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PAN AMERICAN HEALTH ORGANIZATION

XIII Meeting

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Topic 26: FINANCIAL OUTLAY REQUIRED TO FORMULATE A CONTINENTAL PLAN OF WATER SUPPLY AND SEWAGE DISPOSAL

(Document presented by the Government of Mexico)

FINANCIAL OUTLAY REQUIRED FOR WATER SUPPLY AND SEWAGE DISPOSAL SYSTEMS IN THE REPUBLIC OF MEXICO

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Present situation in Latin America

In Latin America today there are 109 million persons —22.7 million in urban communities with a population of over 2,000 and 86 million in rural communities--, who are without proper water services.

Between 1950 and 1960, water services were supplied to 21 million persons but during that same period the population increased by 30 million. With the same rates of population growth and provision of water services the number of persons without water services in 1980 will be 150 million.

Applying the unit costs estimated by the Pan American Sanitary Bureau, i.e., $50 per person in communities with over 10,000 inhabitants, $30 per person in communities with from 2,000 to 10,000, and $10 per person in communities with less than 2,000 inhabitants --48 million dollars per year will be needed for a 20-year program to cover the urban population of 22.7 million and 21.5 million dollars per year for a 40-year program to cover the rural population of 86 million. And these figures do not take into account the growth of the population during those periods. As the figures indicate, the undertaking is beyond the financial possibilities of most countries in Latin America.

The problem is of such scope that each country must carefully plan its program in accordance with its financial resources and supplement these with low-interest, long-term loans.

To attain good results in this endeavor it will be necessary to make the Governments and the communities aware of the fact that suitable water services, which are essential to progress in public health, must be administered like any other commercial service, and that the costs must be fully reimbursed by charging water rates consonant with local financial possibilities. To this end, all active elements of the countries will have to participate in educating, persuading, and influencing the people in order to prepare them to assume the responsibility of paying for water services.

The system of paying for water services and amortizing the loan through taxes on immovable property has been successfully used for financing water supplies in some countries in Latin America.

Present situation of Water Services in Mexico

It may be said that in Mexico water services have not kept pace with the progress achieved in other public services such as roads, irrigation, electrification, education, welfare centers, etc.

In 1910, the population of the country was 15 million, and health authorities at the time reported that the population was being supplied by only 120 water works, most of them of poor quality.

According to the 1960 census, there were 34.2 million inhabitants in 127,000 localities, 1,600 of which have water supplies serving 12.1 million inhabitants, or one third of the total population; however, since that figure includes the Federal District -- which has a water service covering almost all its needs -- it means that in the provinces 7.6 million persons or approximately one fourth of the population have water services.

As a result of this situation, 21.6% of the average of 3,880,000 cases of disease occuring each year, are due to the lack both in quality and in quantity of suitable water supplies. It is estimated that about 300,000,000 pesos are spent each year for the control of these diseases.

It is further estimated that over 4,000,000 persons, mostly women and children, devote a great deal of their time to the carriage of water, the labor involved in which represents about 1,200 million pesos per year.

Most of the existing water supplies have been constructed by the Ministry of Hydraulic Resources since 1947, when the agency was established. Before that date, only 2.7 million inhabitants had water services. (This statement and those to follow do not encompass the population of the Federal District since, there, the solution of the water supply problem is the direct responsibility of the Federal District Department).

Data for the past ten years, for which more complete records are available, show that the population increased by 6.6 million and that during the same period 1,400 projects brought water service to 4.5 million people so that 2.1 million persons still remain unsupplied.

The problem is more acute in the rural than in the urban areas, because for various reasons the Ministry of Hydraulic Resources devoted most of its efforts to solving the water supply problem of the large population centers; and it was not until 1956 that projects in rural communities received attention and even then the budget allocations were far smaller than the actual needs required.

In 1957 the Ministry of Health and Welfare began a systematic program of environmental sanitation primarily in the rural communities, with special emphasis on water works. From 1958 to 1960, 600 works of this kind were built, but they consisted mostly of works for the protection of the sources of already existing supplies and only a small number involved the construction of water supply systems.

Some of the State Governments also built water supply systems with their own resources, but unfortunately data on the population serviced are not available.

Since the largest part of water supply works in Mexico was carried out by the Ministry of Hydraulic Resources, the following data are quoted from the report made by the Ministry for purposes of future investments in water services entitled "The Hydraulic Resources of Mexico", published in 1961:

Direct investment in water supply systems from 1947 to 1960 totaled 768,600,000 pesos as follows:

	Pesos
a) Federal Government investment	343,400,000
b) Contribution of consumers, municipalities, and State Governments	247,600,000
c) Bank of Mexico Urban Mortgage and Public Works Trust Fund	177,600,000

With this investment it has been possible to provide 4,875,425 persons with water service, the average investment being 157.67 pesos per inhabitant.

The total number of inhabitants benefited during the period represents 14.3% of the country's present population.

Water Supplies in Rural Communities

The Ministry of Hydraulic Resources has invested 117 million pesos from 1947 to date, which has made it possible to provide 901,420 inhabitants with water service.

The investment per inhabitant, which was 41 pesos in 1948 when work began, has risen to 189.70 pesos in 1960, so that the average investment per inhabitant from 1947 to 1960 comes to 129.90 pesos.

The contribution of the inhabitants to these works, in cash, materials, or labor, amounted to 49.5 million pesos.

Water Supplies in Urban Communities

In the urban communities, where the Ministry of Hydraulic Resources has worked almost exclusively since 1947, the amount invested was 651,600,000 pesos, as follows:

a)	Federal funds:	268,900,000 pesos, or	41%
b)	Contribution of consumers, municipalities and State Governments	205,100,000 pesos, or	31.5%
c)	Bank of Mexico Urban Mortgage and Public Works Trust Fund	177,600,000 pesos, or	27.5%
	Total	651,600 000 pesos	100%

These works benefited 3,974,005 persons at an average cost of $163,90 pesos per inhabitant.

The present works are being carried out by the Ministry of Hydraulic Resources in accordance with the Law on Contributions for the Provision of Water Supply to Municipalities, Article 1 of which reads: "The Federal Government shall assist the local authorities in carrying out works to provide water services by making non-recoverable investments equivalent to one half of the cost in localities with less than 30,000 inhabitants, and one third of the cost in localities with 30,000 inhabitants and above.

Unfortunately the limited financial resources of most of our municipalities and particularly of the localities to be serviced has prevented them from immediately contributing the amounts of their share that would enable them to avail themselves of the advantages of that Law.

The following is the status of the population with regard to water supplies at the present time:

Without water service	16,771,427	48.9%
With rudimentary service	5,350,000	15.7%
With water service before 1947	2,703,153	7.9%
With water service after 1947	4,875,420	14.3%
Federal District	4,500,000	13.2%
Total	34,200,000	100.0%

(See Annex 1)

Plan Proposed by the Ministry of Hydraulic Resources for the Solution of the Problem

Taking 1980 as the final year of the period during which all localities with more than 100 inhabitants should be provided with water service, the Ministry of Hydraulic Resources has proposed a plan of investments to be applied immediately in order to attain the established goal.

To formulate the plan, the communities of the country were divided into three groups according to the type of service they need and the works required.

1. Communities classed as rural with 100 - 2,500 inhabitants with very weak financial resources.

There are at present 17.4 million persons living in this type of locality, of which less than one million have suitable drinking water supply services. By 1980 the number of inhabitants of rural communities will have risen to 25 million, as follows:

In localities with less than 100 inhabitants	800,000
In localities with 100 - 500	9,100,000
In localities with 500 - 2,500	15,100,000

(See Annex 2)

2. Communities classed as urban with more than 2,500 inhabitants and with sufficient financial resources or at least better financial resources than Group 1. There are at present 11 million urban dwellers, of which only 6.7 million have water services. By 1980 the number of urban inhabitants will have increased to 26.5 million, that is to say, that in the period between 1961 and 1980 this essential service must be provided to 19.8 million inhabitants. (See Annex 3)

3. Population of Mexico City and adjacent communities within the Federal District.

Owing to their special social and economic characteristics it is not possible to provide drinking water services to communities with under 100 inhabitants and they are therefore excluded from this report.

Owing to the special nature of the needs of the third group, no consideration is being given to the solution of its problem in this paper.

The following conclusions were reached from studies made of Groups 1 and 2.

1. The cost of the works required to provide modern water supply services to the population centers of the country should be defrayed by the consumers, either totally or with a contribution from the municipal councils, State Governments or the Federal Government, according to paragraph 2 below.

2. The Federal Government should draw up or approve the plans for such works and contribute financially to their construction in accordance with the following standards:

a) In communities with from 100 to 2,500 inhabitants the Federal Government, through the Ministry of Hydraulic Resources, might contribute towards drinking water supply works in the amount of up to 50 per cent of their cost, and such a contribution shall be non-recoverable.

b) In communities with from 2,500 to 10,000 inhabitants, the contribution of the Government shall be only 33% of the cost of the works and shall also be non-recoverable.

c) In communities with more than 10,000 inhabitants, the contribution shall always be recoverable within a period of not more than 15 years and shall not exceed 33 per cent of the cost of the works.

The investments to be made by the Federal Government under these conditions are summarized in the table below:

ANNUAL INVESTMENTS IN MILLIONS OF PESOS

	1961	1965	1970	1975	1980
Rural communities	96	96	96	100	125
Urban communities	60	84	112	175	250
Totals	156	180	208	275	375

It is believed that these amounts are within the financial possibilities of the country, as the present budget of the Federal Government for public investments is of the order of 2,900 million pesos per year (not including semi-autonomous /descentralizado/ agencies) and, considering the growth recorded in previous years, it may be estimated that by 1985 the federal budget will be 7,700 million pesos. This means that the needs of the Ministry of Hydraulic Resources for providing water services to all the communities in the country at present represent 5.4 per cent of the federal budget and in 1985 will represent only 4.9%.

In this manner the matter of federal investments, will be resolved, but unfortunately it will not resolve the problem of financing the part pertaining to the municipalities or communities that will enjoy these services, and may even aggravate it since it diminishes the non-recoverable federal contributions and increases the contribution which the consumers must give when the works are begun or at least during the time that construction is taking place, all of which is to the disadvantage of the communities with limited financial resources.

Plans for the Recovery and Reinvestment of Investments

These plans are based on a similar report drawn up by Mr. Manuel Amaya engineer, in 1957.

The report is principally based on the following points:

1. The annual investment of the Government should be a constant amount for a reasonable number of years.

2. By means of water rates charged monthly to consumers the investment will gradually be recovered.

Even though the water rates charged in communities with more than 100 inhabitants vary according to the size of the population, the average rate charged in water supply systems now operating is 8.25 pesos. If to this rate is added a monthly quota which averages 4.50 pesos per month, for the purpose of recovering 50% of the investment in a period of 10 years, the sum of these two amounts gives a monthly rate of 12.50 pesos for each domiciliary connection which represents less than the amount of one day's wages according to the minimum wage and much less than a family spends in a month for the carriage of water.

3. The amounts recovered are re-invested in other similar works so that with these amounts added to the constant investment of the Government more and more money becomes available and, at least in theory, the time will come when the amount recovered will be sufficient to cover the investments required for further water services, and the Government will be free of this obligation.

4. In order to arrive at that point, however, it will be necessary for the Government to invest a larger amount than it has been investing heretofore. This difference can be obtained through specific taxes on certain articles. It is recommended that the taxes be levied on non-alcoholic bottled beverages; the annual turnover throughout the country being 410 million pesos for refreshments and mineral water and 575 million pesos for beer. There is also the possibility of increasing the tax on the soap and detergent industries.

This study includes two plans:

Plan A.- It provides for the construction of drinking water supplies without advance contributions by the communities but on condition that each community repays 50 per cent of the cost of the works within 10 years interest-free by means of a small extra-charge over and above the monthly water rate. The amounts recovered will be reinvested in works in other communities.

Plan B.- It provides for the construction of drinking water supply works, without advance contributions by the communities, but in condition that each village repays 100% of the cost of the works, within 20 years, interest-free and by means of a small extra-charge over and above the monthly water rate. The amounts recovered will be invested in works in other communities.

The estimate made in the graphs of investments for solving the problem of water, on the basis of the recovery and reinvestment of 50 per cent of the cost in 10 years (Annex 4) and of 100 per cent in 20 years (Annex 5) takes into consideration the following:

a) That the program will be begun during the second quarter of 1962.

b) That the average cost would be 150 pesos per inhabitant in rural communities (with from 100 to 2,500 population), the water being distributed by hydrants, and 300 pesos per inhabitant in urban communities (with more than 2,500 inhabitants), the water being distributed by house connections.

c) The rate of investment needs in proportion to future population was based on the population growth estimates of the United Nations.

The graphs in Annex 6 were designed to summarize Annexes 4 and 5, and show the points where the curve of accumulated investment needs cuts the various curves of constant annual investments.

From this, it is possible to determine the periods in which the problem can be solved and the annual investments necessary. With a 20-year period, ending in 1983, a constant annual investment of 310 million pesos will be necessary if it is wished to recover 100 per cent of the investment, and the amount of 358 million pesos will be required if it is wished to recover 50 per cent of the cost of the works in 10 years.

Financial Outlay required for Sewage Disposal

If the greater part of the population lacks water supplies, the situation is even worse when it comes to sewage disposal. In round figures there are 300 communities that have sewage disposal systems serving an estimated population of 5,000,000, excluding the Federal District. Most of these systems have no treatment plant and hence contaminate the waters into which they flow.

In order to solve this problem the following three points must be taken into consideration:

1. If the plan selected for the provision of water supplies is for 20 years, it is recommended that the plan for sewage disposal be for 25 years.

2. By 1987 there will be an urban population of 35.6 million, of which 5 million now have sewage disposal systems. Thus, works to service 30.6 million inhabitants will be necessary.

3. By the same date there will be 27 million rural inhabitants and since there are now no sewage disposal systems in rural areas, that will be the number of inhabitants for whom they will have to be built.

In view of the nature of the water supply systems planned for this type of community (hydrant distribution network) it is not possible to think of sewage disposal systems since there is no water inside the house; hence the solution of necessity will be the construction of sanitary latrines.

Urban population	
Type of work:	sewage disposal system
Total population to be served:	30.6 million
Cost of the sewage disposal works 30.6 pesos per inhabitant	
Total investment in 25 years:	10,710 million pesos

This investment represents the total contribution to be made by the Federal Government in a 25-year program intended to solve this problem. This investment will be recoverable, not through the payment of fixed rates, but rather through taxes on immovable property.

Rural Population

Type of works:	Sanitary latrine
Total population to be served:	27 million
Cost per sanitary latrine:	20 pesos per inhabitant
Total investment in 25 years:	540 million pesos

Owing to the low cost of sanitary latrines (average cost 100 pesos), it is possible to recover their cost in a period of not more than 2 years, so that if the Government defrays the total outlay of 43.2 million pesos in a period of 2 years, the problem can be solved, since the reimbursements would be reinvested.

Conclusions and Recommendations

1. The policy of the Ministry of Hydraulic Resources to date which has consisted in requesting advance contributions by the communities, has been a requisite that frequently could be complied with, since most of the municipalities have an economy that does not permit them to obtain the amounts necessary or to fulfill the requirements of credit institutions for grantin loans.

The National Urban Mortgage and Public Works Bank is the only institution in Mexico that grants loans for public service works. It charges an annual interest rate of 9 per cent for a 15-year amortization period, terms which are considered high and not attractive as far as water supply works are concerned.

In practice, many communities have not been able to pay their debts and the Federal Government therefore is forced to cancel the debts of the communities from time to time.

This policy has led to a continued increase in the number of persons without water supply services.

2. In the plan proposed by the Ministry of Hydraulic Resources, although apparently the amounts the Federation would have to invest are within the financial possibilities of the country, the portion which communities must contribute is considerably increased, yet no indication is given as to where they are going to obtain the sums they have to contribute.

3. The Recovery and Reinvestment Plan requires no advance contributions by the communities, the entire financing being left to the Federal Government. It has the disadvantage that there is a risk of the investment not being recovered unless an intensive campaign of public education is successfully carried out.

Despite this disadvantage, it is recommended that this plan be adopted, for it must not be forgotten that every program must be based in two fundamental principles: (a) efficient organization and administration of the services so as to ensure maintenance and future expansion; and (b) a self-financing system that includes the necessary capital and the rates needed to amortize the loans and facilitate the operation of the system.

4. In order for this plan to be successful it is considered very advisable to have legislation giving broad power to guarantee the collection of the rates established.

5. The supplementary funds required by the Federal Government could be obtained by applying specific taxes such as those mentioned above or by having recourse to sources of financing that provide greater advantages than those of the afore-mentioned Bank.

6. It is not possible to plan water supplies without making provision for sewage disposal. Moreover, these works should also have the approval and acceptance of the interested parties.

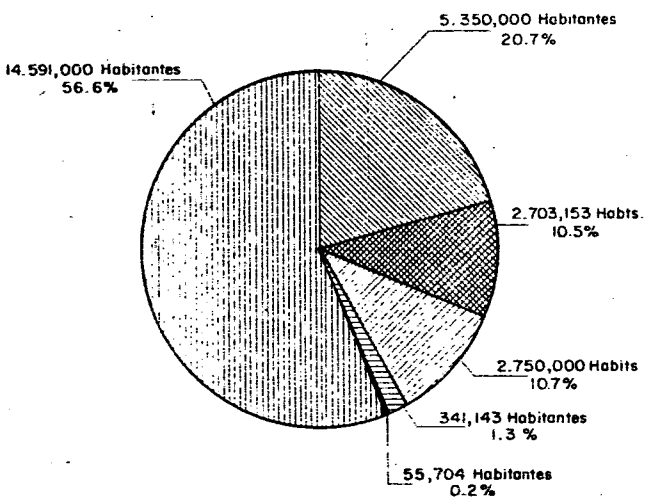
7. The solutions proposed for the rural populations are not definitive. The expansion of water networks for house connections instead of hydrants, and sewage systems instead of latrines, may be left to the initiative and financial capacity of each community.

8. Often, even though water supply and sewage disposal systems may already exist, the public cannot avail itself of these services owing to lack of the money with wich to construct the minimum home installations (toilets, showers, wash basins) and, for this reason, it is necessary to surmount this obstacle by establishing standards, regulations, and contacts with credit institutions so that they will lend the consumers the amounts necessary to build these installations by offering attractive financing plans.

9. Little or no attention has been given to the control of the quality of water supplies and of sewage in the sewage disposal systems. This is an aspect that must be taken into account in any public health program, especially a nation-wide program.

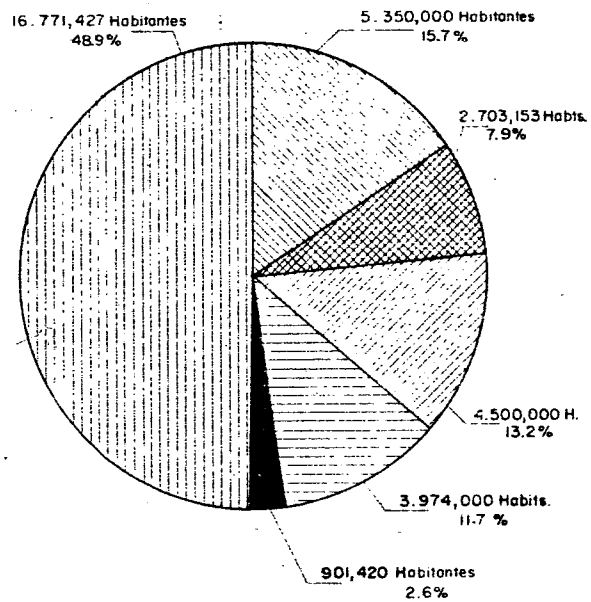
1950

25 791 000 HABITANTES



1960

34 200 000 HABITANTES



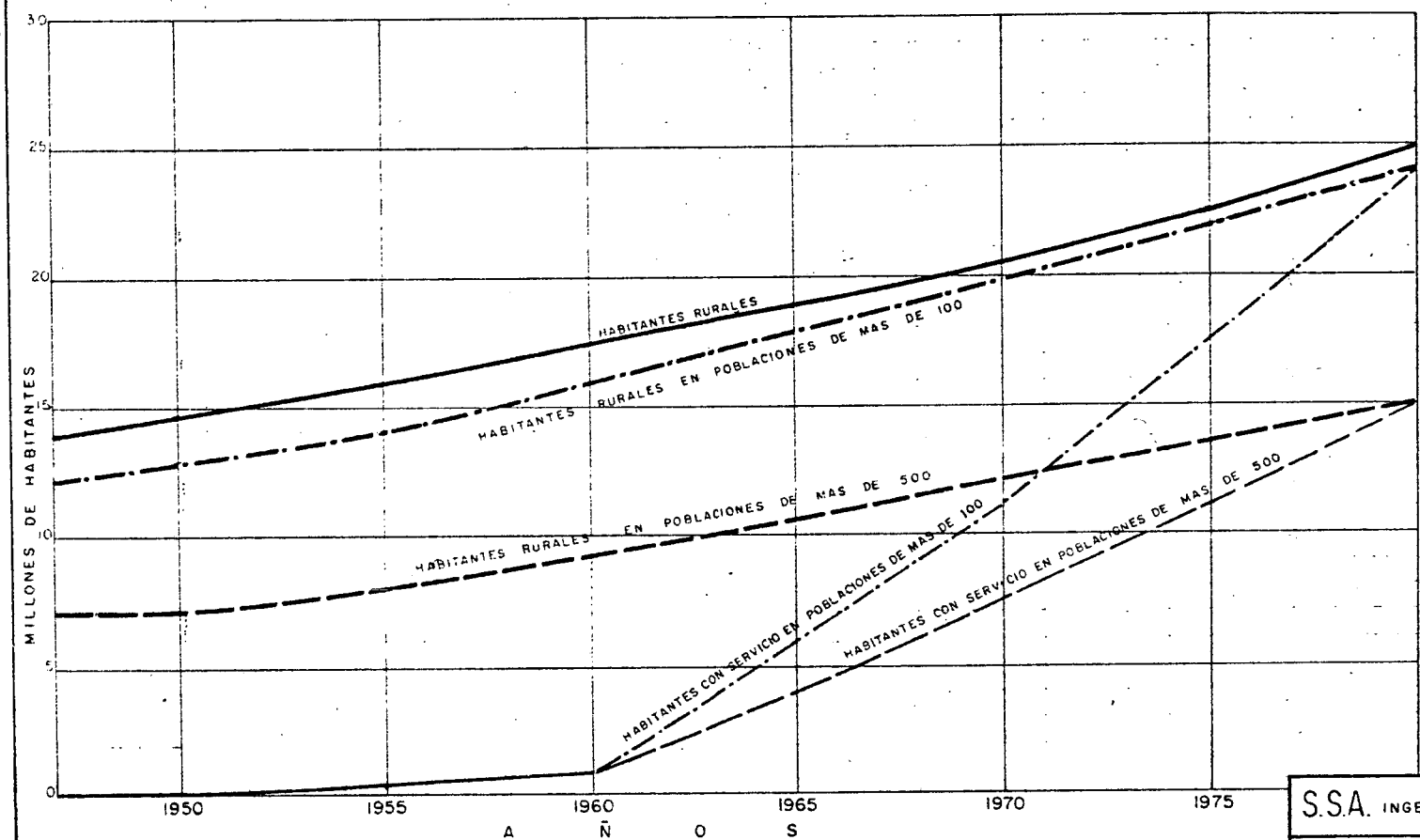
Sin Servicio
Rurales (Servicio de hidrantes)
Urbanos
Distrito Federal
Con Servicio anterior
Con Servicio Rudimentario

S.S.A. DIRECCION DE INGENIERIA SANITARIA

POBLACION DE MEXICO CON SERVICIO DE AGUA

DIBUJO: Antonio Pagaza Linares
FECHA: Agosto 1961

ANEXO No. I



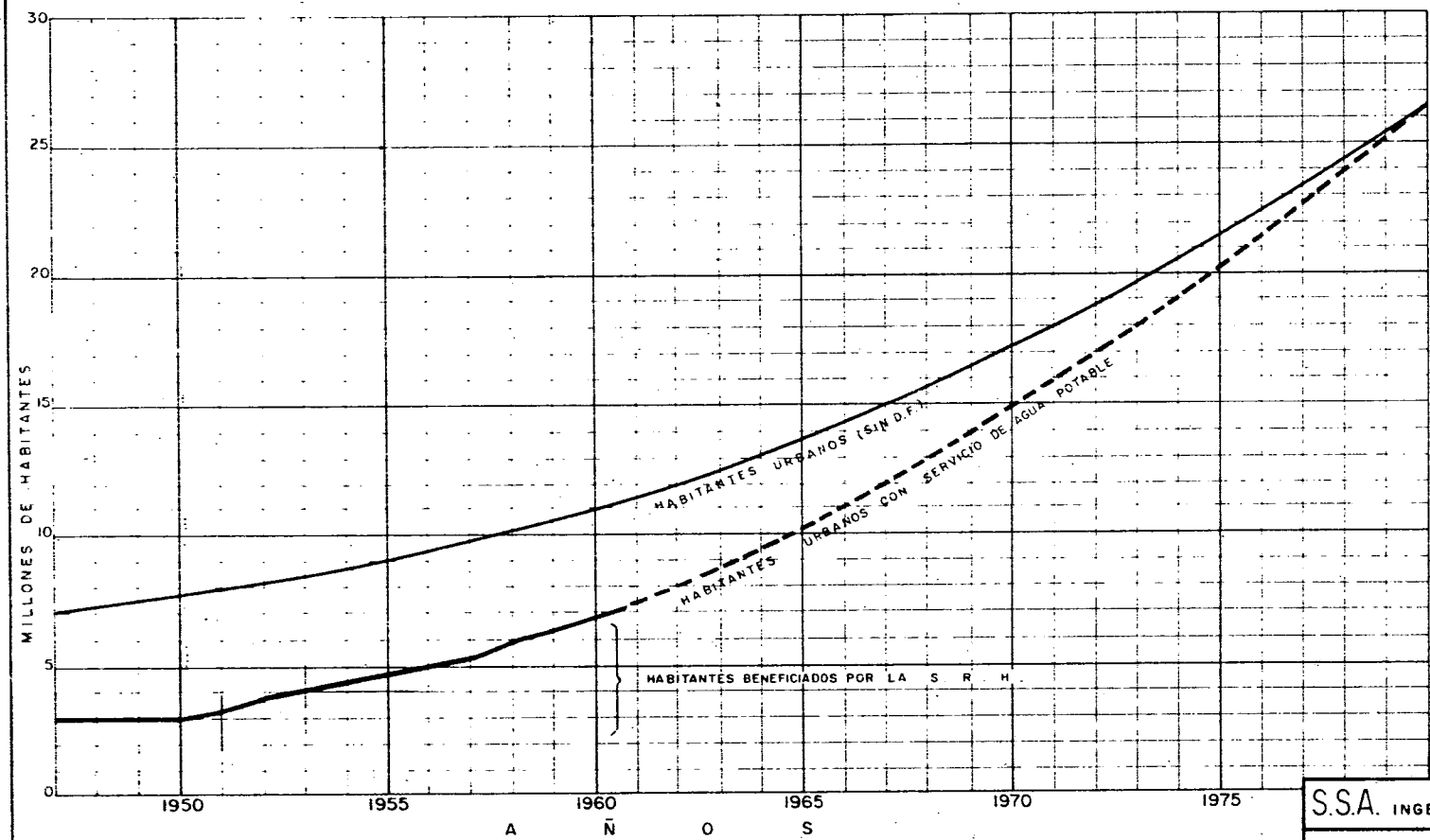
S.S.A. DIRECCION DE INGENIERIA SANITARIA

HABITANTES CON SERVICIO DE AGUA EN LOCALIDADES RURALES

DIBUJO: Antonio Pagoza Linares

FECHA: Agosto 1961

ANEXO No. 2



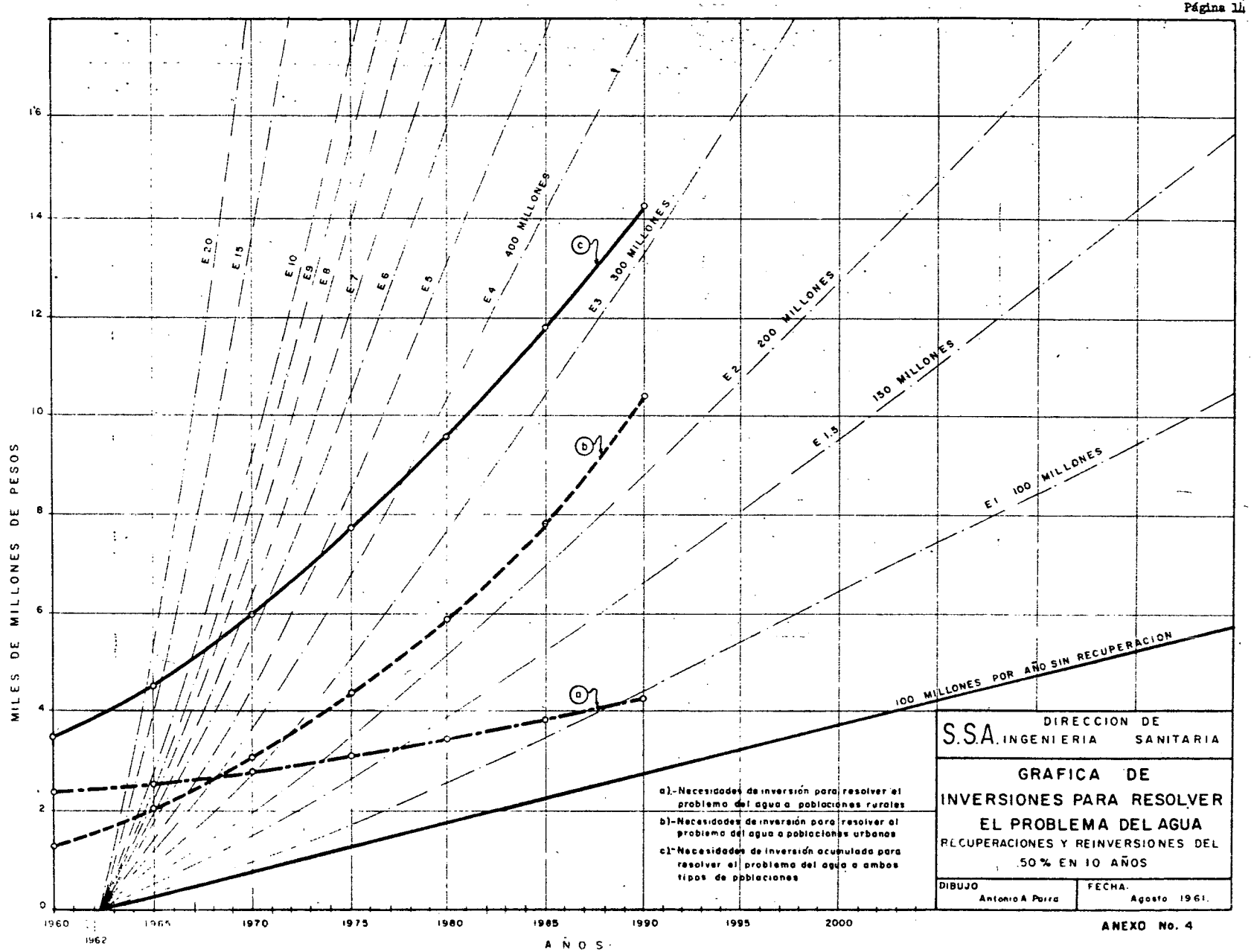
S.S.A. DIRECCION DE INGENIERIA SANITARIA

HABITANTES CON SERVICIO DE AGUA EN LOCALIDADES URBANAS

DIBUJO: Antonio Pagaza Linares

FECHA: Agosto 1961

ANEXO No. 3


MILES DE MILLONES DE PESOS
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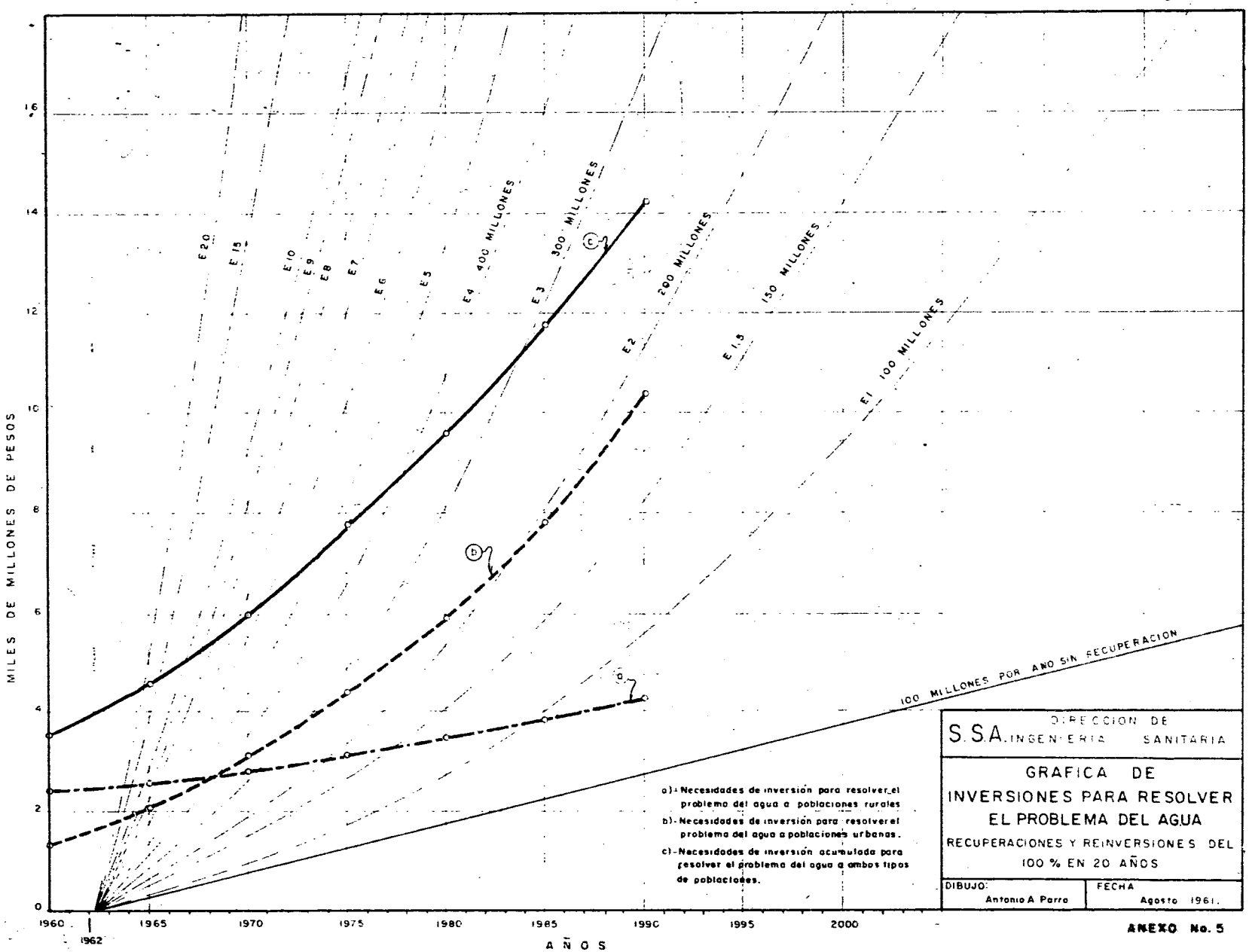
a)
b)
c)
a)-Necesidades de inversión para resolver el problema del agua a poblaciones rurales
b)-Necesidades de inversión para resolver el problema del agua a poblaciones urbanas
c)-Necesidades de inversión acumulada para resolver el problema del agua a ambos tipos de poblaciones
S.S.A. DIRECCION DE INGENIERIA SANITARIA
GRAFICA DE INVERSIONES PARA RESOLVER EL PROBLEMA DEL AGUA
RECUPERACIONES Y REINVERSIONES DEL 50 % EN 10 AÑOS
DIBUJO Antonio A Parra
FECHA Agosto 1961.

ANEXO No. 4


MILES DE MILLONES DE PESOS
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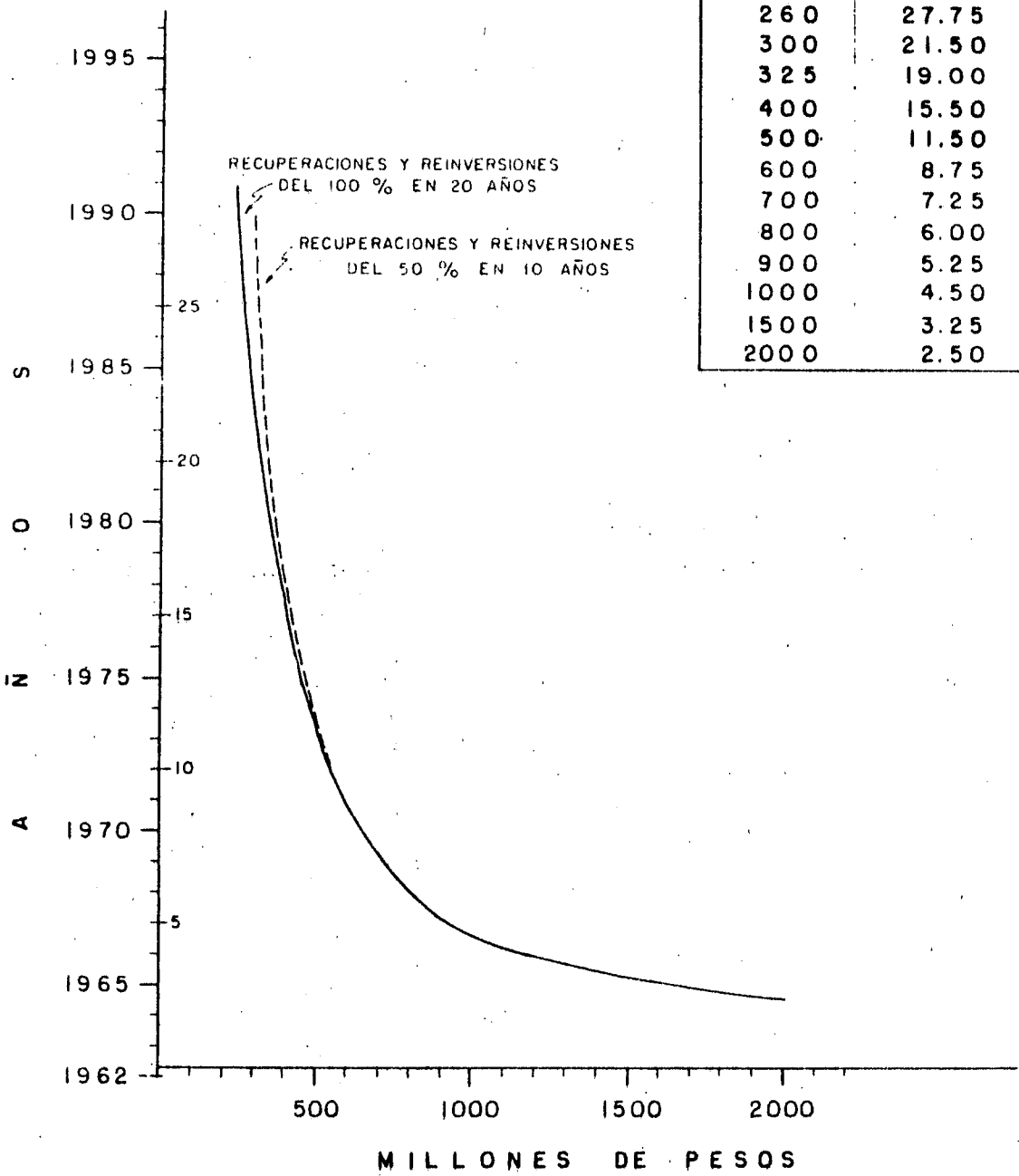
100 MILLONES POR AÑO SIN RECUPERACION
a)- Necesidades de inversión para resolver el problema del agua a poblaciones rurales
b)- Necesidades de inversión para resolver el problema del agua a poblaciones urbanas.
c)- Necesidades de inversión acumulada para resolver el problema del agua a ambos tipos de poblaciones.
S.S.A. DIRECCION DE INGENIERIA SANITARIA
GRAFICA DE INVERSIONES PARA RESOLVER EL PROBLEMA DEL AGUA
RECUPERACIONES Y REINVERSIONES DEL 100 % EN 20 AÑOS
DIBUJO: Antonio A Parra
FECHA Agosto 1961.

ANEXO No. 5

INVERSION ANUAL CONSTANTE	PLAZO NECESARIO	
	100 %	50 %
260	27.75	nunca
300	21.50	nunca
325	19.00	27.75
400	15.50	15.75
500	11.50	11.50
600	8.75	8.75
700	7.25	7.25
800	6.00	6.00
900	5.25	5.25
1000	4.50	4.50
1500	3.25	3.25
2000	2.50	2.50



S.S.A. DIRECCION DE INGENIERIA SANITARIA	
GRAFICAS PARA SELECCIONAR LA COMBINACION INVERSION FEDERAL-TIEMPO MAS ADECUADA	
DIBUJO: C.M.A	FECHA: AGOSTO 1961

ANEXO No. 6