HANOI PEOPLE'S COMMITTEE
UNDP / OFFICE FOR PROJECT SERVICE

HANOI WATER SUPPLY MANAGEMENT PROJECT
VIE / 82 / 011

REPORT OF

REORGANIZATION, TARIFFS AND INFORMATION SYSTEMS FOR MANAGEMENT

HANOI, APRIL 1989

YME group
Helsinki
FINLAND

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SUMMARY

1. REORGANISATION

Hanoi Water Supply Management Project (HWSMP) made in March 1988 a Draft Proposal for the reorganisation of the Hanoi Water Supply.

While planning the "Pilot organisations" for both water production and distribution it became apparent that modifications to the Proposal were necessary. The division of the organisation into departments remained the same as originally proposed. The only remarkable change was to move the Electromechanical Workshop from the Production Department to the Water Network Department. Other changes were minor and concerned the structure and responsibilities inside the mentioned departments.

While developing the whole organisation it was to be seen that there are already 11 water treatment plants. In 2000 the projected number of water plants will be 14-15. Throughout the next 20 years the production will accordingly grow double. Therefore it was considered necessary to form special "Water production Districts" where several water treatment plants are integrated to form one organisation unit.

When water distribution is concerned it was regarded as useful to unite 6 branches to form 3 or 4 water branches only for management and economy reasons.

Benefits of the proposed uniform organisation structure will occur through the improved potential in:

- training and improving the expertise of the personnel
- transferring persons from one job to another
- career planning
- salary policy
- co-operation between the different units

Authority and responsibility should be directed towards the production units.

HWSCo should be run by a staff of roughly 1000 people. The present number is about 1700, engineers and technicians numbering 120 in all. Thisis roughly the same as needed in the new organisation. In the plans for the "Pilot organizations" ("Ngo

Si Lien" water plant and "Dong Da" distribution branch) the following things are specified:

- the regulations and targets
- instructions for the head
- targets and work programme of sub-units (as a training exercise)
- qualifications of personnel
- some parameters to the set targets

It is expected that the HWSCo will start with the pilot organisations in May 1989.

2. TARIFFS

The water tariffs recommended by HWSMP in this proposal are as follows (cost level January 1989):

Category	Present Tariff D/m3	Period 1989-90 Finnida period Tariff D/m3	Period 1991- Tariff D/m3
1. Domestic	35		
- Private houses	12	40	100
- Living quarters	40	80	200
- Public taps	70	120	300
2. Public use	54	120	300
3. Industrial use	70	120	300
Average	51	100	250

These tariffs provide money for operational costs and investment repayments. The private houses ("one-family-houses") pay only for the operating costs. The industry and public use contribute also towards interest payments on the capital.

Families living in flats have a higher tariff than private houses. This is because rent subsidies in block houses are easier to organise according to family incomes. The aim of the higher tariff is to make the flatowners take more interest in the maintenance of the water supply fittings in the building.

It is recommended that the higher tariff is established as soon as possible, at least in the areas where the water supply system is already or will be renovated within 3-5 years.

Metering is the best way to ensure a proper proportioning of the costs to the consumers. If the water tariff is at a realistic level the consumers are prepared to control their own water consumption.

The installation of the water meters should start at connections which are near to the water treatment plants, and then following the water flow, first the large consumers (industry, offices, living quarters etc.) and then private houses.

HWSCo must have the right to close the water supply if a consumer breaks the agreement. The consumer must take good care of the fittings, taps etc and not tamper with the water meter.

3. INFORMATION SYSTEM

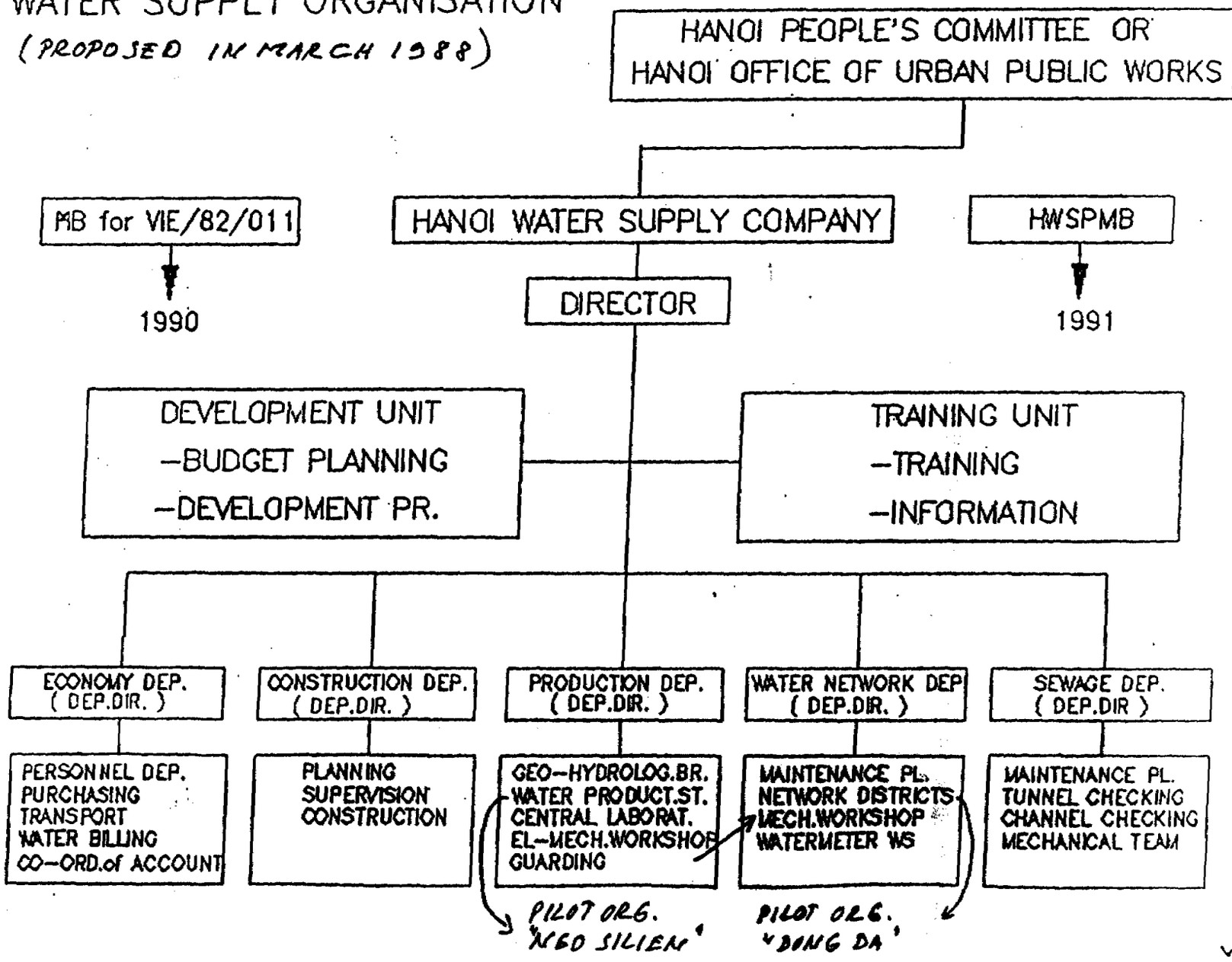
The decision makers on all levels of the water supply administration need information. Today it is not possible to obtain reliable information about the water supply of Hanoi, because for example:

- there is little if any water metering and accordingly statistics of consumption (raw water, pumped water to the network or water sale)
- budgeting and cost control is not reliable or not available

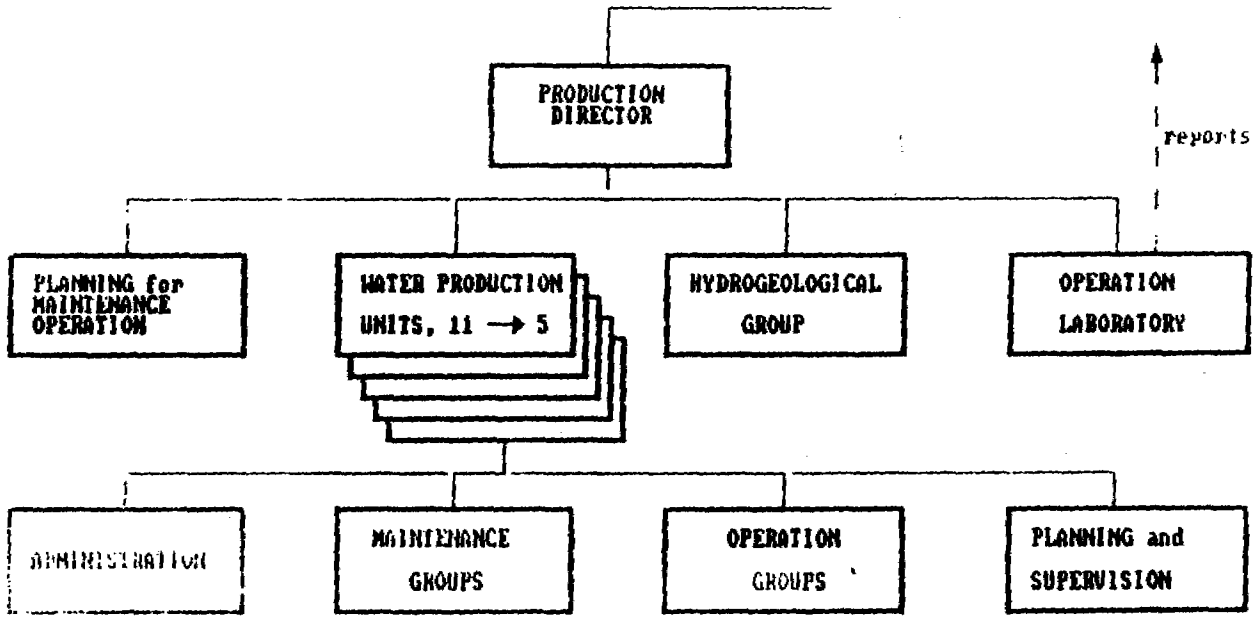
A budgeting and accounting system is to be developed for every water plant and distribution branch, coordinated within the whole Water Supply Company and the Office of Urban Public Works etc.

Ultimately the results through the information system should give data for management to discuss, to set targets and to check the results.

WATER SUPPLY ORGANISATION
(PROPOSED IN MARCH 1988)



VIE/82/011
HWSM-VN
MARCH-88



PROPOSAL FOR REORGANIZATION OF WATER PRODUCTION

(ACCORDING TO " PILOT ORGANIZATION " OF NGO SI LIEN WATER PLANT)

UIE/82/011-HUSH
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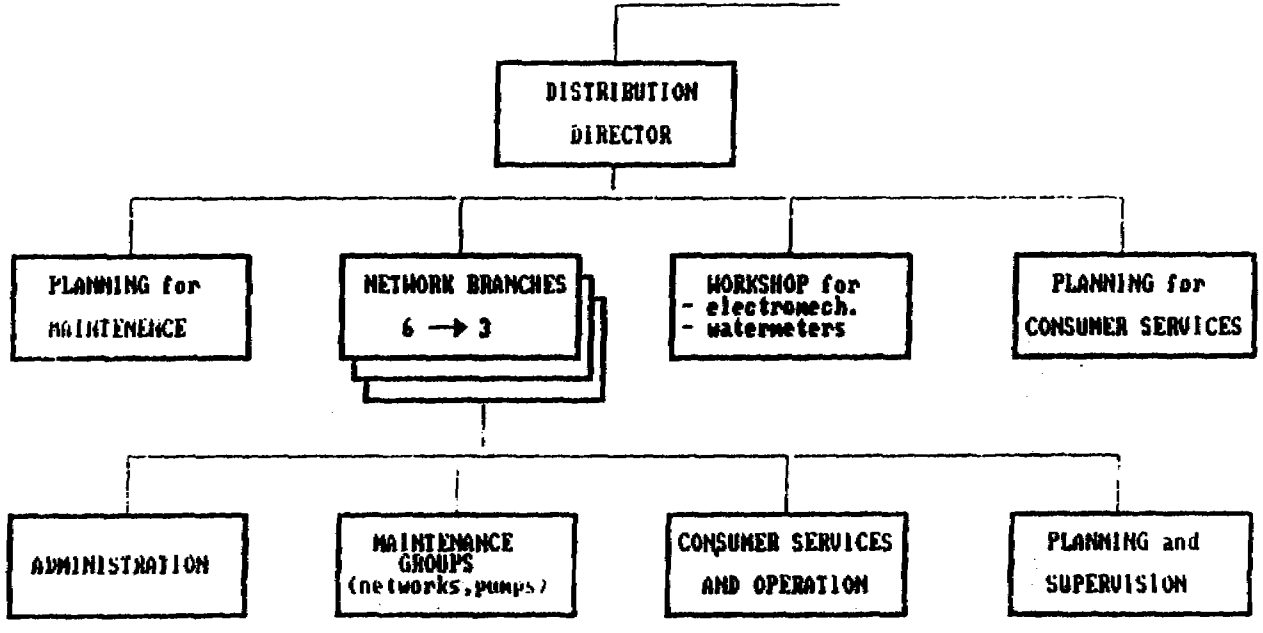

PROPOSAL FOR REORGANIZATION OF WATER DISTRIBUTION

(ACCORDING TO " PILOT ORGANIZATION " OF DONG DA WATER BRANCH)

VIE/82/011-HUSM
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1. INTRODUCTION

One of the main objectives of the Hanoi Water Supply Management Project (VIE/82/011) - later called as the Project - is to develop general engineering and financial management capabilities for the Hanoi Water Supply Company (HWSCo). At the beginning of the work it proved necessary to develop the organization of HWSCo. New investments by the Hanoi Water Supply Project (FINNIDA) require more effective organisation and management to take care of the operation and maintenance tasks, for example.

The first phase of the Project has made " a Draft Proposal on Reorganisation of Hanoi Water Supply and Sewage Works" in March 1988. The second phase made a report about detailed reorganisation, management of water works and tariffs. It was prepared and made by the Management Expert of the Project in Hanoi during the period of October 1988-April 1989. The contents of the report have been presented to the representatives of "the Hanoi People's Committee" and used as training material for the personnel of the HWSCo at the beginning of 1989 (January to April).

According to the information given by the Management Board of the Project, HWSCo should start with the proposed pilot organisations in May 1989.

The third phase in reorganization and management development will be the last quarter of this year. Then there will be enough experience of the pilot organisations for changing the whole organisation. In the autumn the results of the "Water Master Plan 1989" by HWSP (FINNIDA) will be availlable for checking the investment programme and the subdivision of the water supply system into districts for water production and distribution.

2. REORGANISATION OF WATER PRODUCTION AND WATER DISTRIBUTION

2.1 GENERAL PRINCIPLES

HWSM-Project made in March 1988 a proposal for reorganisation of Hanoi Water Supply.

While planning the "Pilot organisations" it was necessary to change some details of the earlier proposal. The main division into departments remained the same as proposed, the only major change was to move the Electromechanical Worskhop from the Production Department to the Water Network Department. The other changes are minor and concern the structure and responsibilities inside the departments.

One thing to be considered is how the laboratory activities are organised. Water production and quality control goes hand in hand - both the development of treatment process and the operation of water treatment plants needs laboratory services. The main principle is that the quality control should be independent of the production. In case the laboratory belongs to the production department there should be a control system for checking the methods and results. The laboratory of the "Health Authority" could be used for checking and controlling the mentioned methods and results. The director of HSWCo should also monitor the results closely.

The other alternative is to keep the laboratory in the technical department (in the reorganisation called "The Construction Department").

Reorganisation for water production and water distribution is in principle uniformed. There are

- production units (water production and water distribution)
- planning units for coordinating and developing of maintenance and operation
- special units like hydrogeological group (in the water production department)
- the office for consumer services (in the distribution department) to co-ordinate and to develop the agreements with consumers and supervision of water consumption.

- workshops for mechanical and electrical plant and watermeter repair and testing (distribution department)
- laboratory for water quality control and for developing treatment processes (in the water production department)

The production units (water plants and distribution branches) are also uniform in both departments.
The main activities are:
- administration
- planning and supervision
- operation
- maintenance

Administration (economical tasks, welfare, storekeeping, salary payment, guarding etc.) are mostly coordinated by the Economic Department.

The benefits of the uniformed organisation are in the mentioned potential in

- training and improving the qualification of the personnel
- transferring persons from one job to another
- career planning
- salary-policy
- co-operation between different units.

2.2 REORGANISATION OF WATER PRODUCTION

For water production there are at present about 11 plants with about 100 wells and 20 km of raw water lines. The present production capacity is 300,000-350,000 m3/d. The plants are managed by a staff of about 650.

The detailed proposal for reorganisation is presented in Appendix A2. The proposal includes organisation charts, qualifications of personnel, regulations and targets of the water plants, targets and workprogrammes (exercises) and indicators for functions for management.

The proposal is naturally subject to consideration and further developments, but it includes the most important elements to

achieve better results in the management of wells, the water treatment process and pumping of water into the network.

The proposal presented in Annex A 2 is tailored for Ngo Si Lien Water Plant as a "pilot organisation". However it is seen applicable to all other water plants as well.

While developing the organisation it has to be noted that there are already 11 water plants. In the year 2000 there will be 14-15 water plants in all. In twenty coming years the production capacity will accordingly be doubled. Therefore it was considered necessary to form:

"water production districts"

where several water plants are brought together into one organised unit.

This integration is easy to realize in the framework of the proposed organisation.

The production director has to manage:

- 4-5 water production districts, each including 2-4 treatment plants with a capacity of 80,000 - 120,000 m3/d and 20-30 wells,
- the planning unit for planning, developing and coordinating of production,
- the hydrogeological group to manage ground water resources (about 100 wells)
- the operation laboratory to monitor the water quality

The head of each of the special groups (eg. maintenance, planning and administration groups) supervises several, 2-4 water plants. Every water plant should, however have its own operational group.
It has to be noted that the Water Supply Company has or should have in the Technical Department (in proposal the Construction Department) planning and work units for bigger renovation and repair work.

The reorganising will continue after experiences about "the pilot organisation" are available and after the final decision of the reorganising of the whole water supply system is made.

2.3 REORGANISATION OF WATER DISTRIBUTION

The proposal for the water distribution organisation follows the guide lines of the planned "pilot organisation" for "Dong Da" district.

The proposal for the Pilot Organisation includes:

- organisation chart
- qualifications of personnel
- regulations and targets
- instructions for the head (chief)
- keyworks and work programme
- some indicators of function for management

This proposal (Appendix A 3) should be experimented with, to gain experience for the developing of the whole Distribution Organisation.

For water distribution there are about 300 km of transmission and distribution pipelines, 22,000 house connections, 15 boosterpump stations and 7 small water plants. These are managed today by six water branches with a staff of roughly 450 persons.

The work load of the staff can be studied by calculating how many house connections and how many meters of pipeline network there are per person. Today these figures are not remarkably high. Naturally both the network length and the number of house connections are increasing. Anyhow it would be reasonable to consider to form only 3-4 water branches. This would be a more effective system in respect of management matters. The most important branches are Hoan Kiem and Ba Dinh -branches.

The new branches should serve as much as possible to the same areas of the city as the earlier proposed water production districts.

The operation and maintenance of small water plants can be taken care by the water production districts in the same area.

Every branch should have its own workshop or room for repairs and a store for spareparts and tools. It is necessary that the own plumbers or fitters of the branch are rapidly available for any repair work. The electromechanical workshop in Mai Dich is more for regular repair works or repair works made in series (e.g. water meter repairing) than for emergency situations.
The workshop in Ngo Si Lien, should be developed to deliver emergency services, as its location in the town centre is ideal.

The most important task of the water distribution sector is to reduce water loss in the network and in houses. It is the keywork for the Water Distribution Department and its branches.

2.4. CONCLUSIONS ABOUT THE MANAGEMENT SYSTEM

The target of reorganisation is naturally to get more effective and economical functions of water supply. It is expected that the new organisation will have more responsibility and authority over important works (keyworks) to reach the desired targets. Furthermore the proposed new tariff will bring enough funds to finance the operation and investment costs.

In the following some opinions and recommendations based on discussions and observations are presented.

The most common problems seem to be:

- the lack of material and tools for maintenance and repairing works
- the slowness in getting the needed material
- the lack of water metering
- breaks in distribution and low pressure in the network (water leaks)
- difficulties of invoicing and lack of motivation in paying for water especially by private houses (water tariff and breaks).
- lack of training in new technics (e.g in installing plastic pipes).

Some recommendations

- the management of water plants and branches should have more education (engineers or technicians especially in the larger units).
- the heads should have more authority (in economy, work plans, store keeping etc.)
- many plants and branches are over staffed, or their work poorly organized. They should have a more effective work plan and tools to carry out their tasks.
- for the renovation of networks there should be a detailed plan (see the water loss reduction programme of HWSP) and a special organisation unit to plan and supervise the implementation in distribution branches.
- water metering and equivalence between cost and water pricing is necessary and should go hand in hand with the rising of the pressure in the network, first the "big consumer" near by water plants and then the others.
- water leaks in houses and in public taps should be reduced to get more pressure in the network. (water metering, tariff and control systems).
- the organisation of the servicing of house connections, fittings and taps in private houses and offices should be better in HWSCo or special plumber businesses could be used.

The management of the water supply is the duty of the Water Supply Company. Outside consultants can only give instruction and advise and transfer their knowledge to HWSCo.

2.5. SALARY POLICY

As an example of the valid salary policy the following information is presented (November 1988, Dong Da water branch):

- The head of a branch	405	Dong/month
- Deputy head of a branch	374-405	"
- Pipe workers	242-319	"
- Water meter reader	256-290	"

The additional income provided for the staff partly depends on the presented salary class. Total incomes were on average 20,000 Dong/month.

Some other examples are shown in pictures / Information system for management. These are about salary according to production.

Conclusions:

- Salary and especially salary changes form a very little portion of the whole income
- Salary classes are many and do not depend on work results.
- The high inflation decreases the importance of the salary

The proportion of salary of all incomes should be higher than it is at present. It should depend more on work results. The number of salary classes should be reduced.

2.6 TRAINING AND MANNING OF THE ORGANISATION

Training should match the targets and tasks of each organisation unit. Study tours, lessons and practising are good training methods for heads of units. On-the-job training is suitable for skilled labour and for the foremen of the groups.

According to proposals for reorganisation and needed qualifications of personnel the following staff should be available:

* Director of HWSCo, University graduate
* Department for water production:

1	Department director, university graduate engineer
3-4	heads, university graduate engineers or others
8-7	heads, college graduate engineers
12	heads, technicians
5	heads, skilled workers (6/7 - 7/7)
6	heads, intermediate school for finance
	appr. 20 foremen, skilled workers (6/6)

appr. 350 workers, skilled workers (4/7-6/7) (target)

* Department for distribution:

1	Department director, university graduate engineer
1	head, university graduate engineer
4	heads, college graduate engineers
8	heads, technicians
6	heads, intermediate school for finance
4	heads, skilled workers (6/7) appr. 25 foremen, skilled workers (6/7)
10	assistants, technicians
300	workers (target), skilled workers

* Department for construction

1	Department director, university graduate engineer
2	heads, university graduate engineers
4	heads, college graduate engineers
10	planners, college graduate engineers
15	planners or supervisors, technicians
100-150	workers, skilled workers

* Department of economy

1	Department director, university graduate
1	head, university graduate
3	head, college graduate
4	head, intermediate school
8	head, skilled workers (6/7)
100	workers, skilled workers or intermediate school

* Units for development and training

2	heads, university graduate
2	planners, university graduate
8	planners, college graduate
50	workers, skilled workers

* Summary

18	University graduate engineers or others
35	College graduate engineers or others
67	Technicians or intermediate school
50	Foremen / skilled workers
900	Workers (skilled workers and others)
TOTAL	1050 persons

The present number of staff is about 1700, i.e. university or college graduate engineers 58, technicians 61, skilled workers 950 and others about 600.

It is possible to get additional qualified personnel from HWSP (FINNIDA) and HWSM-Project, i.e. counterparts.

More details of training is given in the training programme of the Training Center (HWSM-project).

3. PRICING AND TARIFF POLICY

3.1 PRICE OF WATER

The production and distribution of water requires capital. A lot of energy, materials, personnel and different services are needed to operate the wells, treatment plants, and pumping of water to the network. Reliable water distribution requires continuous maintenance of the network and leak-repairing. Metering and invoicing of water, material, supply, transportation and workshop services are the other necessary activities to be mentioned.

What has been the source of data for the calculations? HWSCo has given information about water tariffs, water sale (in Dong) and division of water sale into different cost categories. It can be estimated that due to the heavy inflation the proportion of capital costs was very small (25 %). Operating costs are used in the calculations as given. The only exception are the energy costs, which are included in the water production costs, energy consumption being 0,362 kwh per 1 m3 of water pumped into the network (not sold water, which is 30 % smaller due to water loss).

Capital costs aare calculated here according to unit prices because it was not possible to get cost information from the accounting of HWSCo.
The most important source of data contractors was the HWSP (FINNIDA): The Project Document of Phase II, price lists of pipes, some cost statistics of contractors and estimates by experts were the bases for the calculations.

The detailed calculations are enclosed (Appendix A 4). The price level is that of January 1989 and the exchange rate is 3,500 D = 1 USD.

As a summary of calculations the following cost estimations are presented (in million Dongs/ year):

	Capital	Operating	Total
Production cost	13,300	5,200	18,500
Distribution cost	7,700	1,100	8,800
Overhead cost	2,000	700	2,700
Total	23,000	7,000	30,000

Capital costs are 77 % and operating costs 23 % of the total costs. We notice that: Water treatment process is relatively automatic, the price of energy is at a low level (80 D/kwh) and the salary costs are low, too.

The price of water is following:

Water sale (mill m3/y)	Price (Dong/m3) oper./capit./total	Remarks
90	77/256/333	(Official sale 1988)
73	95/316/411	
55	125/420/545	(consumption according to Water Masterplan 89)

Investments as reinvestments are as follows:

Production	49 mill USD	= 171,000 mill D
Distribution	33 mill USD	= 116,000 mill D
Other	8 mill USD	= 28,000 mill D
Total	90 mill USD	= 315,000 mill D.

The official (HWSCo) total production capacity is 350,000 m3/d. The water production capacity according to the Master Plan -89 is 310,000 m3/d. The whole capacity is used for consumption.

3.2 FINANCING OF THE NEW INVESTMENTS

According to the Water Master Plan which is being prepared by HWSP (spring 1989) the water consumption projection for Hanoi City is following:

Year	Population	Consumption				
		Total		Domestic	Indust.	Losses
		(m3/d)	(l/c/d)	(m3/d)	(m3/d)	(m3/d)
1988	937,000	306,000	327	66,000	87,000	153,000
1995	1,048,000	393,000	375	126,000	110,000	157,000
2000	1,120,000	458,000	409	168,000	130,000	160,000
2010	1,400,000	622,000	444	252,000	196,000	174,000

The water consumption (per day) will increase more than 300,000 m3 in 22 years. The present demand is estimated to be 306,000 m3/d. The official water distribution according to HWSC is 350,000 m3/d. But the most important point here is the need of additional production capacity in the future, that is 310,000 m3/d, because the present capacity is totally in use. The second phase of HWSP (FINNIDA) will construct about 100,000 m3/d (90,000 m3/d) of additional capacity.

If we assume that one investment project adds the production capacity with 100,000 m3/d we have to have four ones in the mentioned 22 years. That means a new water plant with wells, raw-water lines, treatment process and pumping station is to be constructed every 5-7 years.

It is quite possible that some older water plants have to reduce their production because of the draw-down of ground water level.

The program of network construction is an important part of the Water Master Plan -89. in this situation (before the Master Plan) it is assumed that the network construction is on average 10 km/year and the costs are the average costs of the present network (1955-1988) (220 km of new or reconstructed network in all).

The water sale is assumed to develop as follows:

Year	Proposal of HWSM (m3/d)	Other estimations HWSCo (m3/d)	Master plan -89 (consumption) (m3/d)
1988	250,000	250,000	150,000
2000	350,000		300,000
2010	450,000		450,000

According to the water price calculations (appendix A 4), the investments for the period 1989 - 2010 are following:

- Water plants (4x100,000 m3/d, 16 mill USD) = 64 mill USD
- Network (220 km, 150 USD/m) = 33 mill USD
- Others (machines, rehabilitation etc.) = 13 mill USD

Total = 110 mill USD

That means on average 5 mill USD yearly for investments; in the beginning of the period 4 - 5 mill USD/y and then 5 - 6 mill USD/y.

Operating costs are calculated on the actual water sale, here they are assumed to be 100 D/m3.

According to the assumptions above, the approximate water price is following (3,500 D = 1 USD):

Year	Water sale (m3/d)	Investments (mill D/y)	(D/m3)	Operating (D/m3)	Total (D/m3)
1989	250,000	14,000	160	100	260
2000	350,000	17,500	140	100	240
2010	450,000	21,000	130	100	230

The water price is lower (15 - 20 %) than the result of calculations before. The capital costs, yearly depreciation and interest are higher than yearly investments because of interest (6 %). By changing depreciation periods and interest (for inst. from 6 to 3 %) it is possible to get other results.

How to finance investments is naturally a finance political question of the city. One and natural way is to collect money from the consumers.

FINNIDA contributes in the second phase of HWSP (1988-1990) 17 mill USD for investments and rehabilitation. For technical assistance and supervision the contribution is 8 mill USD. The main outputs will be:

- 90,000 m3/d additional water production capacity
- 95 km of new transmission and distribution lines.

The first phase of HWSP (FINNIDA) contributed (1985 -88) a total of about 30 mill USD.

3.3 WATER TARIFF

3.3.1 PRESENT TARIFF

The consumers are divided into twelve (12) groups in the statistics of the water sale. Water sale was in 1988 as follows. New main groups are composed)for proposed statistics.

Category		Percentage proportion of sale of m3/d	of D/d	Water tariff June 88 D/m3	Dec 88 D/m3
1.	Domestic use/total	42 %	28 %		(35)
1.1	Private houses	(16,3)		5	12
1.2	Living quarters	(17,6)		5	40
1.3	Public taps	(8,1)		15	70
2.	Public use/total	28 %	32 %		(54)
2.1	Adm. offices	(10)		15	70
2.2	Hospitals	(3,5)		15	70
2.3	Army	(5,9)		15	70
2.4	Cultural offices	(1,0)		15	70
2.5	Educ. offices	(7,6)		5	11

3.	Industrial/total	30 %	40 %		(70)
3.1	Business	(7,1)		15	70
3.2	Co-operatives	(0,9)		15	70
3.3	Industry	(19,2)		15	70
3.4	Construction	(2,8)		15	70

The target of water sale in 1988 was 250,000 m3/d. According to the statistics of HWSCo it was appr. 244,000 m3/d. The official water loss is 30 %, thus the water production has been 349,000 m3/d.

According to the statistics the domestic water consumption was 42 % but its proportion of incomes (invoicing) was 28 %. The industrial and public comsumption was 58 % and its proportion of incomes 72 %

For the year 1989 the following estimations are made for the proportion of water consumption and incomes at present tariffs and according to official water sale targets, water sale 90 mill m3/y, water production 129 mill m3/y:

Category	Water use percent	m3/y	Water invoicing percent	mill D/y
1 Domestic	42 %	38 mill	28 %	1300
2 Public	28 %	25 mill	32 %	1500
3 Industrial	30 %	27 mill	40 %	1800
Total	100 %	90 mill m3/y	100 %	4600 mill D/y

The water price would be on average 51 D/m3 (0,015 USD).

3.2.2 FULL PRICE TARIFF

The estimate of all expenditures for water supply activities, also capital and operating costs, at cost level January 1989, is given in part 1. According to it HWSCo should collect money as follows:

23,000 mill D/y for capital costs (interest, depr.)
7,000 mill D/y for operating costs
30,000 mill D/y as total revenue.

It means that the water tariff, based on official water sale (90 mill m3/y), should be:

- for capital costs 256 D/m3
- for operating costs 78 D/m3
- for total costs 334 D/m3 (0,1 USD)

The present tariff, on average 51 dong/m3, is not enough even for operating costs. The cash flow without capital costs is showing a deficit of 2,400 mill dong/y. This deficit is to be financed from other sources of the city economy.

The HWSCo has not any possibilities to amortize loans or to pay interest on loans. It is neither able to finance the new-investments.

The full price tariff is more than six times the present tariff. The tariff covering only the operating costs would be 50 % higher than the present tariff (51 D/m3).

3.3.3 CASH FLOW TARIFF

In part 3.2. the estimate of the "cash flow demand" is included in the operating costs/yearly investment debentures (1989-2010). After that in the next 5 - 10 years the water tariff should be on average 250 D/m3. Naturally a yearly budgeting included in the investment program will give more exact result for the price proposal.

For the next two years HWSP (FINNIDA) will finance the main part of the investment costs. As to the cash flow it will thus be necessary to collect money only for the operating costs (80 D/m3) and for the Vietnamese part of investments in the project, and for the own investments of HWSCo.

How big are these investments?
According to the Project Document of HWSP (1.7.1988) the financing of the Vietnamese Government is 2,200 mill D. Is it at present cost level 10,000 mill D. That should mean 4,000 mill D/y. At the water sale of 90 mill m3/y the proportion in the tariff is 45 D/m3. There are naturally other investments for water supply: network, house connections etc. These were in 1988 about 20 D/m3 (HWSCo - information/November 1988 cost level). For the

investments about 65 - 80 D/m3 should thus be collected.

The cash flow tariff should thus be:
- for operating 78 D/m3
- for investments 72 D/m3
  total 150 D/m3.

If the input of the Government to HWSP is excluded, the tariff is about 100 D/m3.

3.3.4 PROPOSAL FOR WATER TARIFF

As a summary of the above, the following water tariff alternatives (round figures) can be given:

1	Present tariff	50 D/m3 (10-70 D/M3)
2	Operating cost tariff	80 D/m3
3	Cash flow tariff-s1	100 D/m3
4	Cash flow tariff-s2	150 D/m3
5	Cash flow tariff -1	250 D/m3
6	Full price tariff	330 D/m3

Cash flow tariff-s1 is a short term (Finnida-project period) tariff assuming that the input of the Government is an allowance to Hanoi Water Supply. Cash-flow tariff-1 is a long term (5-20 years) tariff on an average.

It is naturally possible to charge the consumers for house connections etc. to get funds for investments. The effect of this on water price is not big.

The selling of water is most economical to large consumers (industrial and public use). They are the most solvent consumers groups, too.

Families (domestic use) need proper water supply for health and hygienic reasons. Potable water is necessary for everybody. The price of the water has to be moderate.

One family, five persons, has a monthly income of about 100,000 D (50,000 - 200,000 D/month?). If they use for water 1 - 5 % of their total income, the water tariff might be following:

Monthly proportion of incomes used for water		Consumption (100 l/c/d)	Water price D/m3
%	D/month	m3/month	
1	1,000	15	67
3	3,000	15	200
5	5,000	15	330

The present tariff means:

- Private houses 20 D/m3; 300 D/month; 0,3% of incomes
- Living quarters 40 D/m3; 600 D/month; 0,6% of incomes

The water tariff should be moderate but high enough to bring up enough money for the expenditures of HWSCo and high enough to keep the wastage as low as possible.

Is the charge of 100 dong/m3 moderate? It means 1500 D/month/family and 300 D/capita/month. It is 1,5% of the monthly income of the "example family".

The recommendable water tariff is following (cost level January 1989):

Category	Present tariff	Period 1989-90 Tariff	Invoicing	Period 1991- Tariff	Invoicing
	D/m3	D/m3	mill D/y	D/m3	mill D/y
1 Domestic	35		2,800		
- Private houses	12	40	600	100	1,700
- Living quart.	40	80	1,300	200	3,500
- Public taps	70	120	900	300	2,500
2 Public use	54	120	3,000	300	8,300
3 Industrial use	70	120	3,200	300	9,000
Total / average		100	9,000	250	25,000

These tariffs provide money for operational costs and investment repayments. The private houses have to pay only for the operating costs. The industry and public use have to contribute also towards interest payments on the capital.

Families living in flats have a higher tariff than private houses. This is because rent subsidies in block houses are easier to organise according to family incomes. The aim of the higher tariff is to make the flatowners take more interest in the maintenance of the water supply fittings in the building.

It is recommendable that the higher tariff is established as soon as possible, at least in the areas where water supply is already or will be renovated within 3 - 5 years.

The consumers are motivated to pay a higher tariff if they get a better service level within acceptable time.

3.4 WATER INVOICING, WATER METERING AND CONTRACTS

3.4.1 WATER INVOICING

Water invoicing is done monthly by water branches. These are special units for metering and invoicing of water.

According to the information of the water branches there are about 22,000 house connections in total. Divided according to the consumer groups they are as follows:

Category	Number	Proportion (1988) of connect.	of water sale (m3/y)
- Private houses	16,500	75 %	16 %
- Industry/offices/ living quarters	4,400	20 %	76 %
- Public taps	1,000	5 %	8 %
Total	21,900	100 %	100 %

The water sale to private houses is according to the tariff of December 1988 about 500 mill D/y, i.e. 11 % of the whole water sale.

The monthly collecting of money (in cash) means 200,000 visits per year. One visit (if succesful) results in 2,500 dong. The productivity of this work is at a very low level.

The herein proposed tariff will improve the situation. The other possibilities to achieve better results are:

- Collecting through the bank (eg. larger consumers, industry etc)
- Frequency of invoicing more seldom, several months at a time (partly afterwards, partly in advance).

It ought to belong to the main targets of HWSCo's business management to solve this problem.

3.4.2 WATER METERING

According to the information of the water distribution branches there are only about 4,000 water meters installed and only about 30 %, that is 1,200 of them are running. According to the information received from the HWSP (FINNIDA) about 70 % - that is 3,000 water meters - are running.
Part of the water meters are so dirty (by algae or sediment etc) that they are not readable. Another part of them is stolen.

The metering of water represents thus at present a very little portion of the number of consumers and is actually just starting.

On the other hand the metering is the best way to provide proper proportioning of costs to the consumers. if the water tariff is at a realistic level the consumers are interested in controlling their water consumption.

Water meters should be installed to areas where the water distribution is continuous, and the pressure in the network is high enough to run a water meter. These are the newly constructed and renovated parts of the network.

The installation of the water meters should start at connections which are near to the water plants, and then following the water flow, first the large consumers (industry, offices, living quarters etc) and then private houses.

The main principle is that the Water Supply Company will install only one water meter per house connection. It is thereafter the matter of each consumer (offices, living quarters etc) to proportion the costs.

For the "large consumer"-connections 4,400 water meters are needed, for the public taps 1,000 pcs, and for the private houses 16,500 pcs accordingly. About 200,000 water meters would be needed if all the living quarters and also the block houses want to install a water meter for each family. It would be an impossible task for the Water Company to manage.

3.4.3 CONTRACT FOR WATER DELIVERY

The water supply fittings in houses are usually in a very bad condition. There many are leakages, water loss is remarkable, illegal connections are not rare etc.

Water supply company should be able to control the water losses in the houses, especially the big leakages. Otherwise it is not possible to get enough pressure in the distribution network.

Leakage control in the network and renovation of the pipelines is naturally necessary. However, also the house connections and fittings in the houses must be under control.

Water metering and collecting payment for water are the best ways to control the consumption. However, already before water metering is available it is necessary to make a contract between HWSCo and the consumer about the delivery of water.

HWSCo must have the right to close the water supply if a consumer breaks the agreement. the consumer must take good care of the fittings, taps etc. and not tamper with the water meter.

Models of contracts and agreements are available. That is not a problem. The problem is the effective supervising of the delivery conditions.

4. INFORMATION SYSTEM FOR MANAGEMENT

Water supply needs different kinds of buildings, machines, equipment, tools, energy, personnel etc. An effective organisation is necessary for taking care of planning, construction, operation and maintenance.

The organisation is:

"The arrangement of different parts so as to form an effective whole".

The proper functioning of any organisation requires management the main duties of which are:

- to set targets
- to choose the "keyworks"
- to make workplans
- to give resources
- to supervise the works
- to get results

Management needs and gives information. Information is important for decision-makers, for example to decide about water tariffs in the Peoples Committee. The Water Master Plan produces information for investment programmes etc. The correct information has to move effectively in the organisation. Through the reliable information it is possible to get the whole personnel to work more efficiently.

At present it is not possible to get reliable information about water supply of Hanoi, because:

- there is little if any water metering and respective statistics (raw water, pumped water to network or water sale)

- budgeting and cost control is not reliable or not available.

Budgeting and the accounting system is to be developed for every water plant and distribution branch, coordinated within the whole company and the office of Urban Public Works etc.

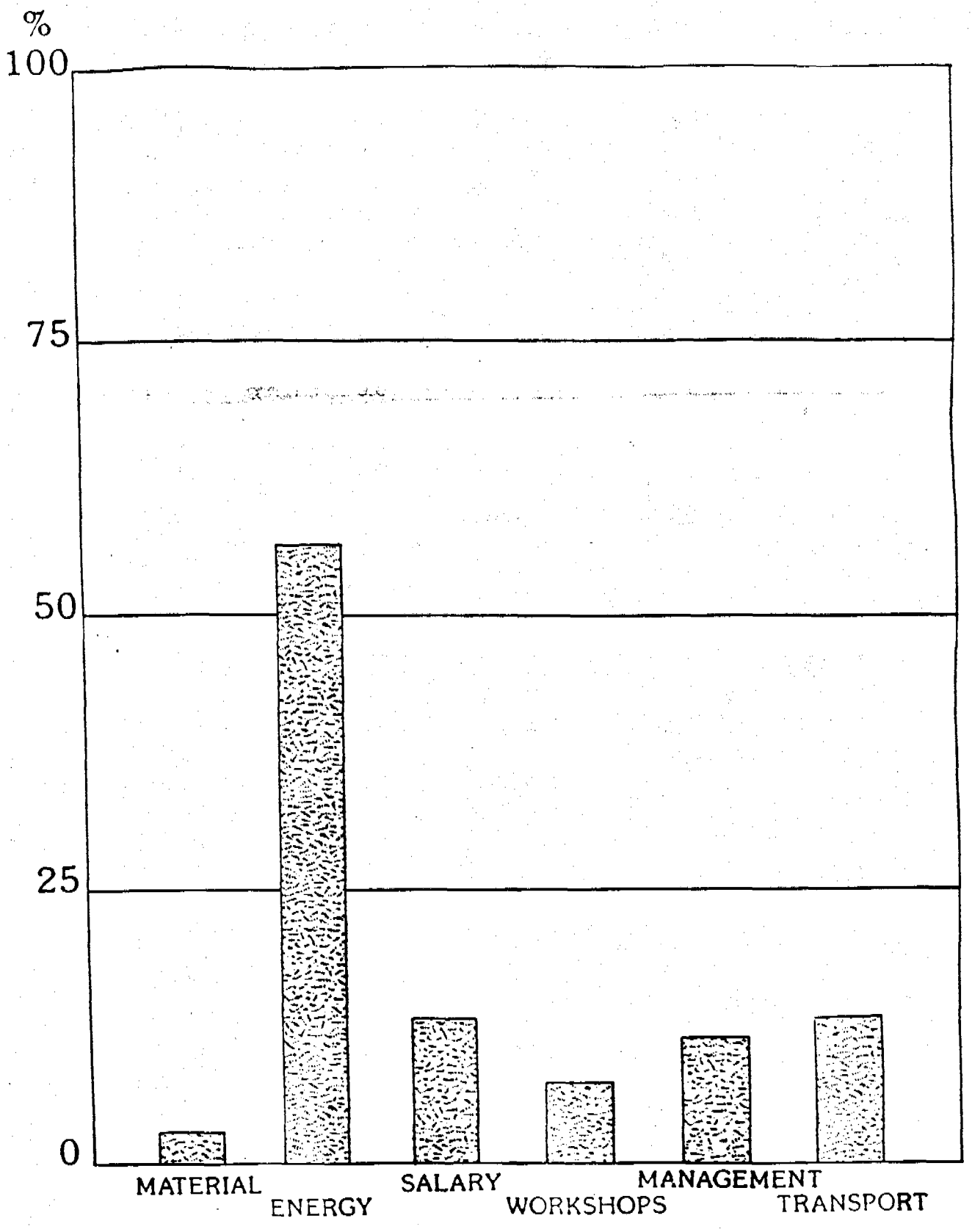
As an example the following draft for accounting and budgeting of Ngo Si Lien Water Plant is presented:

	Material	energy	salary	work-shop	trans-port	manage-ment	Total
2. Water Production							
2.4 Ngo Si Lien							
2.4.1 Overhead Costs							
2.4.2 Operation costs							
2.4.3 Maintenance costs							
2.4.4 Administration costs							
2.4 TOTAL							16 Mill D
2.5 Mai Dich							
2. W.Prod./TOTAL							

Finally, through the information system the management should get data as follows:

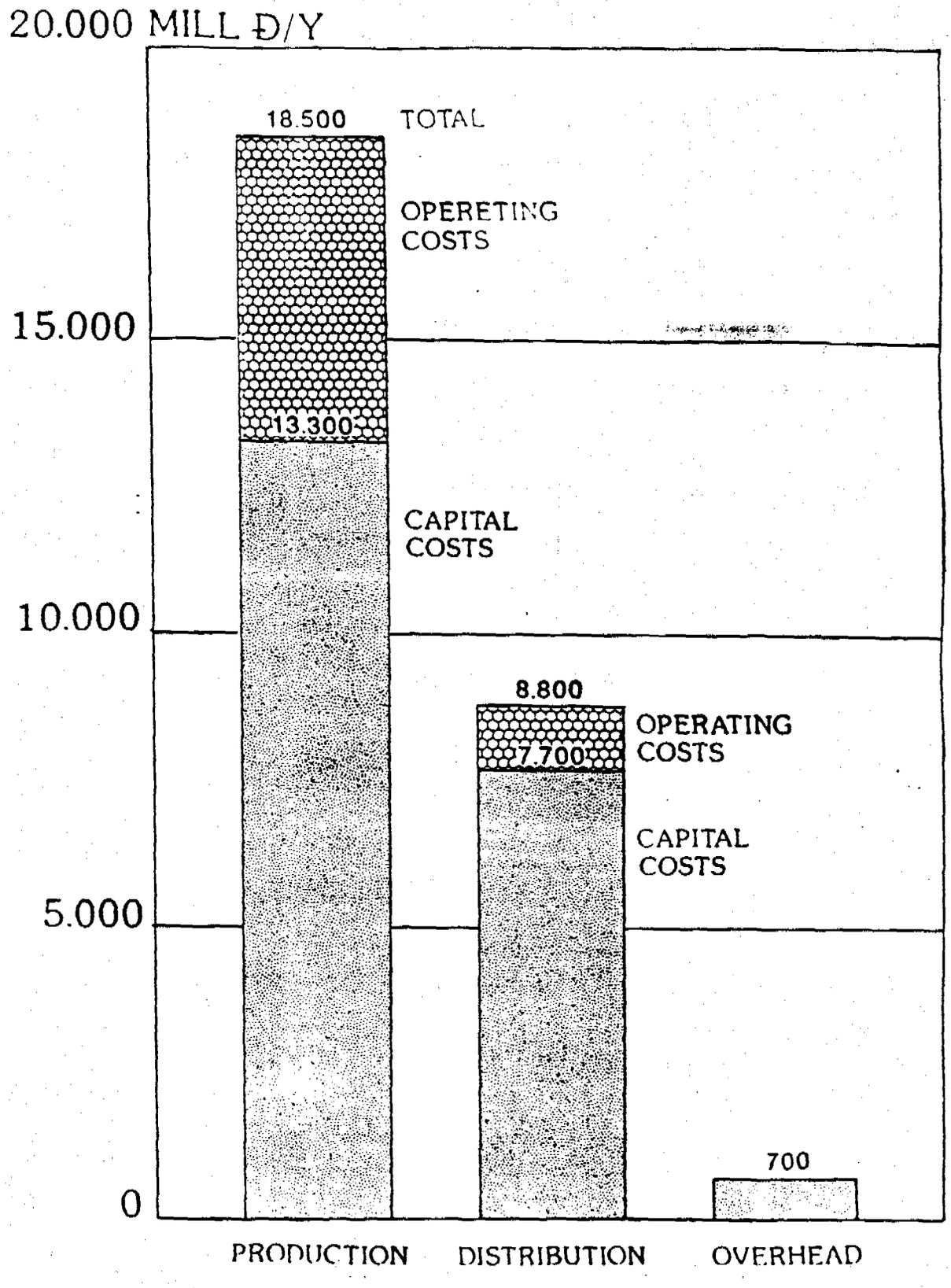
1. Division of operating costs
2. The cost of water
3. Division of water cost
4. Water consumption in Hanoi 1989-2010 Investment programme for water production
5. Water tariff alternatives
6. Proposal for new water tariff
7. Estimate for water sale incomes (new tariff)
8. Water costs in family economy
9. Unit price of water according to water sale
10. Water sale in 1988 (monthly)
11. Division of watersale 1988
12. Dividing of consumer groups
13. Water sale per house connection 1988 (Dong Da -branch)
14. Pipelines; unit costs
15. Division of costs and length of network

16. House connection and network per personnel in water distribution branches
17. Iron contents in water (Ngo Si Lien)
18. Organic material and colour in water (Ngo Si Lien)
19. Water quality after filtration (Ngo Si Lien)
20. Water production and salary (Ngo Si Lien)
21. Water sale and salary (Dong Da)



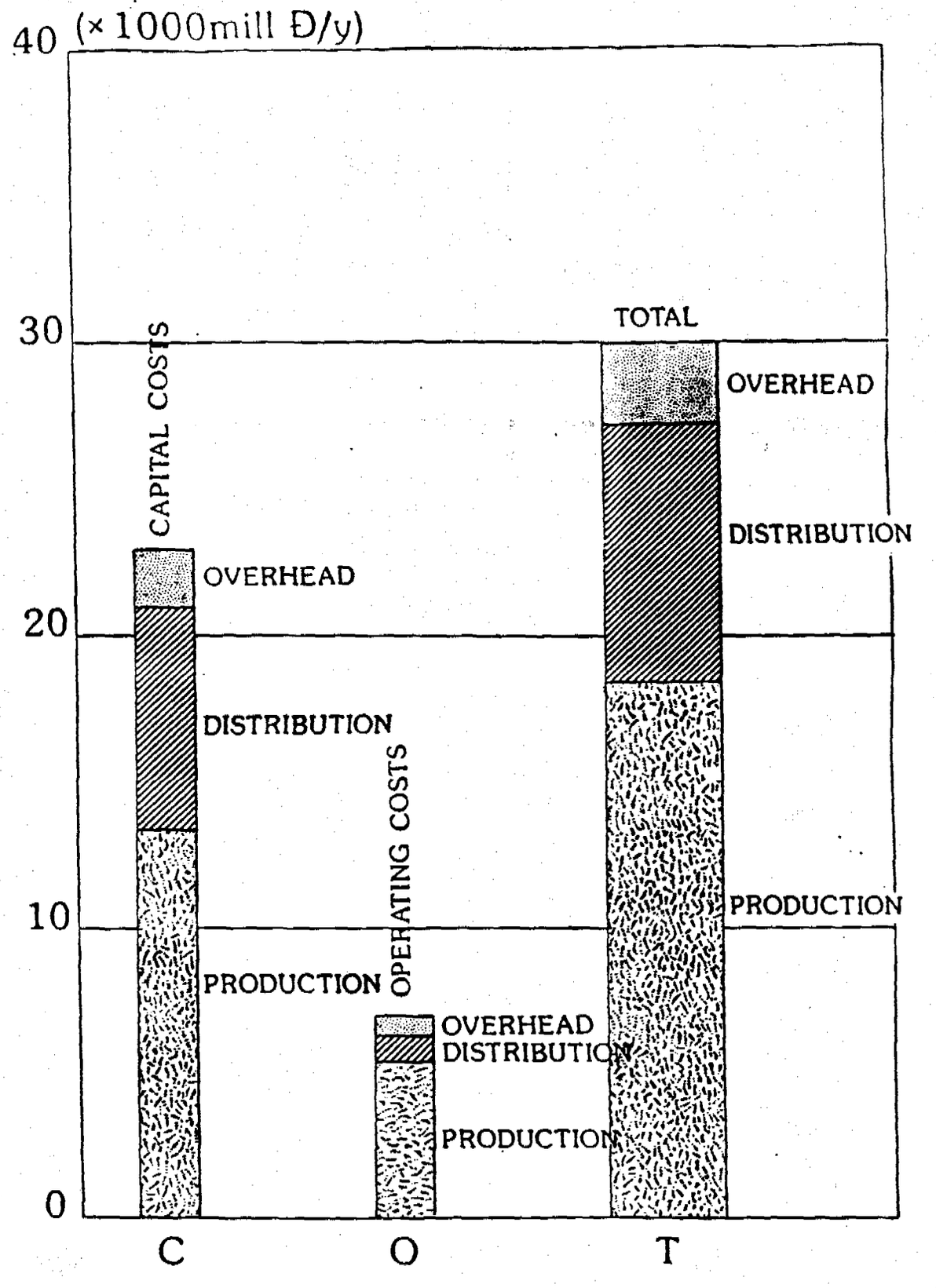
PROPORTION OF OPERATING COSTS
(HWSC-DEC-1988)

VIE/82/011

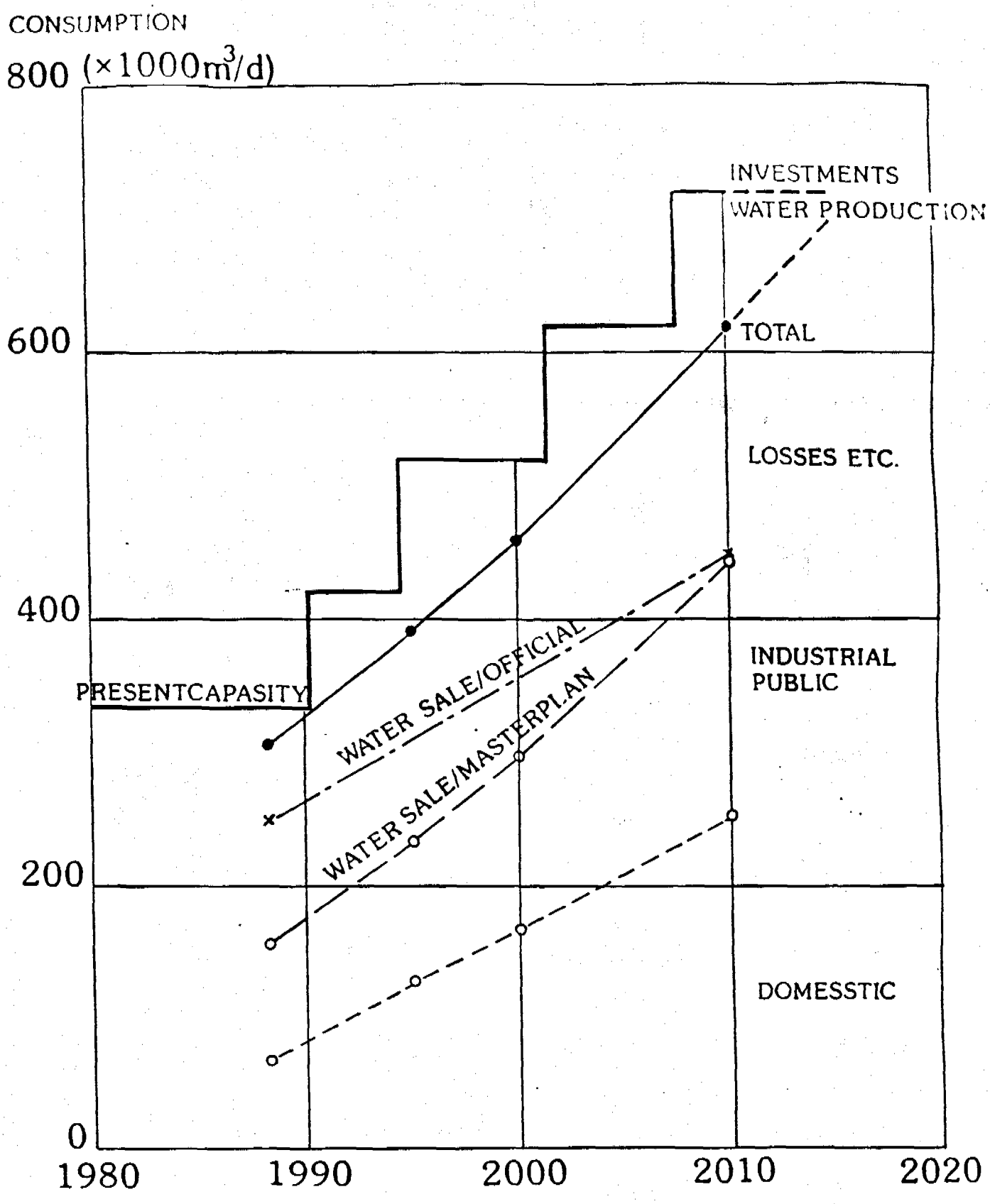


THE COSTS OF WATER
(DEC-1988)

VIE/82/011

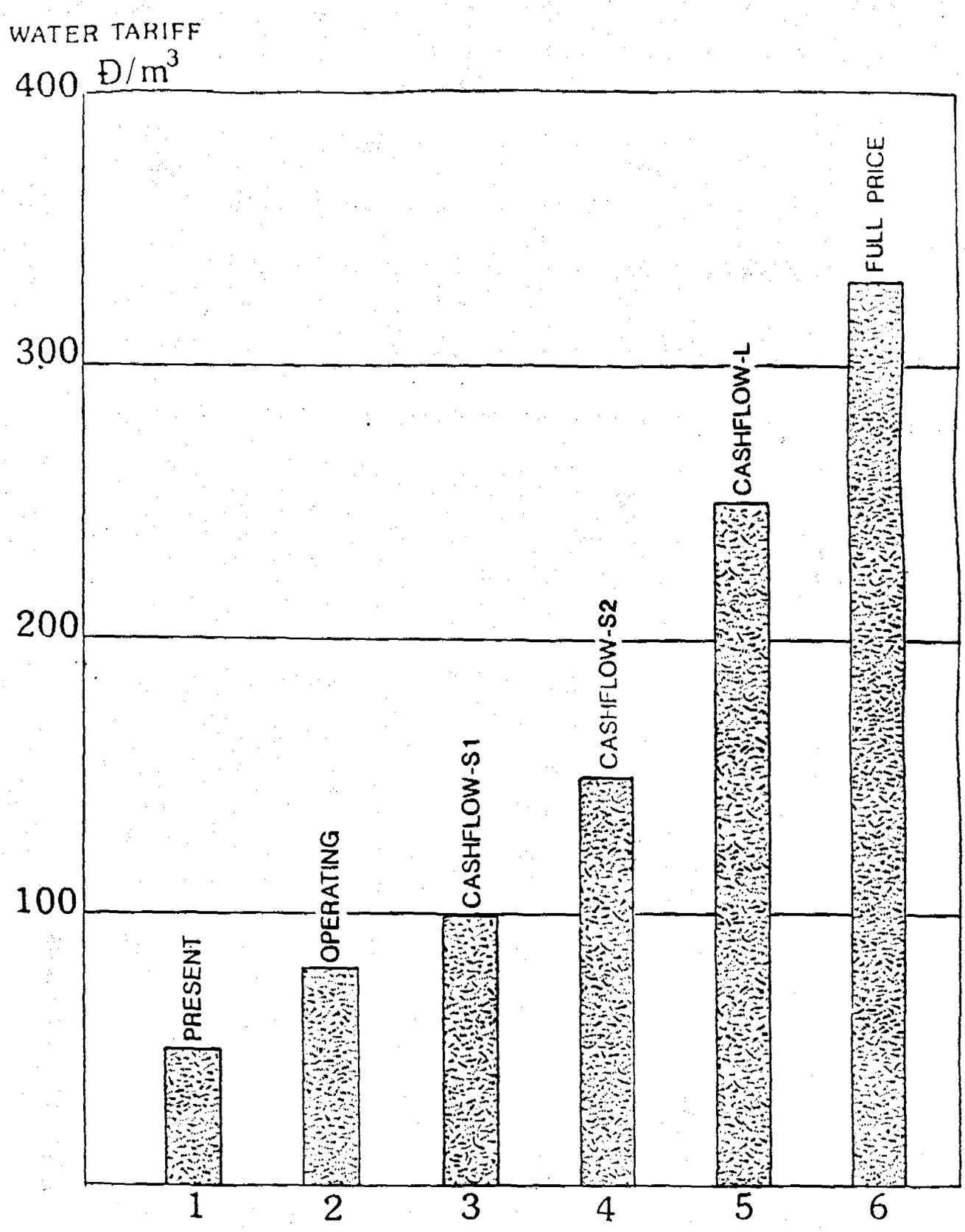


DIVISION OF WATER COSTS (SITUATION JANUARY-89)
(ACCORDING TO FULLPRICE COSTS)

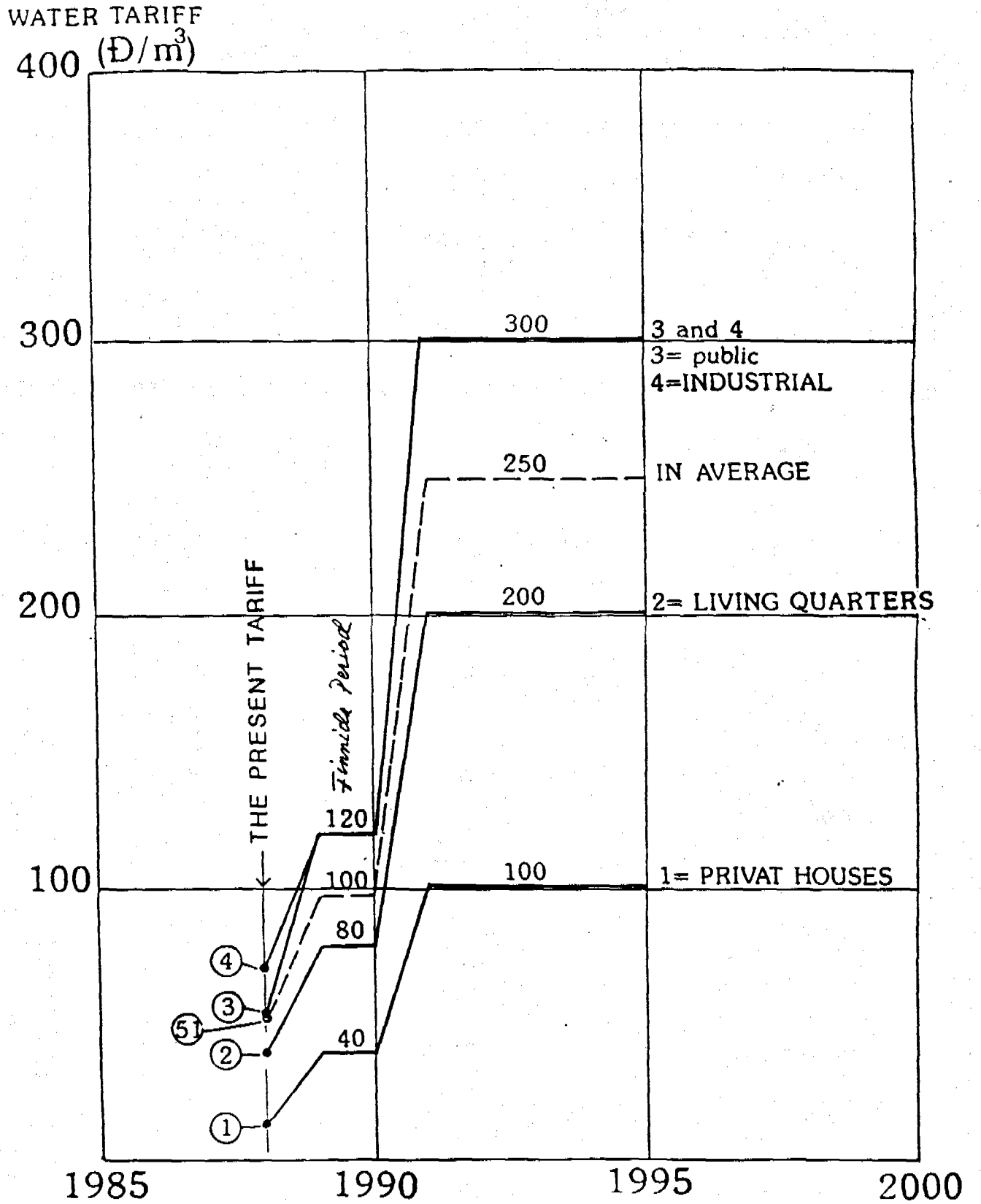


WATER CONSUMPTION IN HANOI CITY
(MASTERPLAN-89)
PRODUCTION INVESTMENT PROGRAM

VIE/82/011
HWSM-VMT

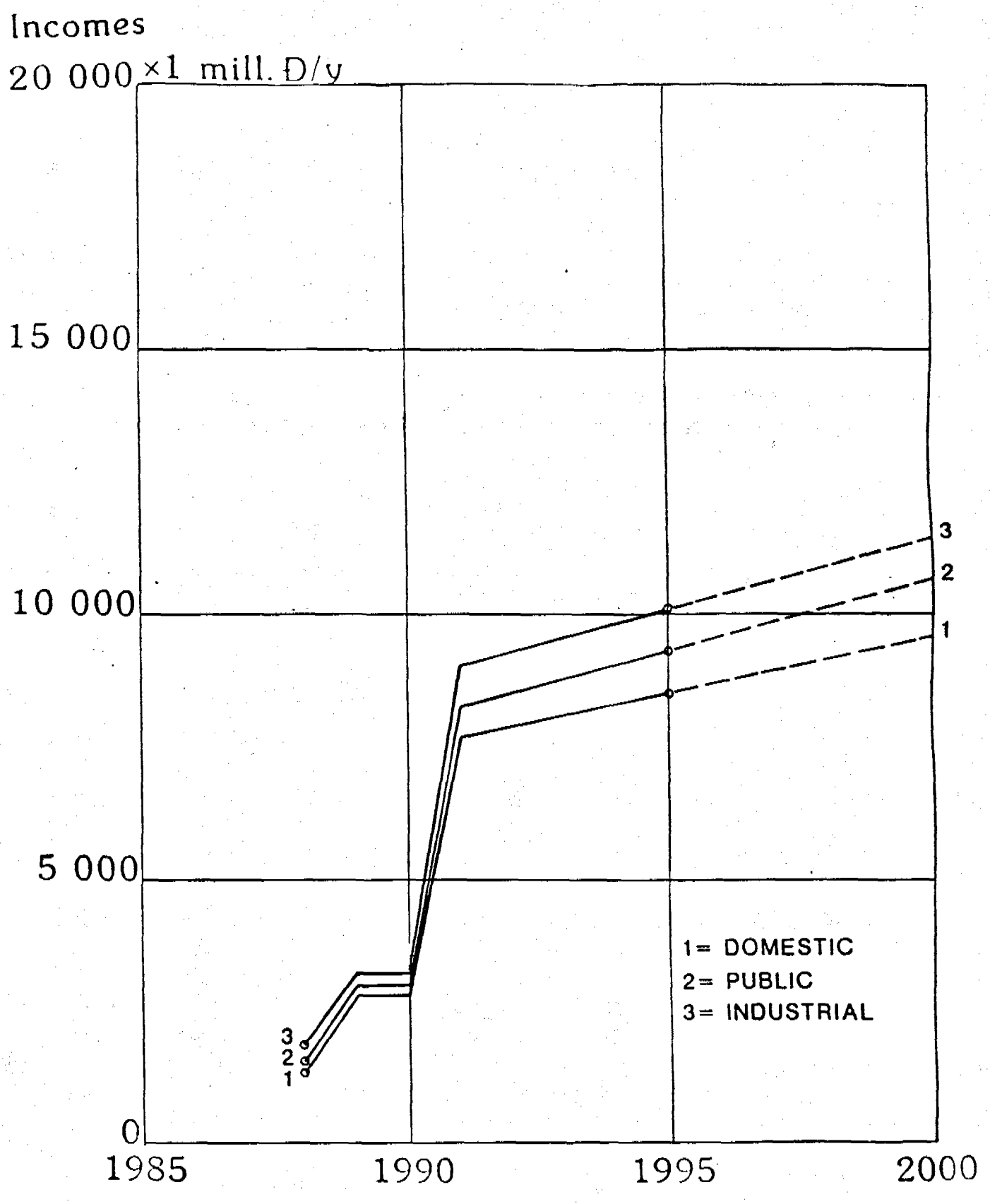


WATER TARIFF ALTERNATIVES
(COST LEVEL JANUARY-89)

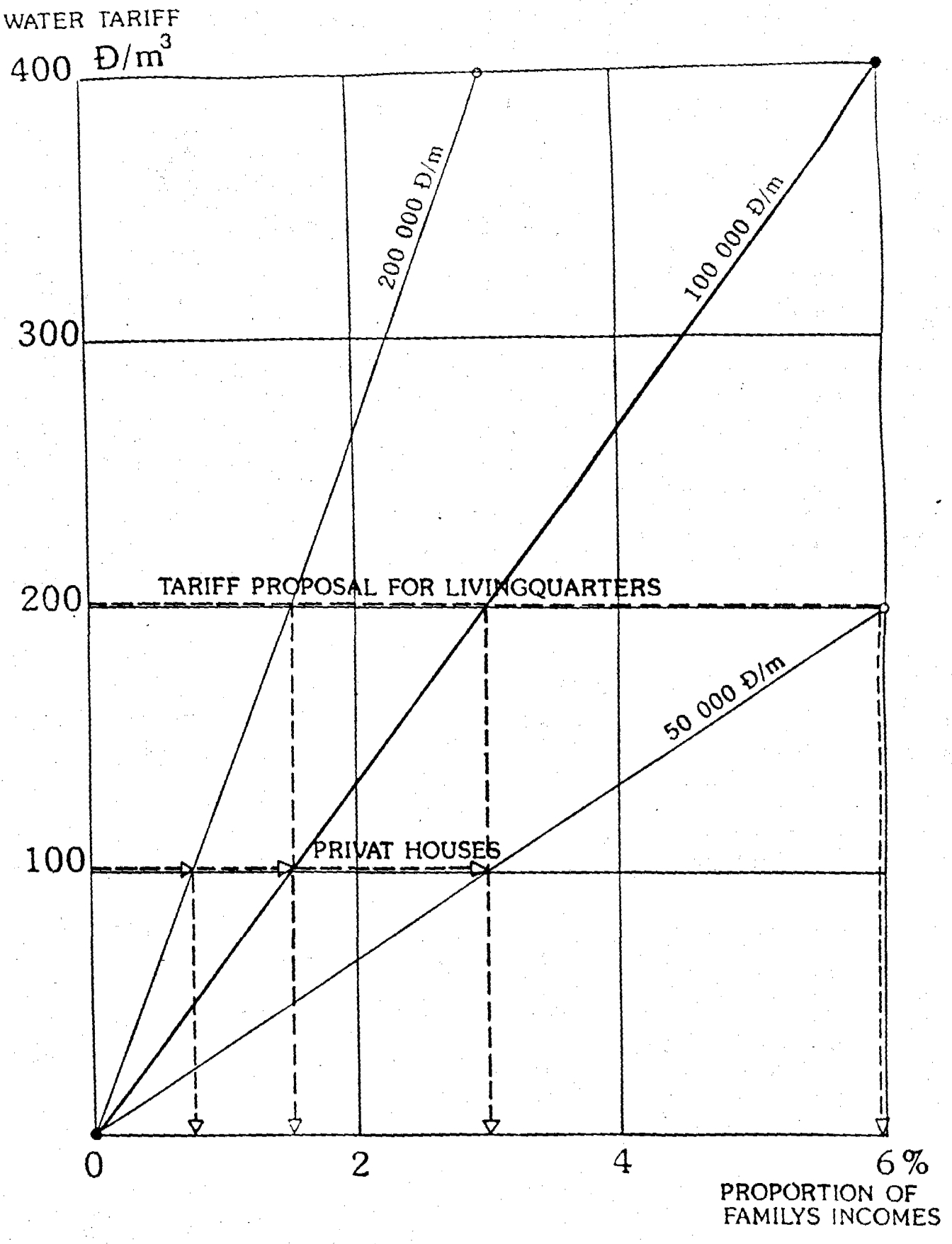


PROPOSAL FOR NEW WATER TARIFF
(COST LEVEL JANUARY-89)

21.3.1989

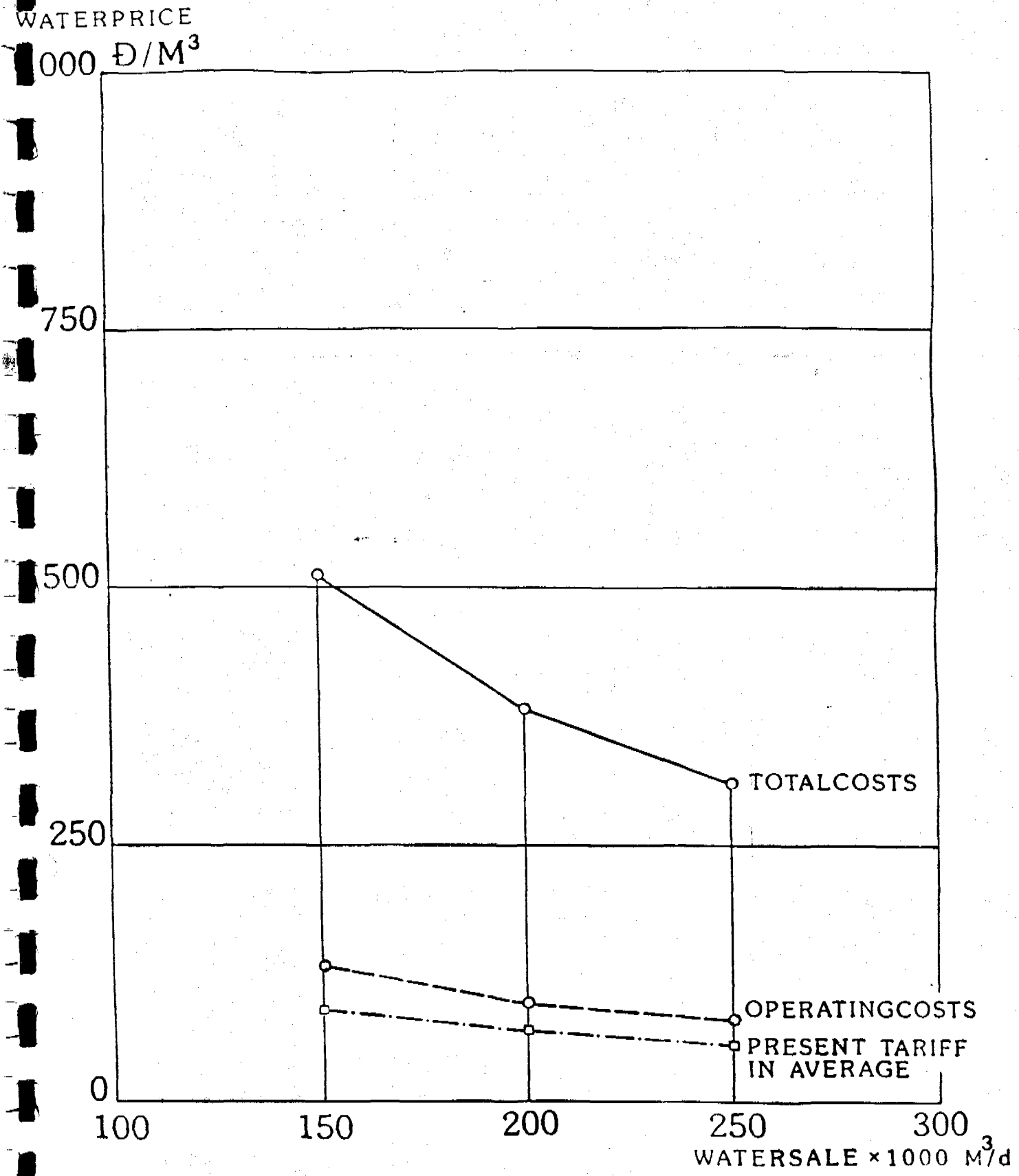


ESTIMATE OF WATER SALE INCOMES
ACCORDING TO THE PROPOSED TARIFF
(COSTLEVEL JANUARY 1989)



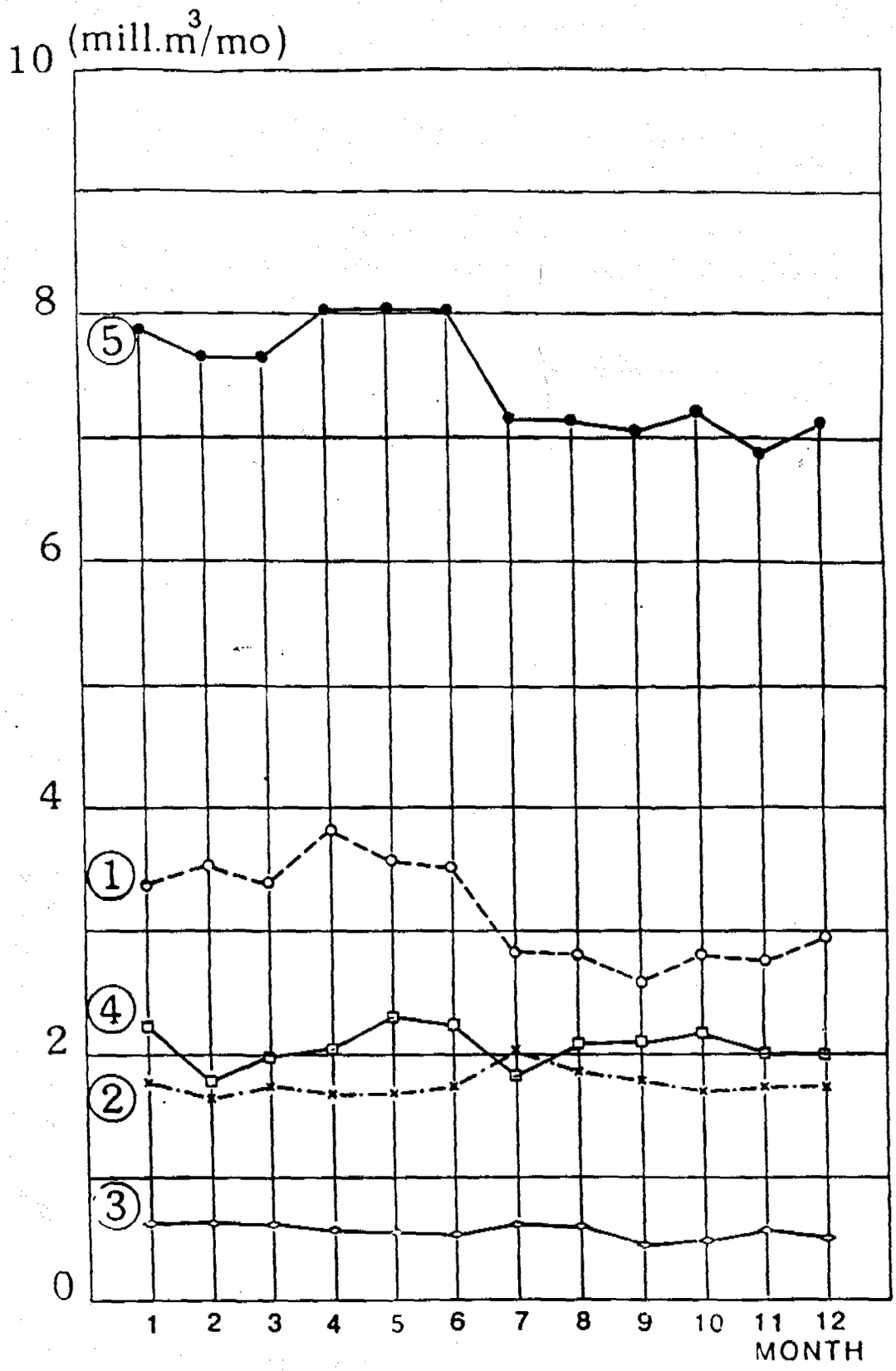
WATER COSTS IN FAMILY ECONOMY

VIE/82/011



WATERPRICE ACCORDING
WATERSALE
(DEC-88)

VIE/82/011
HWSM-VMT

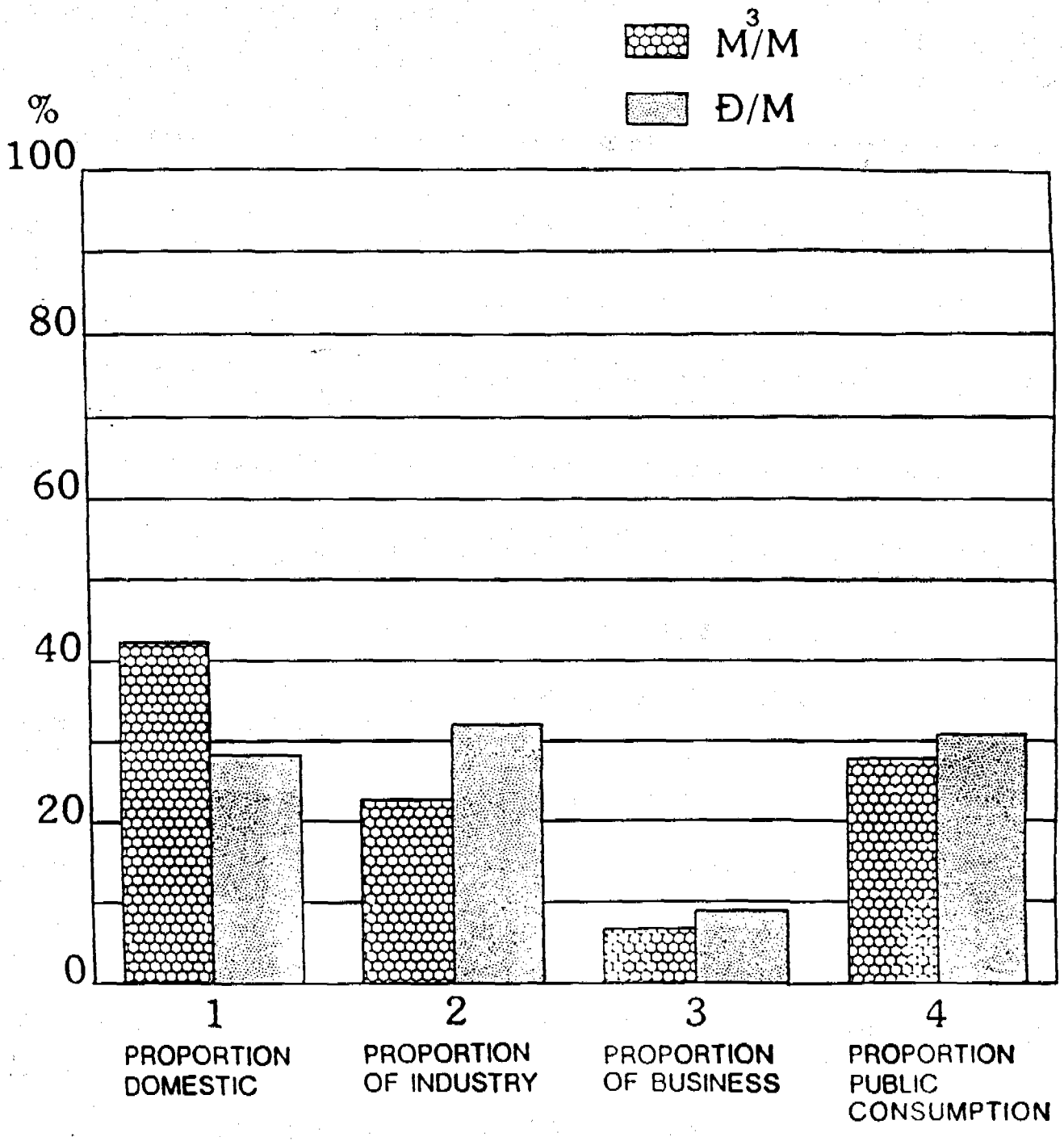


WATERSALE IN 1988

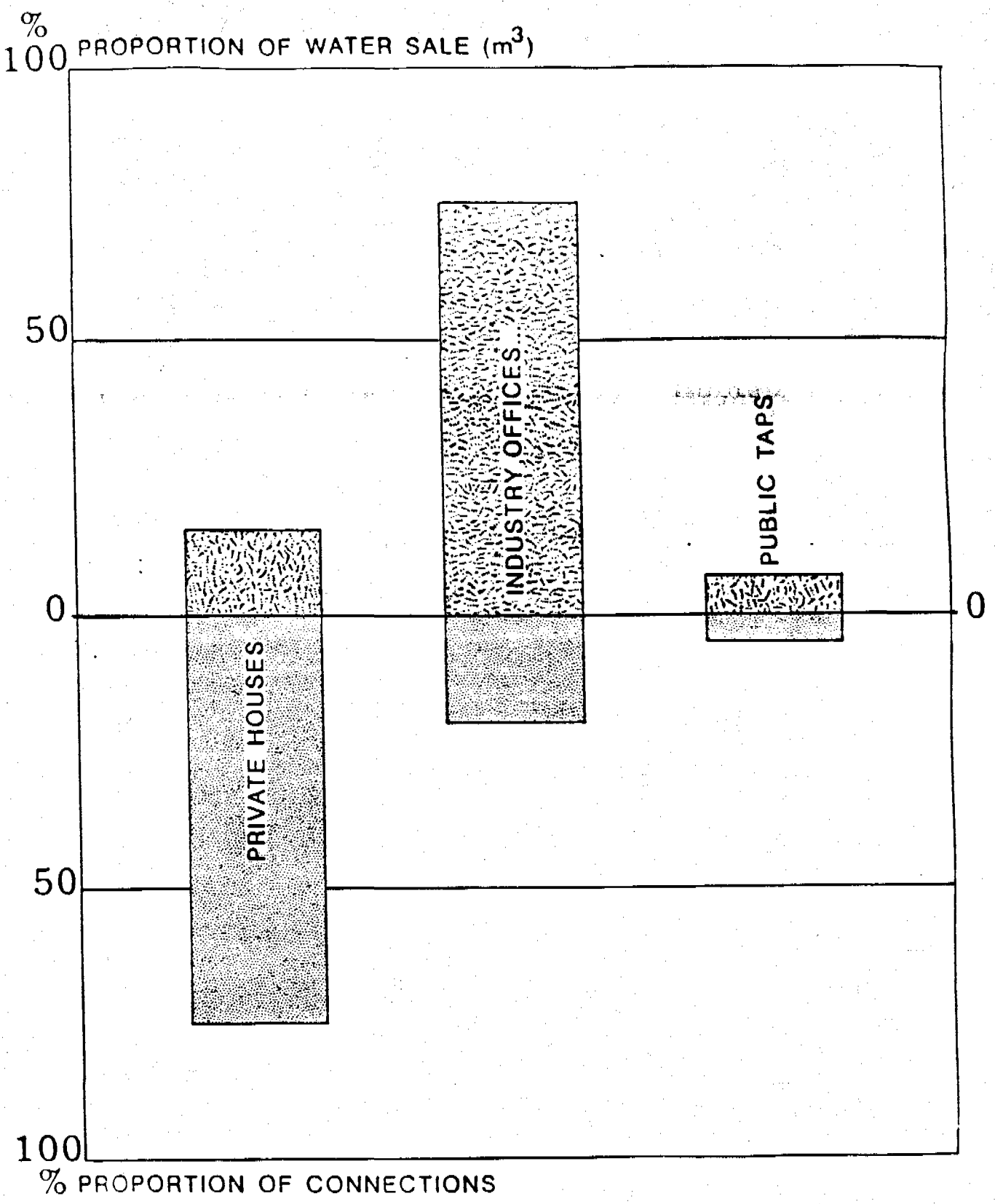
1. Households
2. Industry
3. Business

VIE/82/011
HWSM-VMT

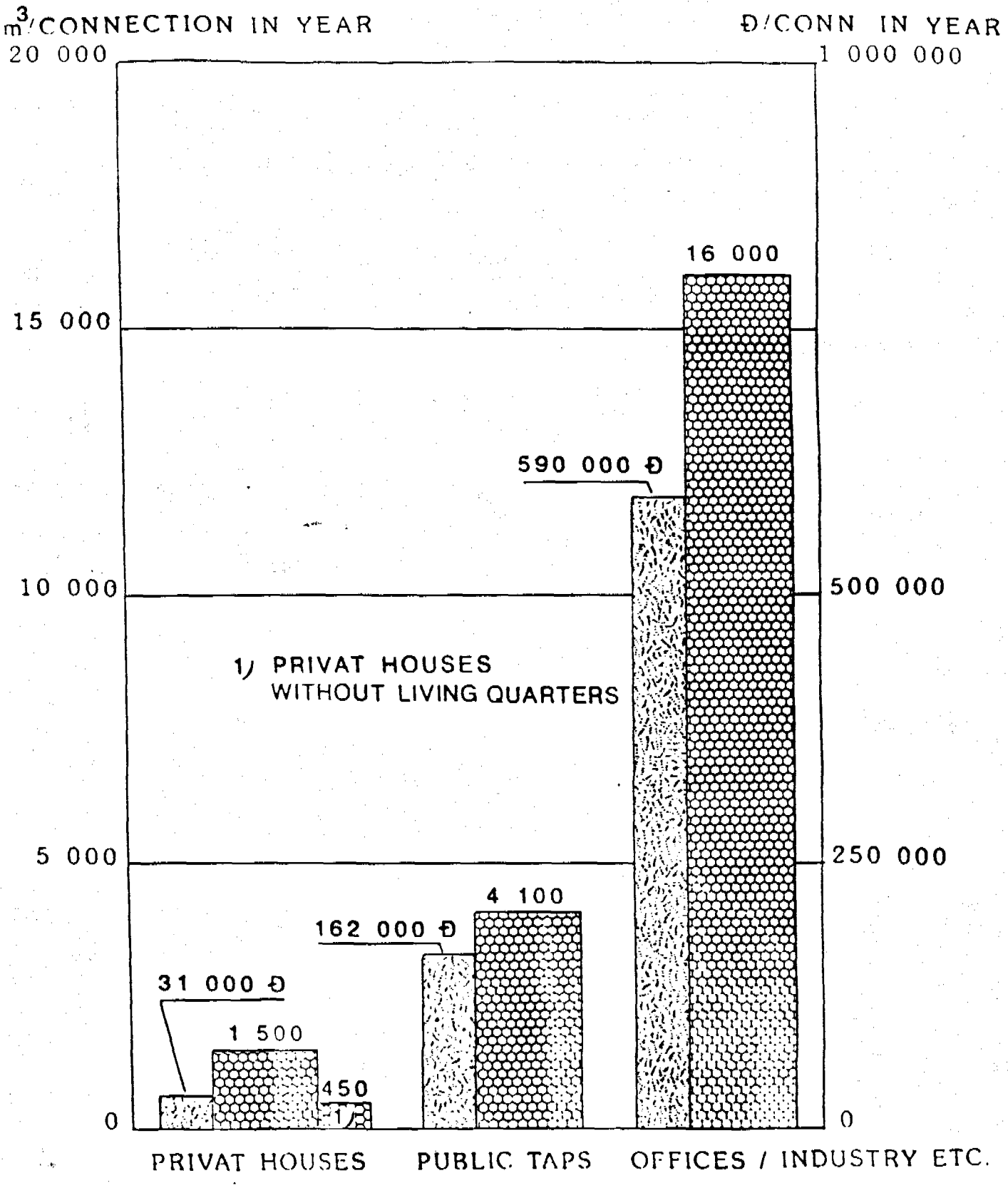
3. Total



WATERSALE 1988

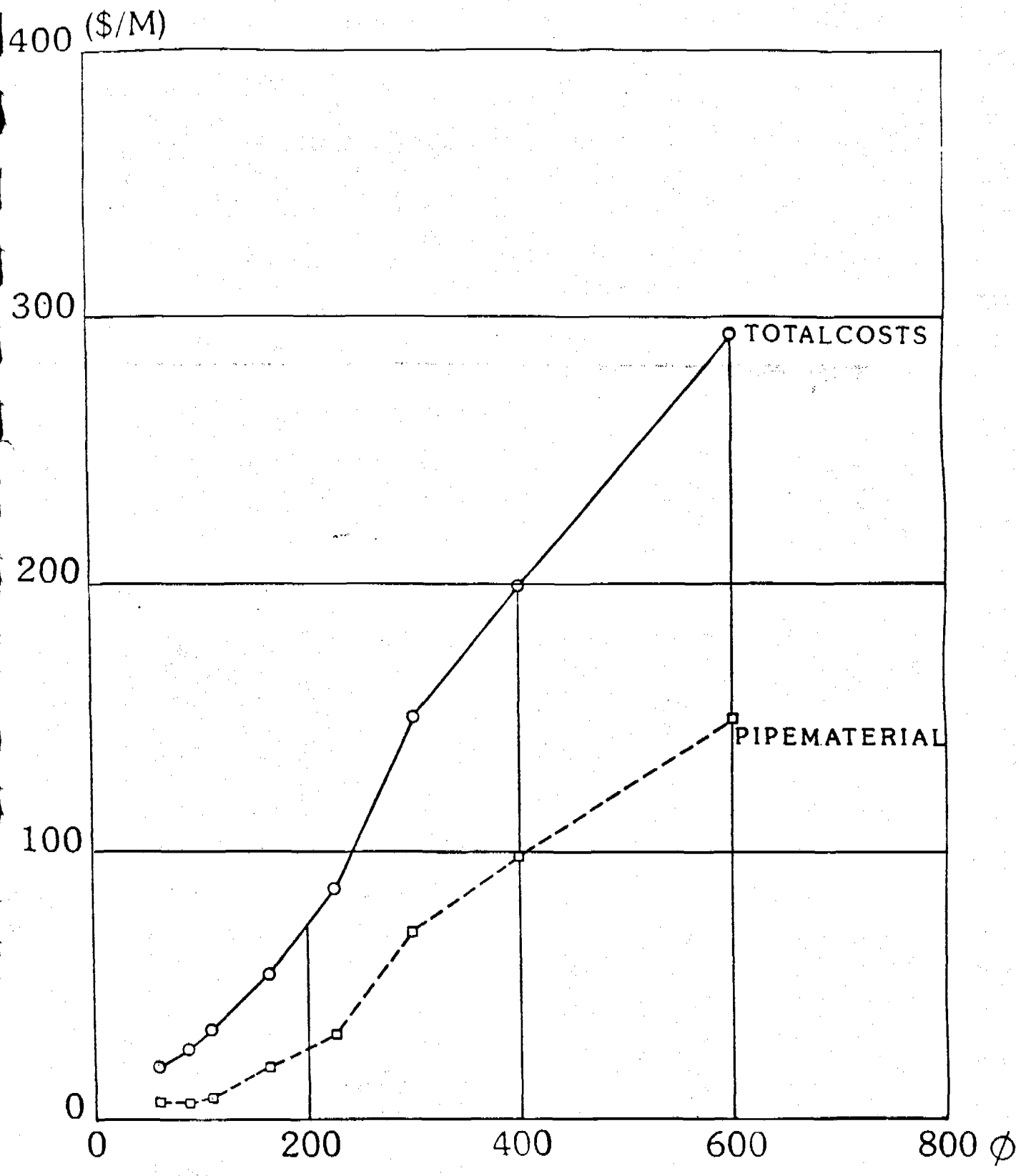


DIVIDING OF CONSUMER GROUPS



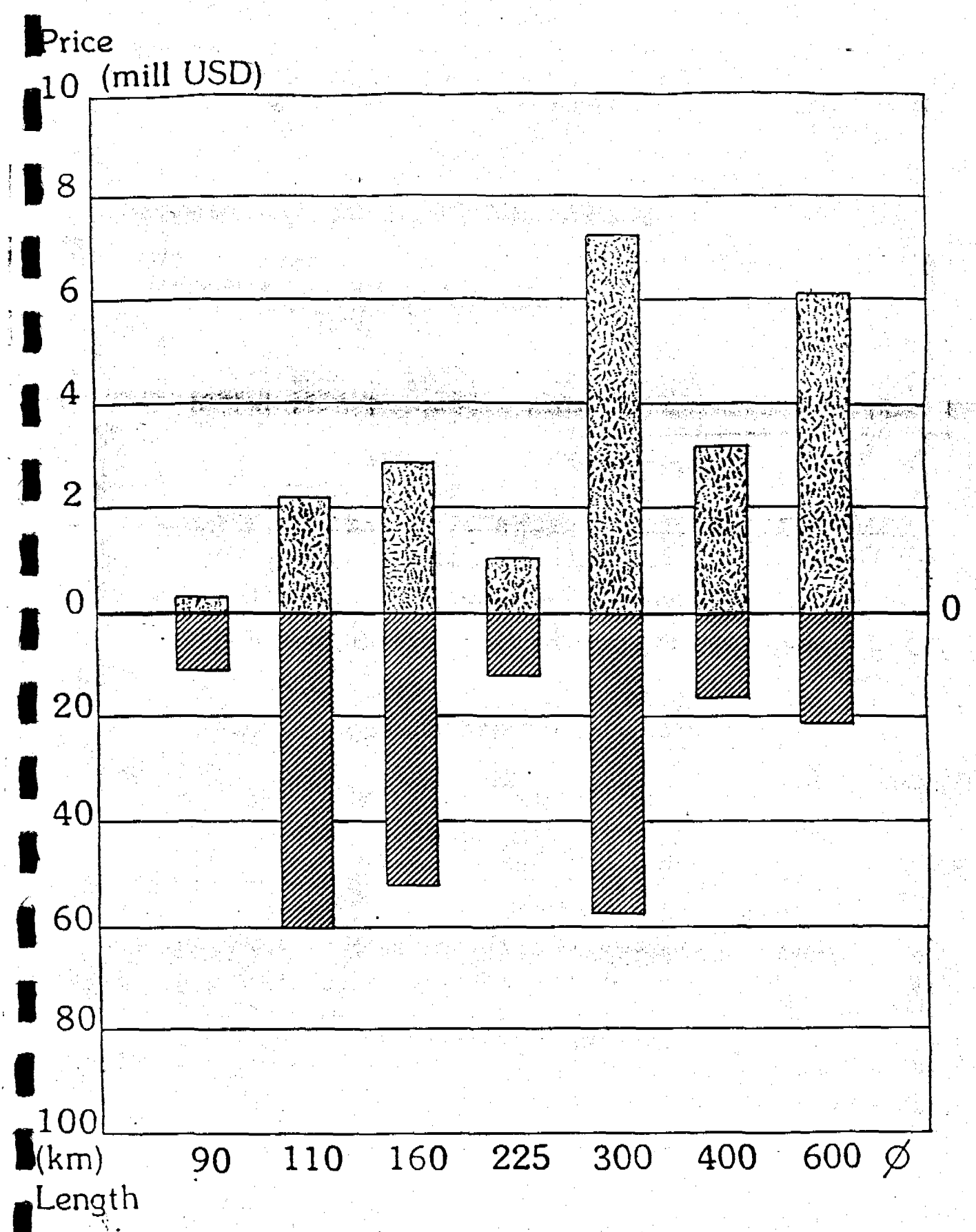
WATERSALE PER HOUSECONNECTION 1988 IN "DONG DA" -DISTRICT

VIE/82/011
HWSM-VMT
16.2.1989



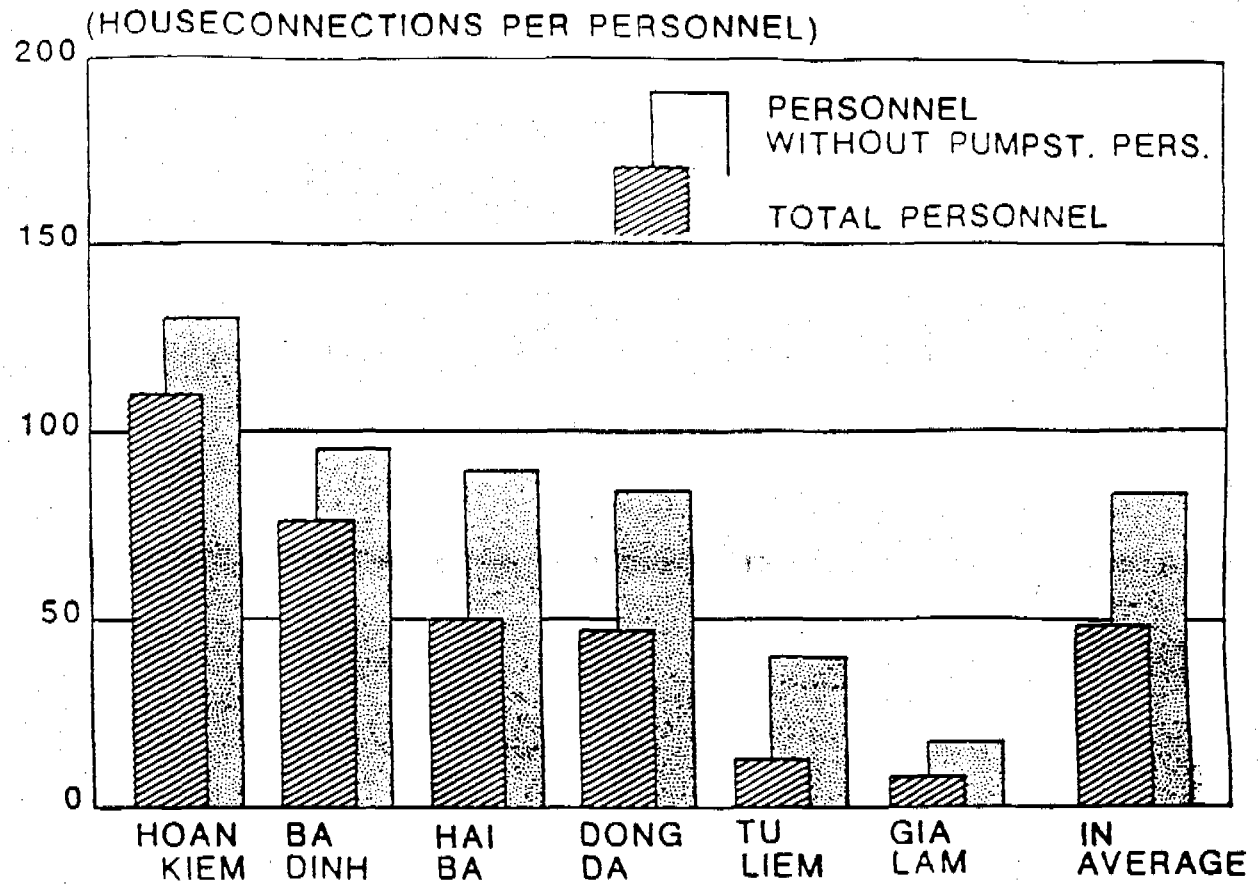
PIPELINES; UNITCOSTS ∅ 90 mm–∅ 600 mm
(Pricelevel / december 1988)

VIE/82/011

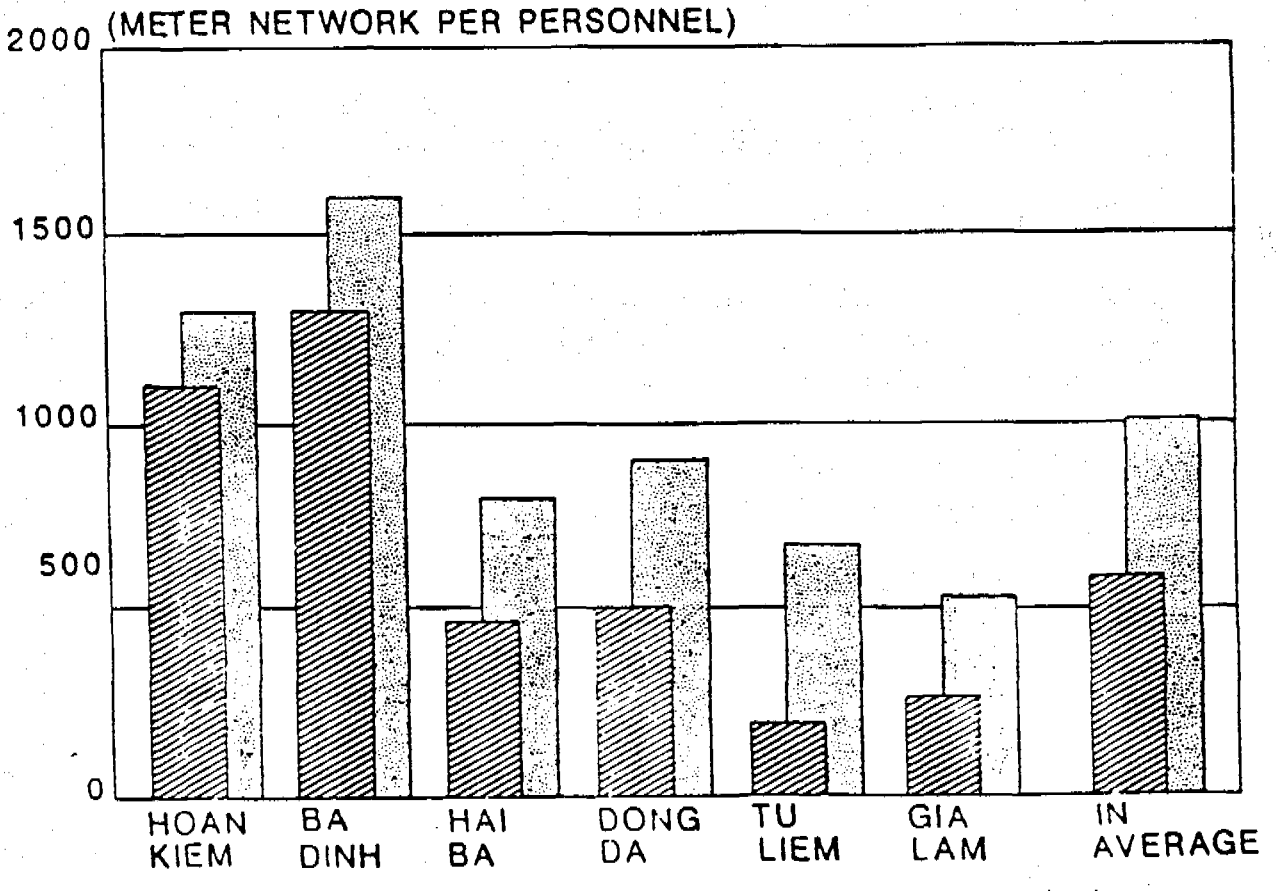


DIVISION OF COSTS AND LENGTH OF NETWORK
COSTS ARE AS REINVESTMENT (CONSTR.1955-88)

VIE/82/011
HWSM-VMT
23.3.1989



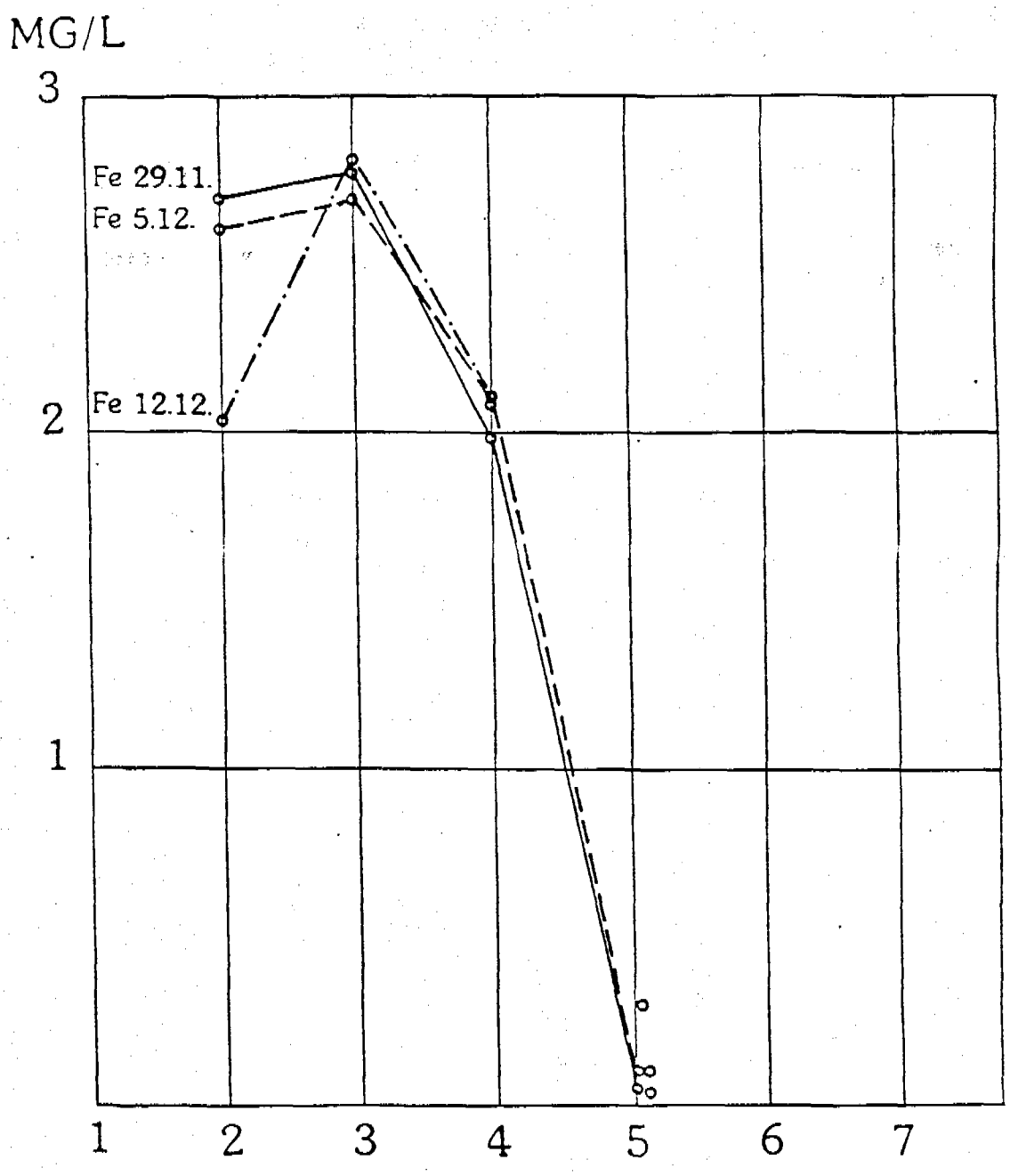
HOUSECONNECTIONS PER PERSONNEL



NETWORK PER PERSONNEL (m/p)

VIE/88/011

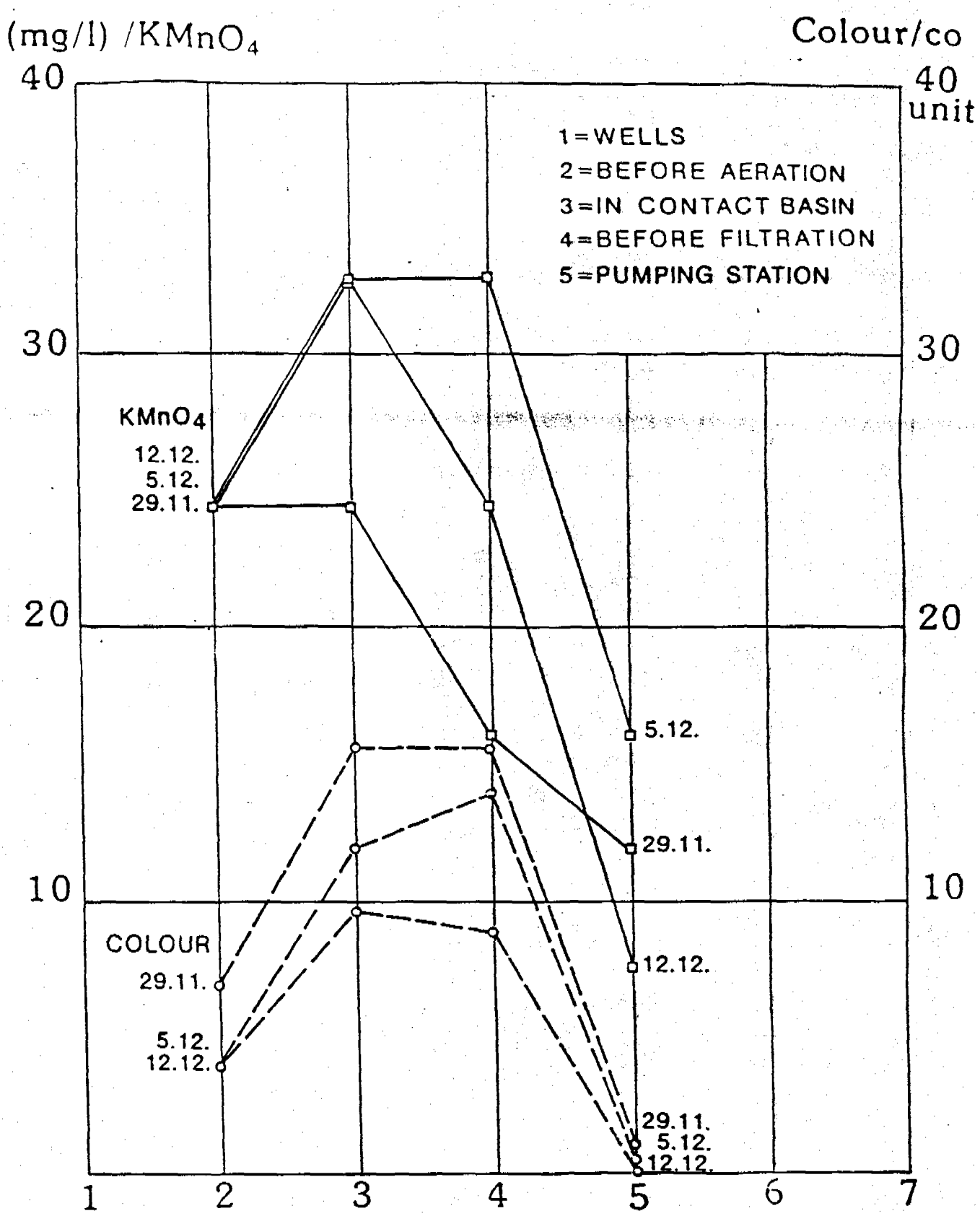
16.2.1989



"NGO SI LIEN" WATER TREATMENT PLANT
IRON IN WATER 1988

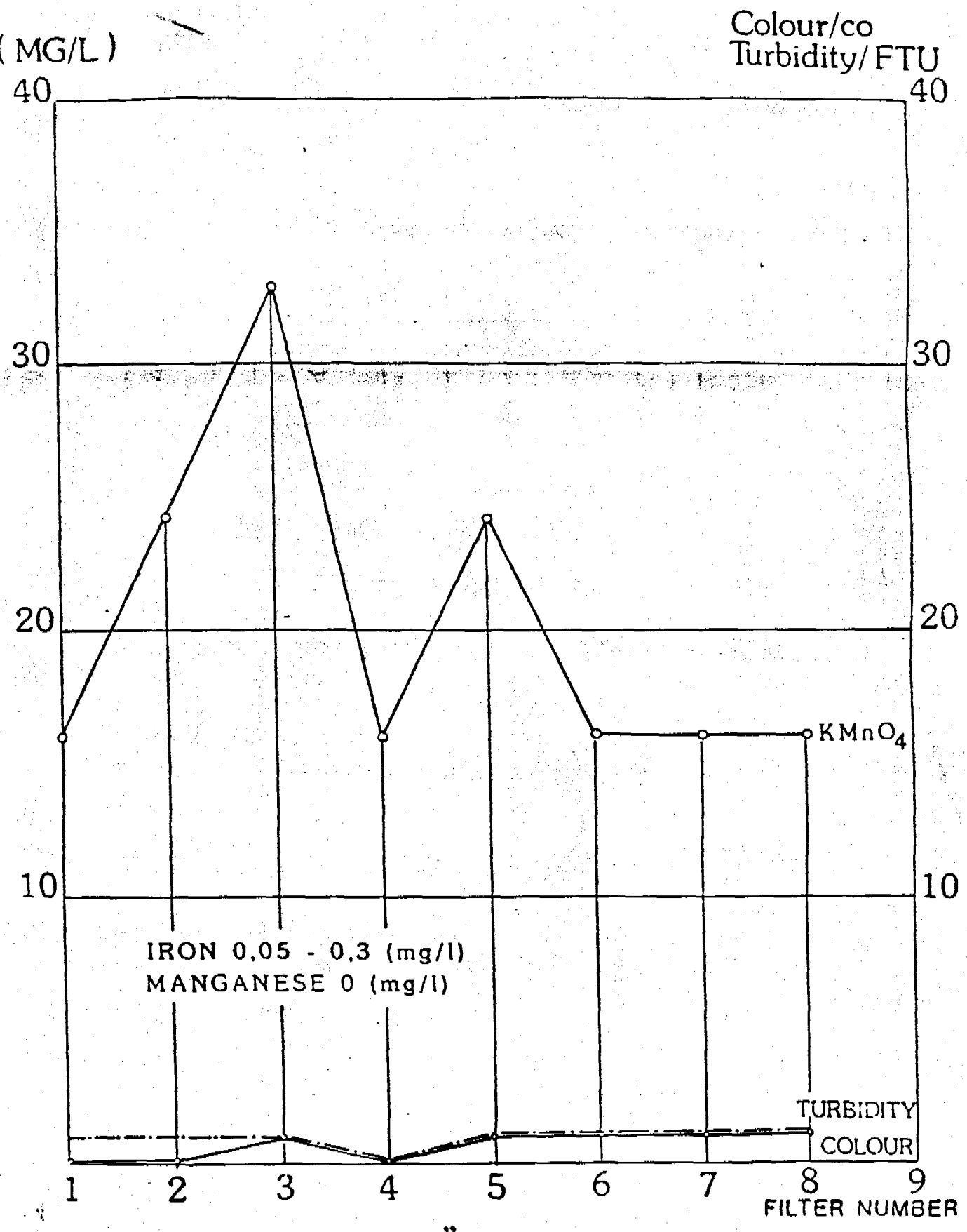
1=WELL
2=BEFORE AERATION
3=CONTACT BASIN
4=BEFORE FILTRATION
5=PUMPING STATION
6=PUBLIC TAP

VIE/82/011



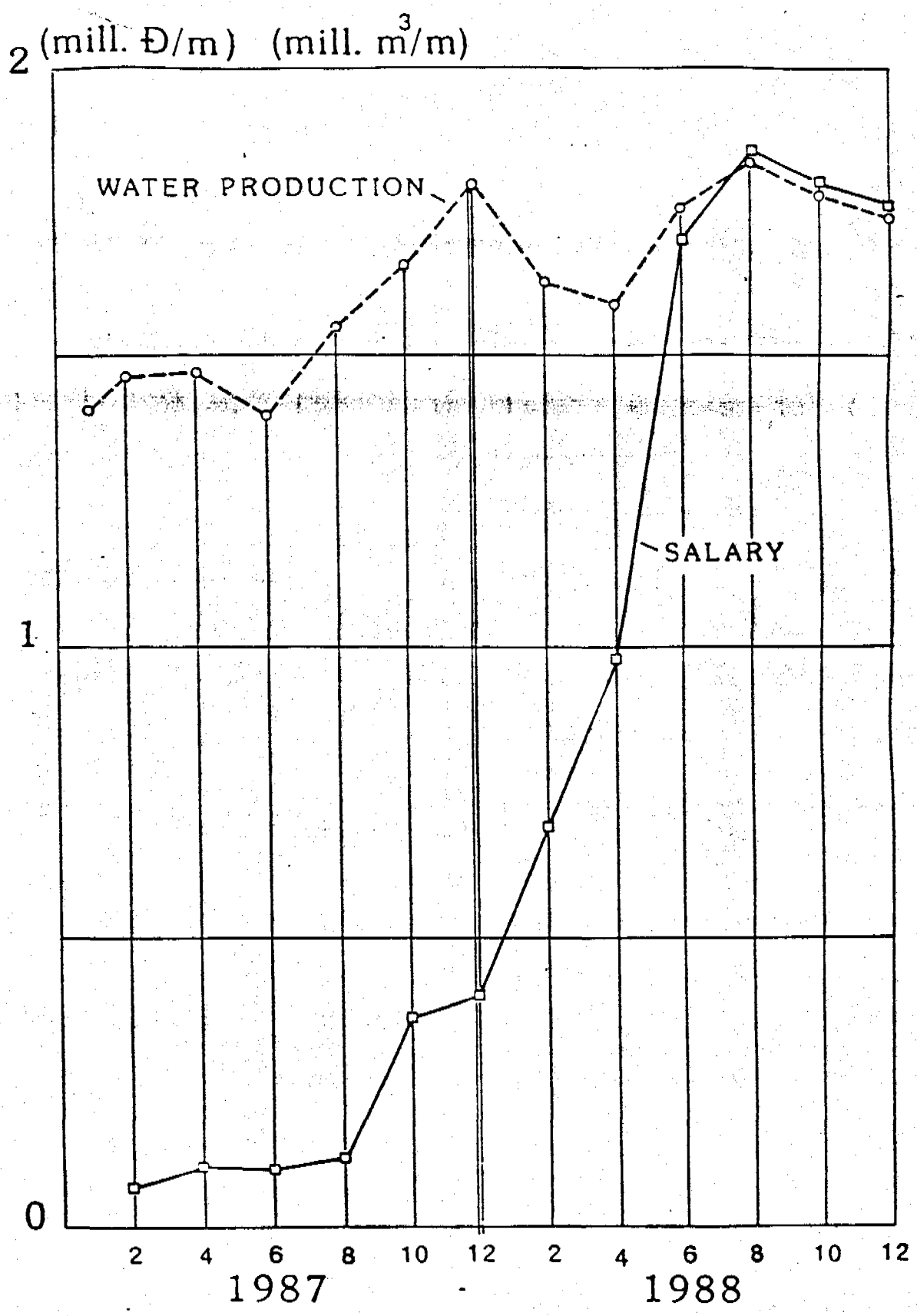
"NGO SI LIEN" WATER TREATMENT PLANT
$KMnO_4$ (mg/l) and COLOUR (pt.CO UNIT)1988

VIE/82/011
HWSM-VMT
2.3.1989



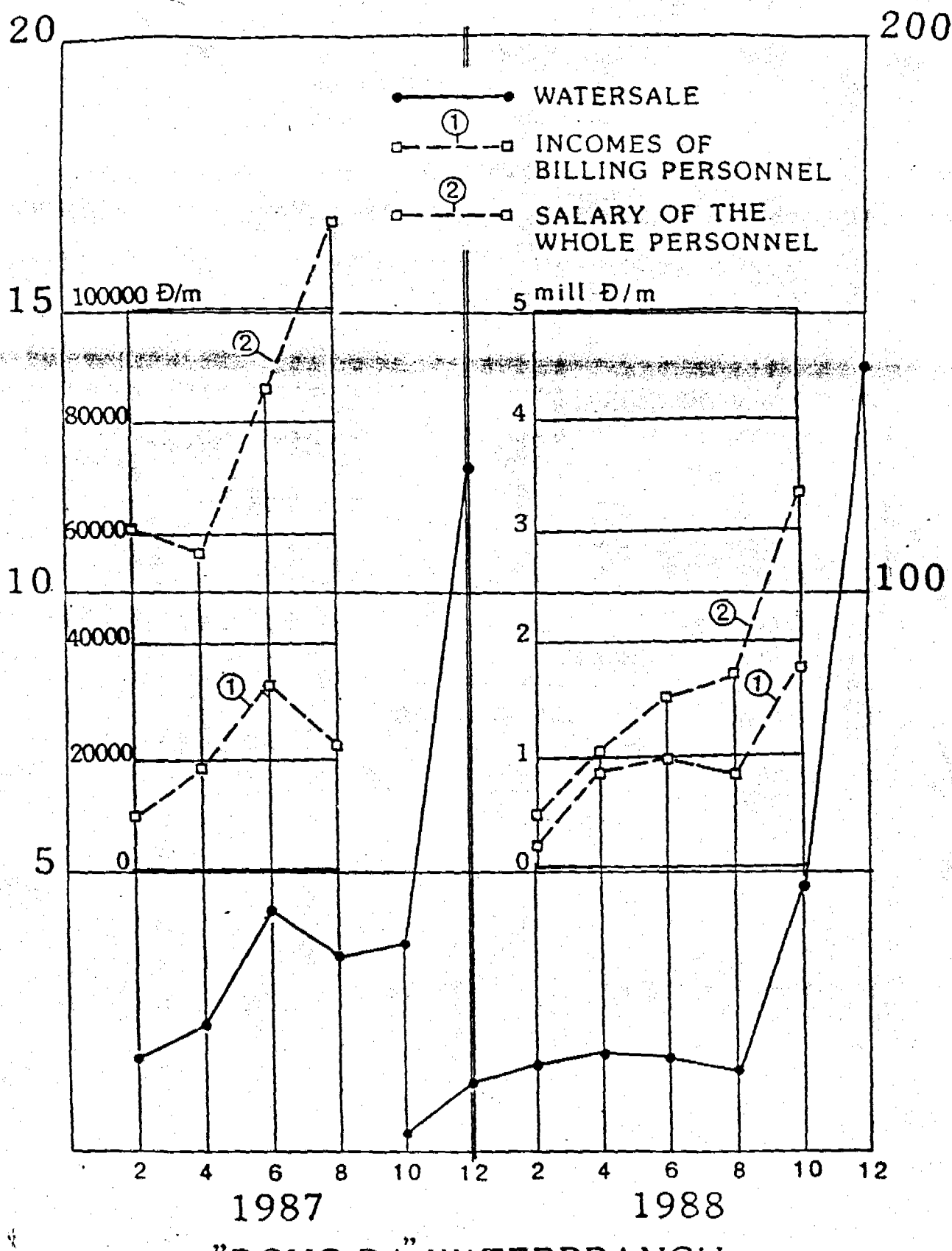
"NGO SI LIEN" WATER PLANT
WATER QUALITY AFTER FILTRATION 5.12.1988

VIE/82/011
HWSM-VMT
27.2.1989



NGO SI LIEN WATER PLANT
WATER PRODUCTION AND SALARY

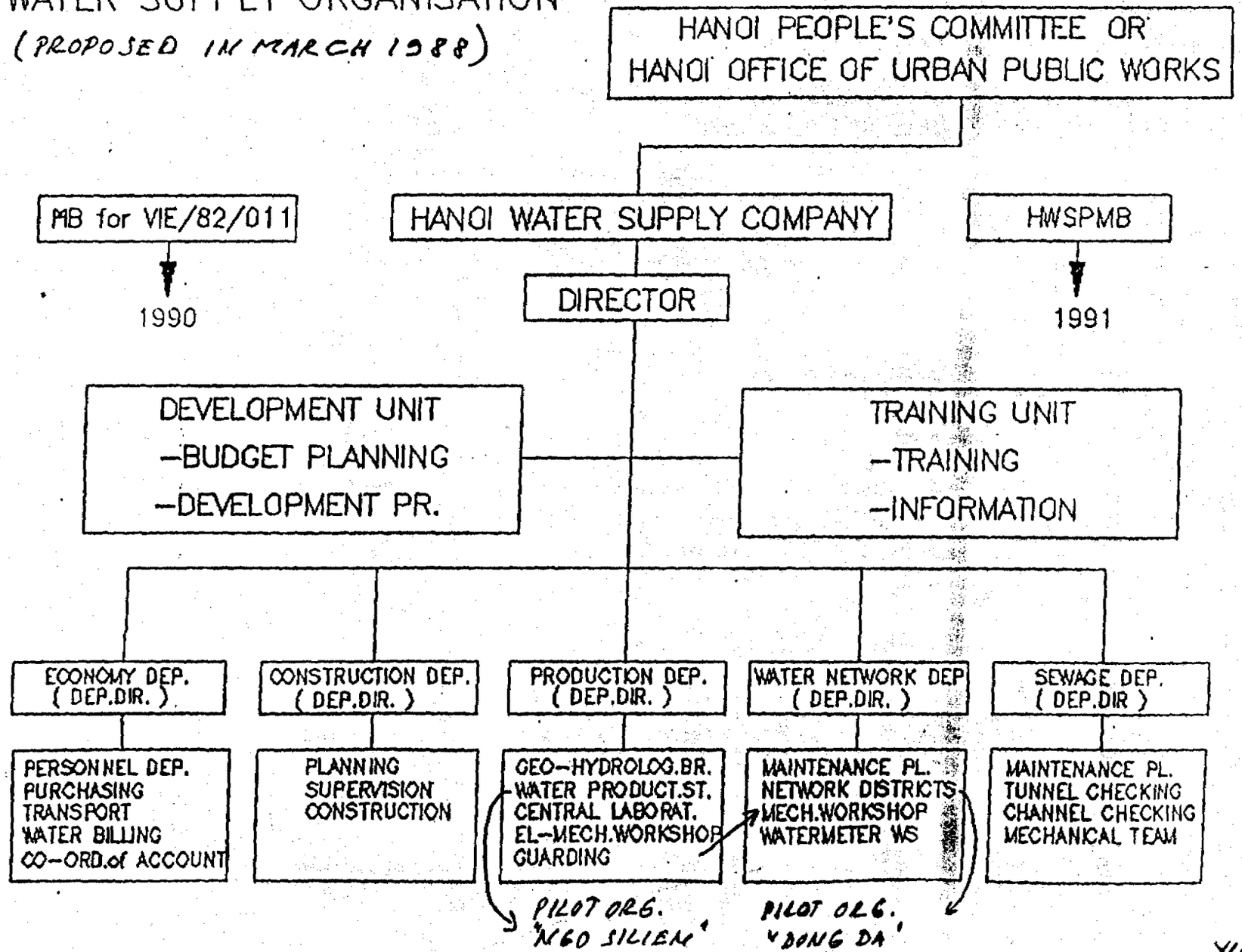
VIE/82/011
HWSM-VMT
2.3.1989



"DONG DA" WATERBRANCH

VIE/82/011
HWSM-VMT
2.3.1989

WATER SUPPLY ORGANISATION
(PROPOSED IN MARCH 1988)



VIE/82/011
HWSM-VNT
MARCH-88

VIE/82/011
HWSM-Project
V-M.Tiainen/lng
5.4.1989

APPENDIX A2

PILOT ORGANIZATION
"NGO SI LIEN"

PROPOSAL FOR REORGANIZATION
OF WATER PRODUCTION

1. THE REGULATIONS AND TARGETS OF WATER PLANTS
2. DIRECTION FOR THE HEAD OF THE PLANT
3. TARGETS AND WORK PROGRAMME OF SUB-UNITS (TRAINING EXERCISE)
4. THE PRESENT ORGANIZATION OF WATER PLANTS
5. REORGANIZATION FOR WATER PLANT
6. REORGANIZATION OF WATER PRODUCTION
7. QUALIFICATION OF PERSONNEL
8. SOME PARAMETERS TO SET TARGETS

1. THE REGULATIONS AND TARGETS OF WATER PLANT

The target of the Water Plant

The target of the water plant is to supply raw water to the treatment plant to treat the water and to pump the potable water in distribution network. The functions have to be technically advanced and economical. The detailed targets will be agreed yearly in the budget planning.

The Head of the Water Plant

The Water Plant has a head who is in charge of the production. He/she will report to his superior the production director.

The Responsibilities

1. To pump raw water from wells to treatment plant according to demand.
2. Water treatment according to given quality targets.
3. Pumping of potable water to the distribution network according agreed programme.
4. The operation and the maintenance of the wells, treatment plants and pumping stations.
5. Take part in receiving and accounting the investments and rehabilitation works.
6. Proposal for yearly repairing programme of wells, raw water transmission lines, treatment plant, pumping stations and reservoirs.
7. Proposal for yearly operation plan including the personnel plan and training programme.
8. Proposal for the yearly budget of water plant after directions of water company.
9. Necessary information for the management of the water production.
10. Other responsibilities given to the water plant by production director.

Sub-Units

The following sub-units belong to the water plant:

- Operation group
- Maintenance group
- Administration group
- Planning and supervision group

2. DIRECTION FOR THE HEAD OF THE PLANT

The head of plant is in charge of all functions named in regulations. His/her rights and responsibilities are as follows:

1. Decisions

- All kind of measures for running the wells, treatment plants and pumps if he has not delegated the right to the heads of the groups.
- To take spare parts of other material from the store.
- To do the necessary purchasing for unexpected breakdowns (max ..... D).
- To control the working times and work output of the staff
- Other decisions that the operation director has delegated to him.

2. Proposals and reports to operation director

- The budget proposal including plan of action. personnel plan and training programme.
- Proposal for purchasing (spare parts, chlorination equipment etc.)
- Proposal for rehabilitation and repairing programme.
- Proposal for training of personnel
- Proposal for "salary changes" of personnel
- Proposal for employing new employees
- Control of bills to water plant
- etc.

The work programme and responsibilities will be defined yearly by the head of the plant.

----------	----------
Deputy director of production	Director of water supply company

PILOT ORGANIZATION

3. TARGETS AND WORKS (TRAINING EXERCISE)

The targets of sub-unit (economical and administrative group, maintenance group and operation group).

The targets are to be defined separately for every group.

The Keyworks

Define the most important works (3-7) for group to get the target.

The Work Programme

How to implement the keyworks? Who, when, where, etc.

What is the need of resources:

- equipment
- transport
- the need of special services from outside for ex. from different units of Technical Department or Business Department
- special services from other organizations

Examples

a) Operating costs

Target 1:
- to save in energy costs by loss water reduction between wells and pumping station.
- target/loss water reduction 4000 m3/d

Keyworks:
-

Work programme:
-

Results and benefits:
- loss water reduction 4000 m3/d = 120.000 m3/month
- savings in energy (80 D/kWh) about 2 mill Dong/month (24 mill D/y)
- salary costs/58 person 40.000 D/month/each = 2.3 mill Dong/month
  "Better salary is depending on good results"

Target 2:
- to save in personnel costs and to get more effective staff by reducing the personnel from 58 to 35 persons.

Keyworks:
- the better maintenance planning and technical realization (see "maintenance / HWSM-project")
- new work programme for operation personnel
- to bring together to same organization unit 2-3 water plant (see the proposal for reorganization)

The last keywork belongs to the directors of company.

Work programme:
-

Results and benefits:
-

b) Water quality

Target:
- quality targets given by health authority or by company, e.g. $KMnO_4$ 10 mg/l in treated water.
- because there is the problem according to analyses of organic material ($KMnO_4$-figure) is something to do

Keyworks:
- more effective cleaning of filters
- to develop the methods to prevent algae growth in the filters, e.g.
- chlorination of water before filtration or
- cover the filters to prevent the lighting of filters and through that the algae production.

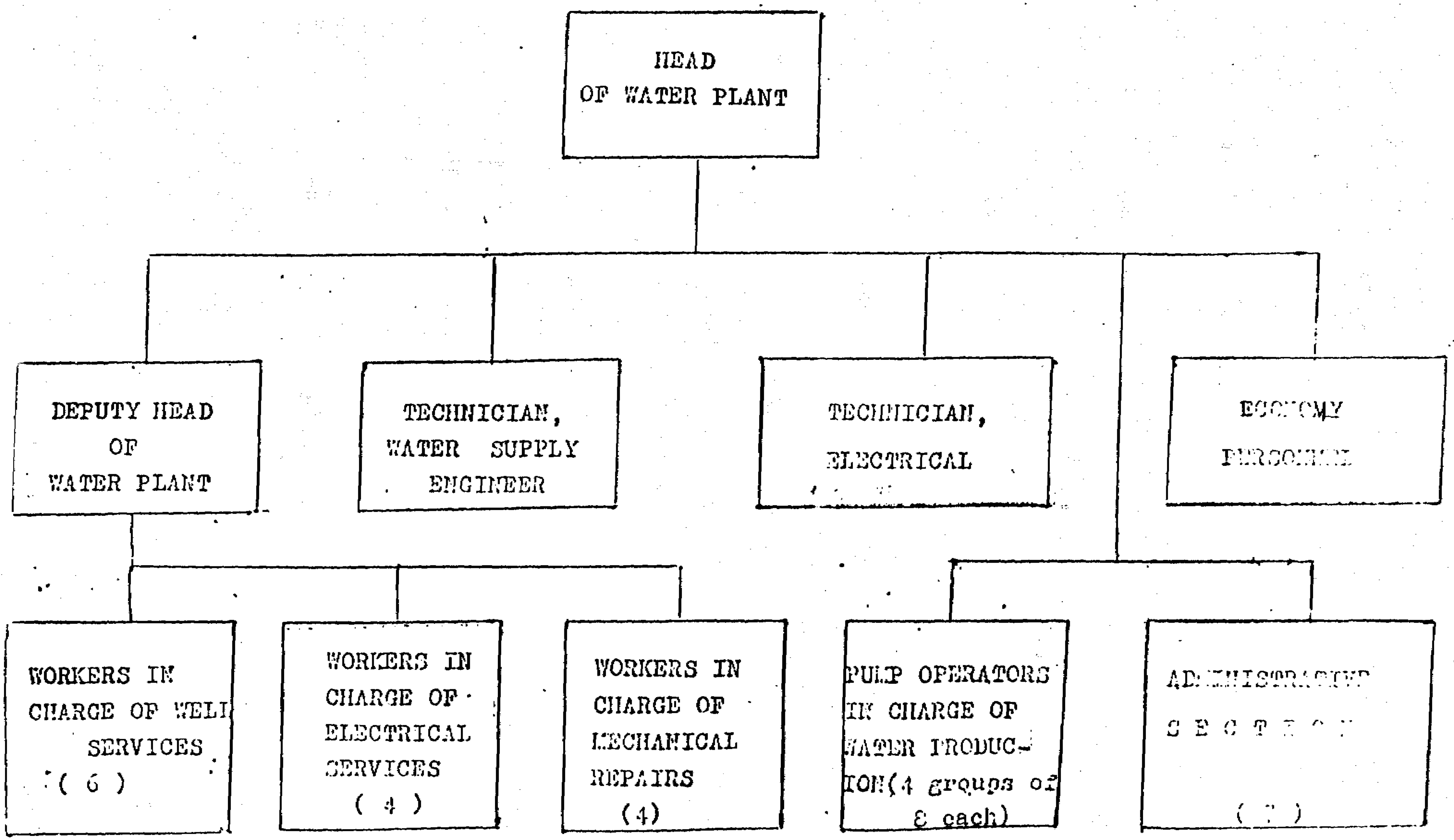
Work programme:
- better cleaning of equipment and tools, painting materials for filters, channels etc.
- programme for research of raw water chlorination after aeration and in other hand covering of some filters against the sunlight.
- measures:
  -- material, construction, equipment etc. work
  -- analyzing of water samples
  -- co-operating with laboratory etc.
  -- timetable, manning, reporting etc.
  -- cost estimate and financing of programme

  The work like this requires a special project group, but the main responsibility belongs to the head of the plant.

Results and benefits:
-
-

ORGANIZATION CHART OF NGO SI LIEN WATER PLANT

10.11.1988



HWSC./HU
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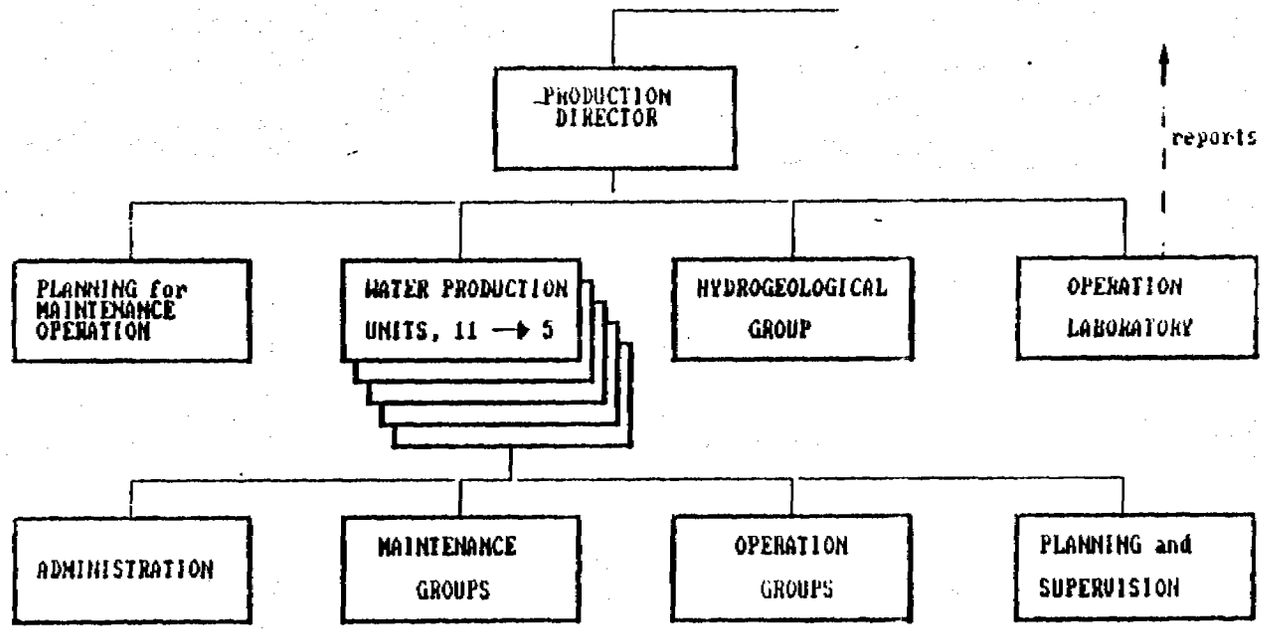
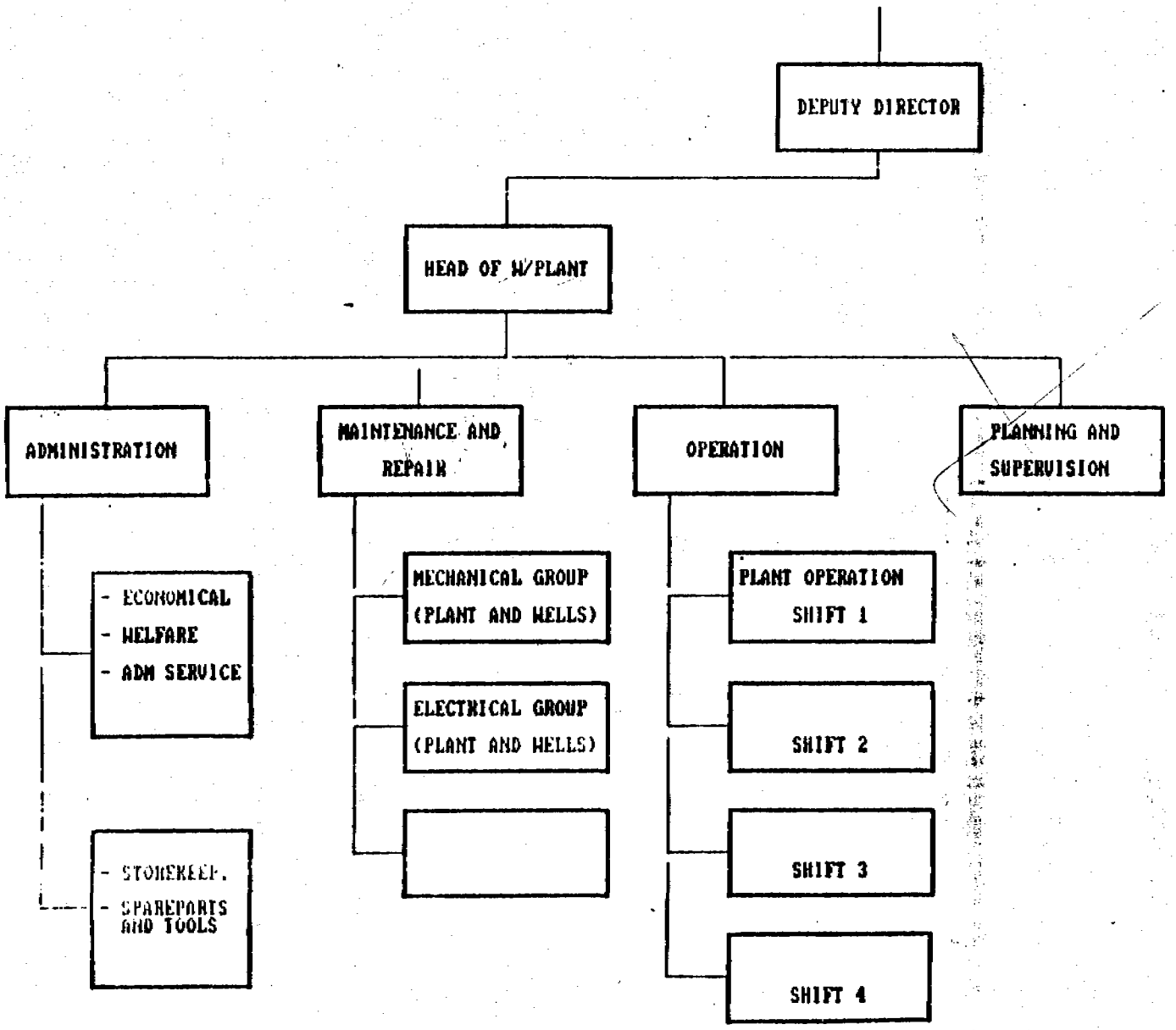


PROPOSAL FOR REORGANIZATION OF WATER PRODUCTION

(ACCORDING TO " PILOT ORGANIZATION " OF NGO SI LIEN WATER PLANT)

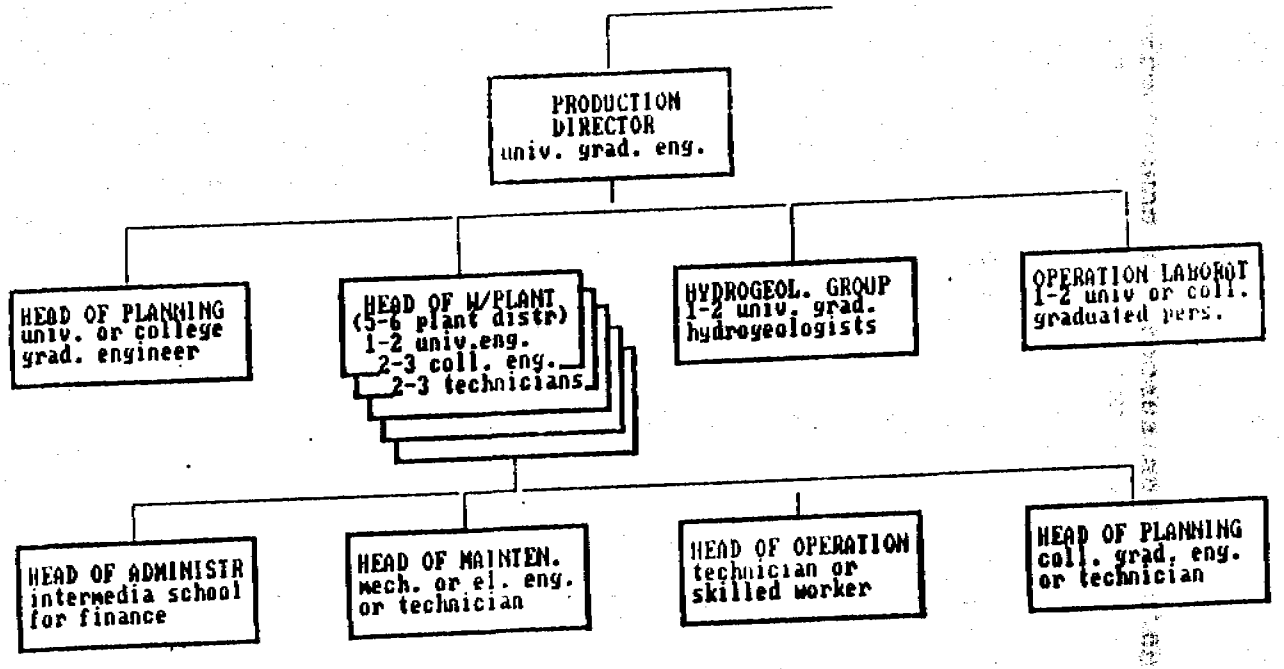
VIE/82/011-HWSN
VNT 29.3.1989



PROPOSAL FOR REORGANIZATION OF NGO SI LIEN WATER PLANT

(PILOT ORGANIZATION)

DIE/82/011-HUSH
VNT 24.3.1989



QUALIFICATIONS REQUIRED FOR HEADS
IN WATER PRODUCTION

VIE/82/011-HWSM
VNT 29.3.1989

8. SOME PARAMETERS TO SET TARGETS

8.1 Loss water reduction in raw water lines, treatment process and lines and reservoirs.
Parameters after calibration of the water meters (1989/HWSP-project)

8.2 Production per personnel
At present the situation is appr. 700-800 m3/d/p
Target should be 1200-1500 m3/d/p.

8.3 Breakdowns in process and pumping. Lack in production in millions m3's per year.

8.4 Abnormalities in water quality.

8.5 Production costs as unit costs and yearly costs. Developing in energy, salary and material costs.

VIE/82/011
HWSM-Project
V-M.Tiainen/lng
2.4.1989

APPENDIX A3

PILOT ORGANIZATION
"DONG DA"

PROPOSAL FOR REORGANIZATION OF WATER DISTRIBUTION

1. THE REGULATIONS AND TARGETS OF WDB
2. DIRECTION FOR THE HEAD OF WDB
3. TARGETS AND WORKS (EXERCISE)
4. THE PRESENT ORGANIZATION OF WDB
5. REORGANIZATION FOR WDB
6. REORGANIZATION OF WATER DISTRIBUTION
7. QUALIFICATION OF PERSONNEL
8. SOME PARAMETERS TO SET TARGETS

1. THE REGULATIONS AND TARGETS OF WATER DISTRIBUTION BRANCH (WDB)

1. Target of the Water Distribution Branch

The target of WDB is to pump potable water into network to be distributed to the consumers and to attend to water billing functions have to be technically advanced and economical. The detailed targets will be agreed on yearly in the budget planning.

2. The Head of the Distribution Branch

The WDB has a head who is in charge of the water distribution and water billing in the district given to him. He/she will report to his superior the distribution director (department head of HWSC).

3. The Responsibilities

3.1 The control and maintenance of the distribution network.

3.2 The control and repairing of the leaks in network and in house connections.

3.3 Installation works or supervision of the works on the pipe lines, public taps, house connections and of water meters and the work in houses after orders.

3.4 Operation and maintenance of booster pump stations and small water plant in district.

3.5 Water metering and water billing according to water consumption and to water tariff. Documentation of consumers.

3.6 Consumer services, information and control of connections and supervision of following the consumer contract.

3.7 Proposal for yearly repairing programme of network and the plan for water metering.

3.8 Proposal for yearly operation plan including the personnel plan and training programme.

3.9 Proposal for yearly budget of WDB after directions of the water company.

3.10 Production of necessary information for the management of WDB (e.g. pumping programme)

3.11 Other responsibilities to the WDB by "distribution director".

4. Sub-Units

The following sub-units belong to the WDB:

4.1 Maintenance unit

Duties mainly according to responsibilities 3.1, 3.2, 3.3, 3.4 (maintenance)

4.2 Consumer Unit

Duties mainly according to responsibilities 3.5 and 3.6

4.3 Planning Unit

Technical advising, coordinating and collecting the proposal for yearly budget and planning also duties after responsibilities 3.7, 3.8, 3.9, 3.10

Remark: According to the size of the branch and to education (level, section and experience) of the head of WDB can the head him of herself be the "planning unit".

4.4 "Administration"

Personnel services, store keeping etc.

The work programme and responsibilities of sub-units will be defined in more detail yearly by the head of the plant.

----------	----------
Deputy director of distribution	Director of water supply company

DIRECTION FOR THE HEAD OF THE WATER DISTRIBUTION BRANCH (WDB)

The head of WDB is in charge of all functions named in regulations. His/her right and responsibilities are as follows:

1. Decisions

- All kind of measures for running the water distribution and water billing if he has not delegated the right to the heads of the groups.
- To take spare parts of other material from the store.
- To do the necessary purchasing for unexpected breakdowns (max ..... D).
- To control the efficiency of the work and the working times of the staff
- Other decisions that the deputy director has delegated to him.

2. Proposals and reports to deputy director

- The budget proposal including targets for function, personnel plan and training programme.
- Proposal for purchasing (pipes, fittings, watermeters, equipment etc.)
- Proposal for maintenance and repairing programme.
- Proposal for training of personnel
- Proposal for "salary changes" of personnel
- Control of bills to water plant
- Proposal for employing new employees
- etc.

TARGETS AND KEYWORKS

The targets of sub-units (maintenance and repairing group, consumer services group and planning and supervision group).

The targets are to be defined separately for every group.

The Keyworks

Define the most important works (3-7) for group to get the target.

The Work Programme

How to implement the keyworks? Who, when, where, etc.

What is the need of resources:

- equipment
- transport
- the need of special services from outside for ex. from different units of Technical Department or Business Department
- special services from other organizations

For example

1. Loss water in houses

Target:
- to reduce loss water in houses 10% in 3 years

Keyworks:
- follow the consumption in houses of them big consumer
- supervision of "water delivery contract"
- water metering

Work programme:
- pilot area, where loss water reduction in network is going on
- purchasing and installing of water meters
- control of water supply fittings in houses
- information of consumers
- timetable, reserve of resources etc.

Results and benefits (the whole water supply):

- Energy save by 80 d/kWh is appr. 1 mill Dong / d and 30 mill Dong/month
- Higher pressure in network
- Possible to change investments of water plants 2 years

2. The number of personnel

Target:
- to reduce the personnel for level:
  200 house connections/person and
  2000 m network/person
  in 3 years

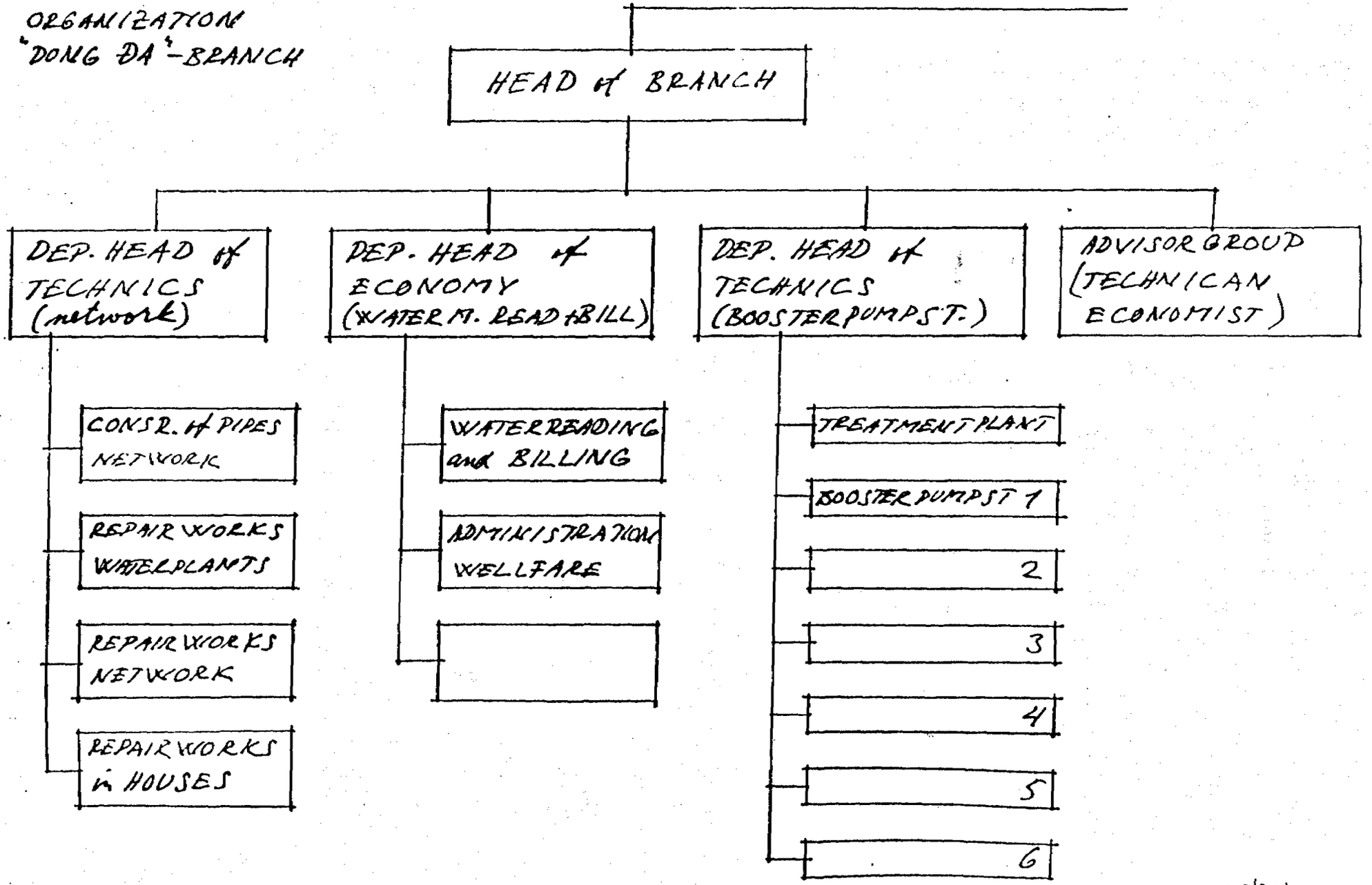
Keyworks:
- to develop the operation methods and purchasing of better tools for example in water billing, material sources, etc.

Work programme:
- to choose the working methods
- training
- new tools and material
- budgeting
- regulations
- resources and timetable
- replace of extra personnel
- extra salary for personnel
- etc.

Results and benefits:

- 100 person salary (or incomes in expenditures in budget of HWSC) is about 50 mill Dong/y. The save in salary costs is them about 25%. Possible it is good to pay to the permanent staff 10-15% higher salary.

THE PRESENT ORGANIZATION "DONG DA"-BRANCH



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HWSC/HWSM
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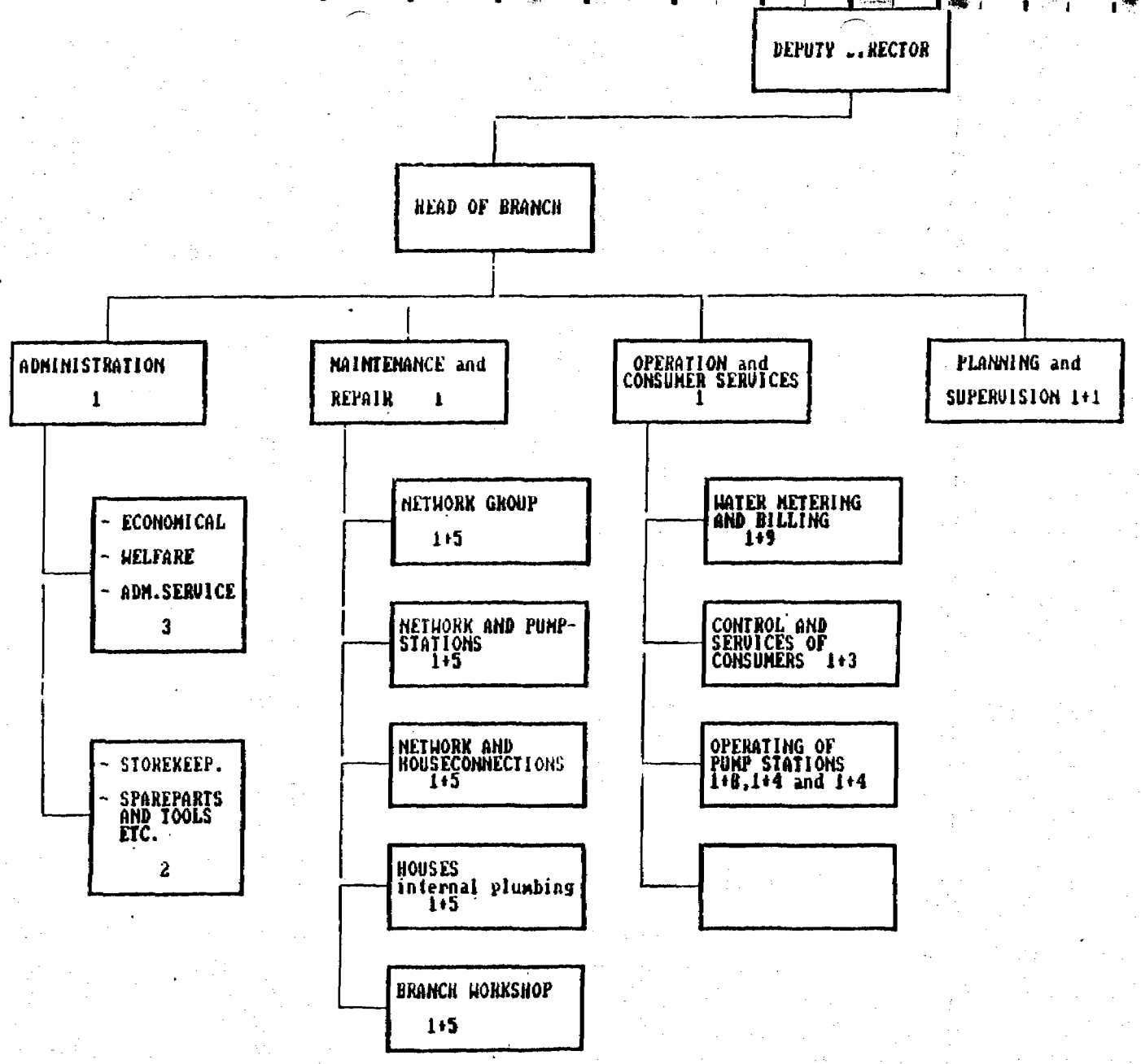
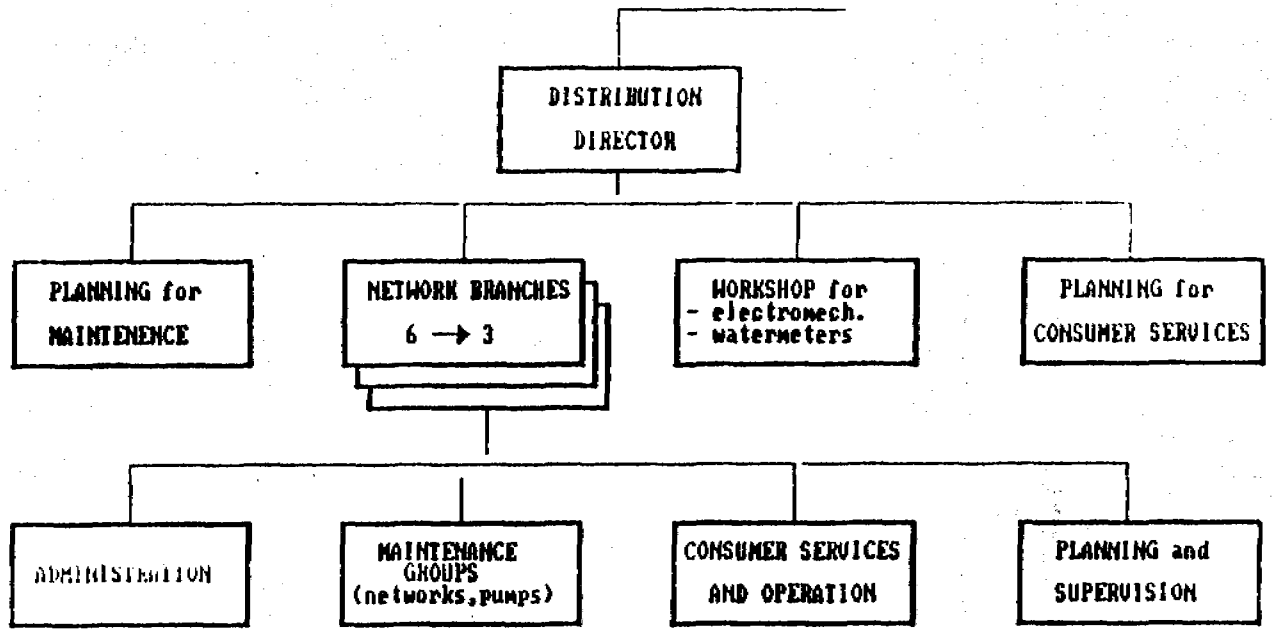


PROPOSAL FOR REORGANIZATION OF DONG DA WATER BRANCH

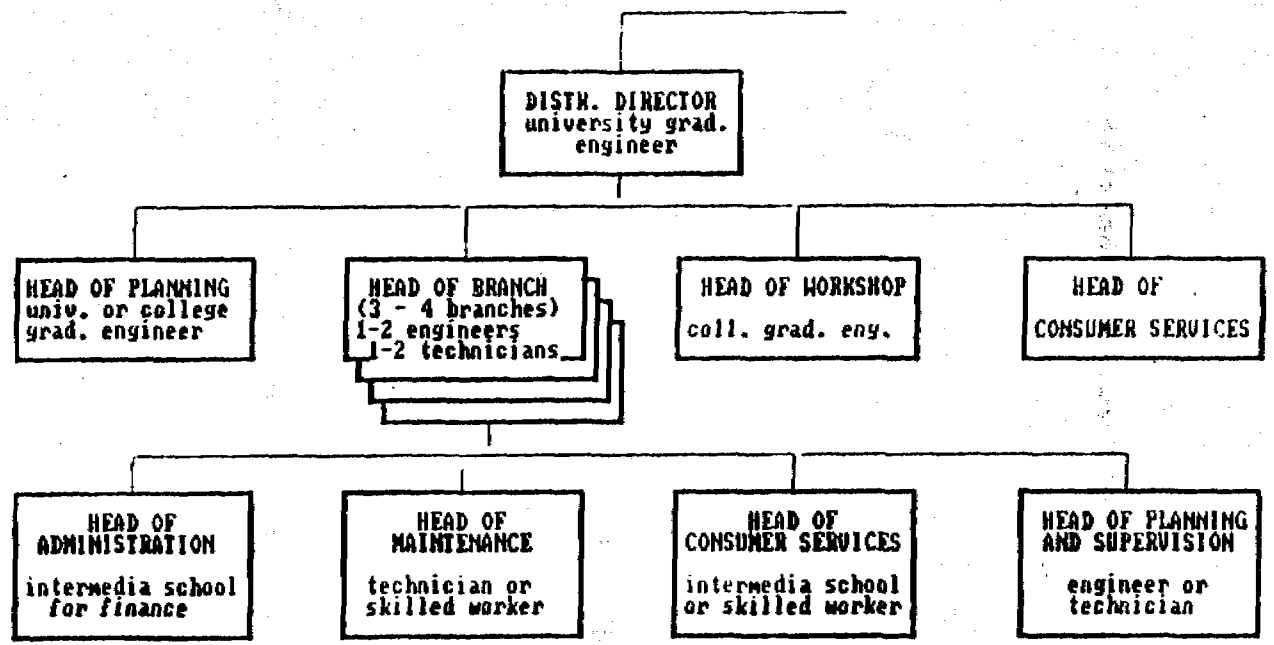
(PILOT ORGANIZATION)



PROPOSAL FOR REORGANIZATION OF WATER DISTRIBUTION

(ACCORDING TO " PILOT ORGANIZATION " OF DONG DA WATER BRANCH)

VIE/82/011-HUSM
VNT 29.3.1989



7. QUALIFICATIONS REQUIRED FOR HEADS IN WATER DISTRIBUTION

8. SOME PARAMETERS TO SET TARGETS
(see diagrams/information for management)

8.1 House connections per personnel and network (m) per personnel. Branches are usual overstaffed (not with trained personnel).

8.2 Breakdowns in distribution or poor pressure in network hours per week.

8.3 Leakages in network and repairtime of leakages.

8.4 Leakages in house connections and in houses.

8.5 Proportion of water meters that are not in the use. Nowadays 3000/4000. Should be in two year time 1000/6000 (target).

8.6 Development of expenditures and targets in budgeting.

VIE/82/011
V-M.Tiainen / lng
3.4.1989

APPENDIX A4

COST CALCULATIONS

1. Water production

1.1 Assumed:

Well capacity (raw water capacity)
- 400,000 m3/d by 100 wells

Water treatment capacity (pur water production)
- 350,000 m3/d (300,000 m3/d)

350,000 m3/d is the official production number. According to the estimates of HWSP pumping to network is about 300,000 m3/d.

Watersale (accounted water)
- 250,000 m3/d (200,000 m3/d)

By loss water about 100,000 m3/d the watersale may be 200,000 m3/d.

Unit prices according to HSWP's information and costestimates

- 1 well 30,000 USD
- raw water line in average for 1 well 200 m x 200 USD/m = 40,000 USD
- Treatment capacity 10,000 m3/d takes 1.2 mill.USD (water treatment and pumping)

For example "Ngoc Ha" new plant in II phase for 30,000 m3/d about 2 mill.USD + 450 mill.Dongs (appr. 300 Dong = 1 USD)

Unit prices according to HWSC's information (December 1988)

- energy demand 0.362 kWh/m3 á 80 Dong/kWh
- salary about 370,000 Dong/person/year

Distribution of operating costs (HWSC -88)

- Material	180 mill Dong/y	/ 4%
- Energy	2610 mill Dong/y	/ 51%
- Salary	630 mill Dong/y	/ 12%
- Workshop	360 mill Dong/y	/ 7%
- Management	720 mill Dong/y	/ 14%
- Transport	630 mill Dong/y	/ 12%
TOTAL	5,130 mill Dong/year	

1.2 Water Production Costs

Investments as reinvestments:

- Wells: 100 á 30.000 USD = 3 mill.USD
- Raw water lines:
  wells 100 á 40.000 USD = 4 mill.USD
- Treatment plants
  350.000 m3/d x 1.2 mill.USD/10.000 m3= 42 mill.USD

TOTAL 49 mill.USD

Depreciation times:

- Construction 30 y
- Machines 10-15 y

In average 25 years

Capital costs

- yearly despreciation 2.0 mill USD/y
- Interest (6%) 1.5 mill USD/y

in Dongs by 1 USD = 3500 Dongs
appr. 13.300 mill.D/year

One cubicmeter by 300.000 m3/d
pure water per day 117 Dong/m3
and by 350.000 m3/d
95.Dong/m3

Operating costs:

- Raw water and process
  pumping 0.250 kWh/m3 á 80 Dong/kWh

- Pure water pumping
  0.112 kWh/m3 á 80 Dong/kWh

Total energy costs: 4.000 mill.Dongs/y

- Salary 600 n á 370.000 Dong/year
  220 mill Dong/year

Other services (materoal, transport, workshop and management)

appr. 950 mill.Dong/y

TOTAL OPERATING COSTS

- Energy	4000 mill.Dong/y	77%
- Salary	220 mill.Dong/y	5%
- Other	950 mill. Dong /y	18%
TOTAL	5.170 mill.Dong/y	100%

GRAND TOTAL water production:

- Capital costs	13.300 mill.Dong/y /	69%
- Operating costs	5.200 mill.Dong/y	31%
TOTAL	18,500 mill Dong/y	100%

WATER PRODUCTION PRICE:

by 300,000 m3/d	/ 110 mill.m3/y	/	170 Dong/m3
by 350,000 m3/d	/ 128 mill.m3/y	/	144 Dong/m3

1.3 WATER DISTRIBUTION COSTS

According to the source material given by HWSP the unit costs are

- 1 house connection	150 USD (with watermeter)
- 1 public tap	170 USD
- 1 small waterplant	400,000 USD
- 1 Boosterpump station	200,000 USD

diameter (mm) (const. 1955...88)	lenght (m)	unit price USD (USD / m) pipe	others	total	price of line USD
40-60 (63)	-	5	15	20	-
75-80 (90)	11.000	6	21	27	297.000
100-150 (110)	60.000	8	29	37	2.220.000
180-200 (160)	52.000	18	37	55	2.860.000
250-280 (225)	12.000	30	56	86	1.032.000
300-350 (300)	52.000	70	80	150	7.800.000
400	16.000	100	100	200	3.200.000
600	21.000	145	145	290	6.090.000
TOTAL	224 km				23.5 mill.USD

Network is constructed in years 1900-54 8.4 km which is not included in the figures.
HWSP (financed by FINNIDA) has constructed in years 1986-88 about 72 km transmission and distribution lines which is included in the above.

Houseconnections

According to the information by HWSC/heads of water branches the houseconnections are as follows:

	House Connections			
	Private	Offices	Pub.taps	Total
Ba Dinh	3226	808	197	4231
Hoan Kiem	5500	1100	100	6700
Gialam-Da-S.Dong	429	126		555
Hai Ba	4289	1293	261	5843
Tu Liem	300	235	67	602
Dong Da	2800	800	400	4000
	16.544	4.362	1.025	21.931

Investments:

- Houseconnections 20 906 x 150 USD = 3.1 mill.USD
- Public Taps 1 025 x 170 USD = 0.2 mill.USD

TOTAL 3.3 mill.USD

Small water plants and booster pumpstations as follows:

	Booster p-station	Water-Plants	Total
Ba Dinh	1		1
Hoan Kiem	1		1
Gialam-Da-S.Dong		3	3
Hai Ba	4		4
Tu Liem	3	3	6
Dong Da	6	1	7
TOTAL	15	7	22

Investments:

- Small waterplants 7 x 400.000 = 2.8 mill.USD
- Booster pumpstations 15 x 200.000 = 3.0 mill.USD

TOTAL 5.8 mill.USD

Water distribution investments as reinvestments are as follows:

	mill.USD
- Network	23.5
- House connections	3.1
- Public Taps	0.2
- Small waterplants and booster pumpstations	5.8
TOTAL	32.6 mill.USD

= 114,000 mill.Dongs

Depreciation times:

- Network	35 years
- House Connections	25 yeras
- Small waterplants and Booster pumpstations	15 years

Capital costs / despreciation:

- Network	0.67 mill.USD/y
- House Connections	0.13 mill.USD/y
- Booster etc.	0.40 mill.USD/y
Total	1.20 mill.USD/y

/ interest:

- Network	0,71 mill.USD/y
- House Connections	0.10 mill.USD/y
- Booster etc.	0.17 mill.USD/y
Total	1.0 mill.USD/y

Capital costs total:

- despreciation	1.2 mill.USD
- interest	1.0 mill.USD
Total	2.2 mill.USD/y

= 7.700 mill.Dong/y

Operating costs:

- Salary 450 p á 370.000	=	170 mill.Dong/y
- Others (material, transport, workshops, management)		950 mill.Dong/y
Total		1100 mill.Dong/y

Grand total distribution costs:

- Capital costs	7700 mill.Dong/y
- Operating costs	1100 mill.Dong/y
Total	8800 mill.Dong/y

Water distribution (without water production):

by	350,000 m3/d	70 Dong/m3
	300.000 "	81 "
	250,000 "	98 "
	200,000 "	122 "

1.4 Overhead Costs

There are usual costs, which are not to direct to some activity, for example:

- management (directors, training etc.)
- general services (personnel, medical, accounting, laboratory, rents, etc)
- profits etc. (to government)

Above material, workshop, management and transport are divided to water production and distribution costs (50% and 50%). They are total 33% of operating costs.

One part of salary costs (222 mill.Dong/y), is not yet divided to production or distribution. It is the same with the profits to governemnt.

Management and general services demand naturally investments for offices, storres, vehicles etc. Hereby it is assumed an "Overhead Cost Percent" which includes costs not directed to operating.

"OC-PERCENT" is assumed to be 10% of all costs.

1.5 Water price

As summary of above made calculations are following the next cost estimations:

	capital c mill.D/y	operating c mill.D/y	total c mill.D/y
Water:			
- production	13.300	5.200	18.500
- distribution	7.700	1.100	8.800
- overhead 10%	2.000	700	2.700
TOTAL	23.000	7.000	30.000

Capital costs	77%
Operating costs	23%

Water price by waterscale:

250.000 m3/d	is	90 mill.m3/d		333 Dong/m3
200.000 "	is	73 "		411 Dong/m3
150.000 "	is	55 "		545 Dong/m3