografía y Economía , XII:, 1978. (Garza/Schteingart: .op.cit: 583.)

[11] This phenomenon of industrial concentration has a dynamic similar to the one in developed countries. However, in these countries there is a generalization of this development, creating systems of industrial cities constituting national development first, and transnational development afterwards. In the case of Mexico, macrocephelia adopts the peculiar form that it has because of the dependent capitalism at its core. Cfr. Garza, G. "Estructura y Dinámica Industrial... op. cit. (Cfr. Garza/Schteingart: 586; Garza. G**.** Atlas... op.cit:121.)

In this region, relative participation of the industry of transformation grew slightly at the same time as modifying the relationship with the tertiary sector of the Federal District and Mexico State (See charts 6a and 6b). Meanwhile, regarding the industrial structure of Mexico City, the same trend as the previous period persisted: the difference in participation in consumer durables was maintained, although smaller.

This industrial structure also had effects on the structuralization of economic space. There was a displacement of industrial location, mostly of capital goods and consumer durables, towards the outside boroughs of the D.F. and Mexico State. This is clear in the growth of the urban area in a very short period from 1940 to 1960. This expansion happened particularly in the 1960s.

Regarding industrial structure, in the 1960s, the trend established in the 1940s continued, with the added characteristic of displacing the industry of capital goods, of intermediate consumption and metal mechanics to the periphery of the city and surrounding municipalities.[12]

If we consider the difference between participation in the number of establishments and the rest of the industrial characteristics, the concentration of small and medium industry in the D.F. and heavy industry in Mexico State is clear.[13] At present, financial services are what are most developed in Mexico City in comparison to its metropolitan area, since these have grown from 62% in 1990 to 70% in 2000.

[12] For this period, there is no precise information on the behavior of this structure and its alterations because of the economic crisis of the country. However, because of the importance of this region of the country in the national industrial production, we can infer that the marked tendency for the country happened in the zone as well, and the most significant changes were not in the trend that followed the subsectors but in the restructuralization of the branches which compose them.

[13](_/ idem: 104-105.)

3 CASE STUDY REPORT

3.1 Brief Introduction and Justification of Case Study

The area of study chosen to carry out the project is the Milpa Alta Borough, one of the 16 boroughs in the Federal District which, as we have already mentioned, was only recently incorporated as part of the metropolitan zone in 1980. The selection of this case is based on the following criteria:

a) Peri-urban characteristics present in this area.

b) Features and characteristics of its water and sanitation system.

c) Presence of problems on different levels for the water and sanitation system.

a) Peri-urban Characterization

The borough of Milpa Alta presents particular characteristics that place it within a peri-urban profile. Although the peri-urban category is still in construction and it is possible to establish empirical differences in a European, Latin American or African peri-urban context, some key elements exist which allow us to define peri-urban zones within a geographic area.

Some of the criteria that have been used to characterize the peri-urban interface (PUI) are:

- From an environmental perspective, the PUI can be characterized as a heterogeneous mosaic of "natural" ecosystems, "productive" or "agro-ecosystems" and "urban" ecosystems, affected by material and energy flows demanded by urban and rural systems.

- From a socio-economic viewpoint, the PUI is characterised by the presence of heterogeneous social groups, in constant transition. That is to say that the composition and interests of these groups tend to change over the time in a process characterised by the fluctuating incorporation of new stakeholders (be they individuals or organisations). Thus, small farmers, informal settlers, industrial entrepreneurs and urban middle class commuters may all coexist in the same territory but with different and often competing interests, practices and perceptions.

- From an institutional perspective, the PUI is often characterised as the converging of sectoral and overlapping institutions with different spatial and physical remits. This is related to the changing geographical location of the PUI, or PUI process. Where institutional arrangements, or areas of responsibility tend to be either too small or too large, too urban or too rural in their orientation to effectively address sustainability and poverty concerns. In addition, private sector bodies as well as non-governmental and community based organisations also intervene in the management of peri-urban areas, but often without clear articulation or leadership from government structures. (Allen et. al., 1999).[14]

In addition to the above information are the presence of homes in conditions of poverty, location of natural resources consumed in towns and cities, transition between rural and urban features, pressure on natural resources (land and water), and an increase in pollution generated by the growing concentration of population and industries.

In the case of Mexico City, it is possible to note a group of agricultural spaces located in its surroundings, which were traditionally oriented towards the production of basic foods for the internal market, but which beginning in the last decades have been reconverted towards new crops in

[14] Allen et. al., 1999 "Guidelines for the production of case study reports".

horticulture and floriculture, in coexistence with the production of basic grains for consumption. Beside this new productive orientation, there is also a proliferation of non-agricultural, commercial and service activities, which lead to new socio-physical ways of life and social organization (Delgado, 2001).

Within this metropolitan context, and based on the criteria noted above, we have characterized Milpa Alta as a peri-urban area, according to the following criteria:

-It has economic, social and cultural features which combine urban and rural characteristics. This can be observed in the different types of ground usage[15]; the composition of the EAP, the presence of indigenous population, the persistence of forms of organization related to the native peoples of the country and the celebration of festivals and traditions that show the indigenous and mestizo origins of the zone.

There are an important number of agricultural producers of different kinds, mainly dedicated to the production of nopal, which has had an important expansion in recent years, responding to exportation to the international market.[16] Milpa Alta is the first place in the country for production of vegetable-nopal, with an annual production of 254.916 tons cultivated on 5.597 hectares; in other words, 48.25% of the total agricultural surface and 96.39% of lands dedicated to perennial crops. According to official figures from the year 2000, 80% of national production is collected in this zone, which is equal to some 7000 producers who cultivate almost 4000 hectares.

The majority of nopal fields in the borough are small; the maximum extension is 3000 square meters, and almost all of them are found on private property with little surface area. The producers use vegetative propagation on their nopal plants; one leaf alone works as a propagule. Planting is done throughout the year, but with better results in the months of March and April. Farmers do not use chemical fertilizers, but they do use organic fertilizer in large quantities.

The harvest is done once or twice a week throughout the year, although more frequently in April and May. Sales of nopal are during the first two or three days of its harvest. Farmers sell the amount they possess to the Central Wholesale Market, the Merced market, the Jamaica market or the Milpa Alta markets.

Small producers own less than one ha with nopal plants and manual labor is carried out by family members, who transport their products on carts to sell. Large producers hire peons for the harvest and maintenance of their plantations. In general, workers are transported from other communities in the states of Mexico, Puebla and Oaxaca. For commercialization, producers transport nopal in trucks.

The use of nopal is varied. In the food sector, it is used for soups, salads, jams, breads, desserts; in the cosmetic sector, for shampoo, gel, creams; and for medicinal products. The Japanese use the fiber to make high fidelity speakers.

-At the same time, Milpa Alta has been affected by institutional changes implemented in the country in the last few decades. Different units of production, ejidos, communal lands and private lands are found

[15] The entire zone is an ecological reserve, with 95% rural surface area, 3.5% for residential use, 0.5% urban and rural equipment and 0.5% mixed. When referring to agriculture and vegetation, INEGI notes that 23.53% of the borough's surface is destined to agriculture, 18% pastures and 49.31% forests.

[16] According to the study on Milpa Alta cited (Torres, 1988), three large periods of transformation in local agriculture can be characterized, to which we can add a fourth. The first, from the prehispanic period to the early 20th century, where the production process of the small corn field was predominant, associated with the exploitation of maguey plants, the second period, from 1920 to 1960, continued the centrality of small corn fields, although with a greater level of diversification of crops. Toward the end of this period, there was a substitution of maguey plants with nopal. The third stage identified by the author, is from 1960 to the period of study, when the corn field was displaced in productive importance by the nopal. We would add a fourth stage, characterized by a higher specialization and technological development accompanying nopal production, at the same time as the beginning of its foreign exportation.

in Milpa Alta, having been affected by diverse reforms implemented: property reforms, commercial openings, decrease in prices, difficulties in access to credit, transformation of regulation and institutionality of support to the rural sector.

Milpa Alta is a heterogeneous region in economic activities; the levels of urbanization and the services to which the population has access; and the customs. There are differentiations within the borough in towns presenting a higher concentration of equipment and services in comparison to others.

-At the same time, the natural growth of the population and the arrival of immigrants from other states has generated some conflicts in the urban structure, such as the change in ground usage in central zones, the pressure on transportation infrastructure in central parts of these towns and the alteration of traditional types of buildings. There is pressure to modify rural ground usage to urban use and also to authorize higher densities (Distrito Federal, 1997). This process has led to development and consolidation of irregular settlements, defined as settlements of people in areas outside of the city limits, which demand a different type of services, among others, an expansion of the sewerage and piped water systems (See Chart 7).

b) Water and Sanitation System[17]

Milpa Alta presents particular characteristics in the water and sanitation system:

- On the metropolitan level it is the borough with the least percentage of in-home water service (See chart 8).

-At the same time, in terms of sustainability, Milpa Alta represents a strategic resource for the city; it is inserted in the proposals for ecological rescue of the Valley of Mexico and is fundamental for its sustainability. It is located completely on Conservation Soil and plays a central role in the recharge of the Valley of Mexico aquifer.

-Its system of water supply presents particular characteristics, since it is carried out through turns called **tandeos,** which consist in the distribution of water in towns by zone, day and hour, in a differentiated manner, given the scarcity of the resource. In each town, valves are opened and closed on different days and time schedules. This job is the responsibility of the Unit of Potable Water and Sanitation of the borough. This system began to be applied in 1995.

-Another criteria for the choice of the case is the existence of serious problems in the supply of water, especially in the highest zones of Milpa Alta, because of topographic characteristics and problems confronted in the dry season.

-At the same time, the presence of different actors who participate in the system of water supply in the area is noted: the DF and borough governments; the sub boroughs (territorial communications); the private sector and the community. While formal rules exist for the system, an interesting process of application of informal rules is developed to demand and partially resolve the problems caused by the quality or absence of the service.

c) Presence of Problems on Different Levels for the Water and Sanitation System.

[17] The points b) and c) will be treated in more detail in the second section of the document: Characteristics and Trends of the System of Water and Sanitation.

In providing water and sanitation services, different actors on national, metropolitan, regional and local levels intervene. The relationship between these actors, beyond collaboration, brings a series of problems. The service of potable water in the Milpa Alta Borough presents conflicts at different levels:

-Regional Level-Metropolitan Surroundings: There is a borough institution for the supply of water provided by Mexico City Water Systems. This institution sometimes implies differences between demand and supply.

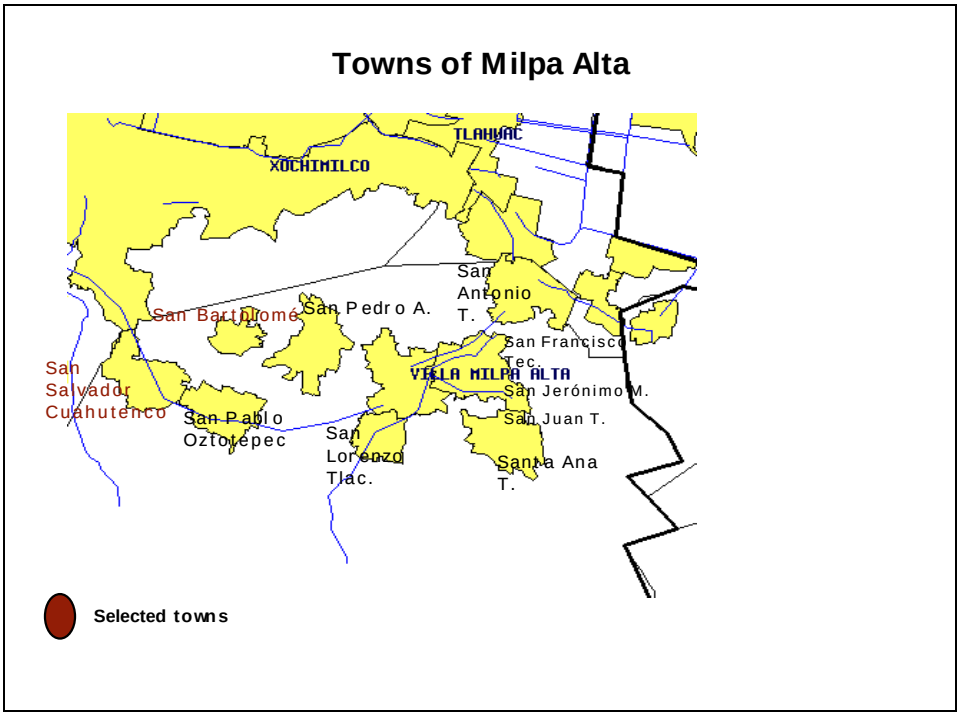
-Borough Level-Users: There is a high demand for water on behalf of the users which cannot always be resolved by the borough. Problems can occur because of the short time period when water is available in some towns (only a few hours a week in the extreme case). There is also a strong demand on behalf of the population occupying new zones in towns (irregular settlements) and the areas farthest away from the city limits who seek the installation of services and the expansion of the potable water network.

-User Level-Users: The water issue leads to the presence of conflicts between users within towns and between them. This leads to disputes because of inhabitants left out of the turn system; and users' obstruction of construction works which would allow the supply of water in certain zones.

In addition, vulnerability, erosion and pollution of the system of distribution occur, since they depend in a large scale on the recharge capacity of deep wells and the good performance of electrical pumping and repumping plants.

d) Selection of Communities: San Salvador Cuauhtenco and San Bartolomé Xicomulco

While searching for secondary data and the development of the exploratory diagnosis that contemplated the application of a series of methodological techniques (interviews with key informants, interviews with users, direct observation), two towns in the Borough were selected: San Bartolomé Xicomulco and San Salvador Cuauhtenco.



This selection sought on one hand to compare between two locations representing, qualitatively, the most important features of the chosen area (Milpa Alta). In this sense the towns form part of the same socio-territorial unit and since they have a common history, they share features; however, they have different characteristics which make them interesting for the analysis of WSS.

This selection is based on the following criteria:

1.-Characteristics of WSS
2.-Economic Activities and Level of Income
3.-System of Land Ownership
4.-Organizational and institutional relations

1.Regarding WSS, both towns present situations where there are difficulties in the access to water because of their altitude. However, the situation in San Salvador is more dramatic, reflected in the supply and availability of water. In the case of San Bartolomé X., according to the data in the census study of the year 2000 (INEGI), homes with water connection represent 49.5% while those that "pour water from a bucket" are 48.4%; in San Salvador, the percentage is 30.6% and 65.9% respectively (See chart 10).

At the same time, in availability of water, in San Bartolomé, 40% of homes have water inside the house, while 51% have water outside, according to census data. But in San Salvador, 21.7% of homes have piped water inside the house, 38.3% with water outside the house and 37.1% of homes get their water from trucks[18], which in the case of San Bartolomé is only 1% according to the source consulted (See Chart 11).
This reflects that in spite of the difficulty in access to water in both locations, San Salvador has a larger population with access through trucks[19], which shows a situation with higher precariousness in the access to water, and a larger percentage of population in irregular settlements and outside the city limits than in San Bartolomé.

According to information from the Coordinators of Territorial Communications[20], in this last town, 95% of the population has all basic services, water, sewerage and pavement, and only 5% of the community does not have access to services, because they are outside the city limits (Interview with San Bartolomé Coordinator, June, 2003). Legal norms impede the extension of services to these zones since the borough is considered an ecological reserve area of the Federal District.

In San Salvador, the percentage of population in irregular settlements is around 50% (Interview with San Salvador Assistant Coordinator, June, 2003), which shows a higher percent of the population without access to water. This leads to the more extended existence of informal and illegal situations in relation to services. Irregular settlements cause strong pressure on services, not only demanding

[18] Trucks transport water in tanks to zones with scarce or no access to water. Generally, they are operated by the Borough, although there are private companies dedicated to selling barrels**.** Supposedly the trucks provided by the Borough are free to the population, although according to the testimonies collected, on some occasions, people must pay for this service. Trucks have programmed stops in the zones that are found outside of the city limits and are recognized by the Borough and non-programmed stops in the zones outside of the city limits and not recognized. The demand for trucks is solicited directly by the people through the Service and Citizen Attention Center.

[19] We suppose that because there is a much higher percentage of homes with access to water through trucks in San Salvador, there is also a higher number of people. It was only possible to access data on the housing level for the availability of water, derived from the 2000 census study.

[20] The coordinators of territorial communications are authorities elected by traditional customs, who serve as mediators between the population and borough institutions. At the moment they do not have a legal foundation, although they do have legitimacy in the population, and in practice they serve as community representatives and as the link between people and borough authorities.

them, but using them informally since they get both electricity and water through clandestine taps, meaning they steal water and electricity, since they do not pay any service, while those who pay are the ones who are affected most by the situation. (Interview with the San Salvador Cuauhtenco Assistant Coordinator, Sergio Mancilla Rosas) (See Charts 9, 10 and 11).

2. Regarding the economic activities of the population, while both towns are similar in their EAP and type of occupation (mainly workers and employees according to census data); according to observation and information collected, in San Bartolomé the population is mainly a worker community which gives manual labor to different companies and factories; the majority leaves to work in other boroughs of Mexico City and suburban municipalities, and only 10 to 15% of the population works in agriculture (interview with San Bartolomé Xicomulco Coordinator).

In the case of San Salvador, there is a higher combination of activities, and agriculture is developed by 60 to 80% of the population, according to information provided by the San Salvador Cuauhtenco Assistant.

These characteristics allow in some measure a comparison between the two locations, because in spite of similar economic activities, in the case of San Salvador there is a higher combination with agriculture (See chart 12).

Regarding income level, although a situation of marginality predominates in the Borough, there is an important difference in the two towns, since San Bartolomé on average presents a higher income level than in San Salvador, which allows a comparison based on different economic situations (See Chart 13).

3. In the entire Borough, the property system is a complex question. However, in the selected towns there are interesting particularities. In the case of San Bartolomé the prevalent form is small ownership, since the majority has a private contract to buy and sell their land, although these lands are included within the 27 000 hectares of communal land in the borough of Milpa Alta, which is why San Bartolomé Xicomulco also has communal representation. This shows a completely contradictory situation that only the agrarian courts have the possibility of resolving, a process which has already begun.

In the case of San Salvador, land is communal, in the same way as all of the towns in Milpa Alta, but usufruct is private.

4. Regarding organization (see Chart 14), San Bartolomé is one of the towns with the highest levels of community organization. In addition, initiatives are being developed with educational institutions outside of the Borough for ecological rescue of the location and a project to develop San Bartolomé as an area of ecotouristic attraction within Mexico City.

According to the interviews carried out, San Bartolomé appears to be a more integrated community than San Salvador because of its organizations and traditional authorities.

Regarding the relationship with borough authorities, according to the coordinator, it is quite cordial and based on proposals and concrete projects.

In the case of San Salvador, the organizational level is lower and more traditional. In addition, a higher level of conflict exists within the community and between this community and the borough authorities, worsened by the subjects such as water and access to services, as reflected in the report.

In summary, we would like to point out that both towns selected represent the socio-economic, institutional and WSS characteristics of the entire area. However, they present important particular features that we believe allow us to go into depth in a differentiated manner on the performance of WSS, institutional relationships and the diverse ways the population accesses water.

3.2 Demographic and Socio-economic Characteristics

The demographic growth of Milpa Alta is a consequence of the general growth of the Federal District and its late economic incorporation as part of the metropolitan area. It is only recently when a trend of growth in the population has begun to show, which, because of its character, could be worrisome, as we shall see below.

a) Demographic Trends

The borough has a total population of 96 773 people (2000), with 49.3% men and 50.7% women. (See Chart 15). The towns chosen for our case study represent 7.7% of the total population of Milpa Alta, of which 5% of the population is found in San Salvador Cuauhtenco and 2.7% in San Bartolomé Xicomulco (See chart 16).

Between 1970 and 1990, the rhythm of growth in the borough was constant, and the population doubled, going from 33 694 inhabitants to 63 654 inhabitants. The rhythm of growth in the borough increased in the five years from 1990 to 1995 at an annual rate of 4.3%, in comparison to the period from 1980 to 1990 when there was an annual rate of 3% growth (See Chart 17). This situation affects in an important way the historical trend of population growth and the corresponding program projection established in the General Program of Urban Development in the Federal District 1995-2000, growth that will have physical implications of densification or expansion over protected areas, and more demand for equipment, housing, services and employment.

There is scarce population in the zone and the majority is concentrated within the city limits of the towns. The gross density of the borough is 2.85 inhabitants per hectare. Communities of 100 to 500 inhabitants and less than 100 inhabitants concentrate 6,430 inhabitants on 433 hectares, with a density of 14.84 inhabitants per hectare; mainly in irregular settlements in very disperse areas. Considering the surface of these areas, the density of the population of the borough would be around 43.18 inhabitants per hectare. This density is the lowest of all the boroughs in the Federal District.

The borough has an average density in rural towns of 52 inhabitants per hectare. The towns with the highest density are San Salvador Cuauhtenco and San Antonio Tecómitl with 88 inhabitants per hectare, and the towns with the lowest density are San Lorenzo Tlacoyucan with 27 inhabitants per hectare and San Francisco Tecoxpa with 13 inhabitants per hectare.

Between 1985 and 1990, the borough registered 1321 immigrants from outside the Federal District which represent 0.44% of all the immigrants to the Federal District. However, given the natural growth rate, estimated at 2.58% annually, the rate of migration to the borough (considering migrants from other boroughs and the total rate in the period from 1990 to 1995) was an annual 1.72% (4.3% - 2.58%); this means that in the past few years Milpa Alta became a borough with a high level of attraction (Chart 18).

In accordance, the population growth is defined by the inhabitants of Milpa Alta in two categories: one is natural and the other is irregular. The first is understood as population expansion in natural growth, while the other is due to immigration to the zone, located mainly in marginal areas of the towns.

In 1999, according to a study carried out by the Commission of Natural Resources, on the Conservation Soil that goes over the territory of nine boroughs of the D.F., 626 human settlements have been identified in addition to 35 rural communities, of which 174 are regularized in their ground usage and 452 are irregular. According to this statistic, in Milpa Alta there are 44 irregular settlements with an average age of 9 years, of which 13 towns are within the protection zone.[21]

Distribution by age from 1990 to 1995 shows an almost equal pyramid, with an increase in absolute volume and a small relative decrease in 1995 in the population between 0-14 years old, with males representing 37.07% in 1990 compared to 34.17% in 1995, while females represented 34.85% in 1990 and 33.3% in 1995. As for the population between 15 and 64 years of age, in 1990 men represented 59.98%, but 61.15% in 1995, and in 1990 women represented 61.02% and in 1995, 62.44%, which shows a significant increase in the working population, as well as in the generation of new families.

The population of 65 years old or older shows small increases. In 1990, senior citizens represented 7.68% of the population, and in 1995, 7.85%, which shows a process of aging society, and in absolute numbers meant an increase of 738 inhabitants.

According to the 1995 INEGI Population and Housing Census, the youngest population (0-14 years) represented 34.7% in males and 33.3% in women. This indicates that although there is an important relative decrease in these ages in comparison to 1980, the young population is still important if compared to the Federal District as a whole (29.2% male and 26.3% female).

Many of the indigenous origins of the settlers have varied over the years, given that only 5% of the population of Villa Milpa Alta speaks an indigenous language. The other 95% speak only Spanish. As for the towns in our case study, 4% of the population of San Bartolomé Xicomulco speak an indigenous language, while 6% of San Salvador Cuauhtenco do (See chart 19).

b) Socio-economic Aspects

[21] According to the Law of Urban Development in the Federal District, conservation soil is defined in the following way: it comprehends all areas meriting protection because of location, extension, vulnerability and quality; the impact on environment and territorial order; slopes, hills, zones of natural aquifer recharge, mountains, elevations and topographic depressions that constitute natural elements of the territory of the city and whose groundwater has been affected by natural disasters or by exploitation or use of any means, which represent permanent or accidental danger for the establishment of human settlements. It also comprehends the soil destined for agriculture, fishing, foresting, agro industrial and touristy production and rural towns.

The areas of conservation soil are:

> **a) Rescue Areas**: Those whose natural conditions have been altered by the presence of inconvenient use or by bad management of natural resources and which require actions to reestablish their original situation. The works realized in these areas will be conditioned to carry out actions to reestablish ecological equilibrium. The programs will establish maximum coefficients of occupation and use of soil;
>
> **b) Preservation Areas**: natural extensions that do not show serious alterations and which require measures for the control of ground usage and to develop activities compatible with preservation. Only works to instrument preservation shall be carried out in these areas, compatible with the objectives noted, with permission from the Secretary, as well as the Secretary of Environment. The applicable environmental legislation will regulate these areas; and
>
> **c) Rural and Agro industrial Production Areas**: those destined for agriculture, fishing, touristic, forestal and agroindustrial production. The law will determine concurrences and characteristics of this production. These areas may transfer potentials for development, for their own benefit, in the terms defined by the programs and article 51 of this Law.

Currently, the population demands more support for agricultural activities, since 60% of the primary sector is dedicated to the cultivation of nopal; however, to create a larger source of income, the introduction of alternative crops is being contemplated, as well as the creation of a collection center of nopal and vegetables for wholesale and retail, and industrialization and commerce of nopal and meat produced in the borough.

The Economically Active Employed Population (EAEP) residing in Milpa Alta in 1990, independently of their place of work, was 19 106, while in 2000 it was 33 614, representing 98.5% of the total EAP.

On the other hand, the Economically Inactive Population was constituted by 24 670 people, mostly dedicated to housework. The presence of students in the borough is proportionately lower than in the rest of the Federal District (See Chart 20).

According to the census taken by INEGI, the population dedicated to the primary sector has decreased; in 1980 there were 5,379 people, while in 1990, only 3,658 people were registered (19.15%). In an inverse relation, an increase was registered in the tertiary sector, which between 1980 and 1990 rose from 46% to 59.8%, with 11 426 employed personnel. This increase is due to the proliferation of small businesses, mostly for sale of food and services (see Chart 21).

The income of the population is distributed in the following manner:

75.52% of the EAP receives less than 2 minimum wages[22] and of these, 29.64% receives less than one. In the Federal District as a whole, the percentage of the population that receives less than 2 minimum wages is 59.41%, which shows that the borough in general has a higher level of poverty than the Federal District as a whole. It is necessary to emphasize programs of social support, generation of remunerative employment and just prices for the products generated. Around 3% of the population receives an income of more than five minimum wages (See Chart 23).

Commercial activity developed in the borough is high, since it incorporates 59% of establishments, 32% of personnel and 52% of income. (See Chart 24). Agriculture, agro industry and services stand out as well.

c) Marginality

The Milpa Alta Borough, and the Tláhuac Borough have the highest marginality of the Federal District, for which programs are necessary to elevate the levels of the factors considered, at least to the average of the Federal District, attacking critical factors presented in the borough (See Chart 25).

In social terms, the high grade of marginality and the lack of access to services in comparison the rest of the boroughs of the D.F. stand out. According to INEGI data (1990), 29.06% of the working population receives less than 1 minimum wage, compared to the Federal District as a whole where this population represents 18.91%. Meanwhile, according to the Municipal Marginality Index of the National Population Council (CONAPO), this borough has the highest marginality, along with Tláhuac.[23]

22 The minimum wage is equal to $43.65 pesos a day in urban zones and $40.30 in rural zones (Approximately US$ 4.3 and US$ 4 respectively).

23 The Index of Municipal Marginality of CONAPO is built according to a series of indicators. This index captures and describes the intensity of the phenomenon of marginality according to the percentage of the population that does not participate in the access to goods and essential services. The construction of this index through techniques of multivariate analysis, such as principal components, allows the index of marginality to be a measure-summary that differentiates units of observation (states, municipalities and towns), according to global impact of deficiencies. In this way, the index captures socio-spatial inequalities that arise from patterns of

According to Rubalcava and Schteingart (2000), who built an index of socio-spatial differentiation which allowed them to stratify by boroughs and municipalities within the Metropolitan Area of Mexico City, Milpa Alta is located in the very low strata, reflecting medium low values related to the EAP; the percentage of people with primary education and high income; the percentage of housing with piped water; and the values related to increased crowding.[24]

3.3 Environmental Characteristics and Processes of Change

Of the total surface area of the borough, 28 375 hectares, 95% is Conservation Area. The ground usage which predominates in the towns is residential, with diverse intensities; in the central zones of the towns of Milpa Alta, Atocpan and Tecómitl, there are plots of land with mixed uses of housing and commerce or services, and in peripheral parts of the towns, housing with agricultural or nopal plots[25] in the majority of cases.

In addition, there are towns with populations from 100 to 500 inhabitants and of less than 100 inhabitants concentrated mainly in irregular settlements in very disperse areas.

In general, the 12 towns are made up of the following areas:

Central Zone: where basic or medium equipment, mixed uses, housing and complete services are concentrated.

Intermediate Zone: represents a transition zone, mostly residential, where the poorest zones are found.

Peripheral Zone: residential area mixed with productive parcels. Bordering this last zone are irregular settlements without services and with precarious materials.

Global distribution of ground usage in the borough, considering rural uses, is the following: forestry use predominates with 58.53% to the total territorial surface area; agricultural use follows with 34.66% of the surface area, and the rural-urban area is last with 6.81%.

In Milpa Alta, there are three kinds of land ownership: communal (21 000 has), mostly occupied by forests; private (5 600 has), dedicated almost entirely to agriculture, and ejidos (1 395 has) (Torres Lima, 1988).[26] In 1991 the Borough concentrated 26.1% of the total of Units of Rural Production of the Federal District, with a total of 5 251 and a total surface area of 7 847.809 has, mostly only temporary.

settlement, economic and social conditions. It is constructed based on seven indicators of deficiency: illiteracy, housing without piped water, housing without sewerage, housing without electric energy, housing with dirt floors, crowding, and working population making up to two minimum wages.

[24] The variables used in the study are those that show social and physical spatial aspects of intra-urban differentiation, after a process of discarding variables. The variables chosen were: crowding, education, housing with water, EAP, income and home owners.

[25] One of the principal crops in the borough is nopal.

[26] In Mexico, ejidos and agrarian communities are forms of social or collective property instead of private ownership. Before the reform to article 27 of the constitution, they were not forms of property, but of usufruct, which implied the prohibition of their sale and only the possibility of inheriting it from ancestors. According to the Agrarian Law, “The nucleuses of ejido population have their own judicial personality and patrimony and are owners of the lands that have been given to them or that they have acquired by any other title.” They have their own administrative organs: ejido assembly, commissary and vigilance commission. The supreme organ is the assembly where all the ejido members participate. Ejido lands by use are divided into: lands for human settlement, lands for communal use and parceled lands. In communities, their judicial recognition implies the existence of the Commissary of Communal Goods as an organ of representation and administration of the assembly of commoners in the terms established by the communal statue and custom; the special protection of communal

In 1991, 9 of the 43 ejidos and agrarian communities in the Federal District were found in the Milpa Alta borough, with a surface area of 22 474 has, of which 19 139 were not divided into private parcels. In 1991, there were a total of 16 980 ejido members and commoners. (See chart 26).

In spite of the communal aspect of property, some plots are sold to people who do not belong to the community.

Crops in the borough are oriented mostly towards the production of nopal (4159 has), corn (2910 has) and oats (1641 has).

Traditional family agriculture oriented towards self consumption and the production of basic grains has been reoriented in the last few decades towards the market, based mainly on the production of nopal. This last production has implied changes and technological development; transformations in the productive process, as well as pushing for advances in the community, such as pavement of internal roads (penetration roads).

Around nopal production, there have also been several different groups, as well as governmental and non-governmental institutions, and Universities, which have supported the process of learning and technological development linked to the different phases of production.

In Milpa Alta a change has been made, as in other parts of Mexico, in order for a larger insertion of the local economy into the international logic, starting with alterations in economic policies and regulatory framework. In this sense, processes of modernization of local production have been developed in the borough, going from traditional techniques to an improvement of processes, to exporting products. One of these is nopal, which has been exported to different countries by some local companies, such as Azteca, founded in August, 1991. While this situation is an exception in the regional context, it is one of the trends that are being promoted by the authorities, who seek to incorporate mercantile logic and modernization of processes, instead of more traditional practices. They seek to support sectors that still use agricultural production to form micro-enterprises.

In order to create more sources of income, alternative crops to those already developed are trying to be introduced; as well as the expansion of the center for collection of nopal (created recently); and the sale and industrialization of nopal and meat produced (Distrito Federal, 1997).

In spite of the communal form of land ownership, the change in economic structure caused the form of growth and transfer of land to be carried out through private buying and selling contracts, where the right to property is ceded. Although this goes against the rules of communal ownership of lands, it is the most frequent form of property ownership.

Therefore, once again we see a gap between the current legislation and the uses and customs that go beyond it. These examples are clear in our case studies.

a) San Bartolomé Xicomulco

lands which makes them inalienable, imprescribable and non-mortgageable, unless they are given to a society in the terms of article 100 of this law; and the rights and obligations of the commoners according to the law and the communal statute. The community implies the individual state of the commoner and allows the owner to use and enjoy his parcel and to cede his rights over the land in favor of his family members and neighbors, as well as the use and benefit of common goods in the terms established by the communal statute.

- ***Land Ownership***

The situation of ownership and property of land in this town is complex due to the fact that it property limits are marked by the agrarian courts. The most prevalent form is small property ownership; in town, the majority of people have a private contract over their lands; however, these lands belong to the 27 000 hectares of communal land in the borough of Milpa Alta, for which reason San Bartolomé Xicomulco also has communal representation. This shows a completely contradictory situation which only the agrarian courts have the possibility of resolving. There is no public title, only private contracts between individuals. The communal rights are for the Town of San Bartolomé Xicomulco and are within the assignment of communal lands of Milpa Alta. However, the usufruct is private.

The way they explain the change from communal to private land is the following: "*…traditionally in 1850 communal properties had to be registered and the only towns that did not register were San Antonio and San Bartolomé Xicomulco, these two did not register their communal properties and this is how it went from a communal regime to small ownership or private ownership."* (Coordinator of territorial communications, Oscar Meza, June, 2003.)

Beginning with the earthquake in 1985, the increase in population of the town began. This increased the demand for land on behalf of the population that came from outside the borough. Before, the land was divided between members of one family: land belonged to parents and they passed it on to their children. Currently, with the demand of land, an important market of property is beginning in the region. One of the people interviewed shows the way his parents arrived in the town*, "…I think they got together [speaking of his parents] at work, and since my mom has family here, they helped her to get a plot of land to build on. …since there are always [new settlers] arriving, they are living in the outskirts. Barrio San José or something like that, towards San Pedro, all of those outskirts are getting really populated."* Health Center Patient.

b) San Salvador Cuauhtenco

Coordinator Sergio Mancilla Rosas explains that the town was founded by a Xochimilca tribe and the problems began from the time of its formation, since this is the last town within the geographic limits of Milpa Alta and its population is 11 000 inhabitants. The population is divided between small farmers who represent 80% of the total population. The people who work in agriculture are generally cattle farmers, and they plant fodder, corn and nopal.

Land is communal, as is the land in all the towns of Milpa Alta, but usufruct is private. The legal form of a private ownership contract is used, while in other places there are property titles governed by the public register of property. Since the land is considered communal, however, and is exempt from taxes, many people do not pay property tax, even when for all other purposes, the land is used privately.

This town has the same problems as all the towns in Milpa Alta: one part of the population is considered within the city limits and therefore has access to water, sewerage, public lighting, telephone lines and other services provided by Mexico City boroughs, while another part of the population outside the city limits has no access to services.

3.4 Legal and Institutional Framework

Milpa Alta, as all the rest of the boroughs of the D.F., is constituted as a deconcentrated administrative organ within its territorial circumscription with autonomy in government actions in its political-

administrative area. The boroughs are hierarchically subordinate to the Chief of Government of the D.F. or the department he determines.

In each territorial limit, there is a head person constituted as Borough Chief, elected every three years by universal vote.

The boroughs must inform the Chief of Government on the exercise of budget assignations, although they exercise their budgets with administrative autonomy.

The Law of Citizen Participation in 1998 constituted the Neighbor Committees, representative citizen organs the principal function of which, among others, is to be the bridge between authorities and the demands and needs of the neighbors of a barrio, neighborhood or apartment complex.

a) Forms of Community Organization[27]

One of the important elements associated with the cultural characteristics of Milpa Alta is the presence of traditional authorities who co-govern with regular authorities. This grants particular features for forms of organization, administration of services, attention and resolution of demands and conflicts between different local actors. The most important representatives in this phenomenon are the so-called *coordinators of territorial communications,* authorities elected by traditional modes, who serve as mediators between the population and borough institutions.

This figure presents complexities from the judicial point of view, because it is legitimate, but it does not have a legal correlation, nor is it immerse in the formal structure of administrative laws, as noted by the coordinators themselves:

> *There is a legal void. We (coordinators) effectively do not exist as a legal framework, we exist as a traditional form, and the authority itself recognizes that traditional form, without taking a position within the structure of the borough. We have all the power to represent each one of our neighbors before any authority. (San Bartolomé X. Coordinator)*

In general, the current position of the coordinators is to form part of the legal situation, in order to have a place within the norm, to access resources and be recognized by other governmental authorities. This has implied the formation of a Council on the Federal District level in coordination with the rest of the boroughs in the southern part of the city and the development of diverse advocacy activities and negotiations to achieve this.

> *"...We are traditional authorities and we had to be recognized by the assembly of representatives or the local chamber in the local chamber of deputies, and on behalf of them or on behalf of another authority, we would have to join. But instead the borough is giving it to us, that is the inconsistency, in that we are traditional authorities elected by our town, but paid by the administration, that is an inconsistency, which is why the coordinators of the southern zone are making a council in Mexico City, for all these details..." (Coordinator San Bartolomé X, June, 2003.)*

A central question is the legitimacy of the coordinators, given the great support of the people of their towns and the historical tradition of their representation. In addition is the supposed possibility of the assembly to remove the coordinator from their position when they believe it to be convenient.

[27] For more detail on modes of specific organization regarding the water and sanitation system, see point 4.5.

> *"Here, if the community does not agree with something, the very community can even remove their coordinator, if they believe he is not working well. If they believe the coordinator is working well, all of the people get together to fight against the authority (speaking of the borough authority) if they are doing things wrong. Then we coordinators have a lot of support from the people." (Coordinator San Bartolomé X)*

The coordinator of communications concentrates different formal and informal attributions, which go from the local administration to conflict resolution in the community on different levels. He serves as intermediary between the community and the political Borough, which is not without problems, since the coordinator owes more to his community than to the borough.

> *Q: How do you, as a representative of the community, get feedback and how does dialogue happen between you and the community?*
>
> *R: They come directly here to me and I do the assemblies in every one of the neighborhoods or streets. I invite them to come to listen to their problems. It is direct. (Coordinator San Bartolomé)*

In San Salvador Cuauhtenco, one of the case studies, the coordinator is elected by public secret vote and the elections are held every three years. The salary of the coordinator is paid by the Milpa Alta Borough while the personnel assigned to the coordination office are paid by the Federal District Department.

The coordinator was re-elected, although previously this did not happen, for example *"…the coordinator who finished in 1997 had been working uninterruptedly for around 12 years, no one said 'let's change him' until one person began to move and look for candidates and in the end an electoral process happened in the entire community, but it seemed like a lot of people didn't agree that it should last for so long. The current coordinator has been here for 2 years and 7 months and they are already thinking about the next elections."*

The coordination is the link between San Salvador and the borough of Milpa Alta, and they are the ones who attend issues directly with the Government of the Federal District. In the relationship between the coordination and the borough, pressures exist. In fact, they consider that in the end, the borough is working badly, since there is no answer on their part to the needs of the community, which complicates the relationship of the Coordination with the population. In this respect, the assistant coordinator notes the following: *"…and people think that we are the bad guys of the movie. We do what we are supposed to, in other words, report to Milpa Alta and insist. We have people who are very present. They have more than a month finishing leveling some grates, and for more than a week the grate has been open, dangerous for the people. We reported this, that's why we have a journal where we note everything there is and the complaints and demands of the people. …The main street pavement is all broken up and it was around a year ago that we reported it. They haven't even come to fix that. I had to call a plumber to fix the toilet (of the Coordination). That's how bad things are. …I think the authorities don't hire capable people."*

Regarding the **type of organizations** existing in the Borough, according to data by the authorities, there are a total of 349 organizations, which can be classified as: community, athletic, productive and commercial, religious and festive, parent, associations and political parties (See Chart 27).

San Bartolomé Xicomulco is one of the towns with the highest number of organizations, with community type organizations and productive and commercial ones standing out. In addition, in this town there are several groups of women and youth that carry out different types of activities.

A. The community is organized in different social groups from the very same community. We are talking about the church representatives, for example, the treasurers and majordomos[28], the commoners, and we are talking about youth groups that are here in the community.

Q. How many youth groups?

A. Approximately four.

Q. And what do these groups do?

A. They are dedicated to organizing festivals and cultural days and others are dedicated to promoting sports in the community. (Coordinator San Bartolomé)

In the case of San Salvador, community organizations predominate. The Territorial Coordination alongside the community organizes neighborhood committees for different things such as water, health, festivities, etcetera, according to what requires the participation and follow-up of the community. These committees work for the community, mostly in services, in almost the same way as the coordinator, with a sort of link with the coordination.

In traditional organizations there is communal representation, as well as majordomos organized by the Catholic Church, who are responsible for religious festivities. The civic events are organized by the borough in coordination with territorial communications.
In addition, there are traditional religious and festive organizations, oriented to the organization of diverse events of this kind developed in the towns of Milpa Alta throughout the year.

"There is a representative … a majordomo that belongs to the Catholic temple, they are responsible for religious festivities....

The civic events are organized by the borough in coordination with the territorial communication, but the religious festivities are done by the majordomos." (San Salvador C. Assistant Coordinator)

[28] In rural communities in Mexico, a person is elected each year as "majordomo" to organize and fund each religious celebration, such as patron saint days.

4. CHARACTERISTICS AND TRENDS OF THE WATER AND SANITATION SYSTEM

4.1 Environmental Conditions and Water Resources

Mexico City is one of the most populated cities in the world. To satisfy growing demands of potable water, sewerage and sanitation, the infrastructure has gradually increased, but on a lower level than the demands of the city.

Mexico City confronts the need to assure potable water supply in a permanent sustained manner. The sustainability of the supply depends on one hand on the physical capacity of the hydrological watershed to capture rain water and recharge the aquifers and on the other hand, on the capacity of institutions to administer hydraulic resources and on society to use them adequately.

The hydrological system is made vulnerable by overexploitation of the aquifers, pollution of the environment and discharge of wastewaters. However, wastewater and rainwater precipitation collected in the sewerage system constitute a valuable resource to complement or substitute the supply of primary use water demanded by the growth and economic activities of the city. The Federal District, as a sociopolitical entity, is limited to assure the supply of 34.7 cubic meters per second of primary use water demanded by the population.

The daily amount of potable water required by a person in his or her home to satisfy their needs depends on the availability of water, customs and the socio-economic level of the family. Domestic consumption is distributed in the following percentages: 34% in toilet use, 4% in dish washing, 14% in washing clothes, 39% in personal hygiene and 9% in other uses. Average daily domestic consumption per person in the DF is 163 liters (there are zones that report 360 liters per inhabitant per day). This represents giving the city a flow equivalent to 16.16 m3/s. To comfortably satisfy the supply of potable water to the population, a daily amount of 180 liters per inhabitant is estimated, equivalent to 19.18 m3/s in the entire city. In boroughs located to the east of the city, for example, in Iztapalapa, the demand of water supply surpasses the availability of sources (UNAM, 2002).

Currently, the situation of the Mexico City aquifers is overexploitation[29]. The continuous growth in the demand for the service, continues to increase exploitation and to carry out costly works to import water from sources far from the city, such as the case of the Cutzamala system.

[29] Region XIII Valley of Mexico is located in the high watershed of Río Pánuco. It is formed by two sub-watersheds, Valley of Mexico and Río Tula. At the head of these watersheds, the physical surface of Region XIII is 16 150 km2, however, the administrative limits of the region cover a surface of 17 126 km2. The states of Mexico, Hidalgo and Tlaxcala, as well as the Federal District, have political jurisdiction in this region. Region XIII is located within the hydrological region No. 26 Alto Pánuco; the Valley of Mexico Watershed is located here, which has an annual runoff of 1 636.4 million m3, as well as the Río Tula Watershed, the flow of which has a value of 947.2 million m^3.

The principal source of recharge of the aquifers in the Valley of Mexico Watershed is rainwater precipitation. Another type of non-natural recharge is that derived from leaks in the potable water and sewerage networks.

The surface areas with the recharge of most importance are located in the surrounding mountain ranges of the valley towards the east and south.

There are 106 storage areas, between lakes and dams with a total capacity of 646.7 million m^3. Reservoirs are used mainly for irrigation, on a lower scale for control of avenues, in a minimum proportion for supply of potable water and an even smaller amount for the generation of electric energy.

The overexploitation of the aquifer and the decrease of its natural areas of recharge have modified its general equilibrium, generating effects such as differential sinking of land, which has caused an increase in the number of leaks in the network of distribution and the potable water lines (Quiñones, 2001).

At the same time, in terms of sustainability, Milpa Alta represents a strategic resource for the city; it is part of the proposals for ecological rescue of the Valley of Mexico and is fundamental for its sustainability. It is located completely on Conservation Soil and plays a central role in the recharge of the Valley of Mexico aquifer. In this sense, the Milpa Alta Borough represents a fundamental reserve for ecological equilibrium in environmental terms for Mexico City.

This borough is divided into two large areas: agricultural and forest. In the agricultural area, corn, nopal, and fodder crops predominate, and in a smaller quantity vegetables, fruit trees and flowers are cultivated. The surface area dedicated to agriculture is approximately 10 535 hectares. It is important to point out the nopal zones, since they are natural, cultural and patrimonial environments, located inside and outside of the towns that need to be fostered and preserved alongside irrigation and temporary agricultural activity.

In the forest area, which occupies the main part of the south of the borough, there are different species of pine, fir, oak and other trees. The surface area is estimated at 16 560 hectares.

In these areas, clandestine logging for firewood or cultivation and/or pasturing soil threatens to break ecological equilibrium. In consequence, programs for erosion control, restoration and conservation of flora and fauna are needed (See chart 28).

The zone of recharge is the Chihinautzin Mountain Range, which constitutes one of the highest yielding aquifers in the watershed. The water extracted at the foot of the mountains is considered high quality. The volume consumed in the borough is approximately 14,397.54 mts³/day, equivalent to 177 lts/person/day. The resource coming from the borough covers additional needs, and is conducted to the La Caldera, Cerro de la Estrella and Xotepingo Pumping Plant tanks, through the Chalco-Xochimilco Aqueduct.

DISTRIBUTION OF POTABLE WATER BY SOURCE (m3/s)

SUBREGION	INTERNAL		EXTERNAL		TOTALS	
	GRND.	SURF..	GRND.	SURF.	GRND.	SURF.
V. OF MEXICO	43.32	2.05	5.86	13.46	49.18	15.51
	45.37		19.32		64.69	
TULA	5.50	0.35	-	-	5.50	0.35
	5.85		-		5.85	
REGION XIII	48.82	2.40	5.86	13.46	54.68	15.86
	51.22		19.32		70.54	

The sources of potable water supply in Region XIII are classified as internal and external to the Valley and these can be surface or groundwater. The principal characteristics of potable water supply for domestic use are resumed in the following table.

In summary, for Region XIII there is a flow of 48.82 m^3/s from internal underground supplies; surface water from the region contributes with an average of 2.40 m^3/s and outside sources, Lerma and Cutzamala, provide 19.32 m^3/s, which means that 27.4% of the total supply of potable water for domestic use is from neighboring watersheds.

Pollution is another big problem. In the Borough there is runoff and small ravines, which cross almost all the settlements, which represent a serious problem of pollution with discharge of wastewater, such as the ravine located in the barrio of Santa Cruz, which covers a distance of 5 kilometers; other factors that contribute to pollution are rodents, trash, pesticides applied to detain the propagation of pests, and open air defecation.

The Milpa Alta Borough, as we have already noted, is one of the zones of recharge of the Mexico City aquifer, and has a risk of pollution because of the problems already mentioned, in addition to the fact that agrochemicals used against pests and for fertilizer, are leached through the soil by rainwater until they reach the level of the aquifer. The Borough Program notes the need to carry out actions for rational use of fertilizers, canalization and treatment of sewerage, periodic cleanings, optimizing the system of trash collection, and fostering the use of latrines and septic tanks.

Another factor that affects the environment in this borough is the erosion caused by urban, agricultural, fishing and forest activities, as well as natural disasters. These elements open the way for the degradation of the soil and the deterioration of the hydrological regime, they create problems for human health and they foster the alteration of ecosystems.

The most affected zone within the borough is the northeast, since it represents a serious hydraulic erosion because it is the zone of plains in the borough. In the highlands of the south of the borough there is a moderate hydraulic erosion. This zone covers more than half of the territory and is considered moderate because there is still a forest vegetative cover, which impedes runoff of water and soil erosion.

The use of water in different human activities, classified as domestic, industrial, commercial and services, provoke pollution. The discharge of wastewater constitutes one of the most important environmental problems, aggravated by population growth and by technical problems for providing sewerage services, because the topographic characteristics result in extremely costly projects.

The existence of numerous clandestine dumps cause pollution of soil and water tables, because by leaching rainwater through waste or pre-strained polluting liquids, they deteriorate the quality of the soil, since it is a zone of recharge of the aquifer.

Environmental pollution caused by the deficiencies mentioned is aggravated by the presence of trash in streets, ditches and rivers, creating strong spots of insalubrity that endanger the health of the population.

The semi-cold sub humid climate with rain in summer of higher humidity, covers 69.54% of the borough. There are also sub humid mild climates with rains in summer of higher and medium humidity, which generates a rainwater precipitation of more than 100 monthly mm and an annual average of 31 years of observation of 746 mm.

In the northern zone of the borough there is flooding in the central areas of San Pedro Atocpan, Villa Milpa Alta and San Antonio Tecómitl. Because these are the main towns, better sewerage systems are needed.

4.2 Characteristics and Trends of the Water and Treatment System

Milpa Alta presents particular characteristics in its system of water and sanitation: in spite of having a high coverage of potable water (see chart 29) on the metropolitan level, it is the borough with the least percentage of in-home water service (see Chart 8).

Its system of water supply is carried out by giving turns to the population in different locations, which means that because the volume of water is insufficient, a measure is taken to distribute it according to towns and within towns, by days and hours in each zone. This system began to be applied in 1995.

This is why in each town, valves are opened and closed on different schedules. The population, knowing what day they have water, fills their own tanks. The task of opening and closing the valves is the responsibility of the Unit of Potable Water and Sanitation of the Borough.

Another characteristic of water supply is the existence of serious problems of supply such as ***suspensions of service***. This happens particularly in the highest zones of Milpa Alta, because of topographic characteristics and problems encountered in the dry season.

a) Water and Sanitation System

There are two water sources for Milpa Alta: the tanks filled by the National Water Commission (CNA) and under the responsibility of Mexico City Water Systems, and wells owned and operated by the Borough. Two institutions are in charge of potable water supply in the borough: Mexico City Water Systems and the Milpa Alta Borough; the former is in charge of extraction of water from the borough wells and the water supplied by CNA and filling the distribution tanks of the borough, through the primary network, and the latter is in charge of distribution to users in the towns through secondary networks.

In Milpa Alta piped water is supplied by extraction of groundwater through two systems of deep wells: “Aguas del Sur” and “Tecoxpa;” the former is located in the surroundings of the town of San Antonio Tecomitl and has 15 deep wells; the latter is on the highway between this town and San Francisco Tecoxpa and has 9 deep wells. These wells, with high yield because of the permeability of the rocks, store water in distribution tanks, located mostly in the highlands of the jurisdiction, which by gravity distribute to the towns. However, in conversations with personnel of the General Direction of Urban Works and Development of the Borough, it turns out that at present there are only 7 wells working, since the others were extinguished by pollution or drought.

In order to transport water, there is a primary water network of approximately 38 km, which fills the storage and distribution tanks, which then provide water for the twelve towns through a secondary network 187.108 meters long.

- ***Water Supply***

According to the Population and Housing Census of 1995, Milpa Alta registered 17 327 houses, with an average of 4.7 inhabitants per home. In 2000, the data showed that the houses increased by 21 600, with an average of 4.5 occupants.

Regarding the availability of potable water services, in 1995, 15 183 houses had piped water service. In 2001, according to the register of users and the register of consumption measured for the first two month period of 2001, an estimate of close to 5 840 homes (27% of the total number of homes registered in 2000) and close to 38.5% of homes with piped water registered in 1995, have a meter of water consumption (Quiñones, 2001) (See Chart 30).

According to borough officials, the system of turns is not applied because of lack of water, but because of the topographic characteristics of the land.

Besides the turns system, the towns or communities farthest away from the city limits, where there are irregular settlements, receive water through trucks. The system of supply by trucks is given two ways, newly dividing the population between natural and irregular. While the natural inhabitants, in other words, those originally born in Milpa Alta, inside the city limits or not, are provided with free water by the trucks, while the new inhabitants, also called "illegals" or "irregulars", must pay for their water,[30] although this can vary depending on the case.

The towns with the most scarcity of water are the highest towns: San Salvador Cuauhtenco, San Pablo Oztotepec, San Bartolomé and Santa Ana.

b) Characteristics and Trends of the Water and Sanitation System in the Two Towns Selected

- **San Bartolomé Xicomulco**

In San Bartolomé Xicomulco, there are no wells, and the water which reaches the town comes from the Tecomitl wells 5, 6, 7 and 8. From there, it is repumped to the high part of Milpa Alta, in the barrio La Luz, passed to Tlaltenamic, then to a storage tank in San Pablo and finally to San Bartolomé Xicomulco, and from there the distribution to the town is made. Every six months there is a treatment to chlorinate the storage tank, done directly by the personnel of Mexico City Water Systems of the Federal District Department. For San Bartolomé to have water, there is a triangulation of three tanks and the water is distributed to the population through the town's primary network.

Because the town is located in the high zone of the borough, they have serious problems of water supply, even for the population connected to the potable water network. In the dry season, there is no water, and there is only service every 4 days or even every week. Normally, water arrives every third day for only two hours. To solve the problem, the people have built cisterns big enough to store water. In the dry season, the borough sends trucks with no cost to the population, or they carry barrels from the communal spout. Also, those who have resources buy water from private trucks which charge between 350 and 400 pesos for 3,000 liters.

95% of the population has all basic services covered, including water, sewerage and pavement, and only 5% of the community does not have services, because they are outside of the city limits and the legal norms impede the extension of these services to these zones because the borough is considered an area of ecological reserve of the Federal District. (San Bartolomé Xicomulco Coordinator).

Within the borough, the problem is worsened by the arbitrary decisions of the valve workers to supply water to the highlands and lowlands of the town. In this sense, one person interviewed states:

"Here in San Bartolomé Xicomulco we have a great lack of potable water, we do not have enough water… Yesterday we had a problem. Why? Because yesterday those of us who live in Vicente Guerrero only got a little bit, a tiny thread… so I came to see the valve worker because we have an agreement that the valve should not be open or closed… it's halfway, okay? Half for the hill and half for us. So the valve shouldn't be opened, but yesterday they opened it and they closed us down completely and left us without water. So I came to see the valve worker to find out why he had closed it and he said, "The water isn't going up the hill at all," "Yes, but you should take note that it isn't arriving to us the way it should either." And… I didn't come to demand something that doesn't exist,

[30] There are different modes for access to water besides the system of turns and the installation of water hydrants. As has been mentioned, the population outside of the city limits but inside the pact for growth receives water in trucks sent by the Borough, which should be free, although sometimes it is paid for. The population in irregular settlements outside of the pact receives trucks which they have to pay for. To ask for trucks in irregular zones, a request is made through the Citizen Attention and Service Center of the Borough, which channels such petitions to the corresponding department.

you know?, I came to see why …if there is only a little thread, well we will conform and we don't come to demand water if there isn't any… Well, another thing I told this guy was: "Look, I'm not here to fight, I just came to see if you would give us two hours, at least you should have warned us so we could store drinking water." They didn't warn us and we only filled one cistern and now we have no water…" (User and community leader, San Bartolomé, interview, May, 2003).

Agreements have been defined by local authorities on the times the valves should be opened for each part of the town. However, the lack of specialized personnel increases the problem, since when the valve workers go on vacation, the problems increase.

"…Well, in our neighborhood the valve is always (regular with the same schedule)… They had told us before that they were going to provide water on different schedules." Speaking of the valve workers, she says: *"…they work here … they are in charge …but there is one valve worker who when he is here, there is no problem, even if there is little water, there is no problem, but when he goes on vacation, these problems always happen" (User and community leader, San Bartolomé, interview, May, 2003).*

The population of San Bartolomé knows there is little water and it is rationed and they have become accustomed to measuring the times. They know the amount of water they need to cover their needs and also when and how much they get weekly. When there are problems, they go to the coordinator and ask for water so it will come on time. (Interview with the doctor in San Bartolomé Xicomulco).

Only 60% of the population in San Bartolomé Xicomulco that receive water has a meter. The meter and charge service is hired out by the government of the Federal District to a private company. There is a lot of inconformity with the payment of water, because of the deficiencies of the service. They only have water a few hours a day, there is a lot of air in the pipes which makes the meters work even when they don't have water, which makes the population believe that in reality they don't pay for the water, but for the air in the pipes. 40% of the population that have the service don't have a meter and pay a fixed bimestrial fee of approximately 25 pesos; those who do have a meter pay according to consumption and according to the interviews carried out, the amount is around 60 pesos per bimester.

The authorities interviewed as well as the population in general consider that the quality of the water is good. In the Health Center in town, the doctor noted that there is permanent care taken to chlorinate the water and the studies carried out by the Secretary of Health show that the water is good for human consumption.

The population without access to the primary network, mostly the population located in communities outside the city limits, is supplied with water by a system of trucks that supply water to the population on specific stops where the population leaves their barrels. At the largest stop, water arrives two times a week and the stops with less population receive water once a week with a maximum of three barrels per family. (San Bartolomé Xicomulco Coordinator). Once the water is collected, it is taken to homes by hose or carried in a bucket.

"In the peripheral zones in the irregular settlements they also receive potable water through trucks brought from San Antonio Tecome. This water is potable and comes from treated wells. (Doctor at the health center in San Bartolomé Xicomulco).

As a social support, the Borough supplies the water trucks to the population in irregular settlements and who have needs. They are not charged one cent unless the family considers it personally and has a tank and buys water, but this is by direct request." (Doctor at the health center in San Bartolomé Xicomulco).

The situation of sewerage is variable in each town, since although it is estimated than 95% of the population has the service, in some towns it is extremely deficient, such as the case of San Bartolomé Xicomulco. In this town the sewerage is very poor. The existing sewerage was planned in 1978 and from 1977 to 1979 was the period of highest introduction of the sewerage network. At that time there were between 900 and 1100 inhabitants, and the sewerage was designed for that amount of people. At present, San Bartolomé has a total of 3423 inhabitants and sewerage is completely insufficient, which becomes absolutely clear in the rainy season. During this time, instead of going down the drains, the water overflows and comes out the manholes, flooding the town with wastewater.[31] (San Bartolomé Xicomulco Coordinator).

- ***San Salvador Cuauhtenco***

In the case of San Salvador, which is one of the highest towns in the borough, it had its own wells in 1935, but in 1970 the water from the wells was no longer provided to the population, but instead transported to meet the needs of the borough, and currently these wells no longer work, since they were extinguished.

The water for urban service comes from San Antonio Tecomitl. It is then repumped to San Francisco, then to San Mateo and to San Pedro Atocpan, where it is sent to a tank located in Tlacotenco which sends it San Pablo and from there it finally arrives at the San Salvador storage tank and is distributed to the population. The amount of transfers this water has to pass through to get to San Salvador makes the service of water to the population depend largely on the efficiency of these transfers, which in turn depends on there not being interruptions in the electric service. The problem is that in the last few years there have been serious problems with this service and power outages are more and more frequent. In order to give water to the town, the storage tank must have at least 3.5 meters. (San Salvador Cuauhtenco Assistant Coordinator: Sergio Mancilla).

One of the main problems in the town is the lack of water. There are places within the city limits which have no way for water to reach them through the network, and therefore have to be supported with trucks which periodically supply water to the families. The same happens with the population located in outside communities, who receive free water.

In San Salvador, the population is also provided with water by turns. The southern and eastern part receive this service on Mondays, by blocks, for two hours a day, giving a total of 1000 liters to the family tanks. On Tuesdays the northern part and a small part of the south receive water.

Because even in the zone considered city limits, there is no service to the population, there are many clandestine taps. The problems caused by these taps are multiple and serious since people open up the pavement to get to the pipe, they break it and then they connect to it. The authorities mention: *"…Here water is being stolen because people have the need. If we had a good level of water, there would be no robbery. The solution would be that in each repumping tank there would be a generator. The other solution is to ask as a favor to the people who supply water by truck to send water. And when we ask for it, the trucks sometimes arrive."* (San Salvador Cuauhtenco Assistant Coordinator: Sergio Mancilla).

A very low percentage of the population has a meter. In fact, a program to put meters in the entire town was going to begin, with the company hired for this purpose by the Federal District government, but the population did not accept it and it could not be generalized. On average, those who have metered service pay around 70 pesos per bimester. Those who do not have a meter pay a fixed fee of

[31] It is important to clarify that there is one system of sewerage, so there is no separation between rainwater and wastewater.

22 pesos per bimester and although it is low, the population refuses to pay the service they do not receive. (San Salvador Cuauhtenco Assistant Coordinator: Sergio Mancilla).

The authorities note that in general, sewerage is good, although there are some problems in the lowlands where the agricultural area is located, because the pipes frequently stop up, flooding the crops with wastewater. In the rainy season is when there are more problems.

4.3 Technical Infrastructure Development

The supply of water for all the populations located in the Valley of Mexico watershed is achieved through one of the vastest and most complex structures in the world. In the DF alone it has 490 kilometers of conduction lines, 241 storage tanks with a total capacity of 1500 million liters, from where water is distributed to users through more than 12 500 kilometers of primary and secondary networks. (Perló, 1993).

In Milpa Alta, the volume consumed by the borough is 14 397.54 mts^3/day, equal to 177 lts/person/day (Distrito Federal, 1997).

The hydraulic functioning of the borough is based mostly on two repumps: Tecomitl Viejo and Nuevo, located in the towns of San Antonio Tecómitl. They send their water to the repumping tank La Luz, with a storage capacity of 1.000 m^3. In total the eight repumps have a total capacity of 1 800 lts/sec. They supply water to 22 storage tanks with a total approximate capacity of 15 830 m^3. The capacities of each tank depend on the storage and regulation required in the zone they serve. The majority of tanks are located in the higher parts of the borough, which allows water distribution by gravity.

Water is supplied to the population from the tanks by gravity using the secondary network and providing the service to the towns: San Salvador Cuauhtenco, San Jerónimo Miacatlán, San Francisco Tecoxpa, San Antonio Tecómitl, San Lorenzo Tlacoyucan, San Agustín Ohtenco, San Bartolomé Xicomulco, San Juan Tepenáhuac, San Pablo Oztotepec, San Pedro Atocpan and Villa Milpa Alta. In general, the potable water infrastructure serves almost all the towns; only the irregular settlements lack the service, but are supplied with water by trucks. (Borough Program 1995).

The deficiencies in the potable water supply are found principally in the highlands of the towns, where there is an estimated 3% lack of network, and the population is supplied with water by truck. Low pressure zones have been detected in San Bartolomé Xicomulco, San Lorenzo Tlacoyucan (El Calvario and La Ermita), San Antonio Tecómitl (highlands) and San Salvador Cuauhtenco. At the same time, in some zones of the towns the service is intermittent; where previously established turns are taken. (Borough Program 1995).

a) Sanitation and Distribution of Treated Water

Regarding sanitation and distribution of treated water in Mexico City, the domestic, industrial and service discharges generate a flow of 44.4 m3/s of wastewater, 90% of which remains without treatment and is used mainly to conserve the level of Texcoco Lake, and to irrigate cultivation zones in Tula, Chiconautla, Zumpango (90,000 hectares of crops in the Mezquital Valley, Hidalgo).

More than 65% of the total volume of potable water for primary use is estimated to be drained as wastewater through the sewerage infrastructure. Chart 10 (see Annex) shows the volume of wastewater conducted by type of sewerage in the Metropolitan Zone of the Valley of Mexico. It is important to note that the system of sewerage is combined, meaning wastewater of industrial,

domestic and service origins and rainwater are carried through it. At the same time, an estimate of the annual volume of rainwater in Mexico City is 16m3/sec (504.5 million cubic meters a year), and the total volume of wastewater coming from the Federal District is around 65% of the total from the ZMVM.

b) Sewerage Infrastructure in the Federal District

The Valley of Mexico Watershed, where the Federal District is located, is a closed watershed with no natural exits. Currently it has four non-natural exits to carry rain and wastewater. The sewerage network of the Federal District covers more than 10,000 kilometers in length, with 68 pumping stations, numerous dykes and regulation lagoons to control the flow of wastewater, above all in rainy periods. It also has 129 kilometers of open canals, 42 kilometers of rivers, used mostly for sewerage, and 118 kilometers of tunnels.
The sewerage system of the Federal District uses the same infrastructure to remove wastewater and rainwater. However, the most important problems the system has to suffer are problems for the control of flooding. In order to achieve these objectives, the operation becomes complex.

One of the central parts of the Federal District System of Sewerage is constituted by 10,363 km of secondary sewerage network, with a diameter smaller than 60 centimeters. The goal of this part of the network is to collect wastewater produced and conduct it to the primary network, along with rainwater runoff. This is a network which cannot be extended to places without collectors and components of the general system of sewerage. Chart 31 shows the historic evolution the extension of the secondary sewerage network has had by borough.

The general system of sewerage also includes rivers and natural open air waterways, which conduct rainwater, and are mostly contaminated by wastewater and trash. Trash and sediment, as well as urban growth, increase the waterways, which systematically cause fissures, leaks and faults in the sides of the waterways, problems which are complicated even more by the force and deformation suffered by the ground because of sinking. The Gran Canal is the most important open air waterway of the General Sewerage System.

The Federal District has a sewerage system that also provides service to municipalities in Mexico State, within the Metropolitan Zone. The discharges of domestic, industrial and service wastewater from Mexico City, as well as rain water, are captured in the secondary sewerage network, consisting of pipe systems by neighborhood. Next, the wastewater is conducted through the principal network. All the sewerage is eventually discharged in the general interceptors, which conduct the wastewater out four artificial exits located in the extreme north of the watershed (See Chart 32).

c) Milpa Alta Sewerage System

In Milpa Alta, the draining of wastewater is carried out through 39.04 kilometers of primary sewerage network, called the eastern and western collector, supported by the secondary network of each town and natural permeability through ravines.

The system is combined. Nevertheless, in the peripheral zones of the towns there is absolutely no service, for which the discharge of wastewater occurs in open air ditches and afterwards in waterways and ravines, generating pollution of the aquifer and spots of infection, even when there are primary and secondary networks and collectors located at their margins.

The majority of towns have secondary networks and some others have bits of primary network, which has caused concentrations of water and sediment in collectors, causing flooding in the lowlands in the north and northeast of the borough.

The primary network is 27 kilometers long and the secondary network is 348.5 kilometers long. The system of collectors can be subdivided into two systems: the Atocpan subsystem, which discharges into the San Gregorio canal, in the Xochimilco Borough, and the Milpa Alta subsystem, which discharges into the Ameca river in the Tláhuac Borough.

The Atocpan subsystem transports discharge from the town of San Salvador C., the neighborhoods San Miguel, Tlacpac, Centro and San Juán del Pueblo; San Pablo Oztotepec; the town of San Bartolomé Xicomulco and the barrios of Tula, Ocotitla, Nuchtla and Pachimalco in the town of San Pedro Atocpan.

The Milpa Alta subsystem transports discharge from the towns San Lorenzo Tlacoyucan, Santa Ana Tlacotepec, San Jerónimo Miacatlán, San Agustín Ohtenco and San Francisco Tecoxpa; as well as the barrios San Marcos, Miguel Hidalgo, San Mateo, La Concepción, Los Angeles, San Agustín, Santa Cruz and Santa Martha.

Currently the borough has two distribution networks for treated water located in the towns of San Juan Ixtayopan and San Antonio Tecómitl.

As for the coverage of sewerage in homes, 48% have a connection to the network, 36% of homes do not have sewerage, 13% have a septic tank and 3% have uncovered sewerage (Distrito Federal, 1997).

As for treatment of wastewater, the Milpa Alta borough has the plants San Pedro Atocpan and Rastro, with a nominal capacity of 60 l/s to treat wastewater, which was previously discharged in the open air. The plant operates at 35 i/s. The wastewater is destined for irrigation of green areas and 60 hectares of nearby agricultural zones.

d) Infrastructure of Treatment of Wastewater in the Federal District

The Federal District infrastructure for the treatment of wastewater has 71 registered plants: 20 plants operated by Mexico City Water Systems, 4 concessioned plants, 1 operated by the National Autonomous University of Mexico (UNAM), 2 operated by the Secretary of Defense (SEDENA) and 44 more, operated by users. It has a nominal production of 5, 855 l/s, an effective production of 3,939 l/s, meaning that only 67% of the capacity of the infrastructure installed is used, and it has a potential of expansion of 915 l/s (See Charts 33, 34, 35).

The capacity and location of the treatment systems depends on diverse aspects: magnitude, quality and location of demand, sufficiency of crude wastewater in the place, availability of land in the zone of influence, geotechnical and geohydrological properties of the soil in the plots selected for the construction of the treatment plant.

The infrastructure for the distribution of treated wastewater in the Federal District has a length of 657 km. It is made up of isolated subsystems, in the zones of influence of the treatment plants. The network of treated wastewater has different diameters, which go from 122 cm to 10 cm. The Gustavo A. Madero borough has the most extensive distribution network. In the case of Milpa Alta, there is one treatment plant of Milpa Alta operated by the Mexico City Water System, and the level of treatment is secondary to be newly discharged. (See Chart 33).

4.4 Economic and Financial Aspects

In Mexico the model of regulation of water distribution went from having a strong state intervention to incorporating diverse social and private sectors in management and finances, based on mechanisms of assignation that agree with market logic. The centralized form of regulation occurred from the late 19th century until the 1980s, with regional differences and at different levels of integration.

After the crisis of this model, a second mode of regulation was imposed, characterized by rapid processes of decentralization and commercial opening. Currently, recent reforms promote the establishment of private rights on water use that would allow privatization of the administration of supply and sewerage services. In this way the privatization decree published in July 1992 created the new Federal District Water Commission, CADF, with the idea to administratively improve the public distribution of potable water and the services of sewerage, treatment and reuse of wastewater. The decree gives this Commission faculties to privatize the administration and operation of water services in the Federal District.[32]

In October of 1992, the Federal District Department asked for quotations from private companies for the administration of distribution and payment in the D.F. They decided to form four zones of service in the Federal District[33]:

-**NORTHERN ZONE**: includes the boroughs Gustavo A. Madero, Atzcapozalco and Cuauhtémoc, with 298.557 taps. Run by the private company Sistemas de Agua Potable S.A (SAPSA), a company associated for 10 years with the French company Generale des Eaux.

-**EASTERN ZONE**: includes the boroughs Venustiano Carranza, Benito Juárez, Ixtacalco and Coyoacán, with 257.825 taps. This zone is run by the company Industrias de Agua de la Ciudad de México S.A. (IASA) associated with the English company Severn Trend.

-**WESTERN ZONE**: includes the boroughs Alvaro Obregón, Tlalpan, Magdalena Contreras, Cuajimalpa and Miguel Hidalgo, with 263.789 taps. This zone is run by the company Aguas de México.

-**SOUTHERN ZONE**: includes the boroughs Iztapalapa, Tláhuac, Xochimilco and Milpa Alta, with 327.408 taps. Run by the company Tecnología y Servicios de Agua S.A de C.V. (TECSA).

The contracts contemplated three stages:

-The first stage implied updating user registration, regularization of home taps, installation of meters, taking cadastre of primary and secondary, treated residual and secondary sewerage networks.

In Milpa Alta, only in 1999, beginning with the private participation policy, did the installation of meters begin. That year 3309 were installed and in 2000, 4774.

-The second stage, currently in operation, consists of the installation of new taps and connections to the sewerage network, meter reading, billing and charging consumers, under the system of metered use.

-The third stage consists of operation, maintenance and rehabilitation of secondary water and sewerage networks, installation of systems of macro metering for different zones of the city, detection and reparation of leaks and the sediment removal of the secondary sewerage network.

[32] Quiñones, 2001: 69-70.

[33] Martinez, 1997: 271, cited in Quiñones, 2001: 70.

In the final stage, the city will sell the water in a block to the companies, while the companies will sell it to the final consumers. The government will establish a preliminary outline for water tariffs, which may vary by zone. The companies will be in charge of operating and maintaining the system of distribution of water under two premises: they will lose income if they don't charge the fees, and they will have to pay for leaks.

The policy of private participation is not a privatization that implies the total sale of the entire hydraulic system to private industry, but it is not a concession either. It is more like a service contract in which the only responsibility of private industry is to extend the secondary network, bring the register of users up to date, install home taps and meters, and bill and charge users. (Quiñones, 2001)[34].

a) Tariffs

In Mexico, the traditional tariff outline has been through administrative decrees. In the DF two tariff outlines have predominated so far:

- A periodic fixed payment determined by the profile of the user.
- A periodic fixed payment determined by consumption.

According to the National Research Council, there are currently two types of tariffs:

a) Metered service, for which a price is established according to the volume of water consumed and registered by the meter.
b) Fixed fee, where the amount to pay is maintained constant without considering consumption. Fixed fees in general underestimate real consumption of water because the real consumption is never counted by a meter.

At present, there are two kinds of use: domestic and non-domestic (which includes industrial, commercial and services). For domestic use, the tariff system adopted in the DF is precisely the one most used in developing countries. The charge of water consumption increases by sector, in order to induce practices of savings in the highest consuming sectors. In this system the value the user pays for the consumption varies according to the range of consumption where he or she is located (See chart 36).

b) Fixed fee Tariff

This tariff takes into account the average consumption corresponding to the neighborhood[35] where the building is located and the potable water tap is installed, when in this neighborhood the number of taps with a meter is greater or equal to 70% of the total of existing taps.

In the cases where this condition is not fulfilled, a fixed fee will be applied, established by neighborhood. There are 9 kinds of neighborhoods (which go from 0 to 8), where a tariff is applied according to the kind of neighborhood it is. The bimestrial tariff for 2000 according to the kind of neighborhood is found in Chart 37.

[34] Quiñones ibid: 72

[35] Neighborhoods are differentiated based on the classification and characteristics noted by the Legislative Assembly of the Federal District, according to type of building and ground usage.

With the study by Quiñones we can infer that in the towns chosen for this case study, the inhabitants consume an average of 1% of their salary in water (See Charts 38 and 39).

Meters generate a negative impact on the population, because of the deficiency of the service and the general idea that they "steal water." Therefore there is no officially legislated regulation on meters. While the coordinator of Villa Milpa Alta, the maximum authority on water in the towns, guarantees that meters are not used in Milpa Alta, many houses have one and pay according to what is established by the meter. Others have a meter and pay a fixed fee and other families have never allowed a meter to be installed.

4.5 Political Institutional Framework

a) Governance of Water in Mexico[36]

In the governance of water, before 1980 in the administration of water in general and also in the provision of potable water and sewerage services[37], only public institutions participated, with a significant predominance of federal institutions (the Secretary of Hydraulic Resources -SRH- had representations in all the states and territories of Mexico). Before that year there was no Law of National Water, and the laws in water were fragmented and incorporated in more than one normative body, instead of constituting one alone, as is shown in chart 41.

In the 1980s the decision of the Mexican State was clearly to decentralize the provision of diverse public services, in particular potable water. In this way the structural changes which have given way to the privatization of public services began to be expressed. In 1980, the federal government turned the operation of potable water and sewer systems over to the state governments, and in some cases the state governments transferred them to the municipal governments. (See Charts 40 and 41).

The change in hydraulic policy in favor of decentralization is very clear beginning in 1980, because of legal and institutional changes on the subject of water for urban use, since then the operation of systems is turned over to the state governments and these in turn turned them over to municipalities. At the same time, the Law of National Waters is the turning point of a national contemporary norm on the decentralization of the administration of water resources. In this law, the changes begun in 1980 are synthesized and brought together, and the first legal conditions are created for private participation in Mexico.

After a long period of centralization, the current policy of administration of hydraulic resources is marked by criteria of decentralization and consolidation, in other words, it is based on a basic premise from article 115 of the Constitution, which establishes the general principle that public services of potable water and sewerage should be run by municipalities and not states, and only by exception because of lack of resources and capacity of the municipality, should the potable water and sewerage service be provided by the state.

The transition from a centralized model to a decentralized one is only one component of the Program of Modernization of the hydraulic sector proposed in the last few years which implies, besides decentralization, other elements such as seeking more participation by users in the administration of systems, the participation of private investment in hydraulic projects and suspension because of lack of payment as one of the most effective mechanisms to achieve self-sufficiency of the sector.

[36] Cited in the Aguascalientes Case Study, Mexico, PRINWASS, April, 2003

[37] At this date, the integral sanitation dimension was not considered. The sanitation dimension began to be considered in the institutional norm in the 1980s, in 1982 the Federal Law of Rights included a charge for discharging polluted wastewaters. This dimension as a whole was not considered in laws until the promotion of the Law of National Waters in 1992.

In the context of modernization, the CNA reorganized its actions around three points of change which are, in order, improving use of hydraulic resources, administering water efficiently and modernizing the organizational structure of the sector. At the same time, the Secretary of Environment, Natural Resources and Fishing (SEMARNAP[38]) which the CNA belongs to, has determined that these actions, in seeking sustainable development, should be developed in a sartorial context formed by three dimensions, the environmental, the economic and the social. The actions the CNA takes form part of an integral strategy to support a profound process of change. The institution is evolving towards a structure whose predominant function will be normative for the administration of water and its inherent goods, as well as specialized technical support, within an outline of organization by watershed and hydrological region.

In as far as the points cited above, the first one seeks to reinforce the financial and operative capacity of the organisms providing potable water and sewerage services, as well as local authorities, to more efficiently meet needs in rural and urban zones. At the same time, it is meant to improve operation and development of infrastructure for the control of the hydrological system and risk prevention. The second point is based on more precise knowledge of availability, quality and location, which will provide better control of discharge of wastewater, a more equitable and rational collection, and updating the judicial framework for exchange and efficient assignation of water rights. The third point, the modernization of the organizational structure of the sector, will reorder responsibilities. Decentralization of functions will provide an efficient solution to local and regional problems, increase the participation of users and the three levels of government in hydraulic planning through Watershed Councils, as well as for funding, building and operating non-strategic systems.[39]

In light of these three points, the government proposed to reach levels of coverage of potable water, sewerage and sanitation services in the period 1995-2000 that contribute to healthcare and quality of life of the population and the development of communities, at the same time as proposing to stop the current process of deterioration of the environment by pollution of domestic origins. Additionally, it stated as a priority to attend the lack of services in rural zones and marginal urban populations, with federal and municipal government support, as well as the participation of sectors of the population.

To achieve this objective, strategies were proposed such as supporting the operating organisms and the municipalities so that in urban zones high levels of physical and commercial efficiency are reached, and service coverage is increased, through technical actions and institutional development favoring access to funding, including the integral concession of potable water, sewerage and sanitation services. In the same way, there was a proposal to promote access to subsidized services for sectors of the population in conditions of poverty and extreme poverty, with an emphasis on attending indigenous communities, in support of the Program to Overcome Poverty 1995-2000.

Another strategy was to support, in coordination with state governments, channels of communication between different operating organisms in order to establish commercial strategies that allow reducing costs in acquiring goods and services, and at the same time, urging municipalities to contemplate planning and providing potable water, sewerage and sanitation services in an integral form to urban and rural populations. This would allow the establishment of a tariff policy to facilitate financial self sufficiency.

Another group of points of action was constituted by the support given to municipalities and operating organisms in technical and administrative aspects and the creation of a healthy financial environment to favor private participation under different modalities. In the same way, support was given for the rehabilitation of potable water and sanitation systems in rural communities, emphasizing the termination of unconcluded works and improving operation.

[38] Now Secretary of Environment and Natural Resources (SEMARNAT).

[39] CNA, Estrategia del sector hidráulico, 1997:8.

In sanitation, the design, construction and operation of municipal systems of treatment of sewage waters was promoted in medium-size cities through the instrumentation of outlines of conversion or concession to private industry. Inspection visits were carried out to users responsible for discharging wastewater with and without treatment to ensure the fulfillment of quality in discharges, and the treatment and adequate availability of organically generated sludge. Observation actions were coordinated with the Federal Agency of Environmental Protection for controlling discharges of treated wastewater and the availability of organic sludge in coordination with the Environmental Program 1995-2000.

On another level, actions of coordination were carried out with federal, state and municipal institutions to support programs in communities located in the 15 priority watersheds and the priorities stated by the state governments. In addition, actions were carried out for the fulfillment of the norms of discharge of municipal wastewaters in these priority water sheds and in the regional programs determined by the SEMARNAP.

In the same way, actions of support were carried out to raise the capacity of treatment of surface water employed for domestic use and for the improvement and expansion of existing treatment plants, with the Program of Health Sector Reform 1995-2000. The Secretary of Health, DIF, the Secretary of Education and municipal and state authorities were supported in programs for public healthcare and environment related to water. Programs that contributed to the development of the culture of water and serve as an example for children were especially supported.

The CNA continued the Clean Water Program in coordination with the Secretary of Health and state governments, with actions such as coordination, observation, monitoring and diagnosis of the quality of water, instrumentation and operation of information systems, follow-up and evaluation of supply sources and wastewater discharge, programming, coordination and support of normal, emergency and corrective operations for disinfecting water for human consumption, protection of sources of water supply, formulation and execution of a program for training, communication and publication of water culture, revision of the norms for sanitation, control of the operation of treatment plants, particularly the removal of contaminants and the availability of biological sludge and the observation of the application and fulfillment of legislation and official current norms on the subject.

Another point of action of the program consisted in the consolidation of the first three stages of the Cutzamala System, rehabilitation and replenishment of existing infrastructure in the Valley of Mexico, and the operation and maintenance of existing systems that currently supply 45% of the total flow consumed by the population, with which the demand would be met until 1997. There were advances in the construction of the fourth stage of the Cutzamala System with which the capacity of supply of the system would be increased from 19 to 24 m3/s in order to satisfy demand until the year 2000. A Peripheral Aqueduct was planned to be built, as well as rehabilitation and expansion of the Berros treatment plant.

At the same time, an integral solution to the treatment of 42 m3/s of wastewater generated in the ZMVM was proposed, through the Valley of Mexico Sanitation Program, under the CNA which includes the construction of macro treatment plants for each transmitter that removes waters from the Valley and diverse actions in the zones of irrigation to use those flows.

To counteract the excessive demand for water and the losses because of poor quality of the supply systems, an efficient use of water was promoted, through campaigns of awareness and economic incentives that promote more participation of private agents in the markets.

- ***Potable Water, Sewerage and Wastewater Treatment***

Article 115 of the Constitution establishes that the provision of potable water and sewerage services is the responsibility of the municipalities. With the decree of December 1999, when this article was reformed and added to, important changes occurred relating to the responsibilities of the three levels of government for providing services. Additional reforms reduced the participation of the state government for providing the service, although they obligated the municipalities to observe federal or state law. At the same time, the concept of public services of potable water and sewerage was expanded, emphasizing treatment and availability of wastewater.

To increase levels of coverage in urban zones and decrease deficiencies in rural zones, the following strategies were developed:

- In rural zones, subsidies were given through the three levels of government to finish or build water and sanitation works and the participation of the population in the operation and maintenance of water and sanitation systems is promoted to contribute to ensuring its duration. These subsidies are considered to be continued in the long term. [40]

-In towns of less than 500 inhabitants, public hydrants were installed, while in towns with a population of between 500 and 2500 inhabitants, the service is provided through home taps.

- In medium cities (with populations of up to 50,000 inhabitants), there is financial support including a mix of federal and local resources donated, a well as credits from the development bank which complement the cash flows of the organisms. The financial self sufficiency of these operating organisms is foreseen in the long term.

- In large cities (of more than 50,000 inhabitants), financial self sufficiency of operating organisms is promoted; meanwhile in the short term, there are fiscal and credit supports. As an instrument to achieve self sufficiency, private participation is stimulated in the administration and investment in systems of potable water and sanitation.

The programs described have allowed the sustained increase of coverage of potable water and sewerage services, in urban and rural areas, by joining federal investment with state and municipal funds in specific programs elaborated together.

In 1990 national coverage of potable water was 78%, by 1999 it was 87%, which represents an increase of 21.4 million people with this service.

While in 1990, 11 states had coverage over 85%, in 1999 there were 23, and the number of states with coverage lower than 70% was reduced from 8 to 5.

- ***Judicial Framework of Borough Participation in Water and Sewerage Services (See Chart 41)***

The administration of the service of water and sewerage in the Federal District is run by three main actors: the Political Boroughs, private contractors and Mexico City Water Systems (SACM), a deconcentrated organ which was recently created (January 2003)[41] which integrates what was the DGCOH and the Federal District Water Commission.

[40] CNA, El agua en México retos y avances, 2000:21.

[41] Beginning on January 1, 2003, by decree published in the Gaceta Oficial of the Federal District Government, the General Direction of Hydraulic Construction and Operation and the Federal District Water Commission, dependents of the Secretary of

The legal framework which gives faculties, norms and regulates the actions of the political boroughs of the DF in water and sewerage is made up of several different kinds of dispositions such as laws, rules, agreements and manuals.

The elaboration of borough and sector programs constituted the first step in administrative hydraulic activity, since they are the instrument which explains the state of the public services and the strategies to improve them. According to the interior rules of public administration and the law for urban development of the DF, respectively, it is the boroughs' job to make up a commission with SACM to formulate these programs together exclusively for water and sewerage, while in general they participate with the Secretary of Urban Development and Housing in drafting and modifying.

One aspect that stands out on this subject is the obligation that the boroughs have since 1997, the year when the rules of Environmental Law of the DF entered into force, to promote the establishment of separate systems of sewerage for wastewater and rainwater in order to reuse rain water.

The construction of hydraulic works and installations in the political boroughs should stick to the agreements established with the commission integrated by the SACM as well as carrying out what has been previously outlined in their respective borough programs, but with the clear statement of the previous Public Administration rules which mark borough programs of works for supply of potable water and sewerage and sewerage services in secondary networks.

The boroughs have the power to develop preventive actions when they concede or refuse construction licenses, after checking, among other things, the installed capacity of potable water and sewerage services, that public hydraulic works are carried out preferentially along sidewalks and central walkways, the presentation of authorization of environmental impact, to avoid or reduce imminent damage to resources and find the best way for use and exhibition on the part of commercial establishments in a preventive report which includes materials and products to be used or obtained.

The Manual of Procedures and Services to the Public regulates in the political boroughs the ability to carry out different hydraulic installations at the request of users: potable water taps and derivations, their removal and connections of exterior sewers, which is a conduct that removes rainwater and wastewater included within the property line, up to the union with the culvert. The appliance not installed by the boroughs, although they receive requests, is the meter of water consumption, since its installation, revision and reparation is responsibility of the SACM.

The Citizen Attention and Service Centers (CESAC) created by agreement on November 25, 1997, are borough organs in charge of receiving, administering and responding to this type of requests for public services that the population of a respective territory requires.

Regarding the provision of potable water and sewerage, the legislation only establishes that the boroughs will provide them within their physical limits of action, only when they are not assigned to other entities, with which priority is given to the activity of central and Para governmental sectors. The scarcity or lack of water should be attended according to the manual of procedures, first, by the CESAC and secondly by the borough in charge of managing hydraulic services through supply with tank-cars and, according to the rules of water and sewerage services for the DF, distributing water equally, according to the proposals of the affected population.

Works and Services until December 31, 2002, make up a public decentralized organism Mexico City Water System, sector of the Federal District Secretary of Environment (http://www.df.gob.mx).

The reparation of water leaks is one of the most important tasks to optimize conduction networks as well as supply. On this topic, the political administrative organs should coordinate with SACM and the local Secretary of Environment for constituting and operating programs to promote their detection and repair. Because of the attribution assigned by the interior law of public administration, leaks should be repaired on the secondary network and for this effect, users should report damage to the CESAC so this institution can give an expedite procedure.

For sediment removal from the secondary sewerage network, requests should also be directed to CESAC so that this institution can channel the petition to the corresponding borough (UNAM, 2002).

According to the Public Account of 2002, the political boroughs carried out programs of supply of water in trucks, leak reparation, conservation and maintenance of the secondary network of potable water and expansion of the same. For sewerage, they participated in the expansion of the secondary network, its conservation and maintenance, and the sediment removal of different sources (For activities in 1999-2001 see Chart 42).

As for private actors, as was mentioned in the section related to economic and financial aspects, currently, recent reforms promote the establishment of private rights over water use that allow the privatization of services of supply and sewerage.

In the southern zone of Mexico City, the company Tecnología y Servicios de Agua S.A de C.V. (TECSA) is in charge of installing meters in the Milpa Alta Borough since 1999.

b) Functions and Public and Community Actors in WSS in Milpa Alta

In the borough, for operating water distribution, SACM is in charge of filling tanks through primary networks, sending the block volume of water authorized by the CNA to the borough. From then on, the borough is in charge of distributing water through secondary networks by three operations:

- Taking Turns
- Repumping
- Extraction from wells (Eng. Agustín Jaime, Borough Milpa Alta)

Besides distributing water through this system, there are other formal and informal modalities developed by the Borough and the population with access to this resource. On the part of the borough, the supply to zones located outside of the city limits occurs by sending trucks every certain number of days.

On the part of the user population, several different legal and illegal practices exist for water supply:

-Buying from trucks[42]
-Clandestine taps (70% according to an informant from the borough)
-Illegal opening and closing of valves.
-Paying valve workers for opening and closing
-Sabotage to the turns system

[42] *Q: What other ways does the population obtain water when there is none?*
A: Well, buying water from private trucks.
Q: That is very expensive.
A: Around 350 or 400 pesos for 3.000 liters.
Q: And the population recurs to this a lot.
A: Only in the outside communities and some people who have the network but the water doesn't get to them (San Batolomé X. Coordinator)

Regarding the expansion of the network, according to the legal framework, the population should request this through the Citizen Attention Centers. From there, the Borough should resolve the different requests, with authorization from SACM. However, this institution does not approve expansion in zones outside of the city limits. In addition, the approval of requests takes a long time; therefore, illegal practices are worsened, as is the conflict around water.[43]

> *Q: And how is a request made?*
>
> *A: A personal request, directly, through the… Citizen Attention Center. The request arrives, and the government supervises the zone. It should be within the city limits, as a norm. And it should be feasible. They request inside the city limits but above the level of the tanks, and we can't make water move except by gravity.*
>
> *Every year we program a goal of expansion of the potable water network, and an expansion of the secondary network of potable water. Every year we do works on different streets, either new streets or streets that don't have the service. In our operative annual program, we have a budget for network expansion, we go through the requests day by day and we make a list.*
> *(...)*
>
> *The volume is insufficient, in the installation of water taps, a problem that has been reflected by the non authorization by the water system of payment for taps. That is the Water System, and the lack of water in the dry season, which is a very problematic time. The rainy season is near and the people who are above the level of the tanks are already complaining. (Director Milpa Alta Borough Department of Potable Water).*

One of the ways to partially resolve the problem of infrastructure for water is through the Agreements of Collaboration between neighbor Work Committees and Borough authorities for hydraulic works in barrios and streets. Although this practice is not contemplated legally, it is carried out by authorities and the community in order to develop necessary infrastructure.[44]

4.6 Sociopolitical Aspects

a) Population Growth

Population growth is a reality that weighs down on the natural reserves of the entire world and Mexico is not the exception. Milpa Alta, one of the last natural reserves of the Federal District, is being

[43] A*: Normally when people lack water they meet with their neighbors and they go talk with the coordinator. They put a lot of pressure, and I get hit too. What we do when people come and we realize they are suffering quite a bit, there are people who even insult us, and we have to process that with the authorities. Here they have been demonstrating recently, and they have let us know that if they suffer again from lack of water they are going to block the streets, because they have done it before, they have blocked the way. (Assistant Coordinator San Salvador C)*

[44] *Q: Do you have a kind of work where the population works with the coordination and the borough?*
A: Sometimes, when a community demonstrates that they are willing to do mainly labor for the elaboration of different services like sewerage, and the Borough provides the materials. (Santa Ana Assistant)

undermined by the urban growth extended over it. This is intimately related to the decline in traditional forms of production and the new economic insertion of Mexico in the world.

As we have already mentioned, demographic growth brings logging and the conversion of lands declared as ecological protection zones into deserts, with consequences for the recharge of aquifer tables and their pollution.

To control this situation, the government of the Milpa Alta borough implemented a measure denominated “Zero Growth,” in which they prohibit new settlements. The measure consists in the signing of an agreement between the populations settled outside of the city limits, which is already counted, stating that only the population appearing in these censuses will be able to access basic services authorized by the borough. New settlements not in the census will not have the right to any services. The main point of this is a perverse consequence where the settlements continue to reproduce with population expelled to other places because of the need to improve their quality of life, at the same time as not receiving basic services because they are considered “irregular” or “illegal” because they do not fulfill the Agreement of Zero Growth.

> *“There are two types of growth. One is natural. If you have a piece of land, two hectares, for example, and you have a lot of children and they don’t have any place to live, but they are married and they want to live separate from you, you give one part of your land to one, another part to another. That is natural growth, because you are the owner, a native of the place.*
>
> *But there are people who sell new plots of land. That is irregular growth.”* San Salvador Coordinator
>
> *“What used to be small farmers who produced on the land are now selling land and buying cars to work as taxi drivers. This has had repercussions on the towns because there are irregular settlements. Land is sold at low prices and to people who maybe don’t have the customs or traditions of the original peoples, but who come with another way of life.”* San Juan Coordinator

To belong or not to the city limits constitutes a limit between “poverty” and “wealth” of water that everyone suffers in the end. Since the solutions, as we have seen, to obtain water, finally affect all of the residents of the region, and the non regularization of the services does not represent anything more than the aggravation of the problem, the solution is far from occurring with “Zero Growth.”

Therefore, this measure of zero growth generates a relationship of tension between “old residents” and “new”, since the settlements denominated as “irregular” of the latter produce a greater demand on water and electric energy, which makes the amount of water supplied by the government insufficient. The idea that the “new” “illegal” or “irregular” people come with “another way of life” shows the latency of a conflict that is barely the tip of the iceberg.

b) Expropriation of Water

For its part, the Federal District government appropriates the water extracted from wells, treats it and turns it over in blocks to the different towns. This redounds to the general conception of the population of Milpa Alta that the government does not give them the same amount of water as is extracted from their soils. These towns have wells with excellent quality water but the population has no direct access to it. And with the scarcity they confront daily, this is seen as an injustice by the residents of the towns of Milpa Alta.

> *“In 1935, we had our own water that we got from our own wells. In 1970 our wells were extinguished because they took the water to Xochimilco and our wells are now dry.”* User in San Salvador.
>
> *“The main problem we have is that the town of San Jeronimo has a well which belongs to us, and since we don’t have it here, we have to ask for water from Santa Ana Tlacotenco so that it can come here.”* Merchant San Juan Tepenahuac

c) Delay in the Decentralization of Decisions

In the governance of water, serious inconveniences arise due to the centralization of decision-making in the organ Mexico City Water System, which is the one that does explorations, perforations, extractions, treatment and supply of water in block to the different boroughs. Due to the extension of territory it controls, it is not always aware of the problems that Milpa Alta residents have.

It is for this reason that when the coordinators from different zones, also the most related to the population and who know their needs the best, try to solve the different problems in their communities, they find the delay of decentralization of functions within the government of the Federal District does not let them decide anything besides sending in complaints of the population to the corresponding institution at the level of the borough.

In this sense, the uses and customs of the communities to organize in assemblies and make common decisions are segmented at the moment of acting on the agreements.

> *"… it is truly complex because many times what is a priority for us is not for them, so that's where the traditional authorities have to struggle with the administrative authorities, to carry out the true interests of the community, which is really serious for us, and they in turn, waste the resource. There on central levels, it is another reality."* San Bartolomé Coordinator

This generates a double legality in these communities: one endorsed by law and one endorsed by the negligence of the authorities. When they are impeded from intervening in determined issues, under social pressure, the only thing they have left to do is try to mediate so the least amount of conflict possible occurs, and in this way the law becomes a thin line with fluctuating limits that are lost in the complexity of daily practices, such as irregular connections and settlements, or connections carried out by the coordination with materials or labor provided by the residents.

d) Informal Solutions to Unattended Problems.

- ***Irregular Connections***

Confronting the impossibility of achieving a water tap legally, the neighbors of different towns connect clandestine taps.

> *A: We have 70% clandestine taps.*
>
> *Q: And how do you do it?*
>
> *A: They do it by night or our very same personnel falls into the crime. And they join the game. The problem is that SACM does not authorize the payment for the taps, it has been a year and a half since we asked for a tap, but a person is not going to wait to put in water for a year and a half.*
>
> *I was mentioning to you that they do not authorize it, so the borough cannot install a tap.*
>
> *They say there are people who are not in the city limits, who are irregular, on the ecological reserve.* Coordinator Villa Milpa Alta

- ***Personal Works***

Another informal and illegal way of solving the water problem is for neighbors to install the works themselves. Then the borough asks the neighbors to collaborate with materials or labor, and oftentimes they resolve the problem of water or sewerage. This should not happen since the only one

with the ability to allow new connections is SACM, but their procedures can become much slower than the needs of the population in constant growth.

> *Q: And the pipes that you say you put out there?*
>
> *A: There are pipes, but I don't know why the water doesn't come up … but there are pipes… they say they have pipes but there is no water and a lot of people.*
> *Q: Do you know if the pipes and water works were only made by the borough or people have also made them?*
> *A: Um...there I don't know… in our street they just left it there… it was pretty far and they didn't put it in any farther up, so we pulled it, we put the rest of the material.*
> *Q: You put it all?*
> *A: Well only up to where they had stopped, up to there, and then just connected it. … and with the sewerage the same thing happened, where our alley is, here is where our alley is and up to here is where the drain came… and the man said "we can't go on," so from here we pulled over there ourselves… (Merchant Santa Ana).*

- ***Change in Direction of Water***

Another way is to change the direction of water through the valves. In no few cases this generates conflicts between neighbors and with the coordination, because of the discretional and individual modification of the change in water flow.

> *Q: Do you get water through the network?*
>
> *A: Yes, but we have to have tanks to keep the water. And in that way save it and make it last.*
>
> *I never lack water, thanks to the tank guard, since when we lack water, he opens it and we fill our tanks and save it."* User in San Salvador

At the same time, it would seem that not all the valve workers understand the needs of the population, which becomes a vital question when water is scarce for everyone.

> *Q: Are the valve workers from the Borough?*
>
> *A: Yes, they work here …they are in charge…but there is one valve worker that when he is here there aren't problems, even if there's just a little water, there is no problem, but when he goes on vacation, these problems always happen.*
>
> *Because they don't know… I think they don't know how to distribute the water or they don't know how the water is distributed, and that's why these problems happen.*" Woman from San Bartolomé

- ***Collective Actions – Social Movements***

When the problem is accentuated, generally in the dry period, the neighbors organize, normally by affected street or barrio and they go talk with the coordinator of the town. If the problem is not solved, they block streets or routes or there can be a take-over of offices until the petition is solved. This generally results in a change in the direction of the water by opening or closing some valve.

Another form of advocacy is when the neighbors name a representative to go talk with the coordinator and look for a solution to the water problem.

The problem of the scarcity of water definitely highlights serious inconveniences which appear when governing such a valuable and vital resource. This is why tensions and conflicts are half solved and are always latent and threatening to become something more serious.

Still no solutions appear from above that listen to “those from below” and can be made into a norm for equitable use of the resource. Meanwhile the possibility of achieving joint responsibility for management of water, which would imply the solution of internal struggles, are far from being possible.

5. CONCLUSIONS

The case of Milpa Alta, particularly in the towns of San Bartolomé Xicomulco and San Salvador Cuauhtenco, clearly shows the social, political, institutional, governmental and environmental complexity for water administration in peri-urban spaces of Mexico City. While the problem identified cannot be extrapolated to all the cases of the city, it does give us guidelines for understanding the common framework in which these areas are inserted, which will be modified and operated in a different manner depending on the particular conditions of each particular situation. However, our case study allows us to identify some central aspects.

- The pre-existence of forms of traditional representation in the administration of services, conflict management and solution of problems inside the community. This figure is still prevalent in the Milpa Alta, Xochimilco, Tlahuac, Tlalpan and Iztapalapa boroughs. The Coordinator of territorial communications not only has a central role within the community, but also has the support and trust of the people. However, while this situation is necessary it is not sufficient for the optimum performance of the coordinators' functions, particularly referring to water. One of the main problems found in both communities is the legitimate character for the community and the borough but without legal judicial recognition supporting it. The local congress would have to make this recognition in the Federal District Government legislature, not only of the coordinators' functions but the economic and political tools that make their optimum performance possible.

- In the particular case of the Milpa Alta Borough, there is a large social heterogeneity existing in relationship to ways to access the resource. There is a population with formal access to the service, who are connected to the secondary network in town, but this is not a guarantee to have regular service. Depending on the location of one's house, in high or lowlands of the town, one will have better or worse service, generally having water on certain days and hours of the week. On the other hand, there is informal access by the population inside the city limits or near the water network with no access, who resolve the problem through clandestine connections. In general, everyone ends up fulfilling their need for the resource through a request for water trucks to the borough or private companies.

- The authorities' solution to the demand for water of the population located in irregular settlements has been to sign agreements of zero growth between borough authorities and the population in irregular settlements. These count the population, and only the registered population who has signed the agreement has a right to water distributed by truck at no cost, two times a week, and a determined number of liters and barrels per family. The population not counted, having arrived after the agreement or being located in zones far away from the city limits, have no rights to this water. This situation has not stopped the growth of irregular settlements; it has only provoked confrontation between neighbors for the resource or has made the incipient irregular market of water an emergency.

- The problem of administration is not only between the territorial coordinator and the borough authorities. The borough authorities also have serious problems in their relationship with the Federal District Government to administer and solve the problems which occur on this level. This is a result of the incipient recent decentralization of functions in the Federal District Government, responsible for assigning budgets authorized by Congress and defined by specific projects, which do not always have sufficient resources or the authorization for budgets. On this level, a legislative reform is required to give more autonomy and budget to the borough governments.

- The water problem in the Milpa Alta Borough seems to have no short term solutions. On the contrary, everything indicates that it will be aggravated with time, not only by the complexity of

the operation and infrastructure and by the fact that currently only 7 of the 22 wells existing in the zone in the 1970s are operating, but also because Mexico City demands larger and larger volumes of volumes and it is clear that the Milpa Alta Borough, and its population, have been one of the most sacrificed in this sense. Milpa Alta has been a provider of very good quality water to the D.F., and even today not all the volume extracted stays in the borough, because a percentage –it was impossible to verify the volume –, leaves the area.

- From this perspective, the population of the Milpa Alta borough, including the population within city limits, some of whom have daily eight hour service, is in a situation of open disadvantage compared to the rest of the Federal District, in spite of having wells in service to supply the entire population.

- An additional element making the administration of this space more complex is that on the level of the corresponding Watershed (Valley of Mexico), there must be coordination between federal authorities, Mexico State authorities and Federal District authorities, in the volumes of water assigned to the capital city.

- The fact that the Milpa Alta borough is the last to be incorporated into the metropolitan system of Mexico City and that it still has an important part of its territory designated as an ecological reserve, allows for the construction of a sustainable peri-urban development project, if there is political will. This situation would be almost impossible in other zones of the Federal District.

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CHRONOLOGY

Most Relevant Occurrences in the Administration of Potable Water in Mexico City with the Participation of Private Industry (1989-2003)

February 16, 1989

Creation of the CNA, deconcentrated organism of the Secretary of Hydraulic Resources, with the ability to make “decision on the use in quantity and quality of national waters,” in other words, with the responsibility to promote efficient use of water and conservation in all the phases of the hydraulic system.

July 10, 1992

Creation of the CADF as a unique operating organism, responsible for the provision of potable water services in Mexico City. Main objectives: 1) provide by own means or through third parties the public service of water for domestic, commercial, industrial or other means; 2) provide sewerage, treatment and reuse of wastewater in the DF; 3) administer, operate and conserve the hydraulic infrastructure necessary for providing this service; 4) optimize the public service of potable water, sewerage and treatment and reuse of wastewater in the DF to ensure its preservation and continuity; 5) foster a new culture of water.

November 18, 1992

Creation of the National Waters Law (goes into force on 2-12-92). This law intends to order and regulate hydraulic matters, that is, the role of the State is redefined as responsible for the integral administration of the resource and the consolidation of the hydraulic programming. The integral administration of water is regulated with more user participation. The creation of a systems of concession and assignation for use of national waters is also highlighted.

December 13, 1992

Call for public bids for providing services related to potable water and sewerage services. With the goal to provide a better service in potable water, the administration of this service is opened to the participation of private industry. According to local authorities, the new modality of mixed administration constitutes one of the means to improve public finances and confront the hydraulic problem.

February 1, 1993

An act of presentation and opening of offers is carried out, where proposals from Mexican and foreign companies published in the call for submissions are received.

March 15, 1993

The results are published, with four winners made up of 51% national companies and 49% foreign. The companies that obtained the contract for 10 years are: Servicio de Agua potable (SAPSA), Industrias del Agua S.A de C.V (IASA), Tecnología y Servicios de Agua, S.A de C.V (TECSA) and Agua de México, S:A de C:V

November, 1993-1994

The General Contract was signed, and beginning on this date, the companies began to operate following the points of the contract where 3 stages of operation are established.

1st Stage (2 years). 1) Update the registry of users. Incorporate already existing domestic taps not registered in the current register. 2) Regularize domestic taps and water meters. Substitute obsolete

domestic taps and meters for new ones. 3) Cadastre of primary, secondary, treated residual and secondary sewerage networks. Identify and locate these networks and the corresponding macro meters on a graph.
2nd Stage (9 years). 4]) Install new taps and connections to the sewerage network in zones of the city where there were no previous ones. 5) Meter readings (consumption readings). Pass from lot to lot to take readings of meters. 6) Billing and charging. Design the technical support to determine fees, distribution and reception of bills for paying service rights.
3rd Stage (8 years). 7) Operate, maintain and rehabilitate potable water and sewerage networks.

From 1994 to 2002

Gradual development of different actions corresponding to the services stipulated in the three stages of the contract.

1998

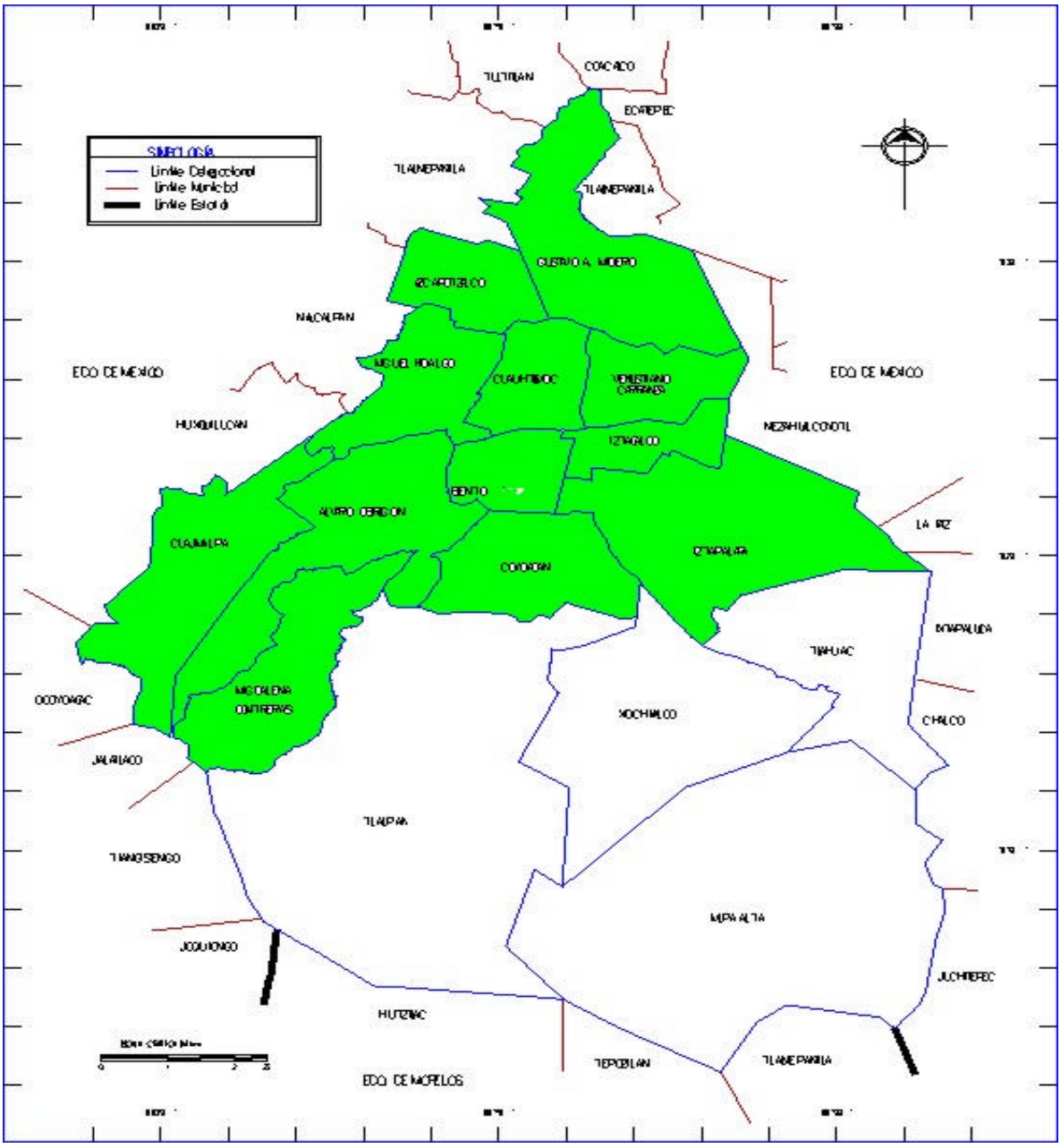
According to official data from the CADF, at the end of this year, the register of users was little more than 1 652 000, of which 840 000 paid metered service, within a specific program that tends to increase meter use.

November, 2003

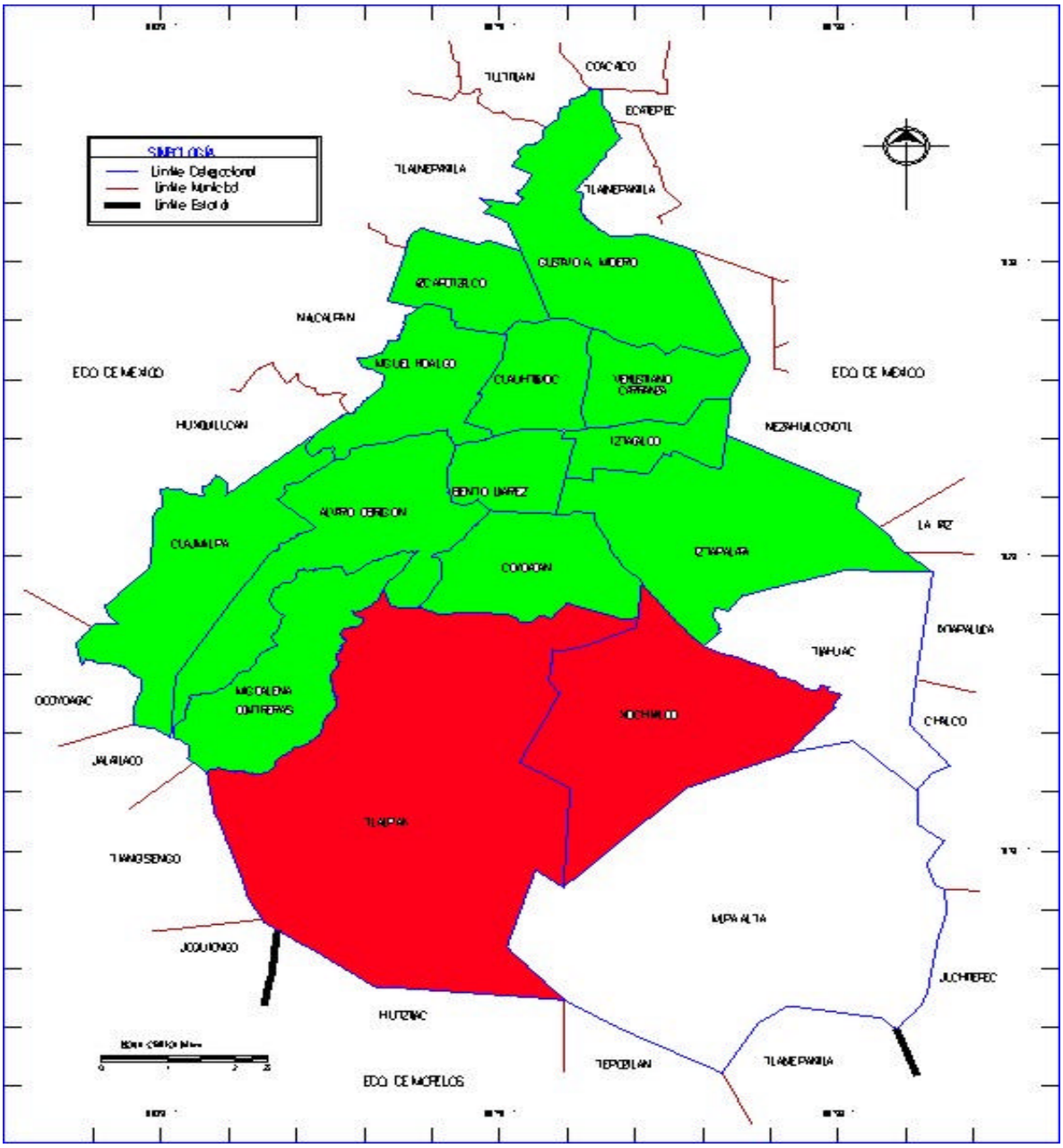
The general contract is finished.

ANNEX: MAPS

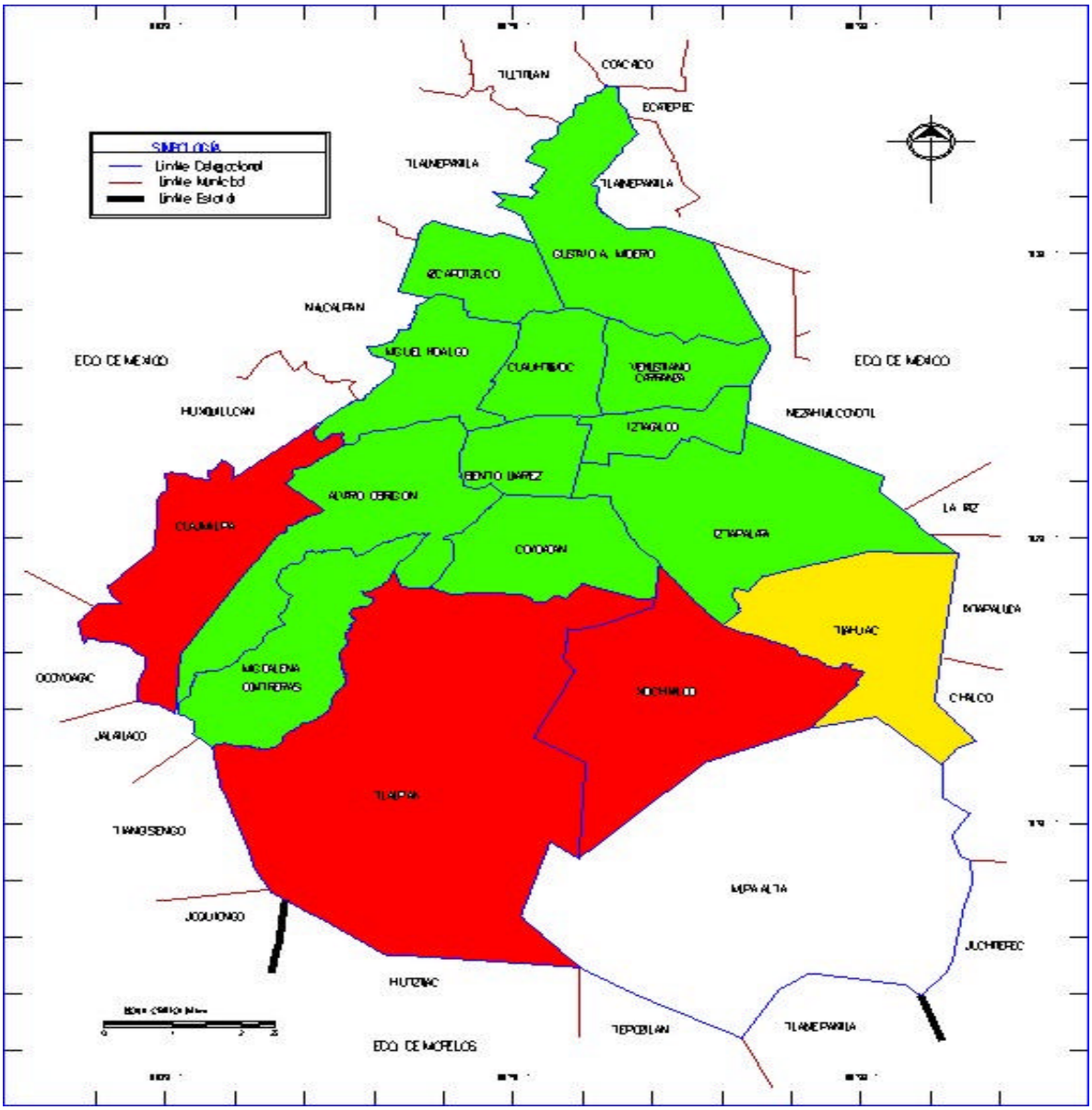
Map 1: Map of Mexico City in 1950



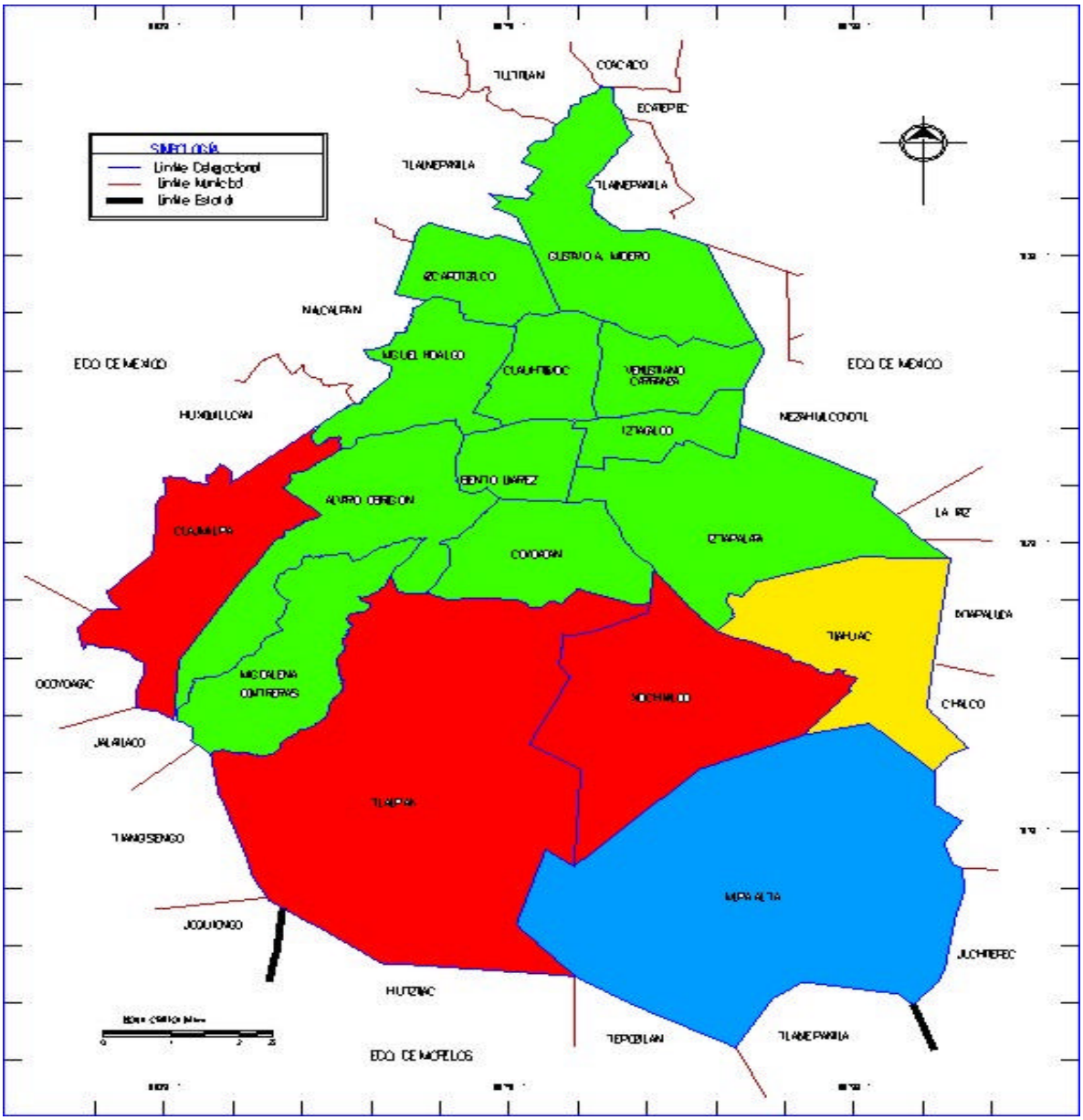
Map 2: Map of Mexico City in 1960



Map 3: Map of Mexico City in 1970



Map 4: Map of Mexico City in 1980



Map 5: Urban Zone of Mexico City in 2002


QUERETARO
HIDALGO
MICHOACAN
PUEBLA
MORELOS
GUERRERO
D. F.
POLOTITLAN
ACULCO
JILOTEPEC
TEQUIXQUIAC
HUEYPOXTLA
APAXCO
ACAMBAY
TIMILPAN
TEMASCALCINGO
CHAPA DE MOTA
EL ORO
ATLACOMULCO
VILLA DEL CARBON
TEPOTZOTLAN
ZUMPANGO
AXAPUSCO
OTUMBA
SAN JOSE DEL RINCON
SAN FELIPE DEL PROGRESO
MORELOS
JOCOTITLAN
NICOLAS ROMERO
TULTITLAN
IXTLAHUACA
JIQUIPILCO
TEMOAYA
TEXCOCO
VILLA ALLENDE
VILLA VICTORIA
ALMOLOYA DE JUAREZ
TOLUCA
XONACATLAN
LERMA
IXTAPALUCA
DONATO GUERRA
IXTAPAN DEL ORO
OCOYOACAC
CHALCO
VALLE DE BRAVO
SANTO TOMAS
TEMASCALTEPEC
ZINACANTEPEC
JOQUICINGO
JUCHITEPEC
TLALMANALCO
LUVIANOS
TEJUPILCO
TEXCALTITLAN
VILLA GUERRERO
COATEPEC HARINAS
TENANGO DEL VALLE
TONATICO
AMATEPEC
SULTEPEC
ZACUALPAN
TLATLAYA
N

ANNEX 2: CHARTS AND GRAPHS

Total Population of the Federal District (by delegation) and Mexico State (by municipality)

Borough or Municipality	Pop.	Per.(%)
Federal District	**8605239**	**100**
Alvaro Obregón	687,020	8
Azcapotzalco	441008	5.1
Benito Juarez	360478	4.2
Coyoacán	640423	7.4
Cuajimalpa	151222	18
Cuauhtémoc	516255	6
Gustavo A. Madero	1235542	14.4
Iztacalco	411321	4.8
Iztapalapa	1773343	20.6
Magdalena Contreras	222050	2.6
Miguel Hidalgo	352640	4.1
Milpa Alta	96773	1.1
Tláhuac	302790	3.5
Tlalpan	581781	6.8
Venustiano Carranza	462806	5.4
Xochimilco	369787	4.3

Borough or Municipality	Pop.	Per.(%)
Mexico State	9355004	100
Tlanepantla	720755	7.7
Chimalhuacán	490245	5.2
Ecatepec	1620303	17.3
Naucalpan	857511	9.2
Atizapán de Zaragoza	467262	5.0
Cuautitlán	75831	0.8
Paz, la	213045	2.3
Tultitlán	432411	4.6
Coacalco	252270	2.7
Huixquilucan	193156	2.1
Nezahualcoyotl	1224924	13.1
Atenco	34393	0.4
Cuautitlán Izcalli	452976	4.8
Chicoloapan	77506	0.8
Chiautla	19559	0.2
Chalco	222201	2.4
Chiconcuac	17977	0.2
Ixtapaluca	293160	3.1

Borough or Municipality	Pop.	Per.(%)
Mexico State (cont.)	9355004	100
Nicolás Romero	269393	2.9
Tecámac	172410	1.8
Texcoco	203681	2.2
Acolman	61181	0.7
Melchor Ocampo	37724	0.4
Teoloyucan	66486	0.7
Tepotzotlán	62247	0.7
Tezoyuca	18734	0.2
Tultepec	93364	1.0
Valle de Chalco Solidaridad	323113	3.5
Isidro Fabela	8161	0.1
Jaltenco	31608	0.3
Jilotzingo	15075	0.2
Nextlapan	19755	0.2
Teotihuacan	44556	0.5
Cocotitlán	10220	0.1
Coyotepec	35289	0.4
Huehuetoca	38393	0.4
Papalotla	3469	0.0
San Martín de las Piramides	19689	0.2
Temamatla	8840	0.1
Zumpango Hidalgo	99781	1.1
Tizayuca.	46350	0.5

Source: INEGI, XII Censo General de Población y Vivienda, 2000

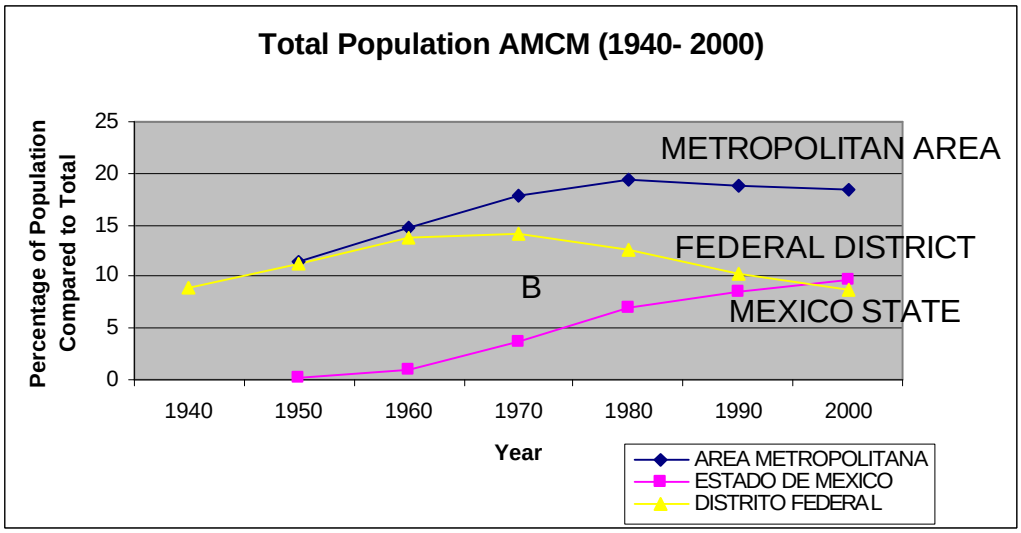
CHART 1: AMCM: Total Population							
Area	**1940**	**1950**	**1960**	**1970**	**1980**	**1990**	**2000**
United Mexican States	**1965352**	**25791017**	**34923129**	**48225238**	**66846833**	**81249645**	**97483412**
Metropolitan Area	2903564	2952199	5125447	8623157	12994450	15274256	17946313
Mexico State		29005	308830	1782686	4631739	6923211	9355004
Federal District	1757530	2923194	4816617	6840471	8362711	8351044	8591309
Milpa Alta					50788	64545	96744

Source: from 1950 to 1970, Direccion General de Estadistica, VII, VIII and IX general census of population and housing; from 1980 to 1990, INEGI, X Y XI X and XI general census of population and housing and 2000, INEGI;XII general census of population and housing, Preliminary Results. The limits of the urban area of Mexico City were taken for 1970 from Unikel, Ruiz y Garza (1976 : 117); for 1980, from Negrete y Salazar (1986:124) and for 1990, from INEGI (1993: 1).

CHART 2: GROWTH RATE							
AREA	**1940 1950**	**1950 1960**	**1960 1970**	**1970 1980**	**1980 1990**	**1990 1995**	**1995 2000**
United Mexican States	2.7	3.1	3.4	3.2	2.7	2.1	1.8
Metropolitan Area	s/d	5.7	5.5	4.0	1.7	1.8	1.4
Mexico State	s/d	26.6	19.9	9.7	4.2	3.6	2.5
Federal District	5.5	5.1	3.7	2.0	0.0	0.3	0.3
Milpa Alta	s/d	s/d	s/d	4.04	2.48	4.12	4.21

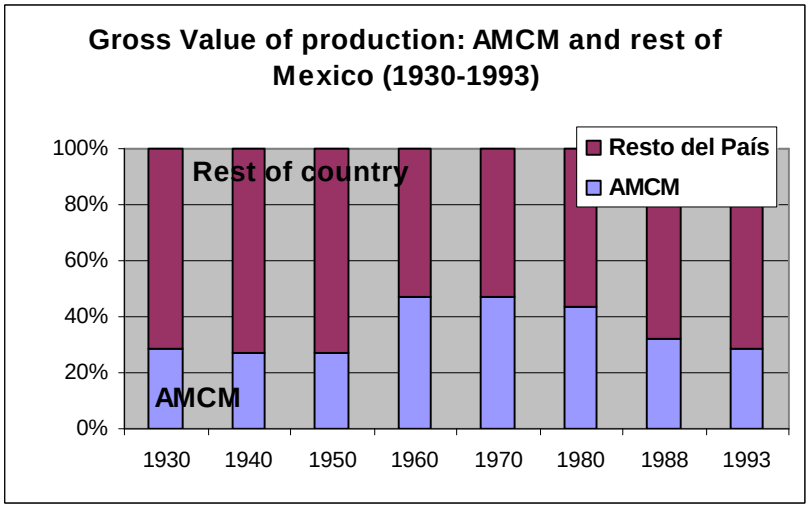
Source: from 1950 to 1970, Direccion General de Estadistica, VII, VIII and IX general census of population and housing; from 1980 to 1990, INEGI, X Y XI X and XI general census of population and housing and 2000, INEGI;XII general census of population and housing, Preliminary Results. The limits of the urban area of Mexico City were taken for 1970 from Unikel, Ruiz y Garza (1976 : 117); for 1980, from Negrete y Salazar (1986:124) and for 1990, from INEGI (1993: 1).

Graph 1



Source: based on information from Chart 1

Graph 2



Source: Elaborated with information from chart 3

CHART 3: Mexico and AMCM: principal industrial characteristics, 1930- 1993

	Establishment	Working People	Salaries	Capital	Gross value of production	GNP	
						Census	National Accounts
UNIT							
1930							
Mexico	100	100	100	100	100	100	100
AMCM	6.8	19.0	32.9	22.6	28.5	27.2	27.0
Rest of Country	93.2	81.0	67.1	77.4	71.5	72.8	73.0
1940							
Mexico	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AMCM	8.7	24.6	36.7	29.3	32.1	32.8	33.1
Rest of Country	91.3	75.4	63.3	70.7	67.9	67.2	66.9
1950							
Mexico	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AMCM	20.0	25.0	44.1	35.5	40.0	40.4	39.1
Rest of Country	80.0	75.0	55.9	64.5	60.0	59.6	60.9
1960							
Mexico	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AMCM	29.9	46.0	51.8	38.6	47.1	46.0	44.4
Rest of Country	70.1	54.0	48.2	61.4	52.9	54.0	55.6
1970							
Mexico	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AMCM	27.9	41.9	51.3	42.5	46.8	48.6	48.2
Rest of Country	72.1	58.1	48.7	57.5	53.2	51.4	51.8
1980							
Mexico	100.0	100.0	100.0	N.D	100.0	100.0	100.0
AMCM	28.1	41.6	45.7	N.D	43.4	47.3	47.0
Rest of Country	71.9	58.4	54.3	N.D	56.6	52.7	53.0
1988							
Mexico	100.0	100.0	100.0	100.0	100.0	100.0	100.0
AMCM	22.6	30.5	34.2	21.3	32.5	34.4	34.7
Rest of Country	77.4	69.5	65.8	78.7	67.5	65.6	65.3
1993							
Mexico	100.1	100.2	100.2	100.0	100.2	100.1	100.0
AMCM	16.8	25.9	32.9	18.8	28.8	32.7	32.6
Rest of Country	83.3	74.2	67.3	81.2	71.3	67.4	67.4

Source: Taken from G. Garza, El proceso de industrialización de la Ciudad de México, 1821 - 1970, México, El Colegio de México, 1985; 1980, from INEGI, Censo Industrial, México, 1988; 1988 from INEGI, XIII Censo Industrial, México, 1989, and 1993 from INEGI, XIV Censo Industrial, XI Censo Comercial y XI Censo de Servicios, Aguascalientes, 1995.

Chart 4a: Type of Population

	Rural Population	Urban Population	Total
1990			
Federal District	0.3	99.7	100.0
Mexico State	2.8	97.2	100.0
AMCM	1.4	98.6	100.0
Milpa Alta	10.0	90.0	100.0
2000			
Federal District	0.2	99.8	100.0
Mexico State	2.5	97.5	100.0
AMCM	1.4	98.6	100.0
Milpa Alta	6.2	93.8	100.0

Source: Population and Housing Census 1990 and 2000

Chart 4b: Population According to Size

	Rural Population	Urban Population	Average
1990			
Federal District	10.2	54.8	54.1
Mexico State	89.8	45.2	45.9
AMCM	100	100	100
Milpa Alta*	29.1	0.7	
2000			
Federal District	8.1	48.6	48.0
Mexico State	91.9	51.4	52.0
AMCM	100	100	100
Milpa Alta*	29.5	1.1	

*Percentage compared to the total population of the Federal District
Source: Population and Housing Census 1990 and 2000

Chart 5: Economically Active Population According to Condition of Activity: 1990 and 2000

	Total population 12 years and older	EAP	EAP Employed	EAP Unemployed	PEI
1990					
United Mexican States	55913847	24063283	23403413	659870	30816069
(%)	100	43.0	41.9	1.2	55.1
Federal District	55.8	57.4	57.5	54.1	54.7
Mexico State	44.2	42.6	42.5	45.9	45.3
AMCM	100	100	100	100	100
Milpa Alta*	0.7	0.3	0.3	0.0	0.4
2000					
United Mexican States	69235053	34154854	33730210	424644	34808000
(%)	100.0	49.3	48.7	0.6	50.3
Federal District	50.3	51.6	51.6	51.1	48.8
Mexico State	49.7	48.4	48.4	48.9	51.2
AMCM	100	100	100	100	100
Milpa Alta*	1.0	1.0	1.0	0.8	1.1

*Percentages of total population of the Federal District
Source: Inegi: Population and Housing Census 2000

Chart 6a: Economically Active Population by Sector: 1990 – 2000

Employed EAP by Sector				
	Primary	**Secondary**	**Terciary**	Total
1990				
United Mexican States	22.6	21.0	56.4	100.0
Federal District	0.7	22.7	76.6	100.0
Mexico State	2.0	32.8	65.2	100.0
ZMCM	1.2	27.0	71.8	100.0
Milpa Alta	19.1	12.3	68.5	100.0
2000				
United Mexican States	15.8	27.8	56.4	
Federal District	0.6	21.2	78.3	100
Mexico State	1.1	30.9	68.0	100
ZMCM	0.8	25.9	73.3	100
Milpa Alta	14.3	20.2	65.5	100

Source: Inegi, Population and Housing Census 1990, 2000

Chart 6b Economically Active Population (EAP) by Sector: 1990 – 2000

Employed EAP by Sector			
	Primary	**Secondary**	**Terciary**
1990			
United Mexican States	5300114	4908263	13195036
(%)	22.6	21.0	56.4
Federal District	31.1	48.3	61.4
Mexico State	68.9	51.7	38.6
ZMCM	100	100	100
Milpa Alta*	19.1	0.4	0.6
2000			
United Mexican States	5338299	9384109	19007802
(%)	15.8	27.8	56.4
Federal District	35.3	42.2	55.1
Mexico State	64.7	57.8	44.9
AMCM	100	100	100
Milpa Alta*	24.6	1.0	0.8
*Percentage of Population in Comparison to the Federal District			
Source: Inegi, Population and Housing Census 1990, 2000			

CHART 7: FEDERAL DISTRICT: REGULAR AND IRREGULAR SETTLEMENTS BY DELEGATION

Delegation	Regular	Irregular	Total	No. of families	Surface Area (ha)	Average Age
A. Obregón	12	1	13	3,240	74.3	9
Cuajimalpa	8	54	62	4,859	622.0	15
G. A. Madero	1	22	23	3,090	58.5	8
Iztapalapa	56	59	115	9,615	259.6	9
M. Contreras	4	15	19	3,898	312.4	10
Milpa Alta	0	44	44	1,550	30.8	9
Tláhuac	4	51	55	2,277	281.5	7
Tlalpan	27	106	133	7,566	718.0	11
Xochimilco	62	100	162	12,632	848.7	9
Total	**174**	**452**	**626**	**48,727**	**3,205.8**	**10**

Source: Natural Resources Commission, 1999

CHART 8: Supply of water for Domestic Use
MCMA per delegation (Federal District) (2000)
Percentage of Homes by Source of Water Supply

Delegatión	Number of Homes	In-house	On-sites	Neighbourhood	None	Non specific
Alvaro Obregón	163,481	81.2	16.5	1.0	0.5	0.8
Azcapotzalco	109,233	84.7	14.0	0.7	0.2	0.5
Benito Juárez	113,741	96.5	2.2	0.2	0.3	0.7
Coyoacán	163,036	85.9	12.9	0.4	0.1	0.6
Cuajimalpa de Morelos	33,163	69.9	25.7	2.4	1.2	0.8
Cuauhtémoc	147,181	93.1	4.8	0.4	0.2	1.5
Gustavo A. Madero	295,329	78.2	20.0	0.7	0.5	0.5
Iztacalco	98,234	83.5	15.1	0.4	0.1	0.9
Iztapalapa	403,922	69.2	27.6	1.3	1.2	0.7
Magdalena Contreras	51,831	67.7	28.2	1.9	1.7	0.6
Miguel Hidalgo	94,475	90.4	8.3	0.3	0.2	0.8
Milpa Alta	**21,350**	**36.7**	**50.3**	**6.0**	**6.4**	**0.6**
Tláhuac	69,564	61.0	36.0	1.6	0.8	0.6

Tlalpan	140,148	65.4	23.6	1.9	8.6	0.6
Venustiano Carranza	116,986	87.2	11.6	0.3	0.1	0.7
Xochimilco	82,078	56.5	34.0	3.6	5.3	0.6
Total D.F.	**2,103,752**	**77.9**	**19.0**	**1.1**	**1.3**	**0.7**

Source: INEGI XII Census of Population and Housing, 2000

CHART 9
Indicators selected by town

Town	Income Level	Number of homes in irregular settlements	Water Problems because of Altitude	Water from Trucks (% of population)
San Bartolomé	2	130	Si	1.0
San Pablo	1 y 2	254	Si	7.4
San Pedro	5, 4,3	64	No	1.2
San Antonio T	1 y 2	536	Si	8.3
San Salvador	1	179	Si	37.0
San Lorenzo	1	23	Si	0.0
Villa Milpa Alta	1,4,5	515	No	0.0
Santa Ana	2 y 3	187	No	1.4
San Juan	2	21	No	s/i
San Fco	1 y 3	92	No	0.0
San Jerónimo	s/i	89	No	s/i
San Agustín	s/i	17	No	s/i

Source: Quiñones, 1999.

CHART 10
Water connection in Milpa Alta towns

	Have water connection	Pour water from a bucket	Cannot pour water	Not specified	Total
Three Other Towns	56	424	201	1	68
	8.20%	62.20%	29.50%	0.10%	100.00%
	6.40%	29.30%	58.30%	25.00%	25.50%
Villa Milpa Alta	176	234	34		44
	39.60%	52.70%	7.70%		100.00%
	20.10%	16.20%	9.90%		16.60%
San Antonio Tecomitl	266	195	29		49
	54.30%	39.80%	5.90%		100.00%
	30.30%	13.50%	8.40%		18.30%
San Bartolome Xicomulco	45	44	1	1	9
	49.50%	48.40%	1.10%	1.10%	100.00%
	5.10%	3.00%	0.30%	25.00%	3.40%
San Francisco Tecoxpa	91	109	20		22
	41.40%	49.50%	9.10%		100.00%
	10.40%	7.50%	5.80%		8.20%
San Pablo Oztotepec	40	144	34		21
	18.30%	66.10%	15.60%		100.00%
	4.60%	10.00%	9.90%		8.20%
San Pedro Atocpan	95	134	15	2	24
	38.60%	54.50%	6.10%	0.80%	100.00%
	10.80%	9.30%	4.30%	50.00%	9.20%
San Salvador Cuauhtenco	52	112	6		17
	30.60%	65.90%	3.50%		100.00%
	5.90%	7.70%	1.70%		6.40%
Santa Ana Tlacotenco	28	37	3		6
	41.20%	54.40%	4.40%		100.00%
	3.20%	2.60%	0.90%		2.50%
San Lorenzo Tlacoyucan	28	13	2		4
	65.10%	30.20%	4.70%		100.00%
	3.20%	0.90%	0.60%		1.60%
Total	**877**	**1446**	**345**	**4**	267
	32.80%	**54.10%**	**12.90%**	**0.10%**	100.00%
	100.00%	**100.00%**	**10 0.00%**	**100.00%**	100.00%

Source: Inegi, Population and Housing Census 2000

CHART 11: Availability of water by source in towns of Milpa Alta

	Piped Water Inside House	Piped Water Outside House	Piped Water at Public Spigot or Hydrant	Piped Water Carried from another House	Water from Trucks	Water from wells, rivers, lakes, creeks or other	Not specified	Total
Three Other Towns	91	142	105	48	337	17	4	744
	12.20%	19.10%	14.10%	6.50%	45.30%	2.30%	0.50%	100.00%
	11.60%	11.20%	71.40%	44.40%	72.30%	65.40%	16.00%	26.30%
Villa Milpa Alta	145	295	11	8			8	467
	31.00%	63.20%	2.40%	1.70%			1.70%	100.00%
	18.50%	23.20%	7.50%	7.40%			32.00%	16.50%
San Antonio Tecomitl	204	231	13	5	42	8	6	509
	40.10%	45.40%	2.60%	1.00%	8.30%	1.60%	1.20%	100.00%
	26.00%	18.20%	8.80%	4.60%	9.00%	30.80%	24.00%	18.00%
San Bartolomé Xicomulco	40	50	4	3	1			98
	40.80%	51.00%	4.10%	3.10%	1.00%			100.00%
	5.10%	3.90%	2.70%	2.80%	0.20%			3.50%
San francisco Tecoxpa	64	152	1	10		1	2	230
	27.80%	66.10%	0.40%	4.30%		0.40%	0.90%	100.00%
	8.20%	12.00%	0.70%	9.30%		3.80%	8.00%	8.10%
San Pablo Oztotepec	49	137	4	21	17		2	230
	21.30%	59.60%	1.70%	9.10%	7.40%		0.90%	100.00%
	6.20%	10.80%	2.70%	19.40%	3.60%		8.00%	8.10%
San Pedro Atocpan	101	140	6	4	3		1	255
	39.60%	54.90%	2.40%	1.60%	1.20%		0.40%	100.00%
	12.90%	11.00%	4.10%	3.70%	0.60%		4.00%	9.00%
San Salvador Cuauhtenco	38	67		5	65			175
	21.70%	38.30%		2.90%	37.10%			100.00%
	4.80%	5.30%		4.60%	13.90%			6.20%
Santa Ana Tlacotenco	31	35	2	3	1		2	74
	41.90%	47.30%	2.70%	4.10%	1.40%		2.70%	100.00%
	3.90%	2.80%	1.40%	2.80%	0.20%		8.00%	2.60%
San Lorenzo Tlacoyucan	22	22	1	1				46
	47.80%	47.80%	2.20%	2.20%				100.00%
	2.80%	1.70%	0.70%	0.90%				1.60%
Total	785	1271	147	108	466	26	25	2828
	27.80%	44.90%	5.20%	3.80%	16.50%	0.90%	0.90%	100.00%
	100.00%	100.00%	100.00%	100.00%	100%	100.00%	100.00%	100.00%

Source: Inegi, Population and Housing Census 2000

Chart 12: Milpa Alta Towns. Employed Population

Town	Total Pop.	Percentage of total population	Percentage of EAP	Percentage Workers or Employees	Percentage Peons or Farmworkers	Percentage Self Employed	Percentage with no income
Santa Ana	9130	10	36.6	57.6	5.8	27.8	6.5
San Salvador	10323	11.3	35.0	65.2	4.6	21.6	2.7
San Francisco	8549	9.4	38.6	47.0	9.2	32.3	8.1
San Bartolomé	3423	3.7	36.0	66.5	1.7	21.9	0.8
San Pedro Atocpan	8575	9.4	37.3	37.6	3.5	45.1	11.1
San Pablo	11932	13.1	36.1	64.2	5.4	23.1	3.8
San Antonio	18931	20.8	37.1	65.4	4.2	22.9	3.2
Villa Milpa Alta	16536	18.2	40.7	44.5	8.9	33.7	9.2
San Lorenzo	3373	3.7	40.6	24.5	19.9	40.5	13.2
	90772						

Source: Elaboration based on 2000 Census

CHART 13

Average income by town

Town	Income Level
San Bartolomé	2*
San Pablo	1 y 2
San Pedro	5, 4,3
San Antonio T	1 y 2
San Salvador C.	1
San Lorenzo	1
Villa MA	1,4,5
Santa Ana	2 y 3
San Juan	2
San Fco	1 y 3
San Jerónimo	
San Agustín	

Source: Quiñones, 2001.
**Income Level*
1= up to 3000 pesos
2= 3000-3500
3= 3500-4000
4=4000-4500
5=4500 or more

CHART 14

TYPE OF ORGANIZATIONS IN TOWNS SELECTED

Type of organizations	San Salvador	San Bartolomé
Community organizations	13	15
Athletic organizations	3	1
Productive or commercial organizations	2	10
Religious and festive organizations	3	8
Parent organizations	4	3
Political parties	1	0
Associations	3	9
TOTAL	29	46

Source: elaboration based on directory of organizations, Milpa Alta Delegation

CHART 15: Milpa Alta Delegation Population 1980-2000

Year	Population
1980	47.417
1990	63.654
2000	96.773

Source: Inegi, Census of Population and Housing 1980, 1990 and 2000

CHART 16: Population of Milpa Alta by town 2000

	Frequency	Percent
Other towns	5932	39.5
Villa Milpa Alta	1987	13.2
San Antonio Tecomitl	2253	15.0
San Bartolomé Xicomulco	409	2.7
San Francisco Tecoxpa	1014	6.8
San Pablo Oztotepec	991	6.6
San Pedro Actopan	1135	7.6
San Salvador Cuauhtenco	752	5.0
Santa Ana Tlacotenco	337	2.2
San Lorenzo Tlacoyucan	206	1.4
Total	15016	100.0

Source: INEGI Census of Population and Housing- 2000

CHART 17. POPULATION GROWTH.

YEAR	POPULATION OF DELEGATION	POPULATION OF FEDERAL DISTRICT	% OF FEDERAL DISTRICT	URBAN AREA DENSITY MILPA ALTA
1970	33,694	6,874,200	0.48	60.5
1980	47,417	8,029,500	0.51	58.7
1990	63,654	8,235,700	0.77	50.4
1995	81,102	8,499,007	0.95	53.6
2000	96,773			

Source: General Urban Development Program in Federal District, 1996 Population and Housing Count 1995, INEGI, 1996.
Note: The information corresponding to the years 1970, 1980 and 1990, corresponds to census information, and in 1995 to the definitive results of the Population and Housing Count.

CHART 18. PERCENTILE GROWTH RATE OF POPULATION.

PERIOD	MILPA ALTA TOTAL %	NATURAL RATE	MIGRATION RATE %	FEDERAL DISTRICT %
1990-1995	4.3	2.58	1.72	0.50

Source: General Urban Development Program in Federal District, 1996
Population and Housing Count 1995, INEGI 1995.

CHART 19: Milpa Alta Towns by Indigenous Language Spoken

	Indigenous Language Spoken			Total
	Speaks an indigenous language	Does not speak an indigenous language	Not specified	
Other towns	287	4908	18	5213
	5.5%	94.1%	.3%	100.0%
	41.1%	38.9%	38.3%	39.0%
Villa Milpa Alta	135	1674	7	1816
	7.4%	92.2%	.4%	100.0%
	19.3%	13.3%	14.9%	13.6%
San Antonio Tecomitl	46	1976	3	2025
	2.3%	97.6%	.1%	100.0%
	6.6%	15.7%	6.4%	15.2%
San Bartolomé Xicomulco	15	356	1	372
	4.0%	95.7%	.3%	100.0%
	2.1%	2.8%	2.1%	2.8%
San Francisco Tecoxpa	64	827	2	893
	7.2%	92.6%	.2%	100.0%
	9.2%	6.6%	4.3%	6.7%
San Pablo Oztotepec	18	855	3	876
	2.1%	97.6%	.3%	100.0%
	2.6%	6.8%	6.4%	6.6%
San Pedro Actopan	59	953	6	1018
	5.8%	93.6%	.6%	100.0%
	8.5%	7.6%	12.8%	7.6%
San Salvador Cuauhtenco	37	604	5	646
	5.7%	93.5%	.8%	100.0%
	5.3%	4.8%	10.6%	4.8%
Santa Ana Tlacotenco	30	278	1	309
	9.7%	90.0%	.3%	100.0%
	4.3%	2.2%	2.1%	2.3%
San Lorenzo Tlacoyucan	7	176	1	184
	3.8%	95.7%	.5%	100.0%
	1.0%	1.4%	2.1%	1.4%
Total	698	12607	47	13352
	5.2%	94.4%	.4%	100.0%
	100.0%	100.0%	100.0%	100.0%

Source: Inegi, Census of Population and Housing, 2000

CHART 20. ECONOMICALLY INACTIVE POPULATION 1990.

Type of inactivity	MILPA ALTA	%	FEDERAL DISTRICT	%
Students	9,017	36.55%	1,256,990	39.69%
Housework	13,139	53.26%	1,518,298	47.94%
Retired and pensioned	363	1.47%	163,626	5.17%
Disabilities	187	0.76%	32,194	1.02%
Other	1,964	7.96%	196,210	6.19%
TOTAL INACTIVE POP.	24,670	100.00%	3,167,318	100.00%

Source: XI General Census of Population and Housing, 1990.

The composition of the EAP is observed in the following chart, the majority of which is dedicated to terciary sector activities (60%), 19.15% to the primary sector and 17.5% to the secondary sector.

CHART 21. ECONOMICALLY ACTIVE POPULATION EMPLOYED BY SECTOR.

ACTIVITY SECTORS	FEDERAL DISTRICT		MILPA ALTA		% OF FEDERAL DISTRICT
	POPULATION	PERCENT	POPULATION	PERCENT	
Primary Sector	19,145	0.66%	3,658	19.15%	19.11%
Secondary Sector	778,434	26.98%	3,346	17.51%	0.43%
Terciary Sector	1,971,646	68.35%	11,426	59.80%	0.58%
Not Specified	115,582	4.01%	676	3.54%	0.58%
Total EAEP	2,884,807	100.00%	19,106	100.00%	0.66%

Source: XI General Census of Population and Housing, 1990. INEGI.

CHART 22

GROSS NATIONAL PRODUCT IN FEDERAL DISTRICT AND PARTICIPATION COMPARED TO THE NATIONAL TOTAL ACCORDING TO GRAND DIVISION OF ECONOMIC ACTIVITY (AT 1993 PRICES)						
	GNP in D.F.					
Grand Division						
	1993	**1994**	**1995**	**1996**	**1997**	**1998**
Total	276,461,702	286,463,350	261,890,107	273,421,565	292,321,731	300,980,225
Agricultura, Forestry and Fishing	386,521	373,480	415,121	378,579	418,563	418,563
Mining	342,291	365,224	280,830	275,129	239,485	239,485
Manufacturing Industry	47,650,936	48,304,840	43,873,387	49,090,399	55,061,767	58,443,901
Construction	14,807,055	15,381,709	11,022,301	11,070,949	12,536,607	11,201,165
Electricity, Gas and Water	1,460,447	1,460,902	1,415,677	1,375,334	1,410,600	1,368,037
Commerce, Restaurants and Hotels	61,858,942	65,251,276	53,701,234	56,487,870	63,253,024	65,260,192
Transportation, Storage and Communications	28,573,423	30,391,631	28,304,788	30,374,969	33,227,298	35,245,211
Financial Services, Insurance, Rental and Real Estate Activities	48,647,942	52,846,968	51,788,446	51,593,213	55,118,407	56,709,405
Community, Social and Personal Services	89,255,441	91,090,587	88,173,869	89,330,278	91,216,546	92,726,304
Imputed Bank Services	-16,521,297	-19,003,268	-17,085,546	-16,555,155	-20,160,568	-20,622,902

Source: INEGI. National System of Accounts in Mexico.

CHART 22

12.3. ESTABLISHMENT OF MANUFACTURING INDUSTRY IN THE D.F. AND NATIONAL

Size	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Micro	16,566	18,124	18,573	17,942	17,067	16,359	18,888	18,075	17,957	21,700	24,506
Small	4,764	4,995	5,021	4,721	4,291	4,056	3,828	3,990	4,117	4,891	2,289
Medium	705	694	675	623	551	545	493	521	538	648	864
Subsector or MSMI*	**22,035**	**23,813**	**24,269**	**23,286**	**21,909**	**20,960**	**23,209**	**22,586**	**22,612**	**27,239**	**27,659**
Large	420	422	415	383	370	348	307	328	345	391	173
Total Federal District	**22,455**	**24,235**	**24,684**	**23,669**	**22,279**	**21,308**	**23,516**	**22,914**	**22,957**	**27,630**	**27,832**
Total National	**105,101**	**117,893**	**125,765**	**127,005**	**123,346**	**121,643**	**141,434**	**143,464**	**153,480**	**225,702**	**234,240**

* Includes Micro, Small and Medium Industry.

Source: SECOFI. Dirección General de la Industria Mediana, Pequeña y de Desarrollo Regional, with data from IMSS

CHART 23. EMPLOYED POPULATION BY INCOME GROUPS, 1990.

LEVEL OF INCOME	MILPA ALTA		FEDERAL DISTRICT		%
	Population	%	Population	%	OF D.F.
No income	992	5.19%	30,424	1.05%	3.26%
Less than one MW	5,553	29.06%	545,441	18.91%	1.02%
From 1 to 2 MW	7,885	41.27%	1,168,598	40.51%	0.67%
More than 2 MW and less than 3	1,991	10.42%	443,807	15.38%	0.45%
From 3 to 5 MW	893	4.67%	316,737	10.98%	0.28%
From 5 to 10 MW	370	1.94%	191,714	6.65%	0.19%
More than 10 MW	214	1.12%	100,556	3.49%	0.21%
Not specified	1,208	6.32%	87,530	3.03%	1.38%
TOTAL EMPLOYED POPULATION	19,106	100.00%	2,884,807	100.00%	0.7%

Source: XI General Census of Population and Housing, 1990. INEGI.

CHART 24. DISTRIBUTION OF ECONOMIC DELEGATION ACTIVITY BY SECTOR, 1993.

SECTOR	ECONOMIC UNITS	% OF DELEGATION	% OF DF	EMPLOYED PERSONNEL	% OF DELEGATION
MINING	0	0.00%	0.00%	44	0.07%
MANUFACTURING	929	8.19%	3.31%	14,939	22.95%
COMMERCE	6,660	58.69%	3.96%	20,649	31.72%
SERVICES	3,758	33.12%	3.46%	29,465	45.26%
TOTAL	11,347	100.00%	3.72%	65,097	100.00%

Source: Economic Census 1994 Definitive Results, INEGI.

CHART 25. MARGINALITY.

Concept	Milpa Alta	D.F.
Population	63,654	8,235,744
% iliterate older than 15	8.06	4.00
% without primary education older than 15	25.47	16.77
% of residents in homes without sewer or toilet	16.19	1.81
% of residents in homes without electric energy	5.37	0.76
% of residents in homes without piped water	16.46	3.33
% of residents with crowding	67.31	46.48
% of residents in homes with dirt floors	15.15	2.48
% of population in towns with less than 5000 residents	10.00	0.32
% of employed population with income lower than 2 MW	75.53	60.47
Place occupied on national level	2112	
Place occupied on DF level	1	

Source: Indicadores Socioeconómicos e Índice de Marginación Municipal, 1990. CONAPO, 1993.

Chart 26: Ejido and Communal Land with More than 26,647-87-92 hectares.

Communal Lands	**Surface Area**
1. Milpa Alta	17,944-00-00
* Small property	7,948-00-00
* Forest zone	9,996-00-00
2. San Salvador Cuauhtenco	6,913-60-00
* Small property	1,800-00-00
* Forest Zone	5,133-60-00
Total 1 and 2	24,857-60-00
Ejidos	
* San Francisco Tecoxpa	82-16-81
* San Antonio Tecómitl	1,275-94-92
* San Jerónimo Miacatlán	59-50-05
* San Juan Tepenáhuac	27-49-99
* Santa Ana Tlacotenco	345-18-15
T o t a l	1,790-29-92

Source: Secretary of Agrarian Reform

CHART 27: ORGANIZATIONS AND REPRESENTATIVES OF TOWNS IN MILPA ALTA

COMMUNITY ORGS
Communal President
Representative of communal goods
President of Ejido Commissary
Ejido Comissary Secretary
Council of Observation
Neighbor Committees
President of base committee
Neighbor representative
Barrio representative
Commission of Treasury of Economic Support
Coordinator of Neighbor Committee
Communal Accounts
Ejido
Ejido Commisary
ATHLETIC ORGS
President of Athletic Committee
Soccer League
Children's Soccer League
Union of Young Athletes
Representative of Cyclists
President of Basketball Players
PRODUCTIVE ORGS
Representative of Nopal Growers
Representative of tables and barrios in Nopal Market
Directive Nopal-Vegetable Tables
Representative of Internal Roads
Rep. Directive Nopal-Vegetable Table
President of nopal grower groups
Agricultural Association
Representative of Agricultural and Industrial Fair
Fruit Tree Growers
Market Leader
Representative of semi-fixed vendors
President of Restaurant Owners
President/representative of market association
Cattle Organization

Merchants
RELIGIOUS AND FESTIVE ORGS
President of majordomos
Majordomo of the Chalma sanctuary
President of majordomos of San Pablo
President of chapel majordomos
Person in charge of the pilgrimage to Chalma
Representative of La Salva de Tecoxpa
President of Board for Remodeling the San Francisco temple
President for church building
Committee for Cemetery
President of Church Board
Representative of Holy Week
President of directive table of the sanctuary
Representative of nocturnal adoration
Representative of artistic cast
Board
Fair Committee
President of Evangelical Temples
Representative of Religious Festival of Bo. De los Angeles
Representative of Fair reg. LVII
Representative of Brass Band Contest
Representative of Artisan Exhibit of Santa Martha Festivities
Advisor on Culture and Nomenclature
President of the Cultural Council of the Zapatista Museum
Aztec and Cowboy Dances
Comission for Patron Saint Festivals
Commission for Castilleros
Youth Commission
Commission for Youth Band
Rodeo Commission
Holy Week Commission
President of Independence Day Celebrations
Representative of Santa Martha Fair Dance
President of Special Events Commission
Representative of Community
Treasurer
PARENT ORGS
Society of Primary School Parents

President of Primary School Directive Table
President of Secondary School
President of Kindergarten Directive Table
Society of Kindergarten Parents
President of Tele-secondary
President of Committee for Buying Plots of Land for Primary School
POLITICAL PARTIES
Sec. Of PRD
Sec. Of PAN
Sec. of PRI
ASSOCIATIONS
Taxi Driver's Group
President of Women's Group
President of Solidarity Social Association
Youth Organizers Group
Representative of Senior Citizens Group
President of Indigenous Community
Representative of National Indigenous Institute (INI)
Representative of social group J.U.C.C.
President of agricultural, cattle and forest union
Apiculture representative
President of Ecological Rescue Association
Representative of Nursery
Representative of Deer Raisers
Committee for Distributing Liconsa subsidized milk
Culture

Source: Elaboration based on Milpa Alta Delegation Directory of Organizations.

CHART 28. NATURAL AREAS REQUIRING SPECIFIC TREATMENT.

Name	Vegetation	State	Non-compatible Activity	Management
Chichinautzin Mountain Range	Open forest of pines and association of pines and brush.	Moderate erosion. Serious erosion.	Agriculture	Conservation, Restoration and Erosion Control
Tláloc Volcano	Dense pine forest. Open pine forest.	Moderate erosion.	Agriculture	Conservation, Restoration and Erosion Control
Teuhtli* Volcano	Pastures Brush	Very endangered	Agriculture	Restoration and Erosion Control: terracing, control of ruts and reforestation

Source: "Medio Ambiente", en: Plan General de Desarrollo Urbano del Federal District Documentos Temáticos. Grupo de Estudios Metropolitanos, UAM-Xochimilco; Vol. 2, Págs. K1 a K26.
Note: * Requires coordination of actions with the Xochimilco Delegation.

CHART 29
Federal District: Principal Indicators of In Home Service Coverage

egation		Piped Water 1		In Home Services				Homes that use gas to cook with		Owned Home	
				Sewerage		Electric Energy					
		1990	2000	1990	2000	1990	2000	1990	2000	1990	200
eral District		96.3	97.9	93.8	98.2	99.3	99.5	97.6	98.4	65.2	70.
	Azcapotzalco	98.8	99.3	98.1	99.1	99.8	99.8	98.1	98.6	59.2	66.
	Coyoacán	98.8	99.2	94.3	99.0	99.7	99.7	98.2	98.6	76.9	76.
	Cuajimalpa de Morelos	94.1	98.1	88.6	97.2	98.5	99.4	96.6	98.4	71.1	76.
	Gustavo A. Madero	97.8	99.0	97.2	99.0	99.6	99.7	98.1	98.9	65.4	69.
	Iztacalco	98.7	99.0	98.2	99.0	99.7	99.4	98.0	98.2	63.9	68.
	Iztapalapa	94.0	98.1	89.0	98.5	98.7	99.5	97.9	98.7	73.6	75.
	La Magdalena Contreras	96.1	97.7	93.7	96.4	98.9	99.4	97.5	98.5	75.8	80.
	Milpa Alta	82.4	93.0	63.1	85.7	94.3	99.0	89.1	95.7	83.3	83.
	Alvaro Obregón	96.8	98.7	95.8	99.0	99.0	99.5	97.6	98.6	68.6	73.

	Tláhuac	93.9	98.6	76.8	97.1	97.9	99.5	97.5	98.6	79.7	80.
	Tlalpan	85.6	90.9	84.2	97.0	98.7	99.4	97.2	98.3	78.4	78.
	Xochimilco	90.4	94.1	80.6	91.8	97.2	99.2	96.2	97.9	76.1	78.
	Benito Juárez	98.9	99.0	98.6	99.3	99.9	99.8	97.7	98.0	51.4	56.
	Cuauhtémoc	98.3	98.3	97.9	98.3	99.8	98.9	96.3	96.8	46.2	56.
	Miguel Hidalgo	98.6	99.0	97.7	99.1	99.8	99.8	97.2	98.3	45.9	56.
	Venustiano Carranza	98.7	99.2	98.5	99.1	99.8	99.7	97.8	98.4	58.8	65.
cludes homes with piped water inside, outside but on the land, and public spigots or hydrants, or carried from another home.											
JRCE: General Census of Population and Housing 1990 and 2000.											

CHART 30 Milpa Alta Delegation: private inhabited homes, availability of water, occupants and average occupants, 1970-2000

YEAR	Private inhabited homes (thousands)	Private inhabited homes with piped water	Private inhabited homes without piped water	Occupants (thousands)	Occupants per home
1970	5.9	5333	567	33.7	5.7
1980	9.4	7696	1704	53.5	5.6
1990	12.3	10095	2205	63.6	5.2
1995	17.3	15183	2117	81.1	4.7

D.F. Delegations
CHART 31
Expansion of the secondary sewerage network

Delegation	1993	1994	1995	1996	1997	1998
Azcapozalco	492.8	401.4	344.2	520.3	520.3	522.4
Coyoacan	747	729	625.1	698.1	698.1	698.1
Cuajimalpa	140.9	98.7	84.6	226.9	227	226.9
Gustavo A. Madero	2.261.8	1.682.0	1.442.3	1.490.8	1.490.8	1.490.8
Iztacalco	493.8	491	421	440.5	440.5	440.5
Iztapalapa	1,406,1	1,388,0	1,190,2	1,799.30	1,800,0	1,799,3
M. Contreras	238,6	226,0	193,8	277,8	277,8	277,8
Milpa Alta	163,9	433	371,3	184,5	184,5	184,5
Aálvaro Obregón	1,171,1	1,510,0	1,294,8	726,1	726,1	726,1
Tlahuac	442,5	205,0	175,8	424.5	410.1	424.5
Tlalpan	389,1	472,3	405	555.9	555.9	555.9
Xochimilco	349.7	223.1	191.3	433.7	433.7	433.7
Benito Juarez	1,325,0	1,325,0	1,136,2	556,8	556,8	556,8
Cuahutemoc	1,660,o	487,8	418,3	614,1	614,0	596,4
Miguel Hidalgo	1.001.0	1.173.0	1.005.8	721.1	721.1	721.1

Venustiano Carranza	700,0	700,0	600.2	566.9	566.9	566.9
Total DF	**12,983,3**	**11,545,3**	**9,899,9**	**10,237,3**	**10,223,6**	**10,221,7**
Source: System of DF Geo-economic Information.						

CHART 32 Sewerage Infrastructure in the DF

Delegation	Coverage	Primary Network	Secondary Network	Piped Waterways	Other Sewerage Infrastructure
Alvaro Obregon	98	132	726		Rivers and Ravines
Azcapotzalco	100	132	522	2.7	Deep Sewerage
Benito Juarez	100	557	840		Semi-deep Sewerage
Coyoacan	98	179	698	5.9	Semi-deep Sewerage
Cuajimalpa	95	32	227		18 KM of open air waterway
Cuauhtemoc	100	135	596	7.3	Deep sewerage
Iztacalco	100	103	440	10.9	Deep sewerage
Iztapalapa	91	306	1,810	4.8	8 Km of canals
Madero	95	287	1,491	9,5	18,1 km of open air waterways
Magdalena Contreras	98	33	278	9,5	4 km of open air waterways
Miguel Hidalgo	100	178	721	10,6	5.4 km of open air waterways
Milpa Alta	54	14	184		Open air ditches and ravines
Tlahuac	98	82	429		39.6 km of open air waterways
Tlalpan	77	109	556		17 km of open air waterways
Venustiano Carranza	100	129	566	12	2.5 km of open air waterways
Xochimilco	90	72	434		Regulatory reservoir and lagoon
Total		2,034 km	10,235 km	73.2 km	

Source: DGCOH 1997

CHART 33: Treatment Plants

Delegation	Treatment Plant (Residual)	Use of treated residual water	Nominal capacity(l/s)	Real Capacity(l/s)
A. Obregon	Santa Fe	Irrigation of green areas	280	280
Azcapotzalco	El Rosario	Irrigation of green areas	25	16
Coyoacan	Coyoacan	Maintain levels of Xochimilco canals	800	203
Cuauhtemoc	Tlatelolco	Irrigation of green areas	22	18
G.A Madero	Acueducto Guadalupe	Commerce, industrial and irrigation	87	76
G.A Madero	San Juan de Aragón	Lake Aragón and irrigation, industry	500	238
Iztacalco	Iztacalco	Irrigation of green areas	13	10
Iztacalco	Cd. Deportiva	Industry, commerce and irrigation	230	149
Iztapalapa	Cerro de la Estrella	Filling lakes and agricultural irrigation	3500	1853
Miguel Hidalgo	Bosques de las lomas	Irrigation of green areas	55	17
Miguel Hidalgo	Chapultepec	Filling lakes and irrigation of green areas	130	106
Miguel Hidalgo	Campo Militar No 1	Irrigation of green areas and agriculture	30	25
Milpa Alta	Rastro de Milpa Alta	Sanitation	7	
Tlahuac	San Juan Ixtayopan	Irrigation of green areas	15	15
Tlahuac	San Nicolas Tetelco	Irrigation of green areas and open air flow	15	15
Tlahuac	San Pedro Actopan	Agricultural irrigation	60	35
Tlahuac	San Andres Mixquic	Agricultural irrigation	30	30
Tlahuac	San Lorenzo	Irrigation of green areas, agricultural irrigation, lakes	255	
Tlalpan	Ciudad Universitaria	Irrigation of green areas	54	30
Tlalpan	Abasolo	Irrigation of green areas and open air flow	15	7
Tlalpan	H. Colegio Militar	Irrigation of green areas	30	12
Tlalpan	Parres	Irrigation of green areas and open air flow	7.5	2
Tlalpan	PEMEX-Picacho	Irrigation of green areas	20	6
Tlalpan	San Miguel Xicalco	Agricultural irrigation and open air flow	7.5	4
Tlalpan	Topilejo	Sanitation	7	
Xochimilco	Reclusorio Sur	Irrigation of green areas	30	18.6
Various	Registered	Industry, irrigation and cleaning	75,9	68,3

CHART 34 TREATMENT PLANTS OPERATED BY PRIVATE PARTIES		
Delegation	**No. of treatment plants**	**CAUDAL (l/s)**
Alvaro Obregon	22	20.5
Coyoacan	5	1.12
Cuauhtemoc	1	3,52
Miguel Hidalgo	7	20,13
Tlahuac	1	1,30
Tlalpan	8	29,82
Total	44	75,94
Source: DGCOH, 1997		

CHART 35 Volume of Residual Waters Conducted by Type of Sewerage in the Metropolitan Zone (thousands of m3/year)

Type of Sewerage	1995	1996	1997
Deep sewerage	466,733	199,000	199,000
Eastern Transmitter	133,397	347,000	347,000
Tequixquiac Tunnels	725,328	1,091,000	1,091,000
Total	1,325,458	1,637,000	1,637,000
Source: INEGI			

CHART 36: Federal District: Domestic Use Tariff for Metered Service 2000

Bimonthly Consumption m3		Tariff	
Lower Limit	Upper Limit	Mimimum Fee (pesos)	Additional Fee per m3 above the limit
0	10	11.50	0.00
10.1	20	11.50	1.36
20.1	30	25.06	1.58
30.1	50	46.60	2.76
50.1	70	101.80	3.53
70.1	90	172.27	4.51

90.1	120	262.37	8.97
120.1	180	531.33	11.34
180.1	240	1211.70	16.29
240.1	420	2189.15	18.76
420.1	660	5565.41	21.66
660.1	960	10811.97	23.62
960.1	150	17897.34	27.18
1500.1	MORE	32.567.36	28.96

Source: Federal District Treasury, Federal District Government, 2000. Extracted from Quiñones, 76

CHART 37

Federal District: Fixed Tariff in Domestic Use 2000

Type of neighborhood	Bimonthly Fee in Pesos
0	15.56
1	23.66
2, 3 and 8	47.33
4, 5 and 7	202.04
6	473.39

Source: Federal District Treasury, Federal District Government, 2000

CHART 38. AGEBS: Basic Geo-statistic Areas

Ageb Key	Average income home / AGEB	Consumption of water per 1 family homes			Water Use (billing)			Number of Homes	Consumption of water on average per home	Water use ave/home (bill)	% of monthly income spent on water services per month
	(S)/month	m3 bim.	%	% accum	$ bim.	%	% accum	m3 bim.		$ bim.	
	(1)-	(2)-			(3)-			(4)-	(5) : 2/4	(6)=3/4	(7) = (6/1 * 100)
037-A	2507	2770	2.6	2.6	6490	2.7	2.7	65	43	100	1.99
033-1	2669	4790	4.5	7.1	13549	5.6	8.3	120	40	113	2.12
035-0	2767	73	0.1	7.2	129	0.1	8.3	2	37	65	1.17
034-6	2813	837	0.8	8	1558	0.6	9.0	27	31	58	1.03
030-8	2915	4005	3.8	11.8	10916	4.5	13.5	91	44	120	2.06
031-2	2923	6518	6.1	17.9	17915	7.4	20.8	175	37	102	1.75
020-4	2934	2262	2.1	20	4839	2.0	22.8	62	36	78	1.33
043-5	2986	6834	6.4	26.4	13981	5.8	28.6	205	33	68	1.14
024-2	3057	15	0	26.4	18	0.0	28.6	1	15	18	0.3
019-1	3121	3246	3.1	29.5	5943	2.5	31.1	121	27	49	0.79
039-9	3130	850	0.8	30.3	1503	0.6	31.7	34	25	44	0.71
021-9	3231	884	0.8	31.1	2076	0.9	32.5	30	29	69	1.07
040-1	3249	23040	21.7	52.8	46849	19.3	51.8	741	31	63	0.97
012-A	3301	8069	7.6	60.4	15901	6.6	58.4	245	33	65	0.98
041-6	3330	10421	9.8	70.2	25329	10.4	68.8	296	35	86	1.28
023-8	3331	219	0.2	70.4	855	0.4	69.2	5	44	171	2.57
042-0	3434	11459	10.8	81.2	25440	10.5	79.7	323	35	79	1.15
045-4	3530	969	0.9	82.1	1957	0.8	80.5	30	32	65	0.92
036-5	3546	1598	1.5	83.6	4516	1.9	82.4	33	48	137	1.93
038-4	3594	1765	1.7	85.3	4081	1.7	84.0	42	42	97	1.35
022-3	3797	1250	1.2	86.5	2287	0.9	85.0	44	28	52	0.68
032-7	4159	5138	4.8	91.3	15428	6.4	91.3	117	44	132	1.59
044-A	4398	2413	2.3	93.6	5085	2.1	93.4	66	37	77	0.88
047-3	4612	438	0.4	94	830	0.3	93.8	12	37	69	0.75
002-6	4637	5036	4.7	98.7	12855	5.3	99.1	128	39	100	1.08
046-9	5280	1232	1.2	100	2232	0.9	100	44	28	51	0.48
TOTAL		106131	100		242562	100		3059	911	79	

Source: Quiñones, 99. Elaboration based on information provided by TECSA and Mexico City Secretary of Health, 2000

Note: The average income of the house of each AGEB was imputed to each one of the houses located within them. This was done once it was verified that in all the AGEBS each home had an average of 1.1 families (Secretary of Health, 2000)

CHART 39. AGEBS Key, Milpa Alta Towns

San Bartolomé Xicomulco	012-A
San Salvador cuahtenco	034-6
	035-0
San Pablo Oztotepec	020-4
	021-9
	019-1
San Pedro Actopan	044-A
	045-A
	048-9
	047-3
San Antonio Tecomitl	040-1
	041-8
	042-0
	043-5
San Lorenzo Tlacoyucan	014-2
	031-2
	030-8
	002-6
	032-1
	033-1
San Francisco Tecoxpa	038-5
	037-A
	038-4
San Juan Tepenahuac	039-9
Santa Ana Tlacotenco	022-3
	023-8
	024-2

CHART 40: Modifications installed in governance of water

Year	Action	Consequences
1982	Responsibility for federal intervention in urban and industrial water is transferred from the SARH to the SEDUE.	A federal institution of regulation of urban development and ecology is created, which administers water, particularly urban industrial water.
1983	Art. 115 of the Constitution is reformed.	Responsibility for providing water and sanitation services is transferred from the Federation to the municipalities.
1986	Federal Fees Law is reformed.	Fees are introduced. The issue of efficiency and cost of water begins to be discussed.
1989	Creation of the CNA, dependen ton the SARH.	Commission in charge of water[45].
1990	Federal Fees Law is reformed.	Fees for water use are updated.
1991	Federal Fees Law is reformed.	A charge is included for discharge of polluted wastewaters.
1992	Art. 27 of the Constitution is reformed.	Frees land and water markets.
1992	Promotion of the National Waters Law.[46]	Possibility to give way to private industry.
1993	Public Registry of Water Rights (REPDA)	Titles of concession, assignation and permission for water rights are registered.
1999	Art. 115 of the Constitution is reformed.	Frees the water market even more, transfers from State to municipalities.

Source: Our own elaboration.

[45] In the beginning, the CNA is a deconcentrated organ of the Secretary of Agricultura and Hydraulic Resources (SARH). However, in 1994, it becomes a deconcentrated organ of the recently created Secretary of Environment, Natural Resources and Fishing (SEMARNAP) which is transformed in 2000 into the Secretary of Environment and Natural Resources (SEMARNAT). Axel Dourojeanni et. al. 2001, CNA, 2001.

[46] In 1992, after the significant constitucional reform, the National Waters Law was promoted, to regulate Article 27 "which sustains as fundamental objectives the integral administration of water, more user and private participation in financing, building and operating water; the judicial security of water use, and the integral sustainable development of water, its goods and services." Ortiz Rendón, Gustavo con la colaboración de Flor Cruz y Juan Carlos Valencia, Aspectos relevantes de la política del agua en México, en el marco del desarrollo sustentable. INTERNET. Regarding the participation of private companies, the Law offers a judicial framework base for their participation in hydraulic works and projects under the responsibility of the Federal Government. The Law considers the possibility that private industry participate in funding, building and operating federal hydraulic infrastructure, as well as providing corresponding services. This legislation represents a central change in relationship to previous water issues, because it specifies government responsibilities and because it notes that the effort of the public sector can be complemented with the participation of private investment in fudning, building and operating federal hydraulic infrastructure.

CHART 41. Judicial Framework

Judicial Framework before 1980	Current Judicial Framework and Regulation of Private Participation in Mexico
Law of Nationally Owned Waters Federal Law of Sanitary Engineering Irrigation Law Law of Cooperation for Providing Potable Water to Municipalities Regulatory Law in the fifth paragraph of Article 27 of the Constitution on SUBSUELO Waters	Political Constitution of the United Mexican States National Waters Law and Regulation National Fees Law Public Works Law General Law of National Goods State Water Laws Diverse state laws and orders related to public works and fiscal and comercial aspects, among others. Municipal regulations.

CHART 42

ACTIVITIES OF THE POLITICAL DELEGATIONS ACCORDING TO THE 1999-2001 BUDGET PROGRAM (WATER AND SEWERAGE)
Conserve and maintain the secondary potable water network.
Conserve and maintain the secondary sewerage network.
Distribute potable water in trucks.
Expand the secondary sewerage network.
Repair water leaks.
Remove sediment from the secondary sewerage network.
Expand the secondary potable water network.
Connect home sewerage discharges
Carry out clearing and sediment removal of collectors, culverts and wells.
Install home water taps.
Give preventive and corrective maintenance to culverts and manholes.
Build collectors for the sewerage system.
Build sewers.
Build wastewater treatment plants.
Remove sedimient and rehabilitate lagoons, lakes, waterways, rivers, canals and reservoirs.
Build containers to collect rainwater.
Rehabilitate the secondary sewerage network.
Build a storage tank.
Rehabilitate sides of open air waterways.
Build wells to absorb residual water.
Rehabilitate teh secondary potable water network.
Carry out studies and projects to support works for the sewerage system.
Carry out a citizen campaign for a rationed use of water.
Build dam reservoirs.
Build, expand and/or update storage tanks for hydraulic reinforcement.
Carry out studies and projects to support works for the potable water system.
Build dykes.

Source: Agenda of hydraulic policy from the Legislative Assembly of the Federal District, *La participación de las delegaciones políticas en la gestión del servicio de agua en el D.F.* UNAM, 2002.