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WATER RESOURCES MANAGEMENT IN MEXICO

By

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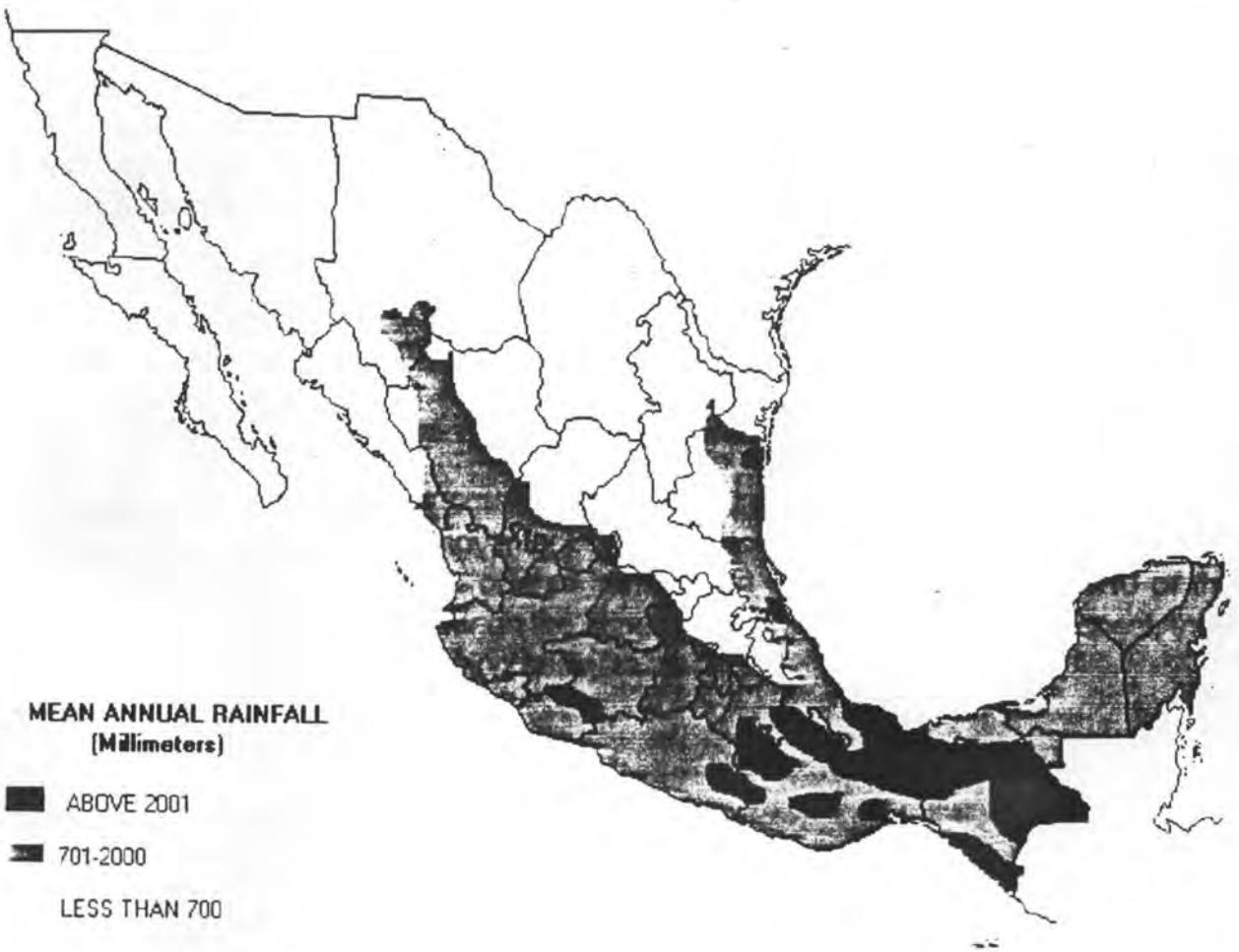
WATER AVAILABILITY AND USE

Mexico extends over an area of approximately two million square kilometers and has over 80 millions inhabitants, is a federal republic composed of 31 states and a Federal District (DF). Since 1917, was adopted the Constitution of the United Mexican States. The nation's economic growth of the last two years has maintanded positive tendencies, with a 1990 gross domestic product (GDP) of approximately US$ 269 billions, at an average annual rate of 3.9 percent. On april 1991, the exchange of rate was US$ 1 = Mex$ 2,993.

Out of the annual average rainfall of 78 cm in the entire country, nearly 27 percent (410 km3) is transformed into surface runoff, with a renewable volume of groundwater estimated at 31 billion cubic meters and a total of 110 billion cubic meters in nonrenewable water stored in the aquifers.



WATER AVAILABILITY DISTRIBUTION IN MEXICO (Km3/year)

Renewable:

Runoff.....410

Recharge..... 31

Non-Renewable: (*)

Aquifers.....110

Availability is very unevenly distributed in the country, with extensive variations throughout the year.

There is only 19% runoff in the North and the high lands (more than half of the territory), with two thirds of the population, 70% of industry, and 40% of seasonal agriculture land. The Southeast, on the other hand, which covers less than one fourth of the total territory with 24% of the population and very little industry, has 67% runoff.

More than a quarter of the total population lives at an altitude of 2,000 meters above sea level, with only 4% of the runoff, whereas at 500 meters above sea level there is 50% runoff for another 25% of the population.

The annual distribution of rainfall is so irregular that almost 80% is concentrated in a three month period, from July to September. This produces the variety of climates in Mexico which go from extremely arid regions in the Northeast to the tropical humidity of the Southeast.

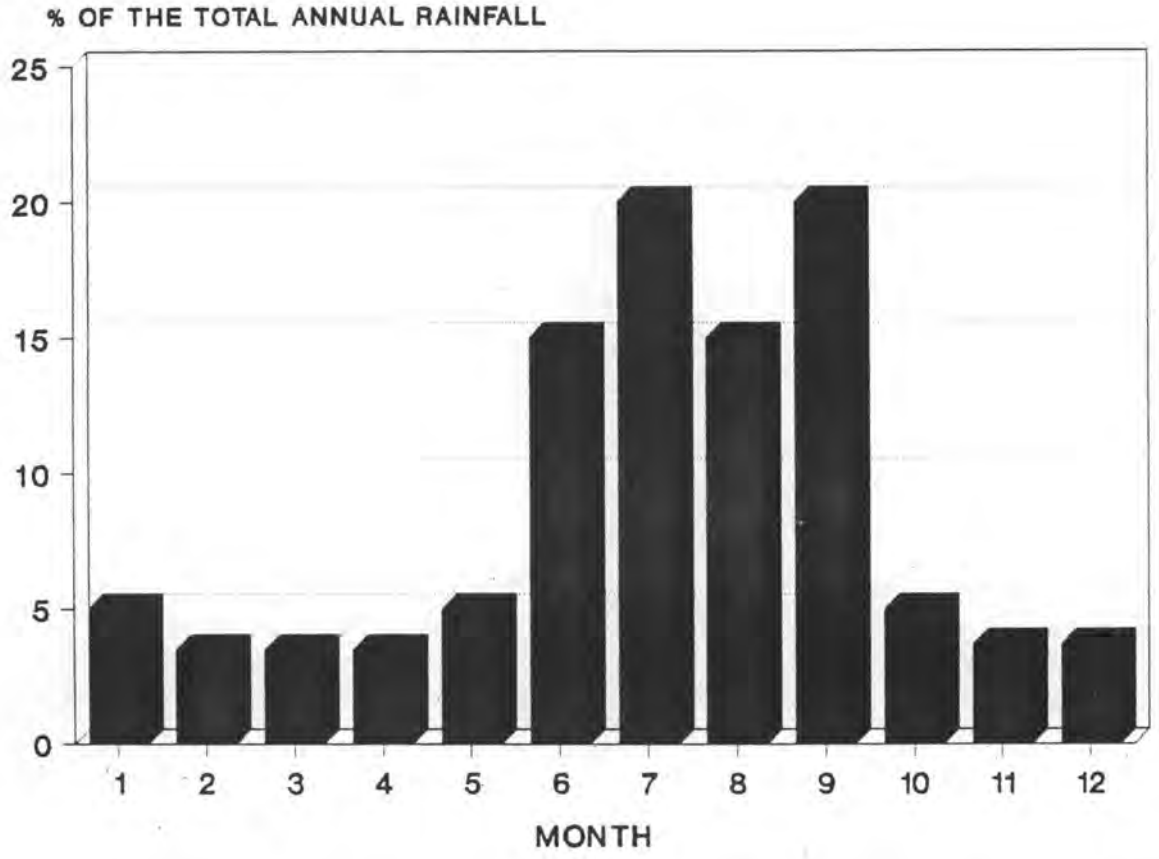
There is another factor that adds to the general climatic condition in Mexico, and that is a continental climate and atmosphere alteration phenomenon in the Pacific Ocean called FENOS(**) (El Niño-South Oscillatory Phenomenon), which produces intermitent anomalies that generate torrential rains and disastrous droughts.

Another cause of frequent anomalies in the rainfall distribution are the tropical cyclones. The number and directional movement of these wind storms determine to a large extent whether seasons will be more or less humid. On the average, there are 10 of these destructive wind storms per year on the Atlantic coast, and 20 on the Pacific coast, though they do generate very far reaching heavy rainfalls.

(*) This volume, identified in geohydrological research, may be potential higher but quality, geographics distribution, quantity or cost accessibility have not yet been studied in depth.

(**) FENOS: Fenómeno El Niño- Oscilatorio del Sur

These cyclones cause an annual damage estimate of between 150 and 500 billion pesos through floods and droughts. In both cases extensive and expensive work is required to curtail the powerful seasonal and annual variations of the seepage flows.



At present there are 147 km3 of water storage by the 1,270 dams that have been built, and 14 km3 of water storage in natural lakes and lagoons. Almost 11 km3 evaporate from the free surface of these storage.

With this hydraulic work, 185 km3 or 43% of the mean annual runoff is applied to various usages. 65% is used for hydroelectric power generation ; 29% is used for agriculture; and the remaining 6% is used for industry in urban areas.

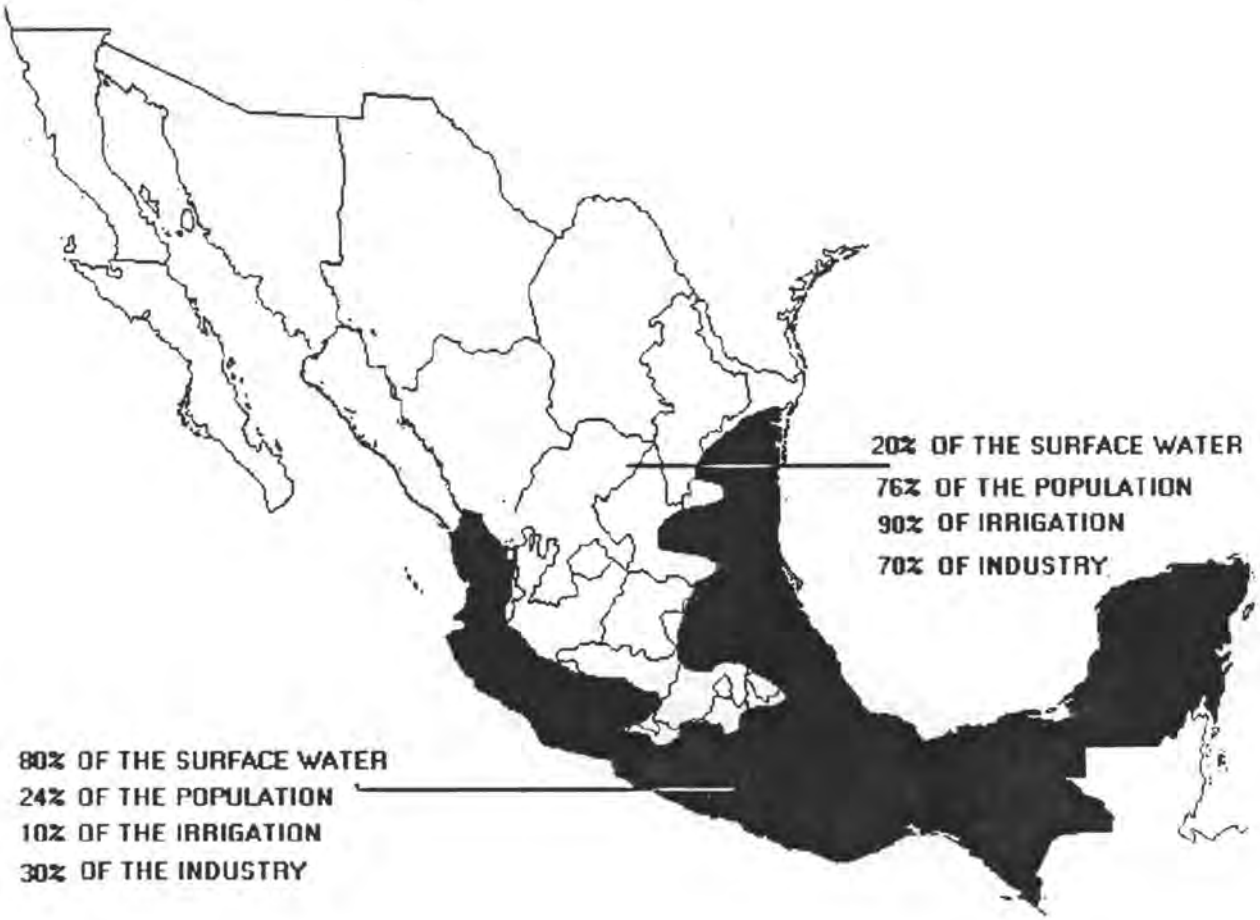
28 km3 are extracted from groundwater aquifers; of this amount, 19 are used for irrigation, 5.6 for urban industrial requirements, 2 for industry, and 1.4 for rural domestic and cattle needs. Although 90% of the extraction correspond to the groundwater recharge, extensive regions are in critical condition, since most of the requirements are in arid zones with very slight recharge, and the groundwater storages are not only being depleted but contain various levels of salinity.

The water not consumed retuns to the rivers and other water bodies, but in a different conditions of quality and volume, to be used latter for other uses. Water used for hydroelectric generation is reused with hardly any alteration.

From the total water applied in agriculture 8% returns to the rivers and other water bodies contaminated with agrochemicals. 80% of urban and industrial water returns contaminated with organic and industrial waste. Contamination produces serious problems for recycling and use of the water in many of the country's watersheds, such as the Valley of Mexico, Lerma Chapala Santiago, San Juan, Balsas, Blanco, Pánuco, Nazas and Bravo watersheds.

WATER PROBLEMS AND INSTITUTIONAL DEVELOPMENT

Hydraulic problems in Mexico are as varied as the general water and rainfall conditions. In the overpopulated areas of the central high lands runoff and groundwater are increasingly unable to supply the high and growing levels of economic development activities. Excessive over-withdrawn of the aquifers, transfer of water from neighboring watersheds, water contamination and the intensive and conflictive rivalry between the users, are some of the conditions that prevail especially in the Valley of Mexico, Lerma, Balsas, San Fernando, Fuerte, Coahuayana, Colorado and Bravo watersheds.



However, the problems are just as serious in the heavily water supplied areas, where extensive and costly water control and drainage work are required to eliminate obstacles to the socioeconomic development of many underdeveloped communities. There is not much industry in those areas, but highly developed oil extraction operations and refineries in the last few decades has been one of the main causes of ecological damage. The great hydroelectric potential has not been developed for financial and environmental reasons, as well as by institutional factors.

Critical problems of lack of water and flooding, conflicts over the use of water and water contamination that affects most of the principal aquifers and hydrological watersheds of the country, have been caused mainly by population concentration and economic development. However, in the last few decades, institutional factors have also contributed to the inefficient use the water and the existing hydraulic infrastructure.

There is extensive legislation covering the use of water in Mexico, as well as decrees that establish that water is a national asset and that water can only be controlled by the Federal Government. The basis for this legislation is Article 27, section 5 of the Constitution of the United States of Mexico, and the governing laws are the Federal Water Law and Regulations, the Agrarian Reform Law, the General Law of Ecological Balance and Protection of the Environment, and the Organic Law for Federal Public Administration.

Water is allocated according to public interest, the priorities for the allocation of national waters is as following: 1.- Domestic; 2.- Public Services; 3.- Cattle Needs; 4.- Crops Irrigation a)communal and ejidos(*) lands b)private property farms; 5.- Industries a)Generation of electrical power for public service b)Other industries; 6.- Aquaculture; 7.- Generation of electrical power for private service; 8.- Washing out croplands and drainage; 9.- Others. Except domestic, this priorities can be altered by Government.

The institutional framework for the management of the Nation's hydraulic resources has been adjusted over time to adapt it to changing development conditions. The process has been dynamic, with the creation of a number of government agencies at the different stages of development requirements:

- (1926) National Irrigation Commission

- (1946) Ministry of Hydraulic Resources

- (1947-1971) Development of hydrological watersheds through Executive and Research Commissions: Papaloapan, Balsas, Fuerte, Grijalva-Usumacinta, Pánuco, Lerma-Chapala, Valley of Mexico

- (1972) Federal Water Law

(*) Small farm holding issued by land distribution laws

- (1975) Integration of first Mexican National Water Plan
- (1976) Creation of the National Water Plan Commission
- (1981) Second version of the National Water Plan
- (1986) Mexican Institute of Water Technology (MIWT)
- (1989) National Water Commission (NWC)
- (1991) Technical Council of the National Water Commission

A public administration reform in 1976 divided the government's responsibilities in the matter of water, but generated considerable problems in coordinating hydraulic policies and led to additional problems in relation to water scarcity, conflicts over water usage, and contamination of the principal watersheds in the country.

Facing the problem of water scarcity on the one hand, and the waste of water on the other; of the demands of 25 million Mexicans who do not get sufficient drinking water for their needs; of the need to increase agriculture production and food supplies; and of limited financial resources required to expand the hydraulic infrastructure, the government created the National Water Commission (NWC) by decree on January 16, 1989. The National Water Commission is the only institution authorized to conserve, distribute and manage national water.

To fulfill its responsabilities, NWC's includes 4 sub-directorates, 6 Regional and 33 State units. Beside the Mexican Institute for Water Tecnology (MIWT) is a decentralized units of Secretariat of Agriculture and Hydraulic Resources but its Director is NWC's Director.

a) Hidroagricultural Infraestructure is responsible for norm, studies, maintenance and construction of federal hydraulic infraestructure, water flood control and agricultural development in drainage and irrigation districts; it is also responsible for transferring infraestructure operation and maintenance to users' organizations and for efficient use of irrigation water in existing infraestructure;

b) Urban and Industrial Hydraulic Infraestructure is responsible for water and sewerage systems management and must promote efficient use of water in urban areas and in industries.

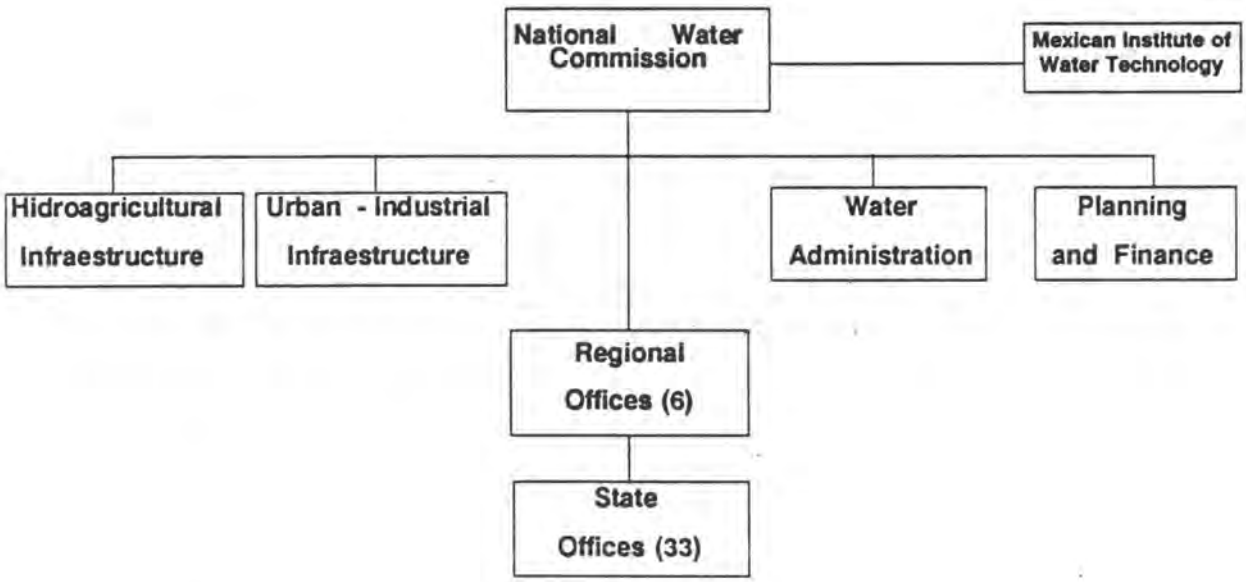
c) Water Administration is responsible for planning, regulating and controlling use of national waters, promoting programs for conservation, and quality maintenance;

d) Planning and Finance is reponsable for supervising implementation of the National Hydraulic Program. It is responsible for cost recovery;

e) 6 Regional Offices are responsible for rrreaching coherence and harmony within every basin; Regional Directorates will also ensure harmony and coherence among States within the six corresponding basins; and

f) 33 State Offices represent NWC in every State, providing support to State Governments, Municipal authorities and to users' organizations to achieve a more efficient use of water resources.

ORGANIZATION OF THE NATIONAL WATER COMMISSION



At present, the Mexican Congress is discussing proposals to change legislation in order to give NWC total authority concerning quantitative and qualitative aspects of water. Increased independent management within the government services is necessary, with the possible participation of the private sector in some aspects of management and services,an increase in water supply revenues, and a more rigid application of aquifer over-withdrawn regulations, as well as tariff mechanisms for a more equitable distribution of water for the most important uses.

POLICIES

The average annual water availability is sufficient to guarantee national development, if appropriate measures are taken to manage the overall water situation.

Guidelines for the water policy are:

-To promote the establishment of self-financing enterprises with technical and management autonomy, to improve city and irrigation district water services.

-To organize and set up the Water Financing System on the basis of the financial capacity of the users' systems, in order to try and recuperate water services operation and maintenance costs, as well as to finance expansion and maintenance of the installed infraestructure.

-To promote the rational use of water, including recycling and quality control.

-To expand the hydraulic infrastructure in order to provide services demanded, eliminate backlogs, and promote full usage of the existing infrastructure.

-To develop the necessary technology to solve problems caused by inefficient use of water and to help users systems to become self-financing.

-To develop new social attitudes toward the use of water which will lead to total community participation in the problem.

-To consolidate the sole authority of NWC in connection with overall water waters usage and management, on the basis of local and regional objectives as well as national objectives.

PROGRAMS

This chapter presents a brief summary of the programs for revenue collection and financing, water supply and sewage services, irrigation and drainage and sanitation. These medium range programs - Together with the very concret problems and needs identified thorough process of public consultation and negotiation between the federal governments and the state and local governments-, mark the starting point for NWC's annual working programs at central, regional and state levels.

Water revenue collections and financing

The basis for the Federal Water Revenue Collections System, wich was established in 1989, has considerably increased NWC income and budget funds. The estimated intake for 1991 is 500 million dollars, or about 60% of the annual budget, in comparison with almost no income from this source in 1988.

Additional funds have been obtained from the IDB and the World Bank for the subsector urban water and sewage programs, as well as irrigation and drainage programs. These founds, however, comes under the heading of credits for programs, rather than small individuals projects.

Further funds are also available for specific macroprojects for the cities of Guadalajara and Monterrey.

REVENUE COLLECTION IN MILLION DOLLARS

	1988	1989	1990	1991 (expected)
AQUEDUCTS	N.A.	105.92	77.24	133.89
PRIVATE ENTERPRISSES	N.A.	36.93	143.37	215.64
PUBLIC ENTERPRISSES	N.A.	39.83	101.73	127.0
IRRIGATION DISTRICTS	N.A.	18.12	30.16	23.94
TOTAL	43.69	200.81	352.50	500.47

N.A.: Not Available

Water supply and sewage

170 m3/s (5.4 km3) are supplied annually to urban centers. A total of 83.5 m3/s is supplied to the three largest cities in Mexico: Mexico City (63), Guadalajara (11), and Monterrey (9.5).

From the amounts supplied, 115 m3/s of residual water are reverted, and only 15% of that amount is treated. There are 256 water treatment plants with a capacity of l4 m3/s: 150 are industrial plants with a capacity of 12 m3/s. Only 35% of the municipal plants are on operation.

In spite of all government efforts to expand the services, more than 30% of the population lacks home drinking water , and sewage is available only to 50% of the population, mostly in the sub-urban lower income areas, where a population of 12.7 million lack water services and 21.5 million lack sewage services. The supply of drinking water without adequate sewage creates more health problems.

Even more serious than the problems of backlogs in infrastructure work, and the poor quality of the services, is the inability of the operational agencies to take full responsibility for these services. Most of the agencies operate under guidelines that have not been updated, without adequate participation of the users in the new problems that development and growing populations have produced.

In general, water rates are set by the local government Congress, without taking into account system operation, expansion and maintenance costs. The low rates do nothing to encourage people to save water, or industries to recycle or use treated residual water. And generally speaking, the low rates and billing practices do not generate sufficient revenue to maintain the services or systems, to update the technological and management operations of the systems operators responsible for the services.

The lack of adequate finances prevents giving proper attention to basic aspects, such as water disinfection, services to the lower income and rural areas under their jurisdiction, treatment and distribution of residual water, contamination and health controls, and promoting efficient use of water. Consequently the Federal government has had to substantially increase subsidies to the State governments, and inequality in the subsidies expensive water costs to communities that lack adequate water services, while the communities that do benefit from the system waste water and do not pay enough for maintenance, conservation and expansion of the systems.

Subsidy restrictions caused by the general economic crisis had led to a general deterioration of the systems, and large investments are required to repair them.

1. Consolidation of the operating agencies, as follows:

a) Provide them with autonomy and decision-making authority, legal status, and independent funds.

b) Involve citizen participation in the board of Directors of the entilities by providing information and accepting public influence in the decision-making process.

c) Ensure that water revenue is used for servicing the systems.

d) Have rates set by the Board of Directors of the water entilities.

e) Encourage financial self-sufficiency to improve technical and management conditions, expand services, pay adequate wages, and in general organize the operation in a more business-like manner.

2.Establish local State agencies to assist the operating agencies. Such assistance should include:

a) Budget planning of the sub-sector in coordination with the Sub-Committee for Drinking Water and Sewage under State Development Planning Committees (SDPC)

b) Supply technical assistance and support services requested by operating agencies and community organizations.

c) Supply direct operation management on a temporary basis to systems that do not have the adequate capacity.

3. Strengthen central authority, as follows:

a) Norms and final authority

b) Intervention in systems when necessary

c) Technical assistance

d) Promotion of national interest programs such as: water disinfection, clean water treatment, and efficient use of water.

e) To finish with non-justified subsidies

In 1988 total expenditures amounted to 131 million dollars, 282 in 1989, and 880 in 1990. Revenue from water billing totalled 330 million dollars in 1989, about one third of the annual income required.

Overall total revenue from water supplied in the entire country amounts to 263 million dollars, compared to 2915 million from electric power supplied, and 2630 million from bottled soft drinks.

Considering the rate of population growth and the need to update backlogs, 3 million people per year require water services. This means an average annual investment of around 1 billion Dls. for year 57% for the large cities, 35% for medium size cities and towns, and 8% for rural communities.

Goals and Results to Date

Steps were taken in May 1990 to update long lasting backlogs and to implement the necessary actions. Available resources were assigned under the National Urban Water and Sewage Program to implement a common strategy in accordance with national social and economic priorities, with the participation of the users, and availability, use, and quality of water.

In order to deconcentrate and decentralize services, Urban Water and Sewage Sub-Committees were set up in every State of the Republic, under the SDPC , with representatives from State, Federal, and Operating Agency levels.

NWC acts as Technical Secretary in these Sub-Committees, for coordination and follow-up of agreements reached, as well as for studies and research, decisions on project priorities, and the application of norms and standards. NWC supervises the progress of the programs, provides technical assistance to State and municipal governments and to system operation agencies. NWC also participates in budget revision, budget decisions and the assignment of credit disbursements for contractors.

NWC also is responsible for the overall supply to the large cities, such as the metropolitan areas of the Valleyof Mexico, Guadalajara, Monterrey, and to six middle size cities, among them Tijuana, Ciudad Victoria, and Huajuapan de León.

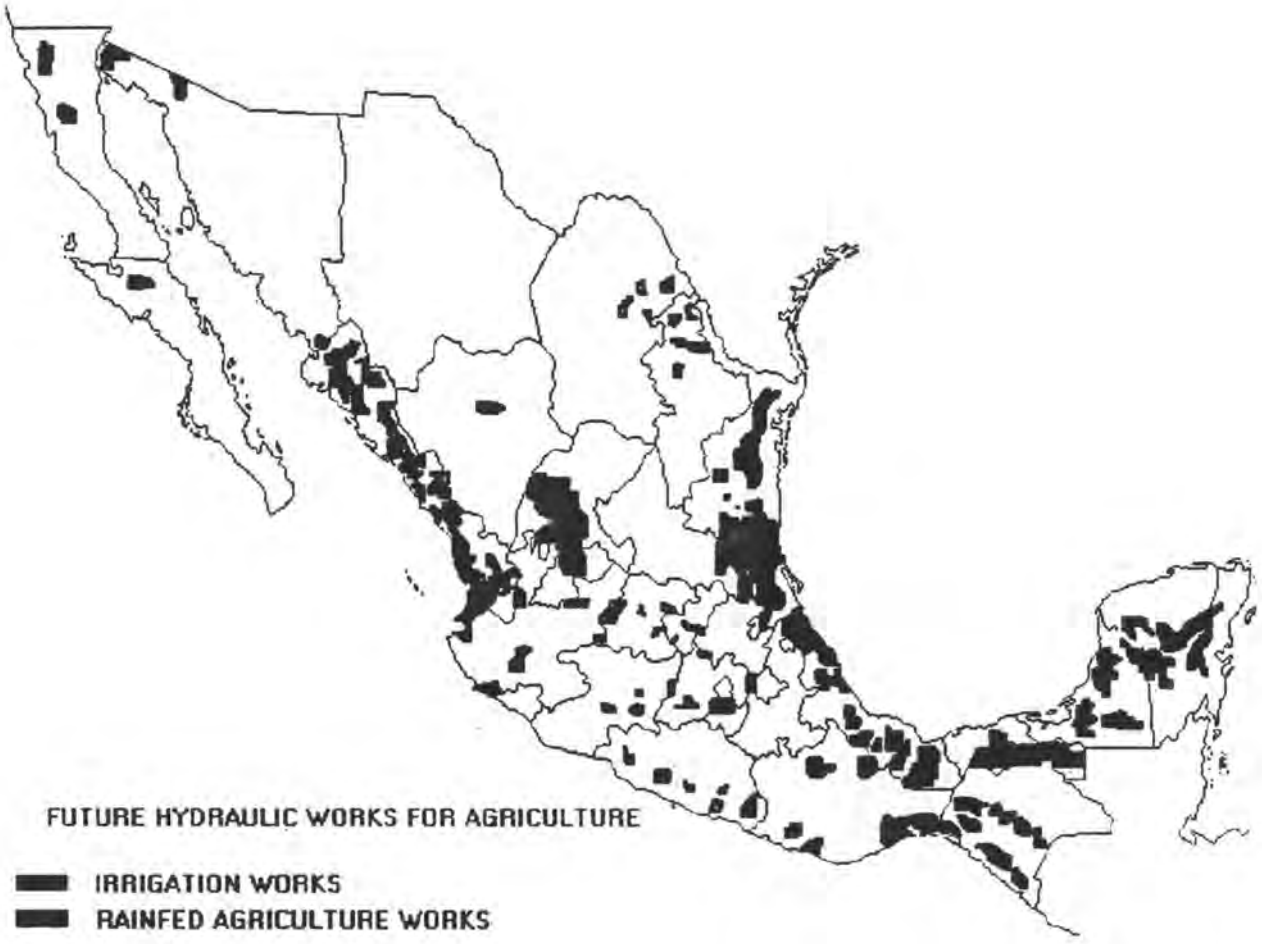
Five state organizations have been consolidated (from a total of 31), as well as 15 operation agencies from a total of 200. Furthermore, 10 State governments have now amended their water legislation as a result of this overall program.

As a result, in 1990, improved services, including the installation of 450 thousand water outlets and 334 sewage connections, provided three million new users with services.

Irrigation and drainage

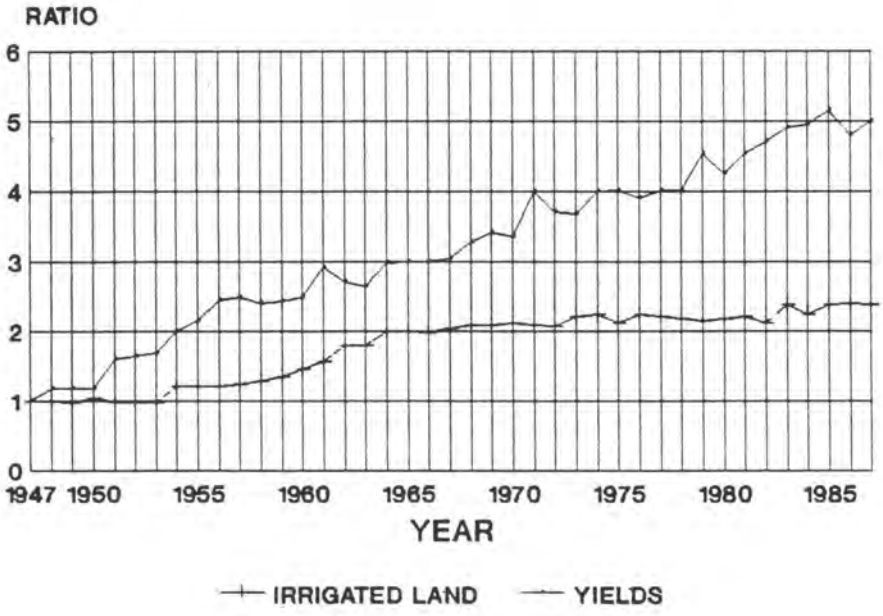
According to the national inventory, only 32 million hectares are useful for agriculture. At present 20 are already being farmed: 6 by irrigation, and the rest by seasonal rains. An estimated 7 million additional hectares can be added in the humid tropics, 1 in the Northwest, and the remaining 4 million hectares in the high lands and the NorthEast.

The 6 million hectares of irrigated crops produce 50% of the total production, 2.5 times more than in rainfed agriculture. These areas include 77 irrigation districts with 3.2 million hectares (60%) and 27,000 small units with 2.8 (40%).

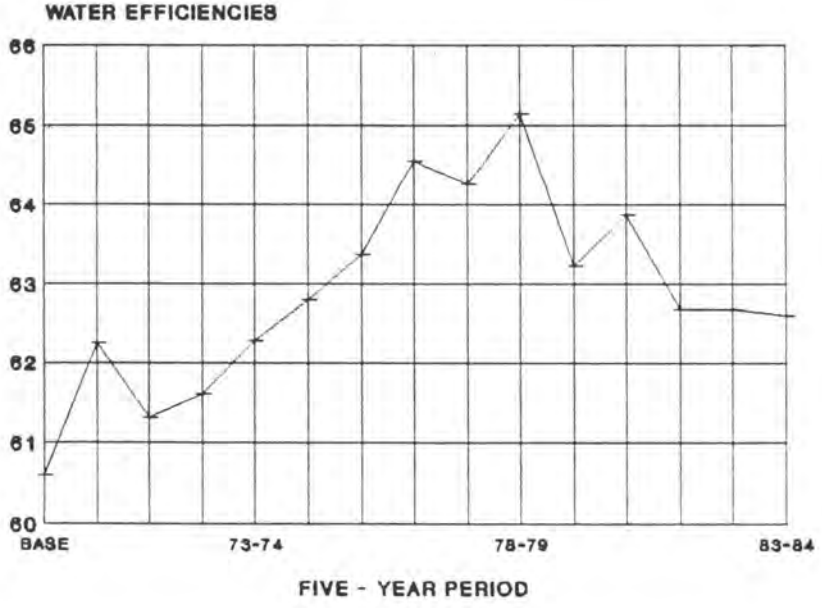


For the past several five-year periods there has been a backlog in increased production, and intense competition for water has magnified water scarcity and contamination. The lack of financial resources to subsidize water services and management, combined with inadequate user participation in district management and low rates that do nothing to encourage saving and efficient use of water, have led to the low level of technical and financial self-sufficiency, to the physical deterioration of water works and services, and to significant loss of productivity.

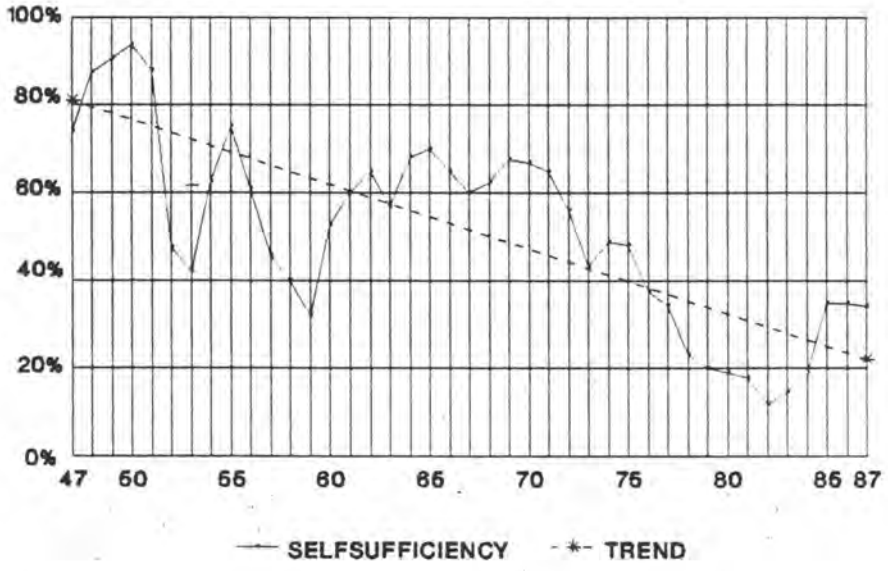
At present 3.2 million district hectares require various degrees of rehabilitation, and 400 thousand hectares under limited irrigation are not being used to full capacity due to social, institutional and political problems.



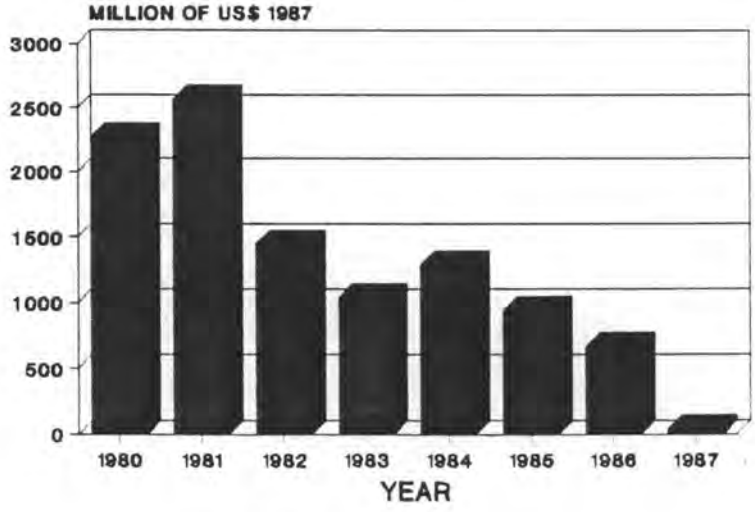
Only an estimated 35% of irrigatble land is farmed during the spring-summer cycle, and 60% is used in the autumn-winter cycle - 50% in total. The efficiency of irrigation units decreased from 65% in 1978-1979 to less than 62% in 1987-1988. Total irrigation efficiency in 1990 was 40%, which means that less than half of the water provided for small farms is actually used for crops.



Irrigation practices are closely linked to rates, and to the extent that the rates reflect the real cost of water. Since 1950, when they completely covered costs, rates went down sharply up to 1960, when they reached the 55% level. In 1970 they increased to 65%, and went down again to 25% in 1980, with a slight improvement to 30% in 1988.



On the other hand, low complementary development investments, combined with institutional, legal and social problems in the sub-sector, have led to unfinished infrastructure and deteriorated productivity. The lack of resources to add another 4 million irrigation hectares, which would mean an additional 16 million tons of grain, is a very big challenge for the nation's capacity for food self-sufficiency.



It is estimated that, in order to recuperate the momentum, agriculture production must increase 3.5% per year between 1989 and 1994, which means restoring the productivity of the irrigation areas, total use of the existing infrastructure, more participation on the part of the users for efficient and rational use of water and soil, and expansion of irrigation and rainfed agricultural lands by 500 thousand hectares, over the total of 4.9 million at present available. (Studies have been carried out for 2 of large irrigation, 2.5 large rainfed, 0.3 of medium irrigation, and 0.1 small seasonal).

Hydraulic policies aim at:

-Stimulating descentralization through healthy financial and independently managed enterprises for irrigation services.

- Strengthen the Water Financial System so that users will pay for the operation, conservation and maintenance as well as for the expansion and improvment of the infrastructure.

-Promote efficient use, reuse, and adequate water quality.

-Complete unfinished existing infraestructure, fulfill new demands, and eliminate backlogs.

-Develop technologies to improve usage efficiency and management of the users systems.

The Program has the following aims:

-To adequately service the 77 Irrigation Districts with 3.2 million hectares. This means modernizing 20 Irrigation Districs in the North and Northwest which cover 1.9 million hectares; total rehabilitation of 40 that cover 0.85 million hectares; and full use of 17 that cover 0.41 million hectares.

-Full usage of 27 thousand units which cover 2.8 million hectares.

-Add 500 thousand new irrigation hectares to irrigation, and 750 thousand of technical support to seasonal agriculture, in order to increase production by 5 million tons of grain (50% of present imports).

-Increase the level of revenue in two years, to the 80% level stipulated by the Federal Tax Laws.

Investment Programs

Taking into account the projected population growth rates, the basic food basket with minimum nutritional requirements, the yields of different crops and regions, it is estimated that in order to satisfy the demand for agriculture products 23.3 million hectares must be farmed in 1994, and 25.4 by the year 2000. In other words, agriculture production must increase by 383,000 hectares per year. Another alternative would be to reduce grain imports by 5 million tons, which means increasing around 200 thousand hectares per year by 1994.

Goals and Results Obtained to Date

38,000 irrigation hectares and 54,700 technified rainfed hectares were added in 1990. A total of 44 thousand hectares were consolidated through rehabilitation works, improvement, supplements, and modenization of the available infrastructure.

NWC took over the temporary operation of the 77 irrigation districts in 1990. These will be transferred to users associations by agreements whereby the latter will undertake to set rates that will ensure self-sufficiency of the operations and conservation of the installations. So far 134,300 hectares have been transferred under these conditions.

Financial self-sufficiency of the operation of the irrigation districts reached a 41% level in 1990, in relation to the 85% level stipulated by the Federal Tax Laws.

A program was implemented to promote efficient use of water. The first stage of this program is also aimed at improving efficient use of electric power in the wells.

Sanitation

The principal cause of water quality deterioration is the dispossal of untreated liquid wastes into rivers and water watersheds. Other causes are open air disposal of solid wastes (garbage), and erosion and blockage which increase daily with the development of economic activities combined with insufficient legislation on the subject.

The sanitation problem of accumulation and disposal of liquid wastes was tackled until recently by simply diverting residual waters from the sources. Now this problem has reached enormous proportions in health, environmental, and economic effects.

Almost 90% of contamination is generated in 31 of the largest watersheds, among them Lerma-Santiago, Pánuco, San Juan and Balsas, followed by Río Blanco, Culiacán, Colorado, Fuerte, and Nazas.

Urban centers, with 70% of Mexico's 87 million inhabitants, dump 110 m3/s of liquid wastes. Three cities, Mexico, Guadalajara, and Monterrey contribute with 60.7 m3/s. Taken together, the largest cities, with more than 50,000 inhabitants each, discharge 72 m3/s, 51 of which are used for irrigation of 165 thousand hectares.

Industrial discharges into rivers and bodiesof water total 82 m3/s. The sugar industry alone discharges 39%, the chemical industry 21%, and the remaining 40% comes from the industrial sector.

The total volume of irrigation discharges, highly contaminated with pesticides and fertilizers, comes to 265 m3/s.

There are 361 municipal plants with a capacity of 30 m3/s, but only 20% operate efficiently; and there are177 industrial plants with a capacity of 28 m3/s.

What is important in contamination control is that the cost of treatment should be covered by the contaminating organizations. This practice will be implemented beginning at the end of 1991. On the other hand, the consolidation of operation agencies responsible for the treatment plants, must be based on rates that are high enough to cover operation and maintenance costs, as well as investments for conservation and expansion.

To eliminate this problem the goverment has implemented a "Clean Water Program".

Actions to be taken in the program include the following five elements:

1.-Water qualitys standars, wich require joint action by SEDUE, Ministry of Healt and Welfare, SAHR-NWC and State Governments.

2.- Water Desinfection Program, to guarantee bacteria free high quality pure water supplies for human consumption. Rehabilitate existing installations in 57 cities, with a total 68 m3/s capacity, and the construction and equipment installation for 155 towns, with a total capacity of 52 m3/s.

3.- Program for sewage and treatment plants, in order to treat 65% of the residual water generated in the country. Plans for construction of 198 new water treatment plants are in process: 22 are already operational, 20 are in the building stage, and the remaining 156 will be built in the period 1992-1994.

4.- Monitoring and improvement and development of the laboratory network, wich is responsible for water quality supervision, application of technical norms and standars for the use of residual irrigation water and water disposal control.

5.- Training Program, for all personnel at all levels working in water purification and residual water treatment plants and laboratories, to guarantee adequate use of resources to carry out the program.

CHALLENGES FACING THE NATIONAL WATER COMMISSION

On February 1,1989 during the establishment of the National Water Commission, the following statement was made:

"The Commission was created to bring unity and coherence to the actions of the Federal Government in relation to water. It has the duty to be an efficient and modern institution: efficient in its organization and in its working systems; modern in the design of its policies and in its response to the needs of the society.

The Commission is committed to the new national goals: social participation in goverment policies; institutional interaction; rational authority in the management of the nation's water resources.

The basic responsibility of the Commission is to establish a new water culture, based on a clear knowledge of the real value of water.

These statements strengthen the formal definition of the National Water Commission and define the process designed to bring about the quantitative and qualitative changes required by the Federal Executive to modernize the country's rural and urban areas.

In dealing with the technical complexity of managing the country's water resources, of regulating them through infrastructure works, of providing the conditions which would improve the quality, efficiency and coverage of water supply and irrigation services, as well as conditions for the development of water for other uses such as hydro-electricity, aquaculture, tourism, and industry, the Federal Government faces four clear challenges: the political process of water management, the change process involved in the creation of a new water culture, the commitment to achieve greater effectiveness in water management, and the need for the NWC to reach a satisfactory level of technical and administrative excellence.

The National Water Commission is not an entirely new institution: it is founded on more than sixty years of experience in water management and development, and relies on skilled experts who have faced the water problem for many years. Supported by this institutional capacity, the Commission is initiating a new stage in the government's task in relation to water.

The Political process

Water and conflict are two words that are becoming increasingly associated. Therefore, in addition to its developmental activities (mainly through the construction of infrastructure), the Government has to strengthen its regulatory function. The country's political trend towards a more democratic process and citizen participation in decision-making will certainly influence the conditions under which this regulatory task should function.

As the country's Water Authority, the NWC assumes responsibility for solving the numerous conflicts associated with water use. Although the solution to these conflicts may often result in acts of authority (restraints, sanctions, abrogations, etc.), negotiation processes will also be involved, in which the success of the NWC will depend on its capacity to assume leadership and propose enforceable concrete solutions.

To acquire, and later maintain, such leadership requires continuous negotiations with authorites, institutions and groups of users, with whom compromises have to be worked out. These negotiations will be carried out through the various levels of NWC organization -central, regional and State- and will result in a flow of information which will feed back into the Commission's programs and activities.However, NWC must not only resolve conflicts, but also anticipate them; it has the experience and the planning methodology developed over the last two decades, which must be updated according to the present problems and circumstances.

Planning "from above", which at one time enabled the enactment of long-term changes many of which are taking place today should now be changed to planning "from below". Water planning must be the result of a process that includes the participation of those directly affected by Government actions carried out through the Commission; consequently, the negotiating capacity of State and regional units of the NWC must be strengthened.

Invoking public participation is not, nor should it be, merely a rhetorical excercise. The Mexican society is now mature and pluralistic. Mexico is a large country and it would be difficult to manage it under centralized criterion: the cost of doing so is beyond the available resources and, in addition, centralization is inconsistent with the objective of strengthening the democratic life of the country.

Negotiation, participation and decentralization are therefore the elements of the political challenge that the CNA must face to assume its role as Water Authority.

The change process

If the nature or type of institution of the NWC had to be defined, the best description would perhaps be that of "change agent", since its purpose is to induce changes -in the use of water, in the management of the resources, and in the characteristics of government invervention- which will give shape to the new water culture.

This has an important impact on the organization of the NWC. Involved in an internal change process (from Undersecretariat to Commission, from Officers to Managers, from dependence to autonomy), the defense mechanisms usually accompanying this process could negatively influence the NWC's capacity to induce external changes. Also, the external changes that it tries to bring about will have an impact on its own organization. The creation of water utilities, for example, will require less intervention by the NWC and, for that reason, a change in its organic structure.

Therefore, the process of structuring the NWC should promote an open attitude towards change. The institution must also speed up the process of delegating authority and responsibility. Undoubtedly there are certain risks and costs, but it will be very difficult for the Commission to stimulate decentralization if internal decisions are too centralized.

Effectiveness

The speed at which the Commission responds to the problems it faces is a measure of its effectiveness, and is one of the main indicators of its performance as a modern and efficient institution.

The transition from a centralized agency with bureaucratic systems and controls -usually externally imposed from the outside- to a decentralized organization with greater control over its own resources and decisions, implies a series of underlying processes which will have to be understood and regulated.

Autonomy does not necessarily imply the internalization of control, that would result in an excess of monitoring and control systems. As an alternative, the institution can establish effective delegation of authority and responsibillity.

Systems, norms and procedures are all necesary, but they should be designed within a framework of greater delegation of authority to those directly responsible.

Insofar as the organization is able to work with greater autonomy and well-defined limits to its authority and responsibility, the institution will be more effective. Those responsible for carrying out specific actions will be clearly identified, and the evaluation of their performance will be expeditious.

Excellence

To preserve and enrich a longstanding tradition of expertise in the field of water management and development in order to face present and future challenges is the fourth task of the Commission.

To reach this level of excellence implies a major push in the development and transfer of the knowledge and the technology required by the institution to adequately solve its problems. The goal of the Commission is not only to achieve excellence, but to keep ahead in all matters in which the country has already made great progress, and to become a leader in the new water culture, by applying whatever innovations are required to increase water use efficiency.

All this will be possible to the extent that the Commission stimulates and makes real use of the creative potential of its members, establishing working conditions which will adequately channel this potential.

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