MEXICO VALLEY SANITATION PROGRAM

(ME-0179)

EXECUTIVE SUMMARY

BORROWER: Banco Nacional de Obras y Servicios Públicos, S.N.C. (BANOBRAS)

GUARANTOR: The United Mexican States

EXECUTING AGENCY: BANOBRAS as trustee for a trust fund, jointly with the Department of the Federal District and the State of Mexico, with the National Water Commission (CNA) acting as technical coordinator.

AMOUNT AND SOURCE:

IDB:	US$ 365 million (OC)
Cofinancing:	US$ 410 million (OECF)
Local counterpart funding:	US$ 260 million
Total:	US$1,035 million

FINANCIAL TERMS AND CONDITIONS:

IDB loan

Amortization period:	20 years
Disbursement period:	5 years
Grace period:	5 years
Interest rate:	Variable
Inspection and supervision:	1%
Credit fee:	0.75%

COFINANCING: Overseas Economic Cooperation Fund (OECF) of Japan

Amortization period:	25 years
Disbursement period:	5 years
Grace period:	7 years
Interest rate:	4%
Credit fee:	0.1%

OBJECTIVES: The general program objectives are to: (i) help solve the drainage problem in the Mexican Valley metropolitan area (ZMVM) in order to prevent potentially catastrophic floods; (ii) reduce wastewater pollution in the ZMVM to improve health conditions and to slow environmental degradation in this area and in the Mezquital Valley, which receives wastewater from the ZMVM; and (iii) foster improved operating and business efficiency among water operators through performance of support and cooperation agreements between the Federal Government, the Federal District, and the State of Mexico, and of technical assistance and cooperation agreements between the State of Mexico and the 18 regional municipalities in the ZMVM.

DESCRIPTION:

The program has been divided into two investment projects and complementary activities. The first project, to be financed by the Bank (US$309 million in direct costs), calls for expanding and rehabilitating macrodrainage infrastructure, while the second, OECF-financed project (US$364.7 million in direct costs), contemplates treatment for ZMVM wastewater. Such treatment is to meet national environmental standards on wastewater quality.

The program will support, with Bank financing (US$5.75 million in direct costs), implementation and monitoring of action plans, support and cooperation agreements, and technical assistance and cooperation agreements to be signed between the Federal Government, the State of Mexico and the Federal District, and between the State of Mexico and the 18 regional municipalities in the ZMVM. These agreements are described in Annex I-1 and in paragraphs 1.4 and 1.5 of this proposal. The agreements are to help modernize and streamline water and sanitation service providers by setting specific yearly goals to be achieved in operating and business aspects for the five years of program execution.

The following complementary actions in environment, health and education, to be financed by the Bank (US$18 million in direct costs), are intended to secure benefits associated with treatment of wastewater: control of industrial discharge, environmental health plan for irrigation districts, modeling to predict water quality in the El Salto and Tula rivers and Endhó reservoir; studies for reuse of sludge produced in wastewater treatment; and monitoring of water quality in receiving bodies and irrigation ditches.

Preinvestment studies will also be conducted with Bank financing (US$8 million in direct costs) to quantify the recharge of ZMVM aquifers and the rehabilitation and instrumentation of dams to regulate storm waters.

GOALS:

Rehabilitation and expansion of macrodrainage would enable the system to properly dispose of the volume of flood water generated by rain with a recurrence interval of 100 years; restore to the system its conveyance capacity lost through differential soil sinkage; and rationalize operations by significantly lowering the risk of flooding.

The project will allow treatment of a maximum combined flow of 74.5 m^3/s, of which 60% is sewage

and the remaining 40% a mixture of storm water and sewage from the ZMVM. This will contribute to meeting standard NOM-ECOL-001/96 outlining quality parameters for the use of wastewater in irrigation. After treatment, the wastewater will have a pathogen content (parasites and bacteria) in line with recommendations by the World Health Organization (WHO). A significant contribution is also being made to the government's aim of treating two thirds of the wastewater discharged in the country by the end of this decade.

Through performance of the agreements, it is expected that major goals in terms of physical, business and operating efficiency will be achieved in the State of Mexico and the Federal District, raising overall efficiency from 28.5% to 49.8% in the Federal District and from 35.4% to 51.4% in the State of Mexico by the end of the program.

ENVIRONMENTAL CLASSIFICATION: The Environment Committee, at its meeting of January 24, 1995, classified this as a Category III operation. The environmental summary was approved at the October 8, 1996, meeting of the Committee and forwarded to the Public Information Center on October 21, 1996.

BENEFITS: For the project to expand and rehabilitate the drainage system, the main benefit would be the prevention of damage from recurring floods and reduced likelihood of a catastrophic flood that could affect millions of the ZMVM's inhabitants. This project also regulates streamflow taken in at treatment plants.

The water treatment project promotes massive nation-wide treatment of wastewater to meet existing environmental standards, underpins public health strategy, and creates an environmental setting consistent with the country's socioeconomic conditions. The specific impact in the project area would include: (i) reducing the incidence of water-borne diseases affecting an estimated 400,000 inhabitants of the Mezquital Valley; (ii) initiating the cleanup of polluted bodies of water in the project area; and (iii) lifting restrictions on products from areas irrigated with wastewater.

Through performance of the agreements and studies to replenish aquifers, the aim is to rationalize water use, improve quality and sustainability in delivery of water and sanitation services, and institute

sustainable management of aquifers by reducing overuse rates.

The inclusion of tariff and technical and business efficiency commitments as noted above is a very important element since, beyond their impact on funding sources, they are crucial in securing efficient water use and rational exploitation of aquifers. In the absence of such commitments, the large investments needed for water supply and sanitation projects would give rise to economic and social inefficiencies. They would address short-term needs without sending the right signals or providing incentives for operators and users to use water more rationally in line with the cost of water in the ZMVM.

RISKS:

Program execution and operations: There is a risk that the State of Mexico and/or the Federal District may not meet their commitments toward the trust administering the funds, thereby generating a funding imbalance. This risk is minimized, firstly, by the greater efficiency and financial capacity that the operators would gain through performance of the support and cooperation agreements, and secondly by application of the guarantee mechanism agreed upon, whereby the trust is authorized, in the event of default, to collect the necessary funds from the government by deduction from statutory federal transfers to the Federal District and State of Mexico.

Operation of water treatment plants project: There is a risk that one or more of the plant operators may not meet the efficiency parameters set in their proposals, thus generating higher treatment costs per m^3 of water and/or of sludge and exceeding financial viability. This risk is minimized by the inclusion in the contracting process of a recommendation that the contract be awarded to a consulting firm with extensive experience in this area, based on a rigorous analysis of operating costs to produce the proper result.

THE BANK'S COUNTRY AND SECTOR STRATEGY:

This program falls within the Bank's strategy for the 1996-1997 period, as set forth in the programming paper approved in December 1995. In particular, it is consistent with one of the strategy objectives, which is to foster sustainable growth by financing operations in water supply, sewerage and sanitation. The Mexico Valley sanitation program is part of a long-range strategy set by the Ministry of Finance to attain sustainable management of water resources in

the ZMVM. The investments to be funded under the program carry significant social and environmental benefits in line with the Eighth Replenishment mandate. Moreover, the program actions are consistent with improving efficiency in delivery of water and sanitation services, promoting more modern services through greater private-sector participation.

Contracting the wastewater treatment plants to the private sector on a design, build, operate, and maintain (DBOM) basis will avoid increasing the size of the public sector to provide these services.

For the Federal District, where four existing private consortiums are involved in water supply to some extent, achieving financial efficiency indexes will ensure that such participation is viable and sound.

For the State of Mexico, the action plan envisages, in addition to operational and physical improvements, adjustments to the Water Act and the regulatory framework to promote broader private sector participation in service delivery.

POVERTY TARGETING: For the drainage project, it has been determined that flood protection would directly benefit about 4 million inhabitants, 65% of whom live in low-income areas where average earnings are below the poverty line established by the Bank. The entire population of the ZMVM would benefit from the project indirectly. The water treatment project would benefit some 400,000 people living in the Mezquital Valley, who are considered the third most disadvantaged group in the country. An estimated 70% of this population group is living under the poverty line established by the Bank (see paragraphs 4.48 and 4.49).

PROCUREMENT OF GOODS AND SERVICES: The Bank's standard bidding procedures will apply to procurement of goods and services for construction of program works. International competitive bidding will be required for the procurement of goods in excess of US$350,000, and for contracting services for construction of works in excess of US$5,000,000.

EXCEPTIONS TO BANK POLICY: An exception is sought to the Bank's procurement policy such that the executing agency may contract directly with the National Public Health Institute, the Engineering Institute of the Autonomous University of Mexico, and the College of Postgraduate Studies of Chapingo University for the conduct of various studies under the supplementary actions component. These contracts are justified because the

institutions concerned have adequate data bases and processing methodologies for several of the parameters contained in the studies.

SPECIAL CONTRACTUAL CONDITIONS:

Special conditions precedent to disbursement

The borrower is to have presented:

(i) evidence that it has signed a funds transfer agreement with the guarantor; (ii) evidence that separate credit line agreements have been signed with the Federal District and the State of Mexico whereby the borrower transfers the Bank financing to those entities, by way of a loan, for execution of the program and creation of the trust (see paragraph 3.16); (iii) evidence that an irrevocable trust contract on administration and source of payment has been signed by the Federal District and the State of Mexico as trustors and the borrower as trustee, with the participation of SHCP and SEMARNAP, through the CNA (see paragraph 3.6); (iv) evidence that cooperation and support agreements have been signed: (1) between the guarantor and the State of Mexico, in accordance with the guidelines set forth in the draft agreement dated October 30, 1996, delivered to the Bank; and (2) between the guarantor and the Federal district, in accordance with the guidelines set forth in the draft agreement previously agreed upon with the Bank (see paragraphs 1.5 and 2.3). These agreements are to cover fulfillment of the efficiency indexes indicated in subsection (d) of the section on "Conditions during program execution" below; (v) evidence that the consulting firm has been contracted to coordinate the works for the ZMVM macrodrainage rehabilitation and expansion project; (vi) evidence that technical assistance and cooperation agreements have been signed between the State of Mexico and the 18 regional municipalities participating in the program including, *inter alia*, the conditions in the cooperation and support agreement signed by the Federal Government and the State of Mexico (see paragraphs 1.5 and 2.3); (vii) evidence that the CNA has designated its ZMVM Water Supply and Sanitation Project Division as the unit responsible for coordinating and supervising the program (see paragraph 3.10); (viii) evidence that the Federal District and the State of Mexico have made the first contributions of additional counterpart funding for the program, in accordance with the investment schedule for the first year (see paragraphs 3.17 and 3.19); and (ix) evidence that the members of the

technical committee of the trust have been appointed (see paragraph 3.8).

Conditions during program execution:

a. Annually during the second quarter of each of the five years of program execution, a meeting is to be held between the guarantor, the borrower, the executing agency and the Bank, to review the targets met in the year immediately preceding, particularly as to improving technical and overall efficiency indexes for the Federal District and the 18 regional municipalities in the ZMVM, as set out in the cooperation and support agreements and the technical assistance and cooperation agreements (see paragraphs 3.19 and 4.26).

b. Prior to putting the drainage project works out to tender, environmental impact studies and the INE ruling for each works project are to be presented.

c. Prior to undertaking construction of treatment plants, the specific environmental impact studies and the INE ruling for each plant are to be presented, along with the final resettlement plan.

d. The borrower undertakes to present evidence that the Federal District and State of Mexico are fulfilling the physical, business and overall efficiency indexes and effecting the increases in water and sewer charges set forth in the cooperation and support agreements mentioned in subsection (iv) of the section on conditions precedent to disbursement; evidence of fulfillment of this condition is to be presented during program execution as established in subsection (a) of this section (see paragraphs 4.25 and 4.26).

e. Within seven months after the contract effective date, detailed terms of reference and execution programs are to be presented for the following components (see paragraph 2.13) of the environmental plan: (i) industrial discharge control; (ii) environmental health plan in areas affected by wastewater in the program area; (iii) water quality prediction models; (iv) feasibility study for reuse of sludge produced by wastewater treatment facilities; and

(v) water quality monitoring and control in receiving bodies and irrigation ditches.

f. The borrower undertakes to present evidence that during the first two years of program execution the Federal District has installed 450,000 meters in addition to those in existence in 1996 (see table of indicators at the end of chapter IV). This target will be reviewed during the review and monitoring meetings in the second and third year of execution, as referred to in subsection (a) of this section.

g. The borrower undertakes to present evidence of installation in the 18 regional municipalities in the ZMVM, in addition to the meters in existence in 1996: (a) during the first three years of program execution, 50,000 meters for large-scale, non-household consumption, and (b) during the five years of program execution, 50,000 meters to measure household consumption (see table of indicators at end of chapter IV). This target will be reviewed at the review and monitoring meetings referred to in subsection (a) of this section.

h. The loan contract will also include the Bank's standard conditions on, *inter alia*, auditing, reporting, inspections, maintenance, evaluation and procurement of goods and services.

I. FRAME OF REFERENCE

A. The Mexico Valley basin

1.1 The Mexico Valley basin covers an area of 9,000 km^2. At the bottom of the basin, at 2,240 meters above sea level, are the Federal District and part of the State of Mexico, an area known as the Mexico Valley metropolitan area (ZMVM). From a hydrogeological standpoint, this is a closed basin. As Mexico City has grown, however, a system has gradually been developed to drain the basin and control flooding. This has brought about irreversible ecological changes in the region, which originally consisted of a chain of lakes, enabling Mexico City to expand towards the lake plains. Water discharged outside the basin has generated a large irrigated area known today as the Mezquital Valley.

1.2 The ZMVM is one of the largest urban areas in the world. It holds a population on the order of 16 million people, who have settled within the different administrative divisions of the Federal District (52.8%) and the regional municipalities in the State of Mexico (47.2%). Growth in the ZMVM today is explosive, particularly as a result of immigration from other regions of the country.

1.3 Demographic pressures on water use and the urgent need for drainage to prevent urban flooding mean that water systems of vast size and complexity are needed. Moreover, major problems and challenges must be dealt with in administering water in the ZMVM given the institutional, jurisdictional, socioeconomic, geological and environmental complexity of the issues involved. These range from water production and distribution to construction and maintenance of drainage systems and final disposal of wastewater. Generally speaking, the problems associated with water management in the Mexico Valley relate to three major interrelated areas: (i) water supply and sustainability of sources; (ii) drainage capacity of systems and the danger of catastrophic flooding; and (iii) reuse of water and water pollution, with the attendant serious impact on public health and the region's ecology.

1.4 The program outlined herein will contribute to solving these problems through specific investments within an institutional and financial context that will ensure efficient management of the resource. The program is part of a long-range strategy established by the Federal Government to achieve sustainable management of water resources in the ZMVM. The memorandum of understanding signed on October 21, 1996 between the Federal Government, the Federal District and the State of Mexico sets forth the commitments undertaken by the parties and the different legal instruments governing their rights and obligations. The memorandum of understanding is included in Annex I-1.

1.5 The legal instruments governing the rights and obligations of the parties are the cooperation and support agreements to be signed by the Federal Government and the Federal District and by the Federal Government and the State of Mexico, the technical assistance and cooperation agreements to be signed by the State of Mexico and the 18 regional municipalities in the ZMVM, and the trust contract and line of credit agreements. Stipulated in those agreements are the operating, business and overall efficiency indexes that water system operators must meet in order to fulfill their obligations under this sanitation program and future water supply programs, with support from the Federal Government.

B. Physical problems associated with water resource management

1. Water supply and source management

1.6 The principal sources of drinking water in the ZMVM are valley aquifers underlying the city, which supply about 66% of the water consumed (63 m^3/s). The remaining 34% is brought in through aqueducts from sources located outside the Mexico Valley. Approximately 37 m_3/s is used in the Federal District and 26 m^3/s in the 18 regional municipalities in the State of Mexico. Drinking water coverage is 96% and 93% in the Federal District and the State of Mexico, respectively. Projections call for growth in water demand of about 1 m^3/s per annum in the ZMVM.

1.7 Daily water supply per capita in the Federal District is an estimated 355 liters, which is considered high compared to cities in developing countries similar to Mexico. Part of the problem has to do with the high losses and wastage levels, but clearly the historic lack of a means of managing and rationalizing water use has contributed. Mexican legislation has traditionally treated water as every citizen's right, rather than a resource with an economic value.

1.8 One consequence of taking water from underground without a management plan is that aquifers are overtaxed. The aquifers in the valley basin need an estimated 700 million m^3 per annum to recharge, while 1,300 million m^3 is taken out each year. This makes it increasingly difficult to meet growing water demand and to address competing pressures for use of the resource.

1.9 One of the most critical consequences of overusing aquifers, as explained further on, is that it contributes substantially to the problem of differential settling in the city, directly affecting the drainage system and its water removal capacity.

2. Drainage

1.10 Urban drainage is done by a combined storm/sewage system, and its main collectors connected to macro structures are natural riverbeds that cross the city, now largely under cover. Macrodrainage in the

Mexico Valley essentially conveys waters northward through three major conduits: the main channel, which was built at the turn of the century, the eastern channel, built during the 1960s, and the deep central channel, which commenced operations in 1975. These major structures are part of a complex system and require inspection, rehabilitation and adequate maintenance given the features of streamflow and soil sinking. As indicated, these problems are being exacerbated by the excessive pressures placed on aquifers.

1.11 Sinking along the first 10 km of the main channel is about 21 cm/year, while from km 22 to 29 it is 4 cm/year. The resulting differential in the channel's slope diminishes its removal capacity and requires part of the drainage to be done by pump towards the Texcoco lake and downstream from the main channel. Moreover, poor filtration capacity along the main channel means that the central channel (designed to remove storm water) is used to remove sewage all year round. Operations have increased steadily each year, and reduced drainage through the main channel prevents annual inspection and maintenance work on the central channel.

1.12 In view of the foregoing, total drainage capacity is not sufficient to remove maximum streamflow after heavy rains, with the resulting danger of urban flooding. Urban flooding is a recurrent and very costly problem, and the risk of severe flooding through system failure worsens every year. Unless the system is rehabilitated, the main channel will soon be inoperative, and the only drainage northward will be through the central channel. In other words, a large part of the city would be drained through a single conduit, and any failure in that conduit – no matter how unlikely – could inundate large areas of the city with several meters of storm water and sewage, necessitating the evacuation of millions of people.

3. Wastewater treatment and water pollution

1.13 Little wastewater is treated in the ZMVM. Of about 50 m^3/s of wastewater captured by the combined sewer system, 4 m^3/s receives tertiary treatment and 5 m^3/s receives primary and secondary treatment at several small treatment plants. The remaining 41 m^3/s is discharged untreated through the three major macrodrainage channels into receiving bodies – the El Salto and Tula rivers and the Endhó reservoir. The reservoir is located in the State of Hidalgo, where wastewater is used to irrigate crops. The water pollution caused by large amounts of untreated sewage being dumped in the Mexico Valley and in irrigation districts in the Mezquital Valley in the State of Hidalgo has serious implications for health, ecology, quality of life and agricultural production.

1.14 Those affected by contact with wastewater in the ZMVM are mainly inhabitants of irrigation districts in the Mezquital Valley in the State of Hidalgo. This means some 400,000 people in direct or indirect contact with sewage, as well as large population segments

in the ZMVM living alongside open sewers (see Annex II-4). Indirectly, the entire population of the ZMVM is affected by the risk of consuming contaminated food entering city markets from irrigation districts.

1.15 The Government of Mexico has expressed concern over the health problems associated with contact with wastewater and its use for irrigation, not only at the local project level but nationwide. About 35% of wastewater is currently being used for irrigation in Mexico. This also affects the country's image in the context of economic integration with regional trading blocs such as NAFTA. Comparative studies conducted in the irrigation districts receiving ZMVM wastewater show a high incidence of disease through contact. These studies also show that the incidence of water-borne diseases is higher in children, and that it has an adverse impact on normal development and growth, affecting their future physical and mental capacity. The population concerned is the third most disadvantaged population group in the country, despite its location just 70 km from the capital.

1.16 In addition to the specific public health problem, which is of utmost concern to the country's health authorities, current conditions have shaped a degrading environment owing to the pestilence and the eyesore of open sewers running through both urban and rural areas. Aquatic life has either vanished or is in the process of doing so in the area's rivers and lagoons.

1.17 In the irrigation districts, ZMVM wastewater is used to irrigate about 90,000 h. Producers see the wastewater as a source of organic material and an economic good that enables them to maintain a certain productivity and thus save on fertilizers. The producers feel that they are entitled to these waters and have organized themselves to manage and maintain a complex system of irrigation ditches to this end. In 1992, after the cholera epidemic, the government limited production in these districts to two crops: corn and alfalfa. In time, this generated discontent among farmers, who began to sow illegal crops (vegetables) despite the restrictions. The farmers' main concern is that the water they receive after treatment meet quality standards so that crop restrictions can be lifted while maintaining nutrient levels that will ensure adequate crop yields.

1.18 The water pollution problem is attributable not only to wastewater but also to industrial effluents, which affect human health and farm production. There are other factors affecting water quality, such as inadequate disposal of solid wastes that reach the drainage system by surface runoff. Although the use of wastewater has boosted crop yields under irrigation, concentrations of heavy metals and long-lived organic contaminants in the soil and surface layers are being transferred to crops.

C. Institutional and resource management problems

1.19 In addition to the historic, physical, social and economic factors that have contributed to the problems noted, institutional and administrative management considerations have caused or exacerbated those factors. Diagnostic studies (Annex I-2) aim to identify: (i) institutional inefficiencies at the administrative, technical and financial levels; (ii) inadequate tariff policies; and (iii) weaknesses in regulations and legislation on water quality and environmental quality control. These factors have been widely recognized and the government has undertaken commitments under this program to make significant progress on solving these problems. Specifically, the memorandum of understanding (Annex I-1) sets forth the guidelines to be followed in seeking a sustainable use of water resources grounded in a strategy for comprehensive long-range resource management, including water supply and wastewater drainage and treatment.

1. Institutional considerations

1.20 The institutional setting for water resource management is governed by the National Water Act of 1992 and the Federal Tariffs Act of 1991. The former establishes federal ownership of national waters and authorizes their use under concessions granted to private entities or assignment to public agencies. The act also governs permits issued for wastewater discharge, which are required to be entered in the public water rights register. The latter act establishes the fiscal regime governing water resources by setting charges for their use.

1.21 Federal institutions having a direct influence on water resource management are: (i) the Ministry of Finance (SHCP), through project programming and the annual investment budget and transfers of funds and subsidies; (ii) BANOBRAS, as the government's financial agent; (iii) the Ministry of the Environment, Natural Resources and Fisheries (SEMARNAP), which is responsible for water resource regulation and policy; (iv) the National Ecology Institute (INE), which sets discharge standards; and (v) the National Water Commission (CNA), which is responsible for proposing national water policy and enforcing standards on discharge into natural bodies of water. Also, the Mexican Water Technology institute (IMTA) carries out training and research programs and accredits the quality of equipment and materials used in the sector.

1.22 Three major agencies are active in the State of Mexico: the Ministry of Urban Development and Public Works (SDUOP), the State Water and Sanitation Commission (CEAS), and the Department of Ecology. The SDUOP is responsible for state policy and programs and builds, operates and maintains public works through its Water Infrastructure Undersecretariat. It also supports modernization and efficient management of municipal operating agencies. The Department of Ecology is responsible for control of discharges into

the sewer system. The CEAS of the State of Mexico is a decentralized agency that nevertheless falls under SDUOP guidelines. The CEAS receives block water from the Cutzamala system operated by the CNA and distributes it wholesale to municipal operators. The 18 municipalities are responsible for providing water, sewer and water treatment services, either directly or through municipal operators.

1.23 In the Federal District, the Water Works and Operations Directorate (DGCOH) is in charge of overall operations for water, sewer, and water treatment services. The Federal District Water Commission (CADF) is responsible for maintaining inventories, individual metering, and billing and collections. Although the individual metering and marketing functions for the Federal District are incumbent on the CADF, billing and collections are regulated and supervised by the Finance Department of the Federal District. The Federal District Department of the Environment is responsible for controlling discharges into the sewer system.

2. Tariff policy and administration

1.24 Although the Tariffs Act contains guidelines on tariff collection, one of the main problems in resource management is that Mexico has not had tariffs per se but rather payment of fixed water rates unlinked to water consumption. Each state has specific laws governing service delivery, which may deviate from the Water Act and the Tariffs Act. In the case of the Federal District, draft legislation exists which is compatible with federal laws. Tariffs are subject to approval by the House of Representatives. Provisions in the State of Mexico, however, differ from federal legislation in that service may not be discontinued under any circumstances, although the volume of water provided may be reduced, and tariffs do not provide for debt service or cost recovery. Moreover, the tariffs are fiscal in nature and are approved by the state Congress rather than set by the operator.

1.25 The question of tariffs and financial sustainability is directly related to system efficiency. An efficient system requires lower tariffs than a system operated inefficiently. At present, tariff revenues in the Federal District and State of Mexico are not sufficient to cover system operating and maintenance costs, and financial deficits are considerable. This is not attributable to tariff levels alone, however, but rather to inefficiency in system operations. The tariffs in effect in the Federal District are considered high enough (at US$0.504 per m^3) by comparison with other countries. The system is operating at overall efficiency of just 28.5%, only 34.2% of water produced in billed, and only 68.6% of billings is collected. Under these circumstances it is quite difficult to operate on a self-sustaining basis; the tariff increases required would be above the consumer's ability to pay. If the Federal District raises its efficiency to 55%, it could

recover its operating expenses without any tariff increase. Any further improvement would enable investment costs to be recovered.

1.26 The situation in the State of Mexico is similar, although average tariffs are lower (at US$0.243 per m^3) and there are significant differences between individual tariffs charged by each operator. The operators run deficits and require state subsidies to finance their operations. The system's overall efficiency is 35.4% and 50.9% of water produced is billed. Under current conditions, the State of Mexico could recover its operating and maintenance costs if it raises overall efficiency to 80%. That is an unattainable goal in the operating conditions prevailing, however, and tariff increases are required in the State of Mexico (see paragraphs 3.27 and 4.22).

3. Wastewater quality standards

1.27 In late 1995, the INE published 44 Mexican official standards governing discharge of wastewater, all of which apply at the source rather than in receiving bodies. These standards take into account neither the cost of enforcement nor socioeconomic impact and benefits. Some of the parameters established were stricter than those imposed in the United States and other industrialized countries, stricter in some cases than those applicable to drinking water. The standards did not take into account the type of body receiving the wastewater, and were unenforceable within the deadlines stipulated since they did not provided for gradual implementation. This situation has been addressed with the new quality standards described below.

D. Progress on solving institutional, financial and regulatory problems

1.28 The National Development Plan sets forth guidelines consolidating planning and financing schemes that could rationalize investment in the sector. Also, for the area of influence of the program under consideration, the SHCP has agreed upon action plans for the Federal District and operators in the State of Mexico with a view to boosting their operating, business and financial efficiency. Annex II-2, available in the project technical files, contains a description of the plans. The action plan for the State of Mexico, which is described in Annex II-2, is financed by the State of Mexico itself, as specified in the support and cooperation agreement. In the case of the Federal District, financing is considered part of CADF and DGCOH expenditure.

1.29 The memorandum of understanding annexed hereto sets forth a strategy and concrete objectives to support modernization and decentralization, especially in matters of business and financial efficiency, to ensure that water use is assigned a real economic value, that investment projects are financially self-sustaining, and that states and operating agencies are weaned from government

subsidies. Naturally, given current political and social conditions, this would take place gradually under a plan to strengthen operating agencies that would be supported by this program.

1.30 The DGCOH and CADF in the Federal District have put forward a new strategy for managing water resources, and have begun to take concrete steps to update service delivery. As part of a streamlining initiative, the 16 city delegations forming the district were divided into four groups of four delegations each. Each group was awarded under a 10-year contract to a different private company to act on behalf of the CADF. The companies took on these responsibilities in three stages: (i) development of metering infrastructure, including updating the roster of users, installing meters, and updating water system inventories; (ii) operation of the business system, from reading meters to meter-based billing and collection of the applicable rate; (iii) operation, maintenance and rehabilitation of networks. Progress on the first stage has been quite remarkable and approaches 100%. The exception is installing meters, now at 45%; this will be completed at the end of 1997. These activities are being carried out in stages, and are expected to be complete within two or three years.

1.31 Another important step has to do with approving new water quality standards, drafted for the first time following broad-based consultations and rigorously reflecting technical, environmental and economic considerations. The 44 standards previously in effect were replaced by three: (i) NOM-ECOL 001/96, setting maximum permissible limits on pollutants in wastewater discharged into nationally-owned receiving bodies, in order to protect their quality and facilitate their use; (ii) NOM-ECOL 002/96, setting maximum permissible limits on pollutants in wastewater, except for household wastewater, discharged into urban sewer and drainage systems; and (iii) NOM-ECOL-003/96, setting maximum permissible limits on treated water reused by public utilities. Copies of these standards are available in the project technical files. NOM-ECOL-001/96 in particular has a direct impact on the project, as it defines the quality of wastewater needed to protect the health of agricultural workers coming into contact with them, and of those consuming farm products from areas irrigated with wastewater.

1.32 The deadline for compliance with standards on wastewater is gradual and by population intervals. These standards are technically and environmentally feasible given efficiency in removing pollutants by different treatment processes, and facilitate a control policy based on water use. They are also economically rational, since they apply to the receiving body and take into effect the impact of treatment costs on the finances of operating agencies, industries and end users, and allow for gradual progress with objective, realistic goals to be reached at specified times.

E. Conceptualization of the Mexico Valley sanitation program

1.33 In view of the issues described, the Government of Mexico has designed a long-range strategy for the water sector. The first stage of that strategy consists of conceptualizing an integrated sanitation program for the Mexico Valley. The aim is, firstly, to put in place an institutional and financial framework for efficient water use under which priority physical investments would take place. The institutional and financial changes must be part of a politically feasible process and governed by clear interagency agreements and commitments, as stated in the memorandum of understanding.

1.34 The government visualizes a process whereby water operators would become financially self-sustaining and efficient. This would mean having a framework fostering private-sector participation in service delivery, and rationalizing the use of water resources through tariffs that reflect their true economic value. One effective incentive called for under the memorandum of understanding to encourage compliance with business and operating efficiency targets in the State of Mexico and the Federal District is to make federal transfers and subsidies to both conditional on compliance with the support and cooperation agreements, and to make transfers from the State of Mexico to the regional municipalities conditional on compliance with the technical assistance and cooperation agreements. The operating and business efficiency indexes and tariff increases are set in action plans agreed upon by the Federation, the Federal District and the State of Mexico, giving rise to the aforesaid agreements.

1.35 The program proposed herein calls for specific investments in two priority areas: (i) rehabilitation of the ZMVM drainage system; and (ii) wastewater treatment. The program would also support implementation of the action plan and monitor compliance with the agreements established in the memorandum of understanding with respect to operating and business efficiency. Additional activities would also be financed in order to meet the objectives.

1.36 Rehabilitation of the drainage system is a priority given the imminent danger of flooding, and is described in the master drainage plan for the ZMVM to the year 2010. Although the DGCOH is carrying out works projects called for under the plan, additional financing is required for the more urgent projects.

1.37 Treatment of ZMVM wastewater is also very important, as a corner-stone of the country's public health strategy. It is needed to break the cycle of water-borne disease and move toward compliance with the new water quality standards, and will affect the people's well-being, the environment generally, and Mexico's image and position in international integration and trade agreements. In the specific case of the ZMVM, the government considers it unacceptable that the national capital is dumping untreated sewage into one of

the country's most disadvantaged regions. It is therefore viewed as important that, in addition to treating wastewater as a responsibility of ZMVM inhabitants, the State of Hidalgo and its irrigation district be supported in improving local sanitation systems.

1.38 Compliance with NOM-ECOL 001/96 (which establishes quality levels needed to protect the health of farm workers and consumers) could be achieved through advanced primary treatment. This would allow pathogens to be eliminated and crop restrictions to be lifted, while maintaining most of the nutrients for irrigation upon which the district's farmers depend, as planned by the CNA. Moreover, the solutions would be intended to permit more advanced treatment levels in the future in line with different uses for treated water (industrial, replenishment of aquifers, etc.).

1.39 The government has requested financial support from the Bank for rehabilitation of the drainage system. For wastewater treatment, the government has received a formal offer of support from the Government of Japan, and the private sector is expected to take part in plant design, construction, operation and maintenance under a single contract for each plant (DBOM). These two investments, together with actions to boost sector efficiency, are a direct objective of the program proposed and analyzed herein. Consideration would be given in future to financing water supply investments identified in the long-range strategy, with funds from either the Bank or other institutions, including a significant private-sector contribution.

F. Logical framework

1.40 As part of the program identification and preparation process, a problem tree, stakeholder analysis and logical framework were developed in Mexico City in conjunction with the institutions concerned. The results are presented in Annex I-2.

G. Participation in the sector by other multilaterals

1.41 The World Bank is conducting two operations: (i) stage II of a water and sanitation sector project providing continued support to BANOBRAS, the CNA, the IMTA, and the municipal or autonomous water and sanitation enterprises in decentralizing the sector and in developing and implementing standards on discharge, laboratory certification and training; (ii) a water resource management project, being executed by the CNA and the IMTA, for institutional and technological development, improvements to water quantity and quality monitoring and administration systems and information systems, and water resource planning.

H. IDB experience in the sector

1.42 In the past two decades, the Bank has supported development of this sector through various operations, principally water supply and sewerage projects. During that period, the Bank has financed projects to increase water supply in Mexico City (Cutzamala project); to expand water supply and sewerage systems in Tijuana; to execute four stages of the project to expand the water supply, sewerage and wastewater treatment project for metropolitan Monterrey; and has cofinanced, with the World Bank, the National Water and Sewerage Program (see Annex I-3 in the project technical files for a detailed list).

1.43 The Cutzamala project deserves special mention. In April 1980, the Bank granted a loan for US$170 million for execution of a project to increase the supply of drinking water to metropolitan Mexico City by 11 m^3/s. That project was completed satisfactorily, though with delays owing mainly to local counterpart problems. A series of contract conditions were established with a view to achieving, over time, sustainable development and management of water resources. All the agreements were performed except for those relating to loss detection and correction, measurement of consumption, and tariff studies. However, the district authorities are aware of the situation and have already initiated a series of actions to achieve sustainable management of water resources over the long term, as indicated in paragraph 1.30.

1.44 In connection with the Bank's work in the sector, the following lessons have been learned: (i) operations should be designed in the context of a long-term action plan to achieve sustainable water resource management. Accordingly, realistic and quantifiable goals should be set within the execution period to make gradual improvements in operating, business and technical efficiency in water resource management; (ii) the huge investments needed for projects in this sector necessitate seeking other sources of financing in parallel to Bank participation; (iii) timely allocation of counterpart funds helps streamline project execution; (iv) decentralization and private-sector participation play an important role in sector development, so the Bank's actions should continue to support such initiatives.

I. Consistency with the Bank's strategy

1.45 This program falls within the Bank's strategy for the 1996-1997 period as set forth in the programming paper approved in December 1995. In particular, it is consistent with one of the strategy's objectives, which is to foster sustainable growth by financing water and sewerage and sanitation operations. This sanitation program for the Mexico Valley is part of a long-range strategy designed by the SHCP with an eye to achieving sustainable water resource management in the ZMVM.

1.46 The operation of water treatment plants by the private sector upholds the government's intention to eliminate subsidies on delivery of these services and to reduce system operating deficits and thus cut fiscal spending. The investments to be financed through this program will have a significant social and environmental impact consistent with the Eighth Replenishment mandate. Moreover, the program actions are consistent with the objective of improving efficiency in the delivery of water and sanitation services and promoting modernization through greater private-sector participation.

J. Public information

1.47 The support and cooperation agreements contain a provision whereby the State of Mexico and the Federal District, as part of their public information and consumer awareness campaigns, will publicize information each year on changes registered in the efficiency of operating agencies as a result of program execution. In this same spirit, they will inform the public each year for a period of five years, once the treatment plants have been built and calibrated, as to the water quality parameters obtained through program execution. Clause 4.07(c) of the loan contract for the present operation reflects the latter provision.

II. THE PROGRAM

A. General objectives

2.1 In view of the issues described in chapter I (frame of reference), the program is designed to address both health and environmental objectives, and institutional and financial management objectives.

2.2 The health and environmental objectives are to: (i) reduce recurrent flooding and the danger of catastrophic flooding in Mexico City and metropolitan area; (ii) gradually reverse water pollution in hydrological basins and subbasins by raising the quality of water flowing from the Mexico Valley to the State of Hidalgo and enforcing NOM-ECOL 001/96. Achieving this objective will help improve health conditions for people living in the program area, particularly those living in irrigation districts in the States of Mexico and Hidalgo who use untreated wastewater from metropolitan Mexico City, and improve the health of those consuming products from those districts.

2.3 The institutional and financial management objectives are to boost the efficiency of entities providing water and sanitation services in the Federal District and regional municipalities in the State of Mexico which form part of the ZMVM, through the performance of support and cooperation agreements signed by the Federal Government with the Federal District and the State of Mexico, and of technical assistance and cooperation agreements between the State of Mexico and the 18 regional municipalities.

2.4 In order to achieve the health and environmental objectives, the program calls for two investment projects: (i) expansion and rehabilitation of macrodrainage infrastructure; and (ii) treatment of wastewater from the ZMVM. To secure the benefits derived from wastewater treatment, the program also includes the supplementary actions described in paragraph 2.13. To support the institutional and financial management objectives, the program will finance implementation and monitoring of action plans and of support and cooperation agreements by the SHCP. Annex II-2 in the project technical files presents the action plans for the State of Mexico and the Federal District, which give rise to the support and cooperation agreements between the Federal Government and the State of Mexico and Federal District, and technical assistance and cooperation agreements between the State of Mexico and operating agencies in the regional area, as provided for in the memorandum of understanding (Annex I-1).

B. Targets

2.5 Upon completion of the macrodrainage project, the operating system will have been overhauled and be operating properly, and progress

will have been made on implementing the master drainage plan. This will solve the main problem, which is to reduce the risk of catastrophic flooding, by giving the macrodrainage system capacity to properly remove the volume of water generated by heavy rains with a recurrence interval of 100 years for major hidraulic structures. The works will increase the system's regulatory capacity by 5.5 million m^3, or 50% over current capacity. The main channel will be restored to its original conveyance capacity, which it had lost through differential soil collapse, and the central channel could be maintained and repaired during low water periods.

2.6 The four water treatment plants planned under the program would have total installed capacity of 74.5 m^3/s producing effluent between primary and secondary treatment, with 60% would be wastewater base flow through the three macrodrainage conduits, and the remainder combined wastewater and storm water from the drainage system. The proposed treatment is expected to reduce pathogens and fecal coliform levels. The aim is to lift restrictions placed on irrigation water use by the authorities and contribute to compliance with NOM-ECOL-0001/96. Installed treatment capacity will make a substantial contribution to achieving the aim of treating two thirds of all wastewater nation-wide.

2.7 Performance of the agreements will bring about modernization and greater operating, business, institutional and financial efficiency at water system operating agencies (Federal District and 18 municipalities in State of Mexico). This would support achievement of the goals set by the Federal District, the 18 municipalities and the SHCP, as set out in the agreements signed (see paragraph 3.19 and 3.21). The overall goals are to increase overall (physical and business) efficiency from 35.4% to 51.4% for the State of Mexico and from 28.5% to 49.8% for the Federal District by the end of five years (year 2001) (see paragraphs 3.27 and 3.24). Fulfillment of the short-term commitments will be contractually linked during the five years of program execution.

2.8 Controlling industrial discharges will reduce concentrations of heavy metals and organic compounds in wastewater that have an adverse impact on the 90,000 ha of farmland under irrigation. In the Federal District, 1,500 industries would be monitored for such discharges. In the State of Mexico, a number of industries responsible for 80% of such discharges will be identified and monitored. The environmental health plan and the health and environmental education programs would benefit an estimated 400,000 people in the irrigation districts.

C. Program description

2.9 To achieve the objectives and goals set, the program calls for the projects and activities oulined below:

1. ZMVM macrodrainage system rehabilitation and expansion project

2.10 This project, to be financed by the Bank, includes priority trunk works under the ZMVM drainage master plan. The project consists of the construction, expansion and/or rehabilitation of the following components: (i) construction of the Los Remedios river interceptor; (ii) general drainage interceptor for the Mexico Valley; (iii) western channel II; (iv) straightening of Los Remedios river; (v) straightening of general channel for the Mexico Valley; (vi) straightening of western channel; (vii) Casa Colorada and Texcoco Norte pumping stations; (viii) Casa Colorada regulating reservoir; and (ix) El Fusible regulating reservoir and desisting of Churubusco Lake and Horaria regulating reservoir. Annex II-I in the project technical files includes a more detailed description of the macrodrainage project component.

2. Water treatment plants project

2.11 This project is to be financed by the OECF of Japan, for design, construction and operation under a single contract for each of the plants: (i) Texcoco Norte, for runoff from the main drainage channel (44 m^3/s); (ii) Coyotepec, for runoff from the western channel (15 m^3/s); (iii) El Salto, for runoff from the deep central channel (15 m^3/s); (iv) Nextlalpan (0.5 m^3/s), to treat discharge into the main channel from neighboring areas.

3. Support for implementation and monitoring of action plans, support and cooperation agreements, and technical assistance and cooperation agreements (US$5.7 million)

2.12 An overall amount will be made available to the Ministry of Finance to conduct evaluations, studies, advisory assistance and follow-up on efficiency indicators agreed to by the Federal District and State of Mexico in their support and cooperation agreements, and by the 18 regional municipalities in their technical assistance and cooperation agreements.

4. Supplementary actions

2.13 These include: (i) an environmental plan consisting of (a) an industrial discharge control program; (b) an environmental health program for those living in the project area of influence; (c) water quality prediction models (development, calibration and verification) for the El Salto and Tula rivers, Zumpango Lagoon, tributaries and the Endhó reservoir; (d) feasibility study on reuse of sludge produced by water treatment plants, with an experimental plant and field, laboratory and office procedures; and (e) monitoring and control of water quality in receiving bodies and irrigation ditches, and soil quality (see Annex II-3 in the project technical files); and (ii) preinvestment studies to overhaul rainwater regulating reservoirs already built and install control

instruments and to determine alternatives for replenishing aquifers in western ZMVM.

D. Project scale

1. Macrodrainage project

2.14 In establishing the scale of the macrodrainage project components, parameters taken into account were the intensity and frequency of the events to be monitored, following the guidelines of the master plan for drainage in the ZMVM (1994-2000) and the priorities set by the DGCOH. The drainage system works are being carried out in accordance with the DGCOH annual budget, which is approved up to the established limits by the Ministry of Finance (SHCP).

2.15 Each of the components of this project were scaled by means of alternative studies and modelling, following generally accepted engineering practices applied in hydrology, hydraulics, sanitation, geology, soil mechanics, structures, and electromechanical installations. The executive drawings, some finished and others to be completed by the end of 1996, have been drawn up on the basis of the findings of alternative studies.

2. Treatment plants project

2.16 In scaling the water treatment plants, the CNA has taken into account prevailing regulations (NOM-ECOL 001/96) and the possibility of future amendments involving stricter quality parameters. The plants to be constructed would produce effluent between a primary and a secondary biological system. The CNA proposes that all base flows of wastewater and part of the combined flow with storm water be treated. The plants would use 40% of their total capacity to treat surplus combined flows including storm water from the drainage system.

2.17 The CNA evaluated operations and processes in the laboratory and on a pilot plant. As a result, it proposes advanced primary treatment with filtration of base effluent. The contractor to which the contract is awarded to design, build, operate, and maintain (DBOM) each plant should perform evaluations of experimental size modules to confirm the design criteria and efficiency of its proposal and make any applicable adjustments to the amount thereof.

2.18 If in the future, for reasons not now foreseeable, prevailing regulations on wastewater quality should be amended, the proposed installations could be converted to secondary biological treatment plants. The exception is the El Salto plant, which would not be efficient since it is to operate about 50% of the time, during the rainy season, unless the down time is changed, possibly by combining its operations with those of the Coyotepec plant, the drainage system operations and the maintenance period for the central channel.

E. Cost and financing

2.19 The total program cost is US$1,035 million equivalent. This amount includes engineering and administration, direct costs, the action plan, supplementary actions, associated costs, contingencies, escalation, and finance charges.

2.20 Below is a table summarizing the estimated program costs, with a breakdown of investment categories and subcategories and sources of financing.

ESTIMATED PROGRAM COST (US$000s)					
INVESTMENT CATEGORIES	**IDB-OC**	**OECF**	**LOCAL**	**TOTAL**	**%**
1. ENGINEERING AND ADMINISTRATION	**16,198**	**19,030**	**9,510**	**44,738**	**4.3**
1.1 Engineering	-	-	1,926	1,926	0.1
1.2 General coordination and supervision	16,198	19,030	7,584	42,812	4.2
2. DIRECT COSTS	**268,715**	**317,123**	**87,877**	**673,715**	**65.0**
2.1 Macrodrainage systems	268,715	-	40,308	309,023	29.0
2.2 Treatment plants	-	317,123	47,569	364,692	35.2
3. SUPPORT FOR IMPLEMENTATION AND MONITORING OF ACTION PLANS, SUPPORT AND COOPERATION AGREEMENTS, AND TECHNICAL ASSISTANCE AND COOPERATION AGREEMENTS	**5,000**	**-**	**750**	**5,750**	**0.5**
4. SUPPLEMENTARY ACTIONS	**22,620**	**-**	**3,380**	**26,000**	**2.5**
4.1 Environmental subprogram	15,660	-	2,340	18,000	1.7
4.2 Preinvestments	6,960	-	1,040	8,000	0.8
5. ASSOCIATED COSTS	**-**	**-**	**9,660**	**9,660**	**0.9**
5.1 Land and easements	-	-	9,660	9,660	0.9
6. UNALLOCATED	**48,817**	**73,847**	**21,345**	**144,009**	**13.9**
6.1 Contingencies	30,873	49,915	14,966	95,754	9.2
6.2 Cost escalation	17,944	23,932	6,379	48,255	4.7
7. FINANCE CHARGES	**3,650**	**-**	**127,478**	**131,128**	**12.7**
7.1 Interest	-	-	120,929	120,929	11.7
7.2 Credit fee	-	-	6,549	6,549	0.7
7.3 Inspection and supervision	3,650	-	-	3,650	0.3
TOTAL	**365,000**	**410,000**	**260,000**	**1,035,000**	**100.0**
%	**35.3**	**39.6**	**25.1**	**100.0**	**—**

F. Criteria for estimating direct costs

1. Macrodrainage project

2.21 These costs were calculated on the basis of the Ministry of Public Works catalogue of unit prices, which is continually updated. The

metric computations are for scaling at the level of completed executive drawings and an advanced stage of preparation. Weighted progress on preparation of executive drawings at this writing was 63%. The DGCOH expects all executive drawings to be completed by December 1996. The budget includes 10% for contingencies to offset any cost fluctuations.

2. Treatment plants project

2.22 The base costs estimated by the CNA for the treatment plants are indicative for advanced primary treatment with effluent filtration and disinfection. The costs are those of the alternative proposed by the CNA. However, bidding is open to any technology for the Texcoco Norte, Coyotepec and Nextlalpan plants using, *inter alia*, the criterion of expected effluent quality. For the El Salto plant, the CNA will establish the most appropriate technology given that it will operate only in the rainy season. Variations in the indicative cost are to be expected in proposals, given the type of contract (DBOM) for design (including filtration of primary effluents whose use in non-experimental plants is limited), construction, operation and maintenance. The budget includes 15% for contingencies to offset any cost fluctuations.

G. Use of financial resources

2.23 The following paragraphs detail the use of the program funds, by investment category, according to the detailed cost table in Annex II-1 (available in the project technical files).

1. Engineering and administration (US$44.7 million)

2.24 This category, representing 4.3% of total program cost, consists of the following subcategories:

a. Engineering (US$1.9 million). These funds would be used to hire specialized consulting services to complete preparation of executive drawings for the surface and deep macrodrainage system.

b. General coordination and supervision (US$42.8 million). These activities will be carried out through consulting services for: (a) general coordination of drainage project execution (US$2.3 million); and (b) contract supervision and administration of drainage project (US$18.6 million) and treatment plants project (US$21.9 million). Supervision and administration of contracts for works construction and installation of electrical, mechanical and monitoring equipment for the projects will include, *inter alia*: technical advisory assistance, review of detail engineering, verification of metric computations, payroll, and final acceptance of the works altogether until acceptance testing has been done and they have

been operating satisfactorily for an initial period covered by the contractor's warranty (at least 18 months).

2. Direct costs (US$673.7 million)

2.25 This category accounts for 65% of total program cost. The funds allocated would be used to finance construction of microdrainage projects and water treatment plants, including, *inter alia*, to full and satisfactory execution: detail engineering, civil works, electromechanical equipment, monitoring and measuring systems, materials, external adjustments to installations, access and final testing for works constructed and equipment installed.

3. Macrodrainage system (US$309 million)

2.26 The 10 subprojects financed include priority works for the ZMVM surface and deep system.

4. Water treatment plants (US$364.7 million)

2.27 Four plants would be financed to treat wastewater and a portion of combined wastewater and storm water.

5. Support for implementation and monitoring of action plans, support and cooperation agreements, and technical assistance and cooperation agreements (US$5.7 million)

2.28 Consulting firms and individual consultants would be financed to monitor compliance with strengthening actions under the agreements and action plans in the areas of operating, business and financial efficiency.

6. Supplementary actions (US$26 million)

2.29 The funds allocated, accounting for 2.5% of the program cost, would finance an environmental plan (US$18 million) for an industrial discharge control program, an environmental health plan in areas affected by wastewater in the program area, water quality prediction models (development, calibration and verification) in bodies of water receiving effluents from treatment plants, feasibility studies for reuse at an experimental plant of sludge produced by treatment plants, and field, laboratory and office procedures, water quality monitoring and control in receiving bodies and irrigation ditches and soil quality, and preinvestment studies for rehabilitation of stormwater regulating reservoirs and installation of control instruments and determination of alternatives for recharging aquifers in the western ZMVM (US$8 million).

7. Associated costs (US$9.7 million)

2.30 The funds allocated for this category, accounting for 0.9% of total program cost, would be used to finance the purchase of land for works construction.

8. Unallocated (US$144 million)

2.31 This category, which includes contingencies and cost escalation, represents 13.9% of the total program cost. Contingencies were estimated at 10% of net investment costs, except for the treatment plants, where 15% was used. Escalation was calculated for the program execution period, according to Bank practice.

9. Finance charges (US$131.1 million)

2.32 Finance charges during program execution, accounting for 12.7% of total cost, were calculated according to the terms and conditions agreed upon for the IDB and OECF loans. Interest is US$120.9 million, the credit fee on undisbursed balances US$6.5 million, and the inspection and supervision fund US$3.65 million.

H. Financing proposal

	IDB	OECF	LOCAL
Amount (millions):	US$365	US$410	US$260
% of cost	35.3	39.6	25.1
Fund	OC		
Amortization period	20 years	25 years	
Disbursement period	5 years	5 years	
Grace period	5 years	7 years	
Interest	variable	4%	
Credit fee (%)	0.75	0.1	
Inspection and supervision (%)	1	-	

III. THE BORROWER, EXECUTING AGENCY AND PROGRAM EXECUTION

A. The borrower

3.1 The borrower will be the Banco Nacional de Obras y Servicios Públicos (BANOBRAS), the government's financial agent, which will be backed by a guarantee from the United Mexican States. BANOBRAS has been a Bank borrower in many projects and is governed by its Charter of January 28, 1986.

B. The executing agencies

3.2 The executing agencies will be BANOBRAS, which will act as trustee of the trust for financial administration of the program, and the Comisión Nacional de Aguas (CNA), which will act as technical coordinator and supervisor of program works and services. Both institutions are eminently qualified and have extensive experience in the roles they will play in program execution. Annex III-3 in the project technical files gives a more detailed description of BANOBRAS and the CNA.

C. Program execution

3.3 The program will be executed by the two institutions through a series of legal instruments. BANOBRAS will act as trustee and will be responsible for financial administration of the program and for contracting works and services through a trust set up for that purpose, into which all the program funds will be deposited. The CNA will be delegated authority by the Federal District and the State of Mexico to act as technical coordinator and supervisor of execution. The works will be built by private companies contracted on the basis of competitive bidding.

3.4 The following instruments will be needed under this plan:

a. A Memorandum of Understanding between the Federal Government, the SHCP, the CNA, the State of Mexico, and the Federal District, which will serve as the overall frame of reference for the objectives, conditions, obligations, and execution of the program.

b. Instruments from the Federal District and the State of Mexico delegating authority to BANOBRAS to act as trustee, and instruments from the same entities delegating authority to the CNA to act as coordinator and supervisor of program execution.

c. Trust contract between the SCHP, the Federal District, the State of Mexico, and BANOBRAS for financial administration of the program.

d. Support and cooperation agreements between the Federal Government and the Federal District, and between the former and the State of Mexico, stipulating the efficiency targets and the conditions that will apply in the event of failure to comply with obligations.

e. Technical assistance and cooperation agreements between the State of Mexico and each of the 18 municipal operators, stipulating improvements in efficiency, coinciding with the support and cooperation agreement between the Federal Government and the State of Mexico.

3.5 Separate contacts will also be signed between BANOBRAS and the Federal District and BANOBRAS and the state for the transfer of program funds.

D. Financial administration – trust contract

3.6 For the financial administration and execution of the program, taking a long-range metropolitan approach, a trust fund will be set up for the deposit of: (i) the funds from the two loans (IDB and OECF) and the counterpart for program investments which will be used to pay the different contractors; (ii) the funds contributed by the Federal District and the State of Mexico for operation and maintenance of program works; and (iii) the funds necessary to repay the debt and interest to BANOBRAS, which will be provided by the District and the State. Consequently, the trust will have an indefinite duration, at least until the debt is repaid. Entry into effect of the trust contract is a contractual condition.

3.7 The purposes of the trust are: (i) to manage the funds and make payments for the construction, operation and maintenance of the works, and to repay the debt; (ii) to contract construction of works and services on behalf of the Federal District and the State; and (iii) to procure the moveable and immovable goods required for the program works.

3.8 The trust fund will be managed by a technical committee chaired by the CNA and composed of two representatives from the State of Mexico, two from the Federal District, two from the SHCP and two from the CNA, who will have voting rights. BANOBRAS will send one representative who will not have the right to vote. The powers of the committee are, *inter alia*: (i) to approve the bid documents and awards for investment projects and operation, and maintenance for the project works; (ii) to authorize the procurement of movable and immovable goods; (iii) to approve professional services contracts; (iv) to approve the program's investment, operating, and maintenance budgets; and (v) to assess and approve the company (companies) engaged to supervise the works.

3.9 The technical committee will use the CNA as its agent and technical coordinator, which will review and approve all the contracts to be

awarded for works and services and deal with consultations submitted to the committee.

E. Operations administration and coordination

3.10 The CNA set up an office in December 1995 known as the Management Office of the Water Supply and Sanitation Project for the Valley of Mexico Metropolitan Area, to take charge of program coordination and operations administration. This office currently has a staff of 30, mainly professionals with many years of experience in areas and procedures similar to those required for adequate program execution. It also has an approved budget for sufficient additional staff, who will be hired according to program needs and progress.

3.11 The office has a division for administration, one for social development to deal with land purchases and compensation, one for the Valley of Mexico sanitation program, and three for works related to water supply.

3.12 The division in charge of the proposed program is divided into two areas: (i) treatment plant works; and (ii) drainage works. Its functions are: to draw up terms of reference and bid calls for the works, evaluate the proposals submitted by companies, prepare opinions on awards, present the results of the bids to the technical committee with its recommendations, negotiate with the owners of the properties on which the works are to be built, and submit progress reports on the program to the trust's technical committee. Generally speaking, the CNA together with the trust (BANOBRAS) will conduct all bid and award proceedings. However, the trust will be responsible for contracting.

3.13 The treatment plants will be designed, built, and operated by private companies, supervised by a coordination/supervisory company which will also be responsible for recommending contract awards to the CNA, reviewing designs for the plants, supervising construction, reporting on progress to the CNA, presenting technical and financial reports, and monitoring the operation of the plants for 18 months after construction.

3.14 Four supervisory companies will be contracted to oversee construction of the drainage works, each of which will supervise a group of construction contracts in accordance with CNA plans (see Annexes III-2 and III-2.1). These companies, in turn, will be coordinated and supervised by a specialized firm, which will act as coordinating consultant and be responsible for advising the CNA on the terms of reference for bids and technical proposals, and providing any other technical advice that the CNA may require for presentation of its recommendations to the trust's technical committee.

3.15 The activities included in the environmental plan will be coordinated by the CNA. For the environmental health program, the water quality prediction models and the feasibility studies for reuse of sludge produced by treatment plants, the executing agency asked the Bank to grant a waiver to enable it to contract the services of the National Public Health Institute, the Engineering Institute of the National Autonomous University, and the College of Postgraduate Studies in Agriculture. These institutions are recognized internationally and have several years' experience in the irrigation districts in the program area. Since these activities will be separate from the regular work of the institutions, the cost of the components has been included in the program budget.

F. Financial conditions and obligations of the Federal District and the State of Mexico

3.16 The loan proceeds will be transferred by BANOBRAS to the Federal District and the State as credits, under the same conditions as they were provided. The district will be responsible for repaying 60% of the loans and the state will repay 40%, which will be done through the trust fund as described earlier.

3.17 The local counterpart for the program will be provided by the Federal District and the State in the same percentages as the loan. However, the Mexican government will pay the State's contribution through the CNA's budget.

3.18 To ensure that the contributions required by the trust fund are available (for operating and maintenance costs and repayment of the debt), two revolving stand-by lines of credit will be opened (one for the District and the other for the State). In the event that either of the two fail to make the necessary deposits to the trust, BANOBRAS may use these lines of credit, which are to be replenished by the district and the State within a maximum of 180 days. Should that not be done, BANOBRAS will be empowered to retain the equivalent funds from federal transfers to the lower levels of government. This condition has been established in the support and cooperation agreements already signed, and in the contracts for transfer of loan proceeds.

3.19 The Federal Government will provide the local counterpart for the State of Mexico on the condition that the latter complies with the support and cooperation agreement with the government that sets out targets for improvements in technical and financial efficiency indicators and rate increases, which are included in the financial projections and results presented in chapter IV. The 18 entities (16 operators and two municipalities) under the coordination of the state government will be required to comply with these conditions though individual cooperation and technical assistance agreements signed with each of them, which include the efficiency targets applicable to each individual municipality. The Mexican government

will withhold the State's counterpart contribution in the event this condition is not complied with. During the second quarter of each year of the five-year life of the project, the guarantor, the executing agency, and the Bank will meet to review compliance with the efficiency indexes.

3.20 Furthermore, after the program is completed, if the State continues to comply with the targets in the action plan while it remains in effect, it will be exempted from repaying its share of the debt and interest, with the Federal Government taking over its payments to the trust. These conditions are also established in the agreement mentioned in the preceding paragraph.

3.21 The support and cooperation agreement to be signed by the Federal District also includes a commitment by it to comply with the action plan agreed upon with the Federal Government and the Bank, which provides for improvements in its efficiency indicators and rate increases, and sets out a schedule and percentages. The Federal Government will contribute 10% of the Federal District's local counterpart funding for drainage investments and 10% of repayments on the principle of its internal debt if it complies with this commitment.

G. Cost recovery

3.22 As a general government policy, under the new General Water Resources Act the sector will have to become self-sustaining and all its costs, including investment costs, will have to be recovered through the rates it charges. However, an analysis of the sector and its institutions indicates that under current conditions the sector is not self-sustainable and suffers from serious operating inefficiencies.

3.23 Long-term actions are required to improve its operating efficiency, coupled with rate increases. These actions and goals form part of the action plans for the Federal District and the State and the agreements signed with the Federal Government.

3.24 For the Federal District, the priority is to increase overall efficiency from 28.5% at present to 49.8% by the year 2001. The improvements are distributed as follows: (i) a rise in the collection index from 68.6% at present to 75% by 2001 and 90% by 2006; and (ii) an increase in the volume of water billed, from 34.2% at present to 64% by 2000 and 66.5% by 2006. The large increase in the initial years will be brought about by the impact of the household metering program that the Federal District is carrying out.

3.25 Tariffs will be maintained in real terms and will be increased by at least 10% every five years. Consequently, the rise in income during the first five to six years will chiefly be due to

improvements in efficiency but will subsequently include the effects of the rate increase.

3.26 The overall program, including investments in water supply, will have a variable impact on average effective tariffs, depending on instalments of principal and interest payable each year. The impact of the program on that tariff will be minimal during the early years owing to the low interest rate and the grace period. By year five of the program, payments of principal and interest will be 16.8% higher than the tariff, but total income will rise by 93% over present levels as a cumulative effect of the improvements in efficiency and one year of the tariff increase. By the eighth year of the program, when the impact of payments of principal and interest will be greatest, it will be 27% higher than tariffs, but the rise in total income will be 117% owing to cumulative tariff increases and improvements in efficiency.

3.27 For the State of Mexico, the priority is to increase overall efficiency from 35.4% at present to 51.4% by the year 2001. The improvements are distributed as follows: (i) an increase in receipts from billing from 76% at present to 85% by 2001 and 89.4% by 2010; and (ii) an improvement in physical efficiency from 50.9% at present to 60.3% and 71.2% in those same years. By the fourth year of the program, each of the operators in the regional municipalities will have attained overall efficiency of at least 40%. Tariffs will be maintained in real terms and will be raised by 20% and 15% in the next two years, 5% in each of the following three years, 15% in year six, 5% in each of the next five years, and 15% in 2008.

3.28 The overall impact of the program on current average rates will be 26.6% in year five and 31.3% in year eight. However, income will rise by 280% and 430% respectively, owing to the effects of the tariff increase, improvements in physical efficiency, and the volume of water billed. The results for these last two factors are presented in chapter IV.

H. Investment schedule

3.29 The program will be executed over five years. The following table summarizes the preliminary investment schedule, which can be consulted in the technical files.

INVESTMENT SCHEDULE (US$ thousands)							
FINANCING	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5	TOTAL	%
IDB/OC	43,682	109,901	119,376	67,396	24,105	365,000	35.3
OECF	57,959	157,424	144,425	34,560	15,632	410,000	39.6
Local contribution	32,508	52,310	65,773	53,454	55,954	260,000	25.1
Total	134,149	319,635	329,574	155,950	95,691	1,035,000	100.0
Percentage	13.0	30.9	31.8	15.1	9.2	100.0	

I. Advance of funds

3.30 To facilitate program execution, it is recommended that a revolving fund be set up and replenished with proceeds from the Bank financing up to the equivalent of 10% of the total loan. Use of the funds must be justified by the executing agency within 180 days of having received them.

J. Cost recognition

3.31 The borrower has asked to have the cost of preparing the detailed designs recognized as part of the local contribution. Since the consultants who prepared the designs were hired following procedures consistent with Bank policy, it is recommended that costs be recognized of up to US$2 million equivalent.

K. Procurement and bid timetable

3.32 Goods will be procured and construction contracts will be let following the procedures stipulated in Annex B to the loan contract. International competitive bidding will be compulsory for procurements of goods over US$350,000 and construction contracts over US$5 million. These thresholds are considered justified since external bidders have shown interest in similar projects in Mexico over these ceilings (see timetables in Annex III-2).

3.33 Tenders for lower amounts will be conducted according to local legislation, by procedures compatible with those agreed upon by the Mexican government and the Bank.

L. Ex post evaluation

3.34 It has been agreed that the executing agencies will use consulting services to compile and process baseline data during program execution to be used in an ex post evaluation of the results. After processing, these data will be reported to the Bank starting in the fourth year of the project, continuing annually until the fifth year after project completion.

IV. PROGRAM FEASIBILITY

A. Technical feasibility

1. General conclusions

4.1 The proposed program is intended to prevent flooding and significant deterioration of the receiving bodies of water into which liquid waste is discharged, as hazards to public health and environmental quality in the program area. It represents the first of a series of stages in a comprehensive effort to upgrade the combined sewer system and treat wastewater in Mexico City and the metropolitan area.

4.2 The technical justification of the program is described in the following paragraphs.

2. Macrodrainage project

4.3 The macrodrainage project to reduce the risk of flooding, to be financed with Bank funds, is included in the Master Drainage Plan for Metropolitan Mexico City, and covers a time horizon to the year 2010. The costs of the works are considered realistic since they were estimated on the basis of detailed designs 63% complete. The DGCOH expects all the detailed designs to be finished by December 1996.

4.4 The CNA has the technical capacity and experience to execute the macrodrainage project. However, so as not to increase its permanent staff, specialized consulting firms will be hired with program funds to carry out general coordination, supervisory activities, and contract administration.

4.5 There are a number of construction companies that have built works similar in nature and size to those to be contracted and no difficulties are anticipated in obtaining satisfactory indications of interest or adequate competition in the bidding. The five-year execution schedule is feasible under normal conditions, since it reflects the time usually required for similar works built in the past in Mexico City and the metropolitan area. The period covers the prequalification and bid processes as well as construction of the macrodrainage works.

3. Treatment plants project

4.6 The treatment plants project to upgrade the quality of water in the receiving bodies, to be financed with OECF funds, was evaluated on the basis of studies conducted by the CNA, analyses performed by the cofinancing agency, and agreements between the Mexican government and the OECF of Japan on the formula for works

contracting. The conceptual approach is acceptable since it allows for sequencing in execution of the works which will phase in improvements in the quality of wastewater in the combined sewer system and the receiving bodies, enabling them to comply with current and future standards.

4.7 The treatment plants project will be executed on a DBOM (design, build, operate, maintain) basis. The winning bidder under the international competitive process will prepare the designs, build the plants, and operate and maintain them for a period of not less than 15 years. To ensure the best terms and conditions for the borrower and the executing agency, the CNA is preparing detailed bid documents which, *inter alia*: (i) will prequalify potential contractors; (ii) will have to be approved, prior to issuance of the respective bid call, by the specialized consulting firm to be hired with OECF funds to supervise the entire execution of the sewage treatment plants; (iii) will contain all the technical and environmental specifications.

4.8 Among other activities, the consulting firm will participate in the bid process for the treatment plants, review the designs of the plants submitted by bidders, and supervise the results of the treatment process proposed for raw sewage in an experimental module in each plant. It will provide technical advice during execution of the treatment plants project, administer the contracts, participate in testing and in acceptance of the works, and take part in evaluating the operation of the plants for a period to be agreed upon with the OECF.

4.9 The competitions for the detailed designs, construction, operation, and maintenance are expected to take place without restrictions on the bids with respect to treatment technology (except for the El Salto plant owing to runoff from the Central Channel). Any technology that brings the quality of wastewater from Mexico City and the metropolitan area up to current standards is acceptable. It is expected that the size of the contracts and international interest in the project, which is unique since it will be executed in one of the world's largest metropolises, will result in adequate competition among specialized companies or consortia.

4.10 The CNA has the technical capacity to carry out the treatment plants project with the assistance of the specialized consulting firm to be hired with OECF financing. The five-year execution schedule can be complied with under normal conditions. The period covers the prequalification and bid processes, design preparation and construction of the works, among other activities.

B. Financial feasibility

4.11 The program investments will not generate any income. They are necessary to upgrade the drainage system to meet the quality standards for wastewater and will have to be recovered through

water tariffs charged to users. Therefore, financial feasibility is based on operation of the entire system, including the investment plan for water supply agreed upon between the Federal Government, the Federal District, and the State of Mexico, in accordance with the Memorandum of Understanding.

4.12 Investments in water supply include the Temascaltepec project and expansion of Cutzamala, whose cost will be shared equally by the Federal District and the State of Mexico, construction of the macrocircuit to be paid for entirely by the State of Mexico, and the perimeter aqueduct to be paid for by the Federal District.

4.13 These investments will not increase the volume of water available in the Federal District, since they are intended to replace water drawn from wells so that the aquifer, which is being overexploited, can be replenished. However, in the case of the State of Mexico, the investments are intended to provide and distribute additional water.

4.14 The costs considered in the projections include operating and maintenance costs to be incurred for all the projects by the participating institutions – CADF and DGCOH in the case of the Federal District, and CEAS and the municipal operators in the case of the State of Mexico. They also include minor investments to rehabilitate equipment, as part of the maintenance program. Sizeable investments in household metering during 1997 are included for the Federal District, to stabilize in subsequent years as part of normal operations.

4.15 The financial projections used the efficiency indexes agreed upon, as included in the agreements between the Federal Government, the Federal District, and the State of Mexico, and are reflected in the contractual clauses for this program. The indexes increase overall efficiency in the case of the Federal District from 28.5% at present to 49.8% by 2001 and 55.8% by 2004, and in the case of the State of Mexico from 35.4% at present to 51.4% and 55.4% in the same years (see paragraphs 3.24 and 3.27). In its action plan, the State of Mexico undertakes to ensure that none of the 18 regional municipalities will have overall efficiency of less than 40% by year four of the program.

1. The Federal District

4.16 The projections indicate that under the conditions and assumptions described, the Federal District could begin to recover operating and maintenance costs nine years after execution of the sanitation program, and begin to recover its investment costs six years later, i.e. in 15 years.

4.17 For the sake of comparison, if the Federal District wished to operate on a self-sustaining basis (recover the operating, maintenance and investment costs for all its operations) in five

years, i.e. at the end of this program (year 2001), it would have to increase its overall efficiency from the planned 49.8% to 81.7%, or raise its tariffs by 75%, which is not feasible under present conditions, particularly considering that the maximum physical efficiency that the district can attain is about 70%.

4.18 Even with a projected increase of 93% in income in year five, the period that the Federal District would need to become self-sustaining would take somewhat longer owing to its poor efficiency at present. The district will review its action plans in the medium term, which could lead to additional measures to boost the system's efficiency and shorten the time required to become self-sustaining. Any additional improvements in overall efficiency over and above those planned would mean a reduction in the number of years required to attain that goal. Improvements of this kind could result from progress on privatization, since the Federal District is transferring activities to four private operators.

4.19 The impact of this sanitation program on current tariffs under today's production and efficiency conditions would be 19% by the fifth year (2001). In the eighth year (2004) when the impact of the debt and interest payments is at its peak, the figure is 35%. However, impact drops to 10.9% and 17.7% with the planned improvements in efficiency.

2. State of Mexico

4.20 The projections for the State of Mexico indicate that it could recover its operating and maintenance costs one year after this program is completed and begin to recover its investments six years later, or in twelve years in total.

4.21 If the State of Mexico is to become self-sustaining without increasing tariffs, it will have to improve its efficiency and obtain greater volumes of water than are available today. This means that the investments in water supply are absolutely necessary to expand the billing base and raise income. Assuming that the water supply investments are made as planned, the volume of water to be produced would still not enable the state to recover costs for the next 30 years without raising tariffs. Therefore the proposed tariff increase, coupled with the investments in supply and improvements in efficiency, are necessary if the state is to become self-sustaining as planned.

4.22 With the expected tariff increases and improvements in efficiency, the state would increase its income to 154% in the fourth year of the program and to 185% in the fifth year, which in itself would be an achievement. However, to become self-sustaining the state would have to boost its overall efficiency from the planned 51.4% to 72.7%, which is not feasible under present conditions.

4.23 The impact of this program on current rates under today's production and efficiency conditions would be 32.6% by the fifth year and 61.2% by year eight, which is much higher than for the Federal District because the state charges lower tariffs (50% less) than the district. However, impact drops to 11.8% and 14%, respectively, as a consequence of improvements in efficiency, increases in the volume of water billed, and the tariff increases under consideration.

4.24 The financial and operating efficiency considerations with respect to water service operators which are reflected in the draft cooperation and support agreements between the Federal Government and the State of Mexico and between the Federal Government and the Federal District are considered appropriate for achieving sustainable long-range water resource management, as well as consistent with the principles set forth in the public utilities policy to be placed before the Bank's Board of Executive Directors shortly.

4.25 The financial projections for the investments and their results can be consulted in the technical files.

4.26 The borrower will ensure that the Federal District and the State of Mexico attain the overall efficiency and collection targets established in the cooperation and support agreements, so that they will recover the operating, maintenance and depreciation costs of the works in the potable water and sewerage systems. In the State of Mexico, the efficiency indexes and collection levels will only apply to the water and sewerage systems in the 18 municipalities participating in this program.

4.27 Last, the loan contract calls for yearly meetings to be held in the second quarter of each year during the life of the project between the guarantor, the executing agency, and the Bank, in order to review basic information on the physical, business, and overall efficiency goals set in the support and cooperation agreements between the central government, the district, and the state, and the support and technical assistance agreements between the state government and the 18 regional municipalities in the metropolitan area.

C. Institutional feasibility

4.28 The program calls for the participation of two levels of government (the Federal District and the State of Mexico) under different conditionalities and obligations. At the end of the project they will be co-owners of the works. Therefore, the execution mechanism is based on a trust managed by the borrower (BANOBRAS), in which both levels of government will participate, to have financial responsibility for and control over the program.

4.29 The CNA is the agency responsible for the entire hydraulic infrastructure program in the Mexico Valley and has extensive experience in works of this kind. It has been authorized by the Federal District and the State of Mexico to coordinate and supervise execution of the projects independently though an office established for that purpose, thereby ensuring that execution will conform to the timetable and priorities.

4.30 The plan has been designed to ensure: (i) the counterpart contribution; (ii) the operating and maintenance contribution; (iii) repayment of the debt; and (iv) action plans to boost the sector's operating efficiency.

4.31 In short, this plan is considered the most feasible alternative since it has program administration and execution taking place at a senior level with flexible coordination, which will avoid conflicts of interest, and the conditions accepted by the Federal District and the State will ensure that the goals are attained.

D. Socioeconomic feasibility

1. Analysis of the economic feasibility of the macrodrainage project

4.32 Conceptually, the economic benefits of this project stem from the flood damage that would be prevented under the master drainage plan. Flood events caused by rainfall with a recurrence interval of 3, 5, 10, 50 and 100 years were evaluated. The expected annual cost of damage depends on the relationship between the rainfall pattern, the areas flooded, and the assigned annual probability of occurrence (see Annex IV-3 in the project technical files).

4.33 For the analysis of flood impact with recurrence intervals of 100 and 50 years, information was obtained from the Civil Protection Directorate of the Ministry of the Interior, which produced a national risk atlas based on geographic information systems, for the prevention of natural disasters. This information was used to prepare flood maps and to identify zones susceptible to flooding in the metropolitan area and the infrastructure that could suffer damage.

4.34 To prepare the map of flood areas, contour lines were drawn on the city map and the flood areas were determined. The areas were divided into districts and subdivided into socioeconomic zones (lower, middle and upper class) and uses (commercial, industrial, and green spaces). This information was used to determine that the flood plain is an estimated 210 km^2 with a directly-affected population of 4 million.

4.35 The flood maps and the information from the Civil Protection Directorate were used to identify housing, schools, hospitals, hotels, subway stations and other properties that could be hit by floods,

as well as all the roads that would be affected. Information from the Flood Protection Department indicates that 90% of the subway system lies in areas prone to flooding.

4.36 Because of information limitations, the exercise to quantify the monetary value of the damage only covered housing, schools, hotels, and commercial and industrial buildings. The following table summarizes the results of the cost-benefit ratio for a 30-year analysis period. The costs correspond to Bank investments plus all the supplementary flood control works in the master drainage plan.

Estimated present value of benefits and costs (30 years at 12%) (in US$ millions)	
Benefits	**2,468.2**
Estimated value of the damage prevented to:	
— housing	1,763.1
— commercial and industrial buildings	95.7
— schools	543.9
— hotels	65.5
Costs (investment, operating and maintenance)	**796.0**
IDB investment	371.5
Supplementary actions under the master drainage plan	424.5
Net present value	**1,672.2**

4.37 These results demonstrate the substantial impact of the project, even under a partial monetary quantification. Since the catastrophic scenario would entail the evacuation of millions of people and the possible loss of human life, the government considers it unacceptable to run a risk of this kind.

2. Socioeconomic analysis of the treatment plants project

4.38 In this project, the problem of unsanitary conditions and water and environmental pollution caused by the discharge of raw sewage presents a typical case of negative externalities, where the costs of damage to public health and the environment have not been internalized. In this case, the group of polluters numbers 16 million people (the residents of the metropolitan area) and the group directly affected numbers 400,000 who live in the Mezquital Valley, where the untreated sewage from the metropolitan area is discharged.

4.39 Quality standards require a technical treatment solution that avoids complex and costly processes. The technical quality yardstick for the reuse of water for irrigation makes no mention of total suspended solids or biological oxygen demand, thus allowing for a low-cost technical proposal. The treatment level required to

comply with the standard and the objectives is rational for the first stage of decontamination and, in comparative terms, the cost per cubic meter or per population served under this project is relatively lower than in similar projects in other countries.

4.40 However the investment cost presented in this document is a reference amount and not necessarily the minimum cost. This cost is taken from studies on different technical alternatives that include certain basic design restrictions and conservative risk assumptions.

4.41 The DBOM contract approach represents the minimum cost for achieving project objectives. This holds true since: (i) the quality level of treated water is defined; (ii) flexible technical guidelines are used which are open to any technology; (iii) the greatest possible degree of competition in bidding is sought; (iv) the winning firm assumes the technical and economic risks of its proposal; and (v) the proposed solutions are compatible with technologies that will make it possible to move to stricter quality levels in the future, if society wishes. All the above has been taken into account in the bid documents for the water treatment plants.

4.42 The main impact of the project is its contribution to better health indicators, through a reduction in water-borne diseases and food contamination. A second category of benefits derives from alleviating environmental pollution in the Mezquital Valley and beginning to rehabilitate bodies of water that have deteriorated ecologically. A third category of benefits lies in better opportunities for crop production using treated water for irrigation, which permits products to be sold that would otherwise be subject to restrictions.

4.43 The National Public Health Authority (INSP) and the National Nutrition Institute have been studying the health situation in the zone since 1988. The INSP has published scientific articles in international journals (see E. Cifuentes, *et al.* "Health impact evaluation of wastewater use in Mexico", *Public Health Review*, 1992, for example) which demonstrate the impact on public health in the project zone of using liquid waste for irrigation. Through comparisons with groups that differ only in the quality of the water they use for irrigation, these studies have shown that the rates of infection with *Ascaris Lumbricoides* (intestinal parasites) are from 10 to 20 times higher in groups that come into direct contact with dirty water (Tula irrigation district) than in groups with cleaner water (when the water has gone through one or two impounding dams) in the nearby irrigation district of Alfajayucan (see Annex IV-3 in the project technical files).

4.44 Similar results have been found in surveys conducted by the DGCOH and the Japan International Cooperation Agency (JICA) to evaluate an alternative project to the one presented here, which proposes

secondary biological treatment that is three times more costly. In this case areas irrigated with raw wastewater (Tula and Alfajayucan) are compared with areas irrigated with treated water (Xochimilco, DF). The results show large differences in cases per family of all water-borne diseases (diarrhea, hepatitis, cholera, typhoid fever, etc.). The State of Hidalgo, in which the districts of Tula and Alfajayucan are located, ranked second in the number of cases of cholera in the last epidemic in Mexico.

4.45 The economic impact of the project in terms of a future reduction in the cost of treating diseases in the affected zones is an estimated US$10 million in present value over 20 years. The possible impact on agricultural reconversion, in terms of a change in crop patterns, is estimated at between US$120 million and US$250 million. A linear programming model and historical production and marketing data were used to determine how production patterns would change if crop restrictions were relaxed.

4.46 The methods for quantifying the benefits for human health and the quality of life are not adequate to express these fully in monetary terms, particularly in marginal social environments. Specifically, the monetary evaluation of health does not take account of the impact of diarrhea on children in terms of their mental or productive development. Nor was it possible to place a value on the ecological impact of pollution and the risks of food contamination from banned products shipped out of the region.

4.47 The justification for the sewage treatment project in the metropolitan area should be based on the weight assigned to concepts that go beyond a narrow cost-benefit analysis, taking account of the country's general strategy in the fields of public health and the environment. Along these lines, it is reasonable in the context in which this project was planned to apply the economic principle of "polluter pays", with that payment translating into returning used water to the system with a quality that, as a minimum, will reduce pathogens affecting public health.

4.48 It could be argued that if the polluting group, in this case the 16 million people in the metropolitan area, places a value on its concern for the environmental and health problems it causes downstream and is willing to shoulder its responsibility to pay, it would be sufficient if each family were to pay US$2 per month (US$0.40 per month/person) for 20 years (assuming population growth of 2.5% a year) to justify the investment economically. This sum represents less than 1% of the average per capita monthly income of the population in the metropolitan zone.

E. Distributional impact analysis

4.49 Both the macrodrainage project and the treatment plants project have a major direct impact on marginal and low-income groups. It was determined that the drainage project would protect about

4 million people from flooding, 2.6 million of whom live in working-class areas, 890,000 in middle-class areas, and 355,000 in upper middle-class areas. In the low-income zone, family income averages less than two minimum wages which is below the Bank's poverty line. The entire population of the metropolitan area would benefit indirectly from the project.

4.50 About 470,000 people in the Tula valley will benefit directly from the sewage treatment project, and that group is the third poorest in the country. Public consultations and data from the National Statistics Institute (INEGI) and the National Population Council indicate that 68.4% of the population in the Tula irrigation district and 71% in the Alfajayucan district live below the IDB's poverty line.

F. Environmental feasibility

4.51 The Environment Committee, at its meeting on January 24, 1995, classified this as a category III program. The environmental summary was considered by the Committee at its meeting on October 8, 1996. The Committee's recommendations have been taken into account in the program's design.

4.52 To identify and propose measures to reduce or avoid negative environmental impact, the CNA hired consultants to prepare a document on environmental impact associated with drainage and treatment of the wastewater produced in the valley of Mexico. The study was submitted to the Ministry of the Environment, Natural Resources, and Fisheries (SEMARNAP) in compliance with Mexican legislation. It identified a series of regional impacts (see Annex IV-2 in the project technical files) that were taken into account in preparing the basic works project. Specific environmental impact studies will be prepared as part of the detailed designs for the different works (see contractual conditions l and m).

4.53 Rehabilitation of the metropolitan drainage system will produce significant direct benefits by preventing extensive flooding in the city and allowing for optimum functioning of the system. The water treatment plants and the program to control industrial discharges will create direct benefits by improving the quality of the wastewater reaching the irrigation zones and watersheds downstream, gradually cleaning up the waters of the Tula and Salado rivers, the Endhó dam, the Zumpango lagoon, the diversion dams, and the irrigation canals. Crops currently grown will be more wholesome and new crops that are restricted today could be introduced. Sewage treatment will improve public health and the quality of life in the irrigation districts, whose inhabitants will also benefit from parasite control, environmental health, and sanitation programs.

4.54 The component to control industrial discharges will help to remove heavy metals and organic residues and allow sludge to be obtained that can be used in farming. In the first stage, the sludge will be disposed of in landfills and a study will be made of its future use in the irrigation districts.

G. Risks

4.55 Program execution and operation. The State of Mexico and the Federal District may not fulfil their commitments to the trust that manages the financial resources, leading to funding imbalances. This risk will be minimized, first, by the greater efficiency and financial capacity of the operators, to be achieved through compliance with the support and cooperation agreements and, second, by applying the guarantee mechanism whereby the trust is authorized to obtain the funds it requires from the government, through reductions in federal transfers in the event of noncompliance.

4.56 Operation of the treatment plants project. Some of the plant operators may not comply with the efficiency parameters of their proposals, leading to higher treatments costs per m^3 of water and/or sludge, thus exceeding their financial viability. This risk is minimized since the contacting process involves a recommendation by a consulting firm with extensive experience in treatment plants, based on a careful analysis of the operating costs required to produce acceptable effluents.

INDICATORS DURING PROGRAM EXECUTION						
		TARGETS				
COMPONENT	INDICATOR	YEAR 1	YEAR 2	YEAR 3	YEAR 4	YEAR 5
Water treatment plants	Parasite and bacterial standards as per NOM/ECOL-001/96	No	No	No	No	Yes
Macrodrainage project for the metropolitan area	a. Adequate drainage of floodwater caused by storms with recurrence intervals of 50 and 100 years.	No	No	No	No	Yes
	b. The main drainage channel recoups its carrying capacity.	No	No	No	No	Yes
	c. The central outlet channel is maintained during the dry season.	No	No	No	No	Yes
Overall efficiency of the Federal District in operating the water system	a. Rises from 28.5% to 49.8%.	34.5%	38.0%	42.0%	46.0%	49.8%
	b. Installation of 450,000 individual meters.	150,000	450,000			
Overall efficiency of the State of Mexico in operating the water system	a. Rises from 35.4% to 51.4%.	38.5%	41.0%	45.0%	48.0%	51.4%
	b. At the end of year four, none of the 18 operators have overall efficiency of less than 40%.	No	No	No	Yes	Yes
	c. Installation of 50,000 non-residential water meters.	20,000	35,000	50,000		
	d. Installation of 50,000 residential water meters.	10,000	20,000	30,000	40,000	50,000
Program to control industrial discharges containing long-lived contaminants	Number of industries controlled in the Federal District.	150	525	900	1,200	1,500
	Number of industries controlled in the States of Mexico and Hidalgo.	Preparation of control plans	100	300	500	700
Environmental health program	Strategic operating plan.	100% technical report	—	—	—	—
	Percentage of the epidemiological surveillance system implemented.		20% technical report	50% technical report	75% technical report	100% technical report
	Percentage of the system to evaluate the impact of health promotion measures carried out.		20% technical report	50% technical report	75% technical report	100% technical report

MEMORANDUM OF UNDERSTANDING

I. INTRODUCTION

1.1 To meet the potable water and water treatment requirements of the population living in the metropolitan area of the Mexico Valley (hereinafter ZMVM), the Federal Government and the governments of the Federal District and the State of Mexico have agreed to participate in a series of coordinated actions to carry out the projects and works described in this document for the hydraulic infrastructure that is indispensable to supply drinking water and to remove and treat wastewater and stormwater in the ZMVM and to upgrade the quality and efficiency of the water systems in the zone. This memorandum of understanding summarizes and formalizes the agreements reached regarding the technical features of the works and projects; the necessary investments, their financing and the related payment commitments; cooperation among the different government institutions and the organizational plan adopted for that purpose; and the legal actions and technical and economic policies to be applied to boost the physical and commercial efficiency of the different water systems, make them self-sustaining financially, and achieve sustainable water management in the ZMVM.

1.2 This memorandum is a reference document which, as a unifying framework, will permit the government institutions and participating agencies to establish congruent relationships among the different legal instruments that will formally establish the rights and obligations of the parties regarding the different matters arising from the actions to be taken as part of the cooperation mentioned in the preceding paragraph. Said legal instruments will include: loan and guarantee contracts between the Mexican government and international lending agencies, loan contracts between the local governments and BANOBRAS, a trust contract, technical advisory or assistance contracts, cooperation and support agreements, etc.

1.3 The agreements reached in this memorandum are the result of different studies and analyses conducted in recent years on the technical, economic, financial, and legal aspects of the works and projects to be carried out, which have assisted the government institutions and participating agencies in reaching a better understanding of the actions required and have been used as the basis for their decisions. The agreements are also the product of many working sessions held throughout 1996 to examine and evaluate the scope, terms, and conditions of the activities to be carried out.

1.4 The officials listed in Appendix 1 participated in the different working sessions that led to the agreements summarized in this memorandum, contributing their expertise in technical and executive areas.

II. BACKGROUND

2.1 The ZMVM is one of the largest urban areas in the world. Its total population is some 16 million, who live in the different political divisions of the Federal District (52.8%) and in the regional municipalities of the State of Mexico (47.2%). Population growth in the ZMVM has been explosive for several decades and, despite headway made in demographic policy, growth is still very dynamic today, particularly as a result of immigration from other parts of the country. The regional municipalities referred to throughout this memorandum are: Atizapán de Zaragoza, Coacalco, Cuautitlán, Cuautitlán Izcalli, Chalco, Chicoloapan, Chimalhuacán, Ecatepec, Huixquilucan, Ixtapaluca, Los Reyes-La Paz, Naucalpan, Nezahualcóyotl, Nicolás Romero, Tecámac, Tlalnepantla, Tultitlán, and Valle de Chalco-Solidaridad.

2.2 Demographic pressure has led to mushrooming urban growth, which has spread to outlying areas that do not have the necessary infrastructure or public services. The population explosion has led to the establishment of many human settlements in the ZMVM that do not have piped water, sewer service or sewage treatment, leading to serious public health problems.

2.3 Physical and hydrographic factors must be considered alongside the demographic and social situation. The ZMVM is located at 2,240 meters above sea level in a basin that was originally closed but which now discharges northward artificially, through four conduits whose capacity and technical levels have been subject to successive improvements to avert the risk of serious flooding and the tremendous human and material havoc it could wreak. However, the discharges do not receive sufficient treatment to comply with the quality standards established in the General Ecological Balance and Environmental Protection Act or the applicable Mexican Official Standards. As a result, the wastewater flowing out of the basin is a source of pollution that has an adverse effect on the ecology, health, and economy of the affected regions.

2.4 Furthermore, the explosive growth in population and in productive activities in the ZMVM has led to over-exploitation of the Mexico Valley aquifer as a consequence of the large number of wells drilled to obtain water and changes in the ecology in general, which have lowered the aquifer's replenishment capacity. Over-exploitation has caused serious ground settling which has further

aggravated the historical problems of drainage. The main drainage channel has sunk so deeply that it runs contrary to grade for the first few kilometers, which year by year has reduced its carrying capacity.

2.5 The challenge of keeping up with growth in the demand for water in the ZMVM has been addressed for five decades by using sources other than the aquifers in the Mexico Valley. This has required the construction of hydraulic works, storage, transport, and distribution facilities to bring water from increasingly distant places and lower altitudes, with the accompanying increase in the cost of supplying water to the ZMVM.

2.6 Investments in water supply, drainage, and sanitation are large owing to the scope of the works, which reflects the size of the city and the system's hydrographic characteristics. Rehabilitation and maintenance costs are also significant.

2.7 Addressing all these challenges requires an ample response capacity by the different federal and local authorities involved. For almost half a century it has been necessary to take a comprehensive approach to these challenges, and several institutions have been established for that purpose. The Hydrology Commission of the Mexico Valley Basin was established in 1951, reporting to the Ministry of Water Resources, and in 1972 the Mexico Valley Water Resources Commission was created, which absorbed the older body. The mandate of those agencies was to coordinate tactics for coping with the problems, since different entities located in a hydrographic and hydrological region that covers several political jurisdictions are involved. The responsibilities and powers of the commissions included: studying the demand for water in the ZMVM, planning for supply and looking at alternative sources to the Mexico Valley aquifer; programming works, constructing or executing projects, and operating aqueducts; studying ground sinkage and planning and building drainage works, including control dams, river channeling, sewer construction, etc.; planning and building water treatment works and plants and regulating the reuse of wastewater for industry, irrigation for recreational sites and for agricultural purposes; regulating well drilling, operation, and the distribution of potable water and wastewater, etc. In other words, it was recognized that the solution to the problems was not just to pipe water in from distant areas but to manage its use and treat liquid waste for the entire metropolitan area.

2.8 Under current legislation, the governments of the Federal District and the State of Mexico are directly responsible for supplying water and charging users for it. In the Federal District, this responsibility lies with the Hydraulic Works and Construction Directorate (DGCOH) and the Federal District Water Resources Commission, whose activities cover all of the district's political and administrative divisions. In the State of Mexico, each

municipality is responsible for this function, in conjunction with the state government, through the Ministry of Urban Development and Public Works. As a rule, the municipalities have water operators or administrative branches that provide the service.

2.9 Aside from its legal powers and responsibilities exercised through the CNA, as the national authority for water, the Federal Government, has financial obligations under the Federal Public Works Water Infrastructure Betterment Act, which requires it to provide 10% of the recoverable cost of federal water infrastructure works, except for federal sewage treatment public works. The remaining 90% of the cost of works for states and municipalities must be paid by them into the federal treasury. In the event they do not opt to pay directly, the cost will be deducted from their tax credits or retained from federal transfers under the national fiscal coordination system.

III. FISCAL SITUATION

3.1 To address the growing demands of the population of the ZMVM, various aspects of hydraulic infrastructure must be taken into account. With regard to **sanitation**, the sinking of the watershed, particularly in certain zones with special soil characteristics, has reduced the capacity to carry wastewater outside the valley, which has increased the risk of heavy flooding. As is apparent from the study referred to in paragraph 4.2, it is urgent to undertake the series of works mentioned in paragraph 4.4 to expand and rehabilitate the **drainage** system.

3.2 It is also necessary to address the problem of the quality of wastewater, to bring it up to legal standards so that it is no longer an ecological or health hazard in the valley of Mexico or in the adjacent receiving watersheds. The main purpose of **treatment** in the ZMVM is disinfection or the removal of pathogens to protect public health and to enable restrictions on crops in the affected areas to be lifted, to benefit the economy of the entire region. Specifically, the aim is to comply with draft Mexican Official Standard NOM-ECOL-001/96 published in the Official Gazette of June 24, 1996, which sets maximum allowable concentrations of contaminants in wastewater discharged into national waters and properties. The study referred to in paragraph 4.2 finds that the series of **treatment** works mentioned in paragraph 4.4 are necessary to attain the goals.

3.3 The **drainage and treatment** works will benefit the entire population in the ZMVM and in the irrigation zones where the treated water will be used. Although it is difficult to make precise calculations of the extent to which the well-being of the

inhabitants of the zones in question will improve, there will be a clear reduction in the risk of flooding and an improvement in health and the ecology. In the irrigation districts, aside from the health benefits, there will be an economic benefit deriving from the removal of restrictions on crops.

3.4 As for the **supply** of drinking water, the CNA has projected needs for the coming years based on the studies on growth in demand in the ZMVM referred to in paragraph 4.5. It will be necessary to increase the flows received from other regions by 5 m^3/s, to be added to the current carrying capacity of 19 m^3/sec of the Cutzamala system.

3.5 This will provide for close to a 25% increase in the carrying capacity of the Cutzamala system, which will cover projected growth in demand over the medium term and extend distribution into many areas in the ZMVM that do not receive service at present, particularly the regional municipalities in the State of Mexico to the east and north of Mexico City, where hydraulic infrastructure is being built to respond to pressures from immigration and population growth. Furthermore, bringing in water from outside the area will make it possible to cease operating wells in the Mexico Valley to reduce the rate at which the ground is sinking.

3.6 At present, the Cutzamala system delivers 16 m^3/s to the ZMVM, with 9.6 m^3/s used by the public and industries in the Federal District, and the remaining 6.4 m^3/s going to the regional municipalities. In other words relative consumption is 60% and 40%, respectively. It is estimated that in future one half of the 24 m^3/s total will be used in the State of Mexico and the other in the Federal District.

IV. GENERAL DESCRIPTION OF THE SANITATION AND WATER SUPPLY PROJECTS FOR THE ZMVM

4.1 There are two large groups of hydraulic works that are vastly important for the population in the Federal District and in the State of Mexico. The first pertains to **sanitation**, including drainage and treatment, and the second pertains to **water supply**.

4.2 After a careful analysis of **sanitation** problems and requirements by the Engineering Institute of the Autonomous University of Mexico, and thanks to the cooperation of the National Water Resources Commission and the district and state governments, a multidisciplinary study has been concluded that provides a detailed description of the **drainage and treatment** works and investments necessary over the next four years. The study, entitled "Feasibility study for Mexico

Valley Sanitation: final report", dated December 1995, is included as appendix 2 to this memorandum.

4.3 After analyzing various alternatives, the study has determined the main works to be built and their locations, their feasibility based on local geology, construction stages, and costs estimated on the basis of similar works, given the considerable experience available in the construction and operation of works of this kind. The study has also identified various institutional development programs, campaigns to control discharges into the system, health campaigns, and monitoring or follow-up activities necessary to multiply the favorable impact expected from the works. The works and programs described in the study are those covered in this memorandum, under a comprehensive approach to the ZMVM sanitation project. Other supplementary works will form part of the regular hydraulic infrastructure construction programs of the local governments.

4.4 The ZMVM sanitation project includes drainage and treatment works, particularly: the construction of 31 kilometers of tunnels, some major channeling works, including deep and semideep drainage, straightening and recladding of surface drainage ditches, two regulating reservoirs, two pumping plants with a combined capacity of 120 m^3/s, three treatment plants with a combined capacity of 74 m^3/s to process runoff from the three main outlet channels, and a fourth treatment plant with a capacity of 0.5 m^3/s to process water discharged from the main channel at the town of Nextlalpan. Acceptable technologies and treatment processes to be used and the general specifications for plant design have already been determined after a technical and economic evaluation. The ZMVM sanitation project is important for two reasons. It will prevent the risk of serious flooding in the ZMVM and ensure that discharges of wastewater outside the Mexico Valley move toward compliance with environmental standards established for their use in crop irrigation, removing the dangers of disease and contamination.

4.5 To attain the **water supply** objectives mentioned in paragraphs 3.4 and 3.5, studies conducted by the CNA suggest that the best alternative is to use surface water from the Temascaltepec river in the State of Mexico, as described in the document entitled "Comprehensive project for potable water supply for the Mexico Valley metropolitan area: August 1996 version", which is included as Annex 3 to this memorandum. The works described in that document are referred to in this memorandum as the **ZMVM water supply** project. The series of works will provide piped water to zones with high population density and heavy immigration which are not served at present, and will improve the quality of service in other areas, which is currently very poor.

4.6 The works in the ZMVM water supply project include: new constructions to tap the lower part of the Temascaltepec river

basin, consisting of a storage dam, a pumping plant, a surge tank, and a 15 km tunnel to carry the water to the Valle de Bravo dam; and works to expand and rehabilitate the first three stages in the Cutzamala system, including its treatment plant. In the ZMVM it will be necessary to complete other distribution works that are equally important: the macrocircuit and the perimeter aqueduct, which are the north and south branches of a large distribution ring that will carry water to the regional municipalities in the State of Mexico and to the southern and eastern parts of the Federal District. In addition to the infrastructure works, the project pays special attention to productive works with community benefits in the Temascaltepec zone, which is where the main impact of the project will be felt. These actions will be coordinated with the state government to determine priorities.

4.7 The sanitation project and the water supply project for the ZMVM must be dealt with concurrently, since the public requires water supplies as well as drainage and sewage treatment.

4.8 All the works in these project have long execution and maturity periods, of about four years, and should therefore begin as soon as possible in order to satisfy the social requirements on a timely basis.

V. INVESTMENTS AND FINANCING

5.1 The CNA has calculated the investments required and the schedule for carrying out the sanitation and water supply projects in the ZMVM. Appendix 4 to this memorandum presents a summary of the investments, based on the estimates currently available for both projects, breaking down the components that can be financed with external credit from international lending agencies, and those components that cannot. Taken together, the two projects require a total of US$1,794.7 million, with the sanitation project accounting for US$916.9 million (51.1% of the total) and the water supply project for US$877.7 million (48.9%).

5.2 Under both projects, the cost of the investments and debt service will be shared between the State of Mexico and the Federal District in the following percentages: for sanitation, the state will cover 40% and the district 60%; for water, the costs will be shared 50-50 for the Temascaltepec and Cutzmala expansion components; the state will pay for 100% of the macrocircuit and the district for 100% of the perimeter aqueduct.

5.3 The SHCP has been negotiating with the Inter-American Development Bank and the Overseas Economic Cooperation Fund (OECF) of Japan to finance the ZMVM sanitation project through two loans to be used

for the drainage works and the treatment plants, respectively. The negotiations are well advanced. The commitments with the OECF were officially agreed on August 21, 1996, and negotiations with the IDB will be formalized in October and the loan proposal submitted to the Board of Executive Directors in the last week of November 1996. The legal instruments establishing the inter-institutional organization, the obligations of the parties, the Federal Government's guarantee, etc., will soon be submitted to the two institutions, as is explained in section 7 of this memorandum. The international lending agencies have informed the SHCP of their interest in participating in the project, provided it is not limited solely to execution and operation of the works, but is accompanied by different policies to make headway in fully modernizing the water systems, particularly in the following three areas: sustainability of system operation through rational and efficient management of the aquifer and suitable and effective institutional organization; adequate care and attention to the environmental impact of the works and systems; and increasing private sector participation, where feasible, in activities related to the water systems, such as the provision of technical, administrative, and business services under concessions and contracts. The governments of the Federal District and the State of Mexico, the SHCP, the CNA, and BANOBRAS have agreed to have clauses relating to those policies included in the respective loan contracts with the international lending agencies, in the commitments by the parties, as applicable, in the trust contract, and in the other legal instruments mentioned in part 7 of this memorandum.

5.4 The SHCP will begin negotiations to arrange financing for the ZMVM water supply project, which is just as important as the sanitation project. The IDB has been approached to finance the works in the Cutzamala system and the perimeter distribution works in the ZMVM. The World Bank or some other international lending agency will be asked to finance the works on the Temascaltepec river and conveyance to the Valle de Bravo dam. These negotiations will take some months, although technical documentation is already available for the works in the project. During negotiations, the SHCP will keep the parties abreast of the possible financial terms and conditions, and the latter will decide whether to opt for a loan or to use their own funds for the project.

5.5 Throught these loans, the investments to be made over the next four years will be financed over the long term – 25 years, with grace periods for the first five or seven years. The loans will be repaid by 2021 and the interest rates are competitive for projects of this kind. However the loans cannot be used to pay taxes, purchase land, or to cover administrative costs. The document entitled "Projected payments by the Federal District and the State of Mexico deriving from the local component and debt service to finance the sanitation and water supply projects in the ZMVM", which is included as Appendix 5 to this memorandum, presents the

estimates available to date on the payments they would have to make during the period 1996-2021. The governments of the Federal District and the State of Mexico, the SHCP, the CNA, and BANOBRAS have agreed that the financial terms and conditions of the IDB loans will be passed on to the State of Mexico and the Federal District, as set forth in the respective loan and guarantee contracts. Their financial obligations will therefore be as stipulated therein. It has also been agreed that the district and the state will enjoy the same grace periods and amortization terms under which the loans were obtained from the international lending agencies.

VI. OPERATION AND MAINTENANCE

6.1 The treatment plants mentioned in paragraph 4.4 will be designed to comply with draft Mexican Official Standard NOM-ECOL-001/96, which establishs the maximum allowable concentration of pollutants in wastewater discharged into national waters and properties, and the special discharge conditions laid down by the CNA for the State of Mexico and the Federal District under Article 87 of the National Water Resources Act and Article 140 and 141 of the regulations to the act.

6.2 The CNA will provide the state and district authorities, within 15 days after the final version of Mexican Official Standard NOM-ECOL-001/96 is published, with a definition of the technical specifications that the plants must meet to comply with the standard, and an explanation of the bid procedures to be followed to ensure that the works are constructed to that standard.

6.3 In view of the commitments made by the district and the state to build the treatment plants, and since the works are expected to begin in 1996 and begin operating four years later, and because it is indispensable for the works to comply with the water quality standards set out in NOM-ECOL-001/96, the CNA has decided that if the standard becomes effective prior to completion of the works, the penalties and fees stipulated in the standard will be levied against any persons responsible for unjustifiable delays in starting up the plants. Waivers of such fees during the construction period will be applicable in accordance with current legislation.

6.4 In view of the large investments to be made by the district and the state in meeting the water quality requirements established in the standard and the fact that the treatment plants will have a long working life, the CNA has stated that in the event that water quality standards become even stricter in the future, it will do everything in its power to minimize the additional costs and

investments that the district and state will have to make to comply with the new requirements. The CNA has undertaken to ensure that the technologies used in the treatment plants are flexible enough to adapt to possible changes in water quality standards, without additional costs stemming from the original designs.

6.5 Each treatment plant will be designed, built, and operated by a single agent, to ensure thorough and effective coordination of all activities for full compliance with the standard. Should an operator fail to comply with the standard or the specific discharge conditions, or unjustifiably delay the start of operations, it will be sanctioned and required to pay the fees mentioned in paragraph 6.3. Furthermore, the liability of the operator, the district, the state, and the trust, mentioned in paragraph 7.6, for failure to comply with the standard or the specific discharge conditions established by the CNA will be defined in the service, operating, and maintenance contracts mentioned in paragraph 7.10.

6.6 The operators of the different works included in the ZMVM water supply and sanitation projects will be responsible for operating and maintenance costs, as defined in paragraphs 7.10 and 7.11. The State of Mexico and the Federal District will continue to review and adjust the rates they have been charging, with a view to recovering those costs for both new and existing systems. Since the operating and maintenance costs will be included in the tariffs, those expenditures will be automatically distributed between the district and the state, based on their relative consumption.

6.7 As for the operating and maintenance costs of the works on the Temascaltepec river and the Cutzamala system, as part of the project the CNA will present a program to boost productivity and efficiency to the technical committee of the trust referred to in paragraph 7.7. The block rates charged to the district and the state will reflect the cost-reduction efforts to the benefit of end users.

6.8 Accordingly, the loans from the international lending agencies and the federal transfers mentioned in section 7 will under no circumstances be used to cover operating or maintenance deficits, but will be used exclusively for the capital outlays for the water supply and sanitation projects and for debt service.

VII. INSTITUTIONAL ORGANIZATION

7.1 The undertaking and success of the sanitation and water supply projects depend on adequate institutional organization to ensure

effective coordination of the efforts of the State of Mexico, the Federal District, the CNA, and the SHCP.

7.2 The plan designed for that purpose is shown in the figure in Appendix 6 to this memorandum, and its main features are discussed below.

7.3 The Federal Government will sign **loan and guarantee contracts** with the international lending agencies mentioned in paragraphs 5.3 and 5.4, in which BANOBRAS will participate as the financial agent. The contracts will spell out the uses and amounts of the loan and the applicable conditions such as interest rates, grace periods, amortization periods, guarantees, etc.

7.4 BANOBRAS, under the applicable rules in each case, will sign line of credit contracts with the Federal District and the State of Mexico, in which they undertake to put up their federal revenue share-outs as security in respect of their payment obligations for the projects, as explained in paragraphs 7.5, 7.14, and 7.17. The **line of credit contracts** to be signed by BANOBRAS with each of the entities will establish how the lines will function and the applicable conditions, and will empower the trustee (to be established as described in paragraph 7.6) to avail itself of the funds provided to the Federal District and the State of Mexico and to use the proceeds through the trust, in addition to covering the exchange risk on loans and borrowings.

7.5 The debt contracted by the Federal District and the State of Mexico with BANOBRAS under the terms of the preceding paragraph will be secured by their respective revenue share-outs on the terms and conditions and in the amounts to be established in the **support and cooperation agreements** to be signed by the Federal Government individually with them, and the other applicable legal instruments. The security may be called under certain circumstances, as explained in paragraphs 7.14 and 7.17.

7.6 BANOBRAS will set up an administration and payment trust, in which the Federal District and the State of Mexico will be the trustors. They will also be the beneficiaries of the trust. All matters relating to the establishment and operation of the trust will be set forth in detail in the **trust contract** to be signed by the trustors with BANOBRAS.

7.7 The trust's technical committee will be composed of two representatives from the State of Mexico, two from the Federal District, two from the SHCP, and two from the CNA who will have the right to vote. The committee will be chaired by the CNA which will have the deciding vote. A BANOBRAS representative will sit on the committee without the right to vote. When necessary, persons with experience in the subjects to be discussed by the technical committee and

representatives of entities, institutions, or government agencies connected to the business on hand may be invited to meetings, but without the right to vote. All economic and financial decisions made by the committee will require a vote in favor by the SHCP.

7.8 The trust will be an instrument to administer financial investments and control payments, ensuring that the funds are efficiently used for the construction and operation of the sanitation and water supply projects, in keeping with the items, amounts, and schedules set forth in Appendix 4 and referred to in paragraph 5.1. The trust will also ensure that the funds are used to comply with the loan obligations of the trustors, in accordance with paragraph 7.4. The trustors will delegate to the trustee the authority to contract works, subject to prior authorization by the technical committee, and will authorize the CNA to act as technical coordinator of the sanitation and water supply projects.

7.9 Under this plan, the trust will rely on the CNA which, based on the applicable standards, will hold public tenders for the drainage and water treatment works and award the contracts to the most responsive bidders offering the necessary experience and technical expertise and competitive economic conditions, and the trustee will proceed to contract them.

7.10 At the appropriate time, the CNA will select the entity responsible for operating and maintaining the drainage works, while operation and maintenance of the treatment plants will be contracted by the trustors with the winners of the respective contracts. The trust will be required to pay tariffs for wastewater treatment services, and the trustors will provide it with the necessary funds. In the event such funds are insufficient, the **stand-by and revolving lines of credit** established by the trustors with BANOBRAS for that purpose may be used, with the trustee empowered to take the necessary sums into the trust.

7.11 The procedure described in paragraph 7.9 will be followed with respect to construction of the water supply works. Operation and maintenance of the works to expand and rehabilitate the Cutzamala system will be the direct responsibility of the CNA, since it performs these tasks on the existing works in the same system.

7.12 The trust will repay the loan principal and make payments of interest to BANOBRAS and will pay the local counterpart; it will also receive the contributions corresponding to the Federal District and the State of Mexico, including the support provided them by the Federal Government, as described in paragraphs 7.14 and 7.17.

7.13 The land on which the treatment plants will be built will be acquired by the trust for valuable consideration or otherwise, as

applicable. When the plants have been built, the trust will transfer them and the land in co-ownership to the trustors or to persons designated by them. The trustors are required to begin designing the institutional framework under which the projects will operate after the trust is dissolved five years prior to payment in full of the loan.

7.14 The contributions made by the Federal District to the trust as local components not included in the loans, as well as loan principal and interest payments, will be made out of the district's own funds, including the income it obtains from charges for water service. Should that income be insufficient, the Federal District will cover the remainder of those payments out of its other sources of income. In the event that the district is unable to make all its payments in any period, the shortfall will be covered out of Federal Government transfers to the district in that period. Thus, the district will guarantee compliance with its obligations by assigning the revenue share-outs to which it is entitled. The Federal Government undertakes to make the betterment contribution mentioned in paragraph 2.9 starting in 1997, in accordance with the **support and cooperation agreement** to be signed between it and the Federal District.

7.15 Under a **support and cooperation agreement**, the Federal Government will assist the State of Mexico in paying the local component, interest and principal, since the state is currently in financial straits. The state will undertake in the same agreement to increase the earnings of the municipal water system operators in the 18 regional municipalities in the ZMVM. The agreement will give details on the amounts and schedule of the support to be provided by the Federal Government in accordance with paragraph 7.17, and the increases, parameters, and schedules to be observed by the state government in its commitments with regard to the income and efficiency of the municipal water systems.

7.16 In turn, the State of Mexico will promote a program in the 18 regional municipalities, based on another agreement **(technical assistance and cooperation agreement)** to boost the physical and business efficiency of the water systems through complementary actions, including: tariff adjustments, better billing and collection systems, and better physical characteristics of the water systems. This program will make it possible to eliminate system operating and maintenance deficits over the medium term and to post a surplus. The commitments established in these agreements must be fully compatible with the terms and conditions of the agreement mentioned in paragraph 7.15 and with the principles of efficient water use set forth in the following paragraphs. The Federal Government will defray the cost of a technical study to assist the state and the regional municipalities in establishing water tariffs that reflect the principles mentioned and in

developing technical, accounting, and financial information systems for the municipal water operators or the branches performing that function.

7.17 Under the terms of the agreement between the federal and state governments mentioned in paragraph 7.15, the former will pay into the trust, through the CNA's budget, on the latter's behalf, funds to cover all payments of the local component and the principal and interest on the state's loan. In the event that the consolidated income of the municipal operators or the branches performing that function in the 18 regional municipalities is below the level set in the agreement, the state government will use state or municipal funds, under the terms of the agreement with the Federal Government, to correct the operating and maintenance deficits of the operators or branches. It will also be required to pay to the trust a given percentage of the total local component and debt service, in lieu of the percentage paid by the CNA out of federal transfers. If the state government fails to pay its entire share of the local component and debt service, then the remainder would be taken out of its federal transfers so that payments of the local component and debt service for that period would be fully covered, when counting the CNA's contribution. Under the agreement, the percentage of the local component and debt service to be covered by the state in the event that the targets for real growth in the consolidated income of the operators or counterpart branches in the 18 regional municipalities are not complied with will be determined in consideration of the relative shortfall in complying with the income targets and other technical, commercial and economic indicators defined to measure improvements in the water systems in those municipalities.

7.18 The inclusion of the tariff and technical and business efficiency commitments under consideration is very important, since apart from their impact as a source of payment, they are highly relevant for the efficient use of water and the rational exploitation of the aquifers. In the absence of such commitments, the large investments in water supply and sanitation projects would lead to major economic and social inefficiencies. The investments would cover short-term requirements but would not send the right signals or incentives to users to make more rational use of water in accordance with its cost.

7.19 Although other sources of public revenue, not linked to water consumption, can also be used to pay for the necessary investments – such as property taxes – that form of financing has the drawback of not encouraging users to make more efficient, careful, and responsible use of water. Therefore, a tariff policy that charges users on the basis of their consumption, provided it is applied gradually so as not to provoke a social outcry, has the advantage of being a means of obtaining financial resources without neglecting other public spending requirements, while also being an

indispensable policy tool for promoting the efficient and sustainable use of water resources. The importance of water conservation and rational use is becoming crucial in view of the rising difficulties and costs involved in tapping this limited natural resource.

VIII. FINAL CONSIDERATIONS

8.1 Considerable progress has been made in the legal documentation for the organizational plan discussed in section 7 of this memorandum. The trust contract mentioned in paragraph 7.6 is virtually complete, and drafts are being prepared of the support and cooperation agreements between the Federal Government and the State of Mexico and between the former and the Federal District, mentioned in paragraphs 7.14, 7.15, and 7.16. They will be rounded out with the loan contracts mentioned in paragraphs 7.3 and 7.4, once the commitments with the international lending agencies have been formalized and BANOBRAS opens the lines of credit with the state and district governments. The agreement between the state government and the 18 regional municipalities mentioned in paragraph 7.16 will be completed and signed by January 1997 at the latest.

8.2 The text of this memorandum was carefully reviewed by the representatives of the district and state governments, the SHCP, the CNA, and BANOBRAS, mentioned in paragraph 1.4, who found that it did not contain substantive errors or ambiguities regarding the agreements. They submitted it to their superiors for consideration. Those authorities have signed this memorandum in witness to their agreement with its contents and their determination to carry out the actions described herein under the detailed terms and conditions to be formally established in the applicable legal instruments.

For the SHCP

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Javier Beristain Iturbide
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Daniel Ruiz Fernández
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For the State of Mexico

César Camacho Quiroz
State Governor

Héctor Ximénez González
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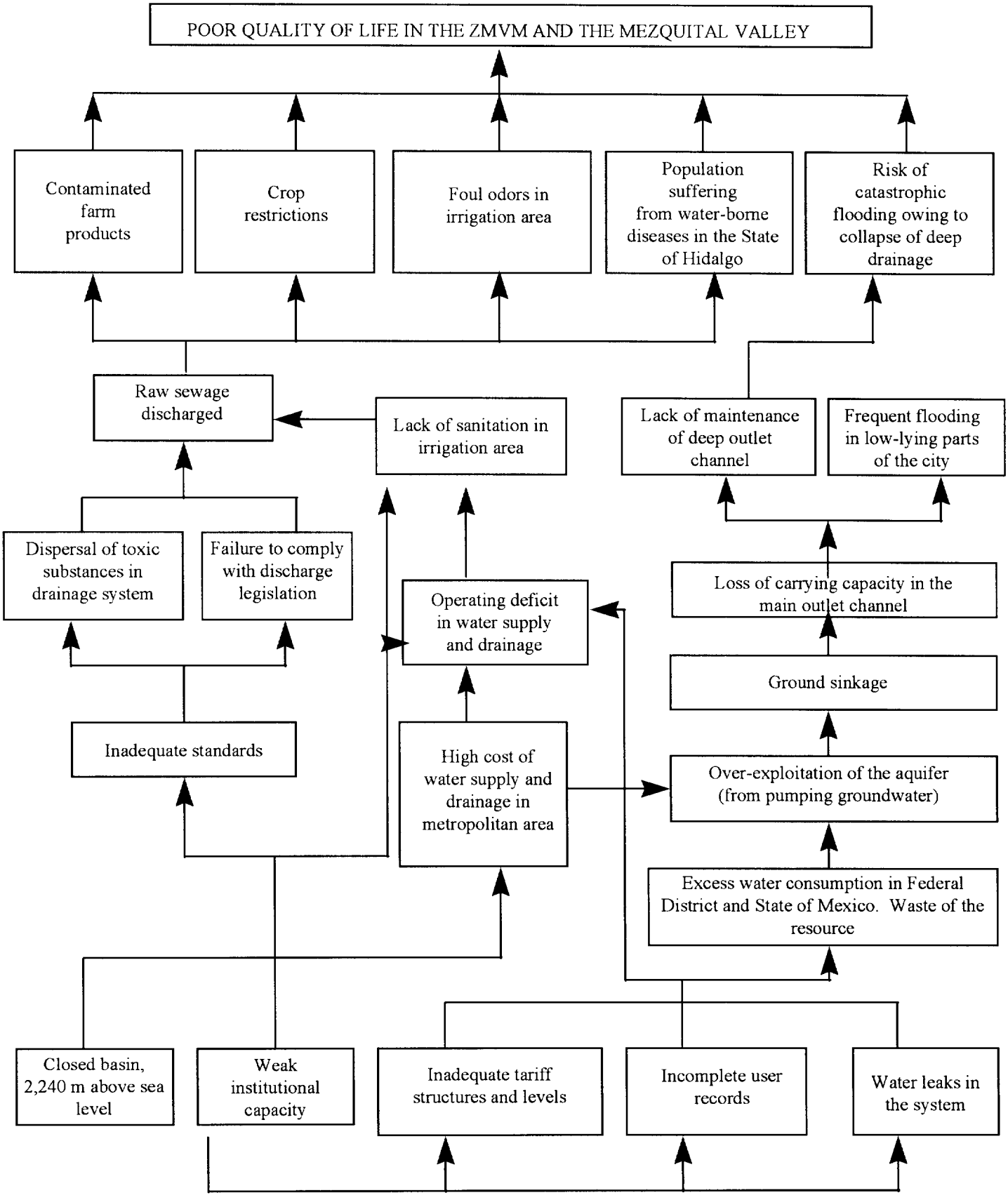
Assistant Director of Trusts

Mexico, D.F. on the..... day of....., 1996

VALLEY OF MEXICO SANITATION PROGRAM
(ME-0179)
Problem tree



MEXICO VALLEY SANITATION PROGRAM
(ME-0179)

Table of stakeholders

GROUP	INTERESTS	PROBLEMS	RESOURCES/MANDATES
1. Population of the Federal District	- Remove wastewater and stormwater - Protect health and property - Clean up urban area and environment upgrade	- Sinkage - Accumulation of water - Main outlet channel does not function adequately - Sewage is discharged	- To influence political entities and institutions to solve flooding and pollution problems
2. Population of the regional municipalities, State of Mexico	- Remove wastewater and stormwater - Protect health and property - Clean up urban area and environment upgrade	- Sinkage - Accumulation of water - Main outlet channel does not function adequately - Sewage is discharged - Contaminated farm products	- To influence political entities and institutions to solve water supply, flooding and pollution problems
3. Population of irrigation districts (farming zone)	- Increase the quantity and quality of farm products and raise standard of living - Continue receiving water with the current nutrient content at today's costs	- Farming areas irrigated with polluted water and crops subject to restrictions	- To pressure the CNA to lift irrigation restrictions
4. Population of the irrigation districts (nonfarming)	- Reduce pollution and disease - Improve urban sanitation	- Cannot work owing to illness - High health care costs - Aquifers are polluted	- To influence institutions to improve living conditions

GROUP	INTERESTS	PROBLEMS	RESOURCES/MANDATES
5. National Water Commission (CNA)	- Improve water quality in Mexico - Provide greater coverage of water supply, drainage and treatment of wastewater - Improve productivity in irrigation district - Protect public health in the project's area of influence - Rectify general drainage in the valley - Clean up the Mexico and Tula valley basins - Prevent flooding - Reestablish hydrological balance in the valley of Mexico	- Use of poor quality water in farming - Contaminated farmland - Housing located in unsuitable areas - Over-exploitation of aquifers in the valley of Mexico - Frequent flooding - Protests by farmers over crop restrictions - Disease indexes too high in the zone - Infiltration of pollutants (metals and organochlorines)	- To regulate the quality of wastewater - To monitor standards and potable water and sewage services - To act as lead agency in planning of the country's water resources - To establish special discharge conditions under the Water Act - To penalize raw sewage discharges into bodies of water
6. Ministry of Finance (SHCP)	- Maximize and make efficient use of the country's resources - Increase wastewater treatment nationwide - Achieve sustainable water resource management in ZMVM	- Poor international image owing to untreated sewage - Inefficiencies in water operators, especially in the State of Mexico - Disease in the State of Hidalgo owing to lack of sanitation	- To support the State of Mexico and the Federal District in designing water investment plans, on the condition that they improve their efficiency - To guarantee external loans - To act as the national authority for contracting and negotiating external loans - To administer the country's financial resources
7. Ministry of the Environment and Natural Resources (SEMARNAP)	- Observance and enforcement of environmental legislation	- Failure to comply with discharge legislation - Contaminated farm products - Lack of sanitation in irrigation areas - Disease in irrigation areas	- To design and lead national water resources policy - To establish and oversee compliance with special conditions for household and industrial discharges, through the CNA
8. BANOBRAS	- Support states and municipalities - Finance infrastructure projects in states and municipalities	- Poor financial situation of states and municipalities - Poor coverage of wastewater treatment	- Own funds and external credits - To act as Federal Government's financial agent

GROUP	INTERESTS	PROBLEMS	RESOURCES/MANDATES
9. Federal District authorities	- Upgrade environmental conditions - Reduce health hazards - Ensure the well-being of the population - Collect taxes and fees more efficiently - Comply with quality standards for wastewater	- High population density - Sanitation services deficit - Sinkage - Accumulation of water - Main channel inoperative	- To comply with INE and CNA discharge standards - To provide the funds necessary for projects
10. Water Works and Operation Directorate (DGCOH)	- Remove water efficiently - Improve levels of drainage services - Make system operations more flexible - Treat wastewater	- Main outlet channel has reduced carrying capacity - Ground sinkage - Insufficient potable water supply in disadvantaged areas - Wastewater not treated - Aquifer depleted	- To conduct studies and design and implement projects
11. Federal District Water Commission (CADF)	- Guarantee collection of charges for the water services provided and increase private sector participation	- Technical, operational and business weaknesses in sector - Lack of sanitation in the irrigated area	- To act as an agency responsible for billing and collection for water and sewer services
12. State of Mexico authorities	- Upgrade the environment and raise standard of living of the urban and rural population - Ensure full use of water - Reduce subsidies - Comply with standards - Distribute income by executing works - Education and agreements with the public and industries	- High incidence of water-borne diseases - Lack of financial resources - High debt level	- To take steps to improve the socioeconomic status of the population

GROUP	INTERESTS	PROBLEMS	RESOURCES/MANDATES
13. State of Mexico Water and Sanitation Commission (CEAS)	- Prevent emergencies owing to wastewater and stormwater flooding - Increase coverage of water and sanitation services	- Floods in the regional municipalities - Water services operating deficit	- To provide technical training for human resources - To ensure works execution capacity - To purchase and distribute block water to municipalities
14. State of Hidalgo authorities	- Attend to social demands - Support adequate development in urban and rural areas - Reduce public health problems	- Complaints regarding poor quality of water in the Tula river, and complaints from farmers concerning crop restrictions	- To enforce laws and standards - To provide more jobs, increasing productivity
15. State of Hidalgo Water and Sanitation Commission (CEAS)	- Improve water quality - Provide more water - Cover costs	- Widespread disease - High health care costs - Contaminated aquifers	- To enforce laws and standards - CNA should provide policies and resources to strengthen the operators
16. Environmental NGOs	- Improve environmental quality - Promote community environmental protection actions	- Wastewater discharges that affect the public and pollute bodies of water	- To support the population to improve environmental conditions
17. Private sector	- Improve environmental conditions - Take interest in participating in execution of works	- Frequent flooding - Poor quality of water service delivery - Raw sewage discharges	- Financial and technical resources - To influence institutions to improve water and sanitation services
18. Universities/colleges	- Apply technologies and policies	- Application of high-cost foreign technologies	- To make use of technologies developed
19. National Institute of Archeology and History (INAH)	- Prevent construction of works near archeological sites	- Potential destruction of the archeological heritage	- To protect the archeological heritage
20. OECF	- Provide financing for infrastructure and environmental projects	- Risk of flooding - Disease and crop restrictions	- To contribute to economic and social development in Latin America

GROUP	INTERESTS	PROBLEMS	RESOURCES/MANDATES
21. IDB	- Help to improve the environment in the ZMVM - Support government efforts to achieve sustainable management of water resources	- Risk of flooding - Disease and crop restrictions - Large operating deficits of water operators - Dispersal of long-lived toxic substances through the drainage system - Inadequate tariff structure and levels - Incomplete user records - Failure to comply with discharge legislation	- Financial and technical resources - To improve environmental conditions
22. World Health Organization (WHO)	- Call for compliance with water quality standards	- Raw sewage discharges - Disease and contaminated farm products	- Technical resources

MEXICO VALLEY SANITATION PROGRAM
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Logical framework

Narrative summary of the project	Indicators	Expansion and rehabilitation of the drainage system	Wastewater treatment project	Action plan for water operators	Complementary actions
Goal • Quality of life and environment in the Mexico and Mezquital valleys improved	• Health of the residents in the area improved • Crops diversified				
Purpose • Stormwater and wastewater generated in the ZMVM efficiently drained and treated in accordance with current standards; efficiency in water resource management improved through support for the water operators		PROGRAM PURPOSE = PROJECT GOAL Quality of life and the environment in the Mexico Valley improved			
Projects 1. Expansion and rehabilitation of the drainage system in the ZMVM 2. Construction of wastewater treatment plants 3. Action plan for water operators 4. Complementary actions		Purpose Wastewater and stormwater in the ZMVM removed efficiently	Purpose Water generated in the ZMVM treated in compliance with current standards	Purpose To improve the technical, operating, business, and financial efficiency of water operators in the State of Mexico and Federal District	Purpose To guarantee benefits associated with wastewater treatment

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Project 1. Expansion and rehabilitation of the macrodrainage system

Narrative summary of the project	Indicators	Means of verification	Assumptions
Goal • Quality of life and environment in the ZMVM improved	• Possibility of catastrophic flooding and recurrences substantially reduced • Fewer complaints regarding flooding	• Opinion surveys • Reports from DGCOH Customer Service Office	• The economic recovery continues
Purpose • Wastewater and stormwater generated in the ZMVM removed efficiently	• Adequate removal of high water produced by rains with recurrence interval of 50 to 100 years • Conveyance capacity of main drainage channel is restored. • Central outlet channel is maintained during dry season • Fewer complaints owing to lack of drainage	• Annual monitoring reports (DGCOH) • Public opinion surveys	• No catastrophes (earthquakes, etc.) occur that could damage the drainage system
Components 1. Los Remedios interceptor 2. Main valley interceptor 3. Western outlet channel II 4. Straightening of Los Remedios river 5. Straightening of main valley drainage channel 6. Straightening of western outlet channel	1.1 10 km long and 5 m in diameter, built and operating by December 2001 2.1 6.6 km long and 5 m in diameter, with a design capacity of 40 m^3/s, built and operating by December 2001 3.1 13.7 km long with a maximum flow of 60 m^3/s, built and operating by December 2001 4.1 To raise carrying capacity to 20 m^3/s over 7.2 km, in operation by December 2001 5.1 4 km long to increase carrying capacity to 54 m^3/s, in operation by December 2001 6.1 To increase carrying capacity to 120 m^3/s over 16.3 km, in operation by December 2001	• Report on execution of the works • Supervision reports	• Adequate functioning of the trust and regular flow of funds into the project • Adequate coordination between the different institutions participating in project execution

Narrative summary of the project	Indicators	Means of verification	Assumptions
7. Casa Colorada and Texcoco Norte pumping plant	7.1 With capacity of 80 m^3/s and $40^3/s$, built and in operation by December 2001.		
8. Casa Colorada regulating reservoir	8.1 With capacity of 5 million m^3, built and in operation by December 2001.		
9. El Fusible regulating reservoir	9.1 With a capacity of 0.6 million m^3, built and in operation by December 2001.		
Goal			
• Quality of life and the environment in the ZMVM and Mezquital Valley improved	• Reduction in water-borne diseases • Crop diversification	• Ministry of Health reports • Ministry of Agriculture reports • CNA reports	• No other negative factors appear that affect the quality of life in the ZMVM and the Mezquital Valley • Investments are made in sanitation in the Mezquital Valley, State of Hidalgo
Purpose			
• Wastewater generated in the ZMVM treated in compliance with current standards	• Parasite and bacteria levels reduced to meet NOM-ECOL-001/96 a/	• CNA reports	• Industries pretreat waste in accordance with the law
Components			
1. Texcoco Norte treatment plant built and in operation	1.1 Plant with a treatment capacity of 44 m^3/s in operation by December 2001, with treated effluent complying with NOM-ECOL-001/96	• Reports on execution of the works • CNA reports • Reports by the supervisory firm	• Adequate functioning of the trust and regular flow of funds into the project • Adequate coordination between the different institutions participating in project execution • Bids for construction of the treatment plants are in line with the financial resources available
2. Coyotepec treatment plant built and in operation	2.1 Plant with a treatment capacity of 15 m^3/s in operation by December 2001, with treated effluent complying with NOM-ECOL-001/96		
3. El Salto treatment plant built and in operation	3.1 Plant with a treatment capacity of 15 m^3/s in operation by December 2001, with treated effluent complying with NOM-ECOL-001/96		
4. Nextlalpan treatment plant built and in operation	4.1 Plant with a treatment capacity of 0.5 m^3/s in operation by December 2001, with treated effluent complying with NOM-ECOL-001/96		

a/ Sets maximum permissible limits on contaminants for wastewater discharged into national water or property.

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Project 3. Monitoring of action plan for water operators

Narrative summary of the project	Indicators	Means of verification	Assumptions
Goal To achieve sustainable water resource management in the ZMVM	Economic value of the use of water resources	• CNA reports • COF-CME reports	The institutions involved honor their commitments in executing the action plan
Purpose To improve the technical, operating, business, and financial efficiency of water operators in the Federal District and the State of Mexico	• Overall efficiency in Federal District rises from 28.5% to 49.8% by 2001 • Overall efficiency in the State of Mexico rises from 35.4% to 51.4% in 2001	• CNA reports • Annual IDB-SCHP-BANOBRAS meetings during the five years of execution	
Components 1. Monitoring of action plan 1.1 Diagnostic study of operators 1.2 Updating and systemization of user records 1.3 Technical survey of operating units and networks 1.4 Macrometering 1.5 Leak detection and correction 1.6 1.7 Operations control	1.1 At least four diagnostic studies per year of water operators in the State of Mexico, to cover all 18 water operators 1/ 1.5 For Federal District, correction of 42,000 annual leaks in secondary water supply network 1.6 For Federal District, inspection of 5,100 km/yr of drainage networks and rehabilitation of 83 km/yr of drainage networks	• CNA reports • Audits of water operators • COF-CME reports	• The action plan is carried out in a coordinated and efficient fashion • No problems arise with the local contribution

1/ The diagnostic studies of water operators.

Narrative summary of the project	Indicators	Means of verification	Assumptions
1.8 Training			
1.9 Information systems			
2. Micrometering	2. Installation of 450,000 individual meters in Federal District and of 50,000 nonhousehold and 50,000 household meters in the State of Mexico		

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Project 4. Complementary actions

Narrative summary of the project	Indicators	Means of verification	Assumptions
Goal To guarantee the benefits associated with wastewater treatment	• Characteristics of industrial waste discharged	• SEMARNAP reports	• Companies have the funds and the capacity to provide pretreatment • Water operators introduce the necessary modernization measures
Purpose 1. To facilitate and promote observance of current legislation on industrial discharges 2. To educate and raise the awareness of the population affected by drainage and wastewater regarding best practices, to reduce the risk of infection and contagion 3. To determine the investments required in water and sanitation in the irrigation zone to supplement the impact of the treatment plants on public health 4. To propose actions to reduce depletion of the aquifer	1.1 Industrial discharges are pretreated 2.1 Number of people trained 3.1 Plan for priority investments in sanitation and sewerage in the Mezquital valley completed 4.1 Studies completed on treatment plant processes whose effluents can be used to replenish the aquifer	• Reports by the different institutions involved: • SEMARNAP • CNA • DGCOH • CADF • State of Mexico, Urban Development Department, State Water and Sanitation Commission • State of Hidalgo	Adequate flow of funds for these activities
Components 1. Control of industrial discharge 2. Environmental health program 3. Preinvestment studies	1.1 At least 1,500 industries in Federal District and 700 industries in State of Mexico and Hidalgo controlled by program end 2.1 Strategic operating plan completed by year one 2.2 Epidemiological surveillance system 20%, 50%, 75% and 100% complete by year 1, 2, 3, 4 and 5. 2.3 Health promotion measures impact assessment study 20%, 50%, 75% and 100% implemented by year 2, 3, 4 and 5. 3.1 Preinvestment studies completed by December 2001	• Follow-up report on the institutions involved	• Adequate coordination among the different participating institutions • Efficient contracting of the necessary consultants

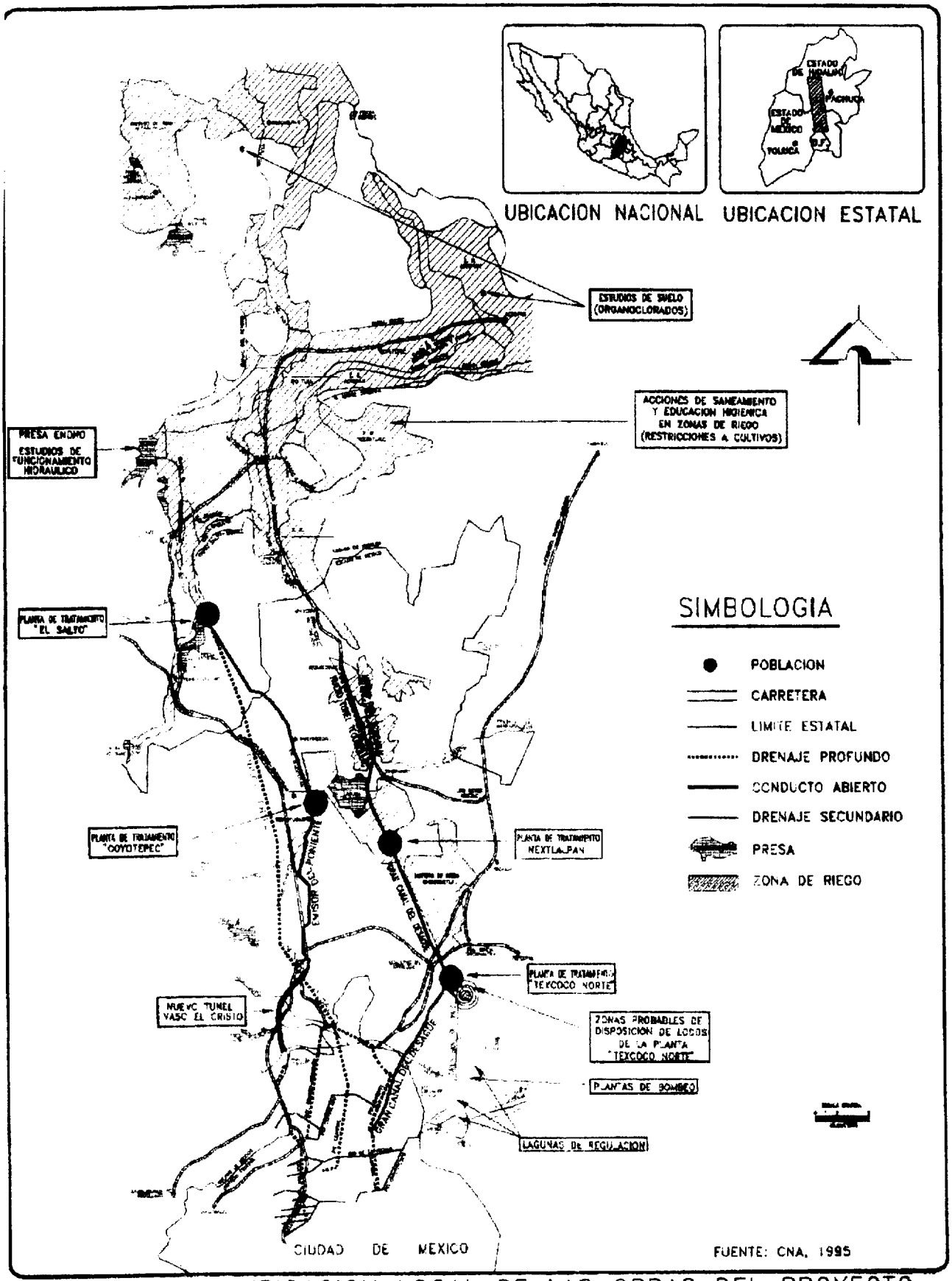
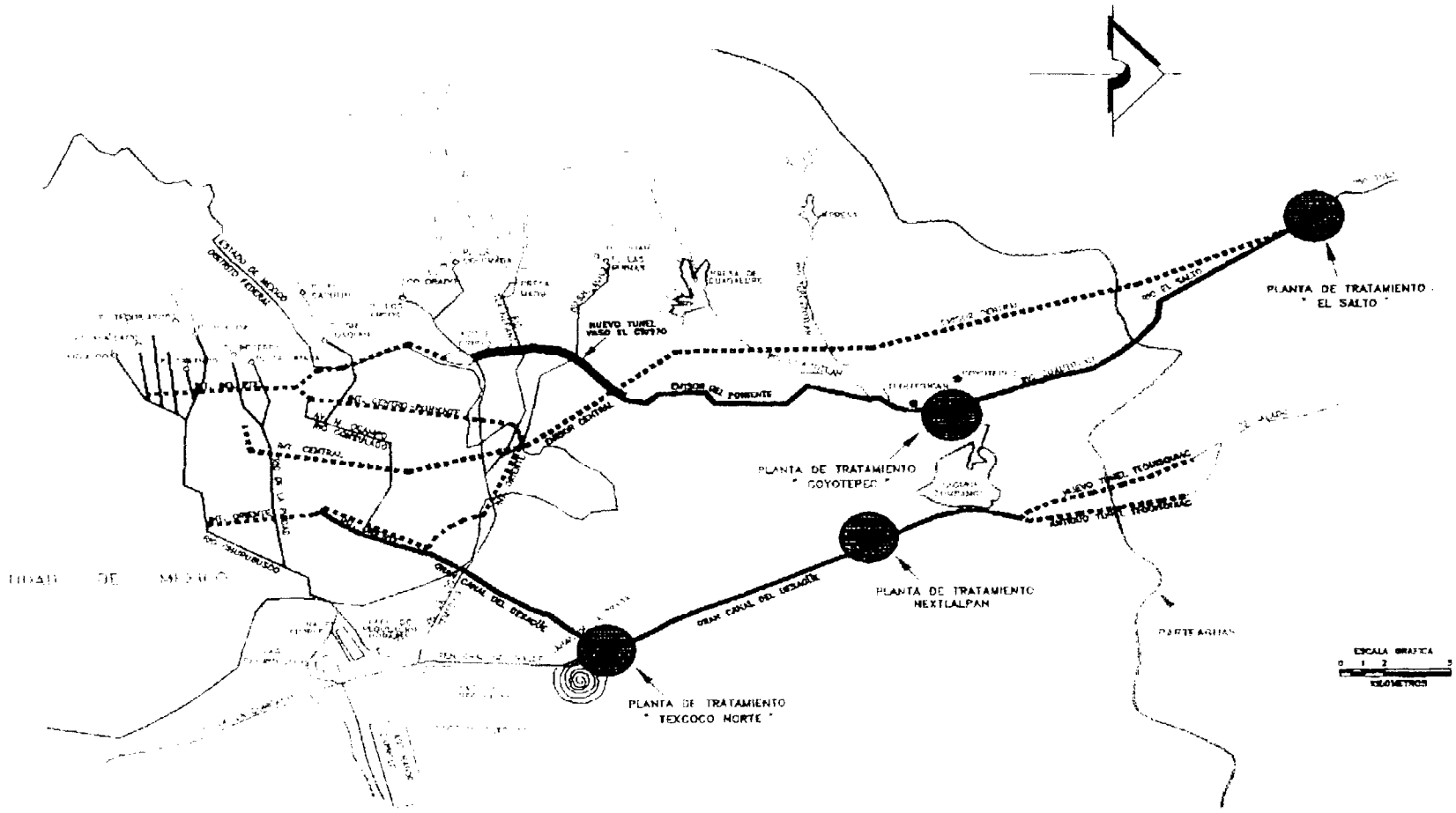


FIGURA 1 UBICACION LOCAL DE LAS OBRAS DEL PROYECTO



SIMBOLOGIA

POBLACION	CONDUCTO ABIERTO
LIMITE ESTATAL	DRENAJE SECUNDARIO
DRENAJE PROFUNDO	PRESA

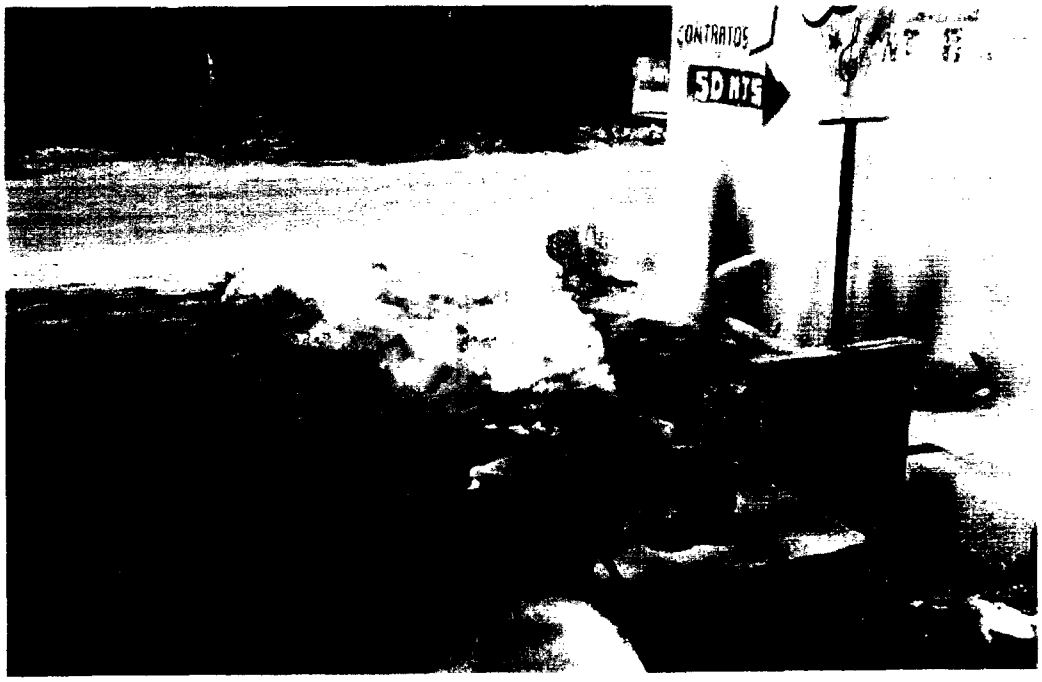
FUENTE: CNA, 1995

FIGURA 2 UBICACION DE DUCTOS Y PLANTAS DE TRATAMIENTO

PHOTOGRAPH 1

Drainage ditches carrying wastewater in Tezuntapec

PHOTOGRAPH 2



PHOTOGRAPH 3. Growing vegetables in Tezuntapec using wastewater for irrigation

PHOTOGRAPH 4.

Drainage ditch carrying wastewater in Tezuntapec with drinking water pipe

MEXICO VALLEY SANITATION AND DRAINAGE SYSTEM
STAGE ONE

GOVERNMENT OF MEXICO-IDB-OECF
WORKS PROJECTS

WORKS PROJECT	FINANCING US$ MILLION		METHOD	PREQUALIFICATION	PUBLICATION **
	IDB	LOCAL*			
LOS REMEDIOS RIVER INTERCEPTOR	66,685	10,003	ICB	YES	Dec-96
MAIN VALLEY OUTLET INTERCEPTOR	50,550	7,583	ICB	YES	Dec-96
WESTERN OUTLET II	91,880	13,782	ICB	YES	Dec-96
STRAIGHTENING OF LOS REMEDIOS RIVER	3,960	0,594	NCB	YES	Dec-96
STRAIGHTENING OF MAIN VALLEY OUTLET	1,235	0,185	NCB	YES	Dec-96
CASA COLORADA PUMPING PLANT (80 M3/S)	42,225	6,334	ICB	YES	Dec-96
TEXCOCO NORTE PUMPING PLANT (40 M3/S)	14,475	2,171	ICB	YES	Dec-96
CASA COLORADA LAGOON (5,000,000 M3)	5,200	0,780	ICB	YES	Dec-96
EL FUSIBLE LAGOON AND DESILTING OF CHURUBUSCO LAKE AND HORARIA REGULATING RESERVOIR	8,310	1,247	ICB	YES	Dec-96
STRAIGHTENING AND RELINING OF OPEN-AIR SECTION OF WESTERN OUTLET	19,000	2,850	ICB	YES	Dec-96

* VAT amount

** Tentative dates

ICB = International competitive bidding
NCB = National competitive bidding

MEXICO VALLEY SANITATION AND DRAINAGE SYSTEM
STAGE ONE

GOVERNMENT OF MEXICO-IDB-OECF
SUPERVISION

WORKS PROJECT	FINANCING US$ MILLION		METHOD	PREQUALIFICATION	PUBLICATION**
	IDB	LOCAL			
LOS REMEDIOS RIVER INTERCEPTOR	3,334	0,730	ICB	YES	Dec-96
MAIN VALLEY OUTLET INTERCEPTOR	2,528	0,724	ICB	YES	Dec-96
WESTERN OUTLET II	4,594	1,494	ICB	YES	Dec-96
STRAIGHTENING OF LOS REMEDIOS RIVER	0,198	0,064	NCB	YES	Dec-96
STRAIGHTENING OF MAIN VALLEY OUTLET	0,062	0,067	NCB	YES	Dec-96
CASA COLORADA PUMPING PLANT (80 M3/S)	2,111	0,460	ICB	YES	Dec-96
TEXCOCO NORTE PUMPING PLANT (40 M3/S)	0,724	0,195	ICB	YES	Dec-96
CASA COLORADA LAGOON (5,000,000 M3)	0,260	0,097	ICB	YES	Dec-96
EL FUSIBLE LAGOON AND DESILTING OF CHURUBUSCO LAKE AND HORARIA REGULATING RESERVOIR	0,416	0,120	ICB	YES	Dec-96
STRAIGHTENING AND RELINING OF OPEN-AIR SECTION OF WESTERN OUTLET	0,950	0,258	ICB	YES	Dec-96

* VAT amount
** Tentative dates
ICB = International competitive bidding
NCB = National competitive bidding

RGII-ME058P
ME-0179
Original: Spanish

PROPOSED RESOLUTION

MEXICO. LOAN ___/OC-ME TO THE BANCO NACIONAL DE OBRAS Y SERVICIOS PUBLICOS, S.N.C.
(Program for the Sanitation of the México Valley)

The Board of Executive Directors

RESOLVES:

That the President of the Bank, or such representative as he shall designate, is authorized, in the name and on behalf of the Bank, to enter into such contract or contracts as may be necessary with the Banco Nacional de Obras y Servicios Públicos, S.N.C., as Borrower, and with the Estados Unidos Mexicanos, as Guarantor, for the purpose of granting the former a loan to cooperate in the financing of a Program for the Sanitation of the México Valley. Such financing will be for the amount of up to US$365,000,000, which are part of the resources of the Single Currency Facility of the Ordinary Capital of the Bank, and will be subject to the "Special Contractual Conditions" and the "Terms and Financial Conditions" of the Executive Summary of the Loan Proposal.