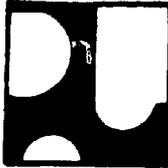


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REPUBLIC OF INDONESIA
MINISTRY OF PUBLIC WORKS
DIRECTORATE GENERAL OF HOUSING BUILDING
PLANNING AND URBAN DEVELOPMENT (CIPTA KARYA)

MEDAN URBAN DEVELOPMENT, HOUSING, WATER SUPPLY AND SANITATION PROJECT

44 P

TECHNICAL MEMORANDUM NO. 31

FINANCIAL CONSIDERATIONS FOR WATER SUPPLY AND SANITATION

This is a draft of part of Section 15 of the Master Plan
Report for Water Supply and Sanitation

NOVEMBER 1979

ENGINEERING - SCIENCE, INC. • SINOTECH ENGINEERING CONSULTANTS, INC

A JOINT VENTURE
in association with
PADCO and P.T. DACREA

MEDAN URBAN DEVELOPMENT, HOUSING, WATER SUPPLY AND SANITATION PROJECT

Jln. Singamangaraja 1-3, P.O. Box 28, Phone 20716, Medan-Sumatra, Indonesia

Our ref.: 79/1200/MUDS/313

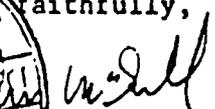
8 November 1979

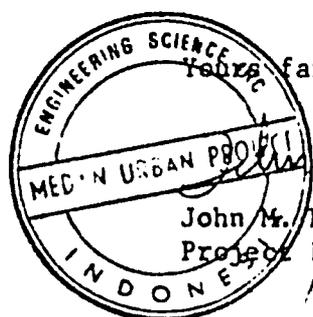
Director General Cipta Karya
Ministry of Public Works
Jalan Pattimura 20
Kebayoran Baru
Jakarta Selatan

Subject: Technical Memorandum No. 31,
Financial Considerations for
Water Supply and Sanitation

Dear Sir:

Attached are 20 copies of the subject Technical Memorandum for your information and review. The material contained in this memorandum constitutes partial submission of Section 15 of the draft Master Plan for Water Supply and Sanitation.

Yours faithfully,

John M. McGill
Project Representative



C.C.: Ir. Ruslan Diwiryo, Director of City & Regional Planning
Ir. Susanto Mertodiningrat, Director of Sanitary Engineering
Ir. Sunaryo, Head Sub-Directorate Town Planning
Ir. K. Pohan, Project Manager, MUDS
AID - Jakarta, attn.: P. Thorn, Project Officer
ES - Arcadia
SINOTECH - Taipei
DACREA - Jakarta

JM/1

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* Not yet submitted.

LIST OF TECHNICAL MEMORANDA PREVIOUSLY SUBMITTED

Report No.	T i t l e	Date Submitted
1.	Preliminary Site Selection Criteria for Perumnas Medan III, SSCH/LCH Project	March, 1979
2.	Work Plan for Water Supply and Sanitation Master Plans and Feasibility Studies	April, 1979
3.	Policy Issues for Project Guidance	March, 1979
4.	Drainage - Principal Rivers and Rainfall Analysis	May, 1979
5.	Preliminary Evaluation of Sunggal Water Treatment Plant	May, 1979
6.	Public Health Considerations	July, 1979
7.	The Present Drainage System	August, 1979
8.	Recommended Drilling Program	August, 1979
9.	Medan Household Income/Expenditures	August, 1979
10.	Existing Land Use in Medan	August, 1979
11.	The Regional Functions of Medan	August, 1979
12.	Existing Solid Wastes Systems and Projected Solid Wastes Characteristics	August, 1979
13.	Evaluation of Medan Master Plan	August, 1979
14.	Physical Constraints to Urbanization	August, 1979
15.	Development in Health Care in Medan	September, 1979
16.	Existing Water Supply Systems	September, 1979
17.	Developments in Education	October, 1979
18.	Existing Water Supply and Sanitation Systems	October, 1979
19.	Public Health and Environmental Aspects	October, 1979
20.	Alternative Solid Wastes Management Systems	October, 1979

LIST OF TECHNICAL MEMORANDA PREVIOUSLY SUBMITTED (CONTINUED)

Report No.	Title	Date Submitted
21	The Distributed Investment Strategy Plan (DISP)	October, 1979
22	Recommended Solid Wastes Management System	October, 1979
23	Recommended Drainage Management System	October, 1979
24	Alternative Water Supply Management Systems	November, 1979
25	Water, Wastewater, Stormwater and Solid Wastes Systems	November, 1979
26	Alternative Wastewater Management Systems	November, 1979
27	Design Criteria and Bases for Cost Estimates	November, 1979
28	Recommended Water Supply Management System	November, 1979
29	Recommended Wastewater Management System	November, 1979
30	Environmental Assessment	November, 1979

15.4 EXISTING FINANCE SYSTEMS

15.4.1 General

At present, only water supply is the responsibility of an autonomous authority (P.A.M. Tirtanadi), conducting its affairs along commercial lines as far as it is able. The other services are provided by Kotamadya Medan whose financial basis has been reviewed in Section 7 of the Long Term Urban Development Plan. The salient financial features of the water supply and sanitation services are discussed below.

15.4.2 Water Supply

15.4.2.1 Income and Expenditure

P.A.M. Tirtanadi operates a commercial accounting system, working on an accrual basis and producing income and expenditure accounts. A standard format balance sheet is also prepared.

Annual income and expenditure statements for the years 1976, 1977, and 1978 are shown in Table 15.1. Some caution is needed when interpreting these figures. Included in revenues is part (30%) of a substantial surplus earned on making new connections, where the charge heavily exceeds actual cost. This is discussed in more detail below. Also, funds made available by Perumnas (the agency responsible for low cost housing development) for investment in water services to new housing projects appear under revenue in 1978.

The fact remains, however, that even after the inclusion of these non-operating surpluses and contributions in the revenue statement, a deficit is recorded in two out of the three years. This reflects the low growth in water revenues, which in turn results from limited water supply (and thus limited potential for additional sales) and low tariff rates. At the same time, operation and maintenance costs have shown a sharp increase, particularly between 1977 and 1978.

Higher operating costs will also be a feature of the current year, following the 50% devaluation of the rupiah in November, 1978. The budget for 1979 is now being reviewed and was not available at the time of writing. Discussions with the Director and financial management of P.A.M. Tirtanadi indicated that a further operating deficit is likely this year.

TABLE 15.1
P.A.M. TIRTANADI - WATER SUPPLY
INCOME AND EXPENDITURE (RP MILLION) 1976-1978

	1976	1977	1978
<u>Income</u>			
Water sales (incl. meter rent)	721	758	780
Excess connection charges)	182	93	121
Connection/reconnection fees)		111	148
Perumnas contribution	-	-	312
Other	18	-	-
Total	<u>921</u>	<u>962</u>	<u>1,361</u>
<u>Expenditure</u>			
Operating and maintenance	779	704	1,194
Depreciation	132	141	154
Total	<u>911</u>	<u>845</u>	<u>1,348</u>
Less contribution to Governor's Office	40	40	40
Surplus/(deficit)	(30)	77	(27)

Source: P.A.M. Tirtanadi

Only by augmenting supply and increasing tariffs can this outcome be avoided. Both these objectives are now being pursued.

Salient features of income and expenditures are discussed further in the following paragraphs.

Tariff Rates: The existing tariff rate schedule was introduced in 1973. These rates are summarized by consumer category in Table 15.2, along with actual consumption and revenue for Medan city in 1978.

TABLE 15.2
TARIFF RATES AND REVENUES 1978 BY CONSUMER CATEGORY

Customer Category	Rate Rp/m ³	Consumption		Revenue	
		m ³ ('000)	%	Rp Million	%
Domestic	15	10,347	45	155	22
	30	2,916	13	87	12
Commercial/ Industrial	100	1,487	7	149	21
	80	2,543	11	203	29
Government Offices	30	1,025	5	31	4
Social/ Religious	5	447	2	2	-
	15	478	2	7	1
Schools	20	877	4	18	3
Army	20	2,385	10	48	7
Public Taps	15	255	1	4	1
Total		22,740	100	704*	100

* This is lower than water sales total in Table 15.1 as meter rents and revenue from Belawan and Brastagi are excluded.

The industrial and commercial sector generates 50% of the revenue while consuming only 18% of the water. Conversely, domestic consumption is just under 60%, providing just over one fifth of total revenue. This proportionately lower domestic contribution reflects the very low average rate

obtained for domestic consumption. Two rates apply: an initial allocation of 4.5 m³ per person per month is charged at the very low rate of Rp.15 per m³; consumption above this allowance is charged at the still very modest rate of Rp.30 per m³. As on average only 22% of domestic consumption is at the higher rate this implies that each person only consumes a further 1.0 m³ above the cheap allowance allocation. This seems highly unrealistic and suggests, as could be expected, that considerable overstates the number of people dependent on private domestic connections.

The rates for all other consuming categories, apart from industry and commerce, are also at very low levels, ranging from Rp.5 to Rp.30 per m³. Public taps are charged at the minimum domestic rate of Rp.15 per m³ but total consumption is extremely low (1%) due to the small number (approximately 100) which have so far been installed.

P.A.M. Tirtanadi is well aware of the need to increase tariff rates and has put forward proposals to the provincial government for both restructuring the tariff schedule and higher rates. Under these proposals the existing structure would be rationalized into three consumer categories; domestic, commercial, and industrial. The industrial rate would increase from Rp.100 per m³ to Rp.150 and all domestic consumption would be charged at Rp.25, with no cheaper band as at present. These rates were put forward before devaluation (and the consequent high increase in costs) and now need reviewing. At present, tariff increases have to be approved by both the provincial legislative assembly and the Governor. According to P.A.M. Tirtanadi, under revised operating regulations now awaiting central government approval, only the consent of the Governor will be required. This should facilitate the processing of increased rate proposals in future.

Meter Charges: At the end of 1978, there were just under 33,000 metered connections, of which 25,500 were domestic and 6,500 industrial or commercial. Monthly meter charges vary from Rp.50 for a 3/8" meter to Rp.750 for a 1 1/2" meter. This is, in effect, a nominal service charge and it would be difficult to justify a higher charge as the property owner pays heavily in excess of actual cost for the meter and its installation. Meter revenue in 1978 was Rp.34 million.

Connection Charges: As P.A.M. Tirtanadi has been unable to effect rate increases, it has sought to generate additional revenue through high connection charges. This is done with conspicuous success. Table 15.3 shows the actual cost of making a typical domestic connection compared with the amount charged. This yields a 'surplus' of Rp.163,000 or, put another way, actual cost is 22 percent of the actual charge.

TABLE 15.3
TYPICAL DOMESTIC CONNECTION COSTS AND CHARGES
Rp ('000)

	Actual Charge	Actual Cost	Surplus
Distribution line	60.0	-	60.0
Meter and pipes	117.5	23.4	94.1
Internal pipes	30.5	21.5	9.0
Total	208.0	44.9	163.1

Source: P.A.M. Tirtanadi

The disadvantage of making excessive charges for connections is that private piped supplies are priced beyond the means of the majority. In fact, this is not a major problem when there is a paucity of supply, as at present; P.A.M. Tirtanadi claims that the demand for connections, even at current charges, exceeds what water pressure in the system enables it to satisfy. This policy will clearly need to be revised, however, when water supply is augmented.

Operating Expenses: The major items appearing in the expenditure statement are wages, rehabilitation costs and depreciation, accounting in total for 71 percent of charged expenses.

P.A.M. Tirtanadi is required to contribute Rp.40 million per annum to the Governor's office as well as 4 percent of revenue as a management fee to the provincial holding company. The 4 percent contribution does not

appear in the expenditure statement, but it is understood that the Rp.40 million is included, although not shown as a separate item. This can be considered as a charge in lieu of interest (albeit at a low rate) as investment funds provided by the provincial government in the past have been in the form of grants.

15.4.2.2 Sources of Finance

In the past, major investments in water supply and water treatment have been financed by the provincial government through grants. Investments in distribution and other works have been made largely through the surplus earned on service connection charges.

There is a complete absence of debt finance in P.A.M. Tirtanadi's capital structure. This is due to the reluctance of banks to lend to the organization given its current status rather than Tirtanadi's deliberate avoidance of this potential source of funds. However, this position should change in the next few months if, and when, the central government ratifies the revised organizational structure for the utility which has already been approved by the provincial government. The Director of Tirtanadi is confident that bank loans will be forthcoming once it has approved Perda status (that is, formal authority from the provincial and central governments).

Meanwhile, Tirtanadi is entirely dependent upon internal cash generation for its routine development finance. In recent years, this has yielded between Rp.300 and Rp.400 million, as shown in Table 15.4. This has been insufficient to undertake major capital works.

TABLE 15.4
TIRTANADI CASH GENERATION 1977-1979
(RP MILLION)

	1977	1978	1979 (Estimate)
Operating surplus	77	(27)	(40)
40% of excess connection charge	82	233	276
Depreciation	141	154	164
Total Cash	300	360	400

Source: P.A.M. Tirtanadi and MUDS estimates

15.4.3 Wastewater and Drainage

As discussed in sub-section 15.2.3, wastewater and drainage operations are primarily the responsibility of the drainage section of the Medan public works department. Certain drainage clearance functions, however, are also performed by the municipal solid wastes department; these expenditures are included in the solid wastes budget but are not clearly identifiable. The sub-directorate of village development also undertakes drainage work in the low income areas of the city.

15.4.3.1 Revenue and Expenditure

Revenue and expenditure for drainage in 1978/79 are shown in Table 15.5.

TABLE 15.5
DRAINAGE - REVENUE AND EXPENDITURE, 1978/79

<u>Revenue</u>	<u>Rp./Million</u>
Drainage	8
Other Taxes (local & central)	116
Inpres funds	35
Total	159
<u>Expenditure</u>	
Routine	68
Development	91
Total	159

Source: Dinas Pendapatan; Drainage Section, PWD; Dept. of Finance; Sub-Directorate, PMD.

Taxes: The major revenue source is local taxes, but only Rp 8 million out of the total tax allocation of Rp 124 million is from a specific drainage tax, the balance coming from the pool of other tax revenues.

Drainage tax is charged at the rate of Rp 200 per m² for open drains which are adjacent to a property and at Rp 300 per m² for closed drains. An additional 30 percent per floor is added for multi-storey properties. In 1978 there were just under 15,000 properties enumerated as having drainage, of which one-third had closed drains. The most recent information available on the number of properties in Medan is the 1975 city census which gives the total of domestic properties as 153,000. No figure exists for industrial and commercial properties, but if the latter were included and allowance made for property growth since 1976 it is clear that the percentage of properties assessed for drainage tax is extremely low.

The revenue from drainage tax is well below potential, but by how much is difficult to estimate. This is for two reasons; firstly, the tax collection department (Dinas Pendapatan) is not necessarily informed when new drains are constructed and secondly, the taxes are often not collected from properties which are assessed. The revenue department estimates the collection rate at around 30 percent. There is no penalty for non-payment and arrears are not carried forward. Property owners, particularly with open drains, refuse to pay on the grounds that no service is provided; it is claimed that the drains are continuously blocked, causing flooding during periods of heavy rains.

On the basis of the current assessment (which is certainly understated) the potential drainage tax revenue is Rp 26 million per annum; actual collection is Rp 8 million. This means that most of the locally financed drainage expenditure is derived from other taxation sources.

In addition to local tax revenue, Inpres (central government) funds are made available for drainage purposes. In 1978/79 this amounted to Rp 35 million, principally for development. The sub-directorate of village development similarly have use of central funds for providing services in the kampungs. In 1978/79 this amounted to Rp 20 million for development and Rp 6 for routine expenditure.

Expenditure: Expenditure is categorised as either routine or development. In practice, these definitions are somewhat fluid as approximately Rp. 20 million of "development" expenditure in 1978/79 would appear to have been for maintenance (routine) items. But however defined, drainage expenditure is totally inadequate to maintain a reasonable level of service.

15.4.4 Solid Waste

15.4.4.1 Income and Expenditure

Revenue and expenditure for solid waste collection in 1978/79 are shown in Table 15.6.

TABLE 15.6
SOLID WASTES - REVENUE AND EXPENDITURE, 1978/79
(RP MILLION)

<u>Revenue</u>	
Collection charges	14
Septic tank emptying	6
Taxes	386
Total	406
<u>Expenditure</u>	
Routine	299
Development	107
Total	406

Source: Dinas Pendapatan & DKKP.

Solid Waste Charges: A range of charges is made, based on type of property, for solid waste collection:

<u>Type of property</u>	<u>Monthly charge (Rp)</u>
Large industrial	1,500
Small industrial	1,000
Large offices	750
Small offices	650
Permanent houses	550
Temporary houses	350

The actual collection of this money is the responsibility of the kampung chief who "sells" tickets to all properties in his area at the appropriate rate. He is then responsible for remitting receipts to the revenue department (Dinas Pendapatan).

The system falls down on a number of counts. The kampung chiefs have difficulty in collecting the fees as there is no guarantee that the waste collection will take place. As already discussed in sub-section 2.6, the DKKP (solid wastes department) has only sufficient facilities to cover 25-30 percent of the wastes generated in the city. This inevitably results in an inadequate service and means that many properties use private collecting services to dispose of their garbage. Even when fees are collected for the official service, the revenue department does not know either what the potential take from a kampung should be or what proportion of the actual money collected is being remitted. Either way, the revenue department's receipts are extremely small and have actually declined slightly in recent years (from Rp. 14.1 million in 1976/77 to Rp. 13.6 million in 1978/79), despite the continued growth of the city.

The other direct charge connected with waste disposal is for emptying septic tanks. Five trucks are maintained for this purpose and septic tanks are pumped out on request from property owners. The charges are: Rp. 1,500 for a single family home and Rp. 3,000 for larger tanks, including office buildings and hotels. The normal work load is 450 truck loads per month.

A further service provided on a small scale through the health department is the water-seal latrine program. Around 1,000 of these units are authorised per year for a cost Rp. 4,500 per slab.

As with drainage, but even more so with solid wastes, the gap between specific charges and expenditure is very considerable and has to be bridged from the total municipal taxes pool. In both cases, the amount of revenue generated through specific user/beneficiary charges is extremely low.

15.5 TARIFF AND FUNDING ALTERNATIVES

15.5.1 General

In this sub-section the financial implications of the proposed capital investment programme are considered separately for water, wastewater, solid wastes and drainage. It is assumed that the existing institutional arrangements, as discussed above, will continue in the future but that the status of P.A.M. Tirtanadi will be enhanced when the new regulations concerning its organisation and structure are approved by the provincial government.

In considering future methods of charging for water and other services, the general principle followed is one of charging customers in accordance with usage. This of course is only possible where a customer specific service is provided, and even in those cases it is necessary to modify the user approach in line with social/equity considerations.

In respect of funding, it is assumed that the capital investment programme will be financed by a mixture of foreign and local (Indonesian) credit. No attempt has been made at this stage to anticipate the terms on which foreign funds might be made available to the Government of Indonesia. Similarly, the terms on which funds could be made available to the regional agencies (Kotamadya Medan & P.A.M. Tirtanadi), and from which sources, have not been assumed. Rather, the approach is to consider the tariff requirements resulting from postulated funding packages and then assessing these against local income levels. Also taken into account is the objective contained in the terms of reference which

is "to improve the financial status of the enterprise to enable it to finance at least a reasonable part of future investments of water supply development from its own resources, thereby reducing the need for Government equity capital, grants or subsidies".

15.5.2 Water Supply

15.5.2.1 Estimated tariff requirements 1980/81 - 1988/89

The average unit tariff rate required to cover specified costs under different patterns of funding are shown in Tables 15.7 - 15.12. Tables 15.7 - 15.9 are shown in constant 1979 prices; Tables 15.10 - 15.12 are in current prices, assuming 10% compound inflation.

The assumptions used in arriving at these unit rates are as follows:

Water production: This is based on the existing supply and the planned augmentation over the period.

Water consumption: An allowance of 25 percent of production for water unaccounted for has been made throughout.

Recurrent costs: Operating and maintenance costs are based on engineering estimates together with existing operating costs and overheads. No allowance has been made for increasing P.A.M. Tirtanadi overheads as capacity is believed to exist for additional activity.

Depreciation: Depreciation of existing assets, by the straight-line method, has been based on P.A.M. Tirtanadi's current rates. Depreciation of new assets, by the same method, has been based on the following estimated lives of assets:

Water treatment plant	30 yrs
Pipelines	50 yrs
Wells	15 yrs
Service reservoirs	50 yrs
Pumping stations	15 yrs
Public standpipes	15 yrs

Depreciation is assumed to commence in the year following acquisition of the asset. No allowance has been made for revaluation of assets.

TABLE 15.7

WATER SUPPLY - ESTIMATED TARIFF REQUIREMENTS 1980/81 - 88/89

- Assumptions: a) Constant 1979 prices
 b) 100% loan
 c) Debt Service A: 15 yrs repayment @ 10% Debt Service B: 20 yrs repayment @ 8%

	Unit	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89
Production	M m ³ /yr	39.4	51.1	53.3	55.1	74.0	79.6	85.2	90.8	96.4
Consumption	M m ³ /yr	29.6	38.3	40.0	41.2	55.5	59.7	63.9	68.1	72.3
Recurrent Costs	Rp x 10 ⁶	1620	1690	2000	2212	2541	2630	2720	2809	2899
Depreciation	"	186	319	529	717	860	924	988	1052	1116
Debt service - A	"	-	523	523	523	3254	3460	3666	3872	4078
Debt service - B	"	-	410	410	410	2551	2712	2873	3034	3195
CASH APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1602	2213	2523	2735	5795	6090	6386	6681	6977
Unit charge req'd	Rp/m ³	54	58	63	66	104	102	100	98	97
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1602	2100	2410	2622	5092	5342	5593	5843	6094
Unit charge req'd	Rp/m ³	54	55	60	64	92	89	87	86	84
RATE OF RETURN APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1788	2532	3052	3452	6655	7014	7374	7733	8093
Unit charge req'd	Rp/m ³	60	66	76	84	120	117	115	114	112
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1788	2419	2939	3339	5952	6266	6581	6895	7210
Unit charge req'd	Rp/m ³	60	63	73	81	107	105	103	101	100

13.

TABLE 15.8

WATER SUPPLY - ESTIMATED TARIFF REQUIREMENTS 1980/81 - 88/89

- Assumptions: a) Constant 1979 prices
 b) 75 % loan
 c) Debt Service A: 15 yrs repayment @ 10% Debt Service B: 20 yrs repayment @ 8%

	Unit	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89
Production	M m ³ /yr	39.4	51.1	53.3	55.1	74.0	79.6	85.2	90.8	96.4
Consumption	M m ³ /yr	29.6	38.3	40.0	41.2	55.5	59.7	63.9	68.1	72.3
Recurrent Costs	Rp x 10 ⁶	1602	1690	2000	2212	2541	2630	2720	2809	2899
Depreciation	"	186	319	529	717	860	924	988	1052	1116
Debt service - A	"	-	392	392	392	2441	2596	2751	2905	3060
Debt service - B	"	-	307	307	307	1914	2034	2155	2276	2396
CASH APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1602	2082	2392	2604	4982	5226	5471	5714	5959
Unit charge req'd	Rp/m ³	54	54	60	63	90	88	86	84	82
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1602	1997	2307	2519	4455	4664	4875	5085	5295
Unit charge req'd	Rp/m ³	54	52	58	61	80	78	76	75	73
RATE OF RETURN APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1788	2401	2921	3321	5842	6150	6459	6766	7075
Unit charge req'd	Rp/m ³	60	63	73	81	105	103	101	99	98
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1788	2316	2836	3236	5315	5588	5860	6137	6411
Unit charge req'd	Rp/m ³	60	60	71	79	96	94	92	90	89

TABLE 15.9

WATER SUPPLY - ESTIMATED TARIFF REQUIREMENTS 1980/81 - 88/89

Assumptions: a) Constant 1979 prices
 b) 50 % loan
 c) Debt Service A: 15 yrs repayment @ 10% Debt Service B: 20 yrs repayment @ 8%

	Unit	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89
Production	M m ³ /yr	39.4	51.1	53.3	55.1	74.0	79.6	85.2	90.8	96.4
Consumption	M m ³ /yr	29.6	38.3	40.0	41.2	55.5	59.7	63.9	68.1	72.3
Recurrent Costs	Rp x 10 ⁶	1602	1690	2000	2212	2541	2630	2720	2809	2899
Depreciation	"	186	319	529	717	860	924	988	1052	1116
Debt service - A	"	-	262	262	262	1628	1730	1834	1936	2039
Debt service - B	"	-	205	205	205	1275	1356	1437	1518	1598
CASH APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1602	1952	2262	2474	4169	4360	4554	4745	4938
Unit charge req'd	Rp/m ³	54	51	57	60	75	73	71	70	68
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1602	1895	2205	2417	3816	3986	4157	4327	4497
Unit charge req'd	Rp/m ³	54	49	55	59	69	67	65	64	62
RATE OF RETURN APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1788	2271	2791	3191	5029	5284	5542	5797	6054
Unit charge req'd	Rp/m ³	60	59	70	77	91	89	87	85	84
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1788	2214	2734	3134	4676	4910	5145	5379	5613
Unit charge req'd	Rp/m ³	60	58	68	76	84	82	81	79	78

15.

TABLE 15.10

WATER SUPPLY - ESTIMATED TARIFF REQUIREMENTS 1980/81 - 88/89

- Assumptions: a) 10% compound inflation
 b) 100% loan
 c) Debt Service A: 15 yrs repayment @ 10% Debt Service B: 20 yrs repayment @ 8%

	Unit	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89
Production	M m ³ /yr	39.4	51.1	53.3	55.1	74.0	79.6	85.2	90.8	96.4
Consumption	M m ³ /yr	29.6	38.3	40.0	41.2	55.5	59.7	63.9	68.1	72.3
Recurrent Costs	Rp x 10 ⁶	1762	2045	2660	3223	4091	4655	5304	5899	6958
Depreciation	"	186	319	550	770	967	1060	1163	1276	1403
Debt service - A	"	-	523	523	523	3822	4142	4501	4897	5342
Debt service - B	"	-	410	410	410	2996	3246	3526	3836	4176
CASH APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1762	2568	3183	3746	7913	8797	9805	10796	12300
Unit charge req'd	Rp/m ³	60	67	84	91	143	147	153	159	170
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1762	2455	3070	3633	7087	7901	8830	9735	11134
Unit charge req'd	Rp/m ³	60	64	77	88	128	132	138	143	154
RATE OF RETURN APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1948	2887	3733	4516	8880	9857	10968	12072	13703
Unit charge req'd	Rp/m ³	66	75	93	110	160	165	172	177	190
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1948	2774	3620	4403	8054	8961	9993	11011	12537
Unit charge req'd	Rp/m ³	66	72	91	107	145	150	156	162	173

TABLE 15.11

WATER SUPPLY - ESTIMATED TARIFF REQUIREMENTS 1980/81 - 88/89

Assumptions: a) 10% compound inflation
 b) 75 % loan
 c) Debt Service A: 15 yrs repayment @ 10% Debt Service B: 20 yrs repayment @ 8%

	Unit	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89
Production	M m ³ /yr	39.4	51.1	53.3	55.1	74.0	79.6	85.2	90.8	96.4
Consumption		29.6	38.3	40.0	41.2	55.5	59.7	63.9	68.1	72.3
Recurrent Costs	Rp x 10 ⁶	1762	2045	2660	3223	4091	4655	5304	5899	6958
Depreciation	"	186	319	550	770	967	1060	1163	1276	1403
Debt service - A	"	-	392	392	392	2867	3107	3376	3673	4002
Debt service - B	"	-	307	307	307	2247	2436	2646	2878	3134
CASH APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1762	2437	3052	3615	6958	7762	8680	9572	10960
Unit charge req'd	Rp/m ³	60	64	76	88	125	130	136	141	152
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1762	2352	2967	3530	6338	7091	7950	8777	10092
Unit charge req'd	Rp/m ³	60	61	74	86	114	119	124	129	140
RATE OF RETURN APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1948	2756	3602	4385	7925	8822	9843	10848	12363
Unit charge req'd	Rp/m ³	66	72	90	106	143	148	154	159	171
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1948	2671	3517	4300	7305	8151	9113	10053	11495
Unit charge req'd	Rp/m ³	66	70	88	104	132	137	143	148	159

TABLE 15.12

WATER SUPPLY - ESTIMATED TARIFF REQUIREMENTS 1980/81 - 88/89

Assumptions: a) 10% compound inflation
 b) 50% loan
 c) Debt Service A: 15 yrs repayment @ 10% Debt Service B: 20 yrs repayment @ 8%

	Unit	80/81	81/82	82/83	83/84	84/85	85/86	86/87	87/88	88/89
Production	M m ³ /yr	39.4	51.1	53.3	55.1	74.0	79.6	85.2	90.8	96.4
Consumption	M m ³ /yr	29.6	38.3	40.0	41.2	55.5	59.7	63.9	68.1	72.3
Recurrent Costs	Rp x 10 ⁶	1762	2045	2660	3223	4091	4655	5304	5899	6958
Depreciation	"	186	319	550	770	967	1060	1163	1276	1403
Debt service - A	"	-	262	262	262	1911	2071	2250	2449	2673
Debt service - B	"	-	205	205	205	1498	1623	1763	1918	2088
CASH APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1762	2307	2922	3485	6002	6726	7554	8348	9631
Unit charge req'd	Rp/m ³	60	60	73	85	108	113	118	123	133
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S.	Rp x 10 ⁶	1762	2250	2865	3428	5589	6278	7067	7817	9046
Unit charge req'd	Rp/m ³	60	59	72	83	101	105	111	115	125
RATE OF RETURN APPROACH										
<u>Debt Service A</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1948	2626	3472	4255	6969	7786	8717	9624	11034
Unit charge req'd	Rp/m ³	66	69	87	103	126	130	136	141	153
<u>Debt Service B</u>										
Revenue required to cover recurrent costs & D.S. & depreciation	Rp x 10 ⁶	1948	2569	3415	4198	6556	7338	8230	9093	10449
Unit charge req'd	Rp/m ³	66	67	85	102	118	123	129	134	145

Debt service: Analysis has been undertaken incorporating the following combinations of loan/grant mix: 100% loan; 75% loan/25% grant; 50% loan/50% grant. Loan repayment has been calculated on an annuity basis (equal annual payments of principal and interest) under two different sets of interest and loan repayment assumptions:

Debt service (A) - 10% interest; loan repayment over 15 years.

Debt service (B) - 8% interest; loan repayment over 20 years.

No moratorium has been allowed for in the case of the immediate action program expenditures and for expenditures in the period 1984/85 - 1988/89. Repayment in those cases is assumed to commence in the year following loan drawal, with interest capitalised during the year of expenditure. In the case of the major works expenditure during 1981/82 - 83/84, repayment is assumed to commence in 1984/85, interest being capitalised during the construction period.

Financial criteria: The tariff rate requirement has been calculated for two sets of financial criteria:

- to cover recurrent costs and debt service (interest and principal) repayments.
- to cover recurrent costs, debt service and depreciation.

The first of these (the cash approach) gives the minimum tariff rate acceptable as only the basic cash requirements of the utility would be met. No internally generated surplus would be available (even for additional working capital requirements). This approach does not satisfy the objective mentioned earlier of some internal contribution being made towards new investments.

The second approach (the rate of return approach) requires depreciation as well as recurrent and debt service costs to be covered. The more normal method of expressing this would be as a target rate of return on capital employed, after deducting recurrent costs, depreciation and interest, sufficient to cover principal repayment and provide a surplus. In effect, the approach followed here is to allow for all specific costs and charges to be covered but making no allowance for a surplus. In practice, in cash terms, a surplus equal to depreciation would be available. This is the minimum financial performance criterion often required

by international lending agencies and attention is therefore concentrated below on the unit rates necessary to satisfy this condition.

Unit rate to cover recurrent costs, depreciation and debt service: The unit rates to cover recurrent costs, depreciation and debt service, under the different debt servicing assumptions and loan/grant mixes selected at constant 1979 prices, are summarised in Table 15.13. In all cases the highest unit rates occur in 1984/85, the year repayment of the debt resulting from the major works program commences. The rate requirements fall away steadily thereafter for the remainder of the decade.

TABLE 15.13

UNIT WATER RATES (RP/M³) REQUIRED TO COVER RECURRENT COSTS, DEPRECIATION, INTEREST AND CAPITAL REPAYMENTS IN CONSTANT 1979 PRICES

% Loan/Grant Loan Terms	1980/81		1984/85		1988/89	
	15 yrs/ 10%	20 yrs/ 8%	15 yrs/ 10%	20 yrs/ 8%	15 yrs/ 10%	20 yrs/ 8%
100% Loan	60	60	120	107	112	100
75% Loan/25% Grant	60	60	105	96	98	89
50% Loan/50% Grant	60	60	91	84	84	78

In considering whether these rates are affordable it will be assumed that water consumed through standpipes will be paid for, directly or indirectly, at the domestic rate. This does not mean that the poor people dependent on these supplies will pay this amount. Some small charge may be levied as at present and the desirability of this will be considered in more detail as part of the tariff studies in the Feasibility report. Any shortfall of revenue, however, resulting from the provision of free or cheap water through standpipes should not be to the detriment of P.A.M. Tirtanadi's financial viability. This shortfall can be recovered either by charging higher rates to other water users (that is by cross-subsidisation) or by charging it to Kotamadya Medan (that is, subsidisation through general taxation).

This leaves the question of whether there should be cross subsidisation between other water consumers. This exists on a substantial scale at present. The average domestic rate is currently Rp. 18 per m³ compared to the average industrial rate of Rp. 87 per m³. As already noted (15.4.2.1) this results in 50% of water revenue being generated from 18% of consumption. Whether this is considered fair or equitable depends on how these terms are defined. If fairness is defined as not treating equals differently, the question is: equal in respect of what - equal in the costs they impose on the system or equal in consumption? If the former, different consumer categories would pay according to the different costs they impose on the system; if the latter, consumers would pay the same rate for the same consumption, irrespective of any differences in the cost of supply.

A third definition of fairness is that charges should be related to ability to pay. While this lacks the economic cost justification of the first two definitions it is much more in tune with the social and political realities of a community such as Medan. While the existing cross-subsidisation may be excessive, any substantial diminution of it is likely to be infeasible (even if considered desirable). This is for two reasons: as the house connection program progresses, more and more lower income households will be connected to the public system with a progressively weaker ability to pay; secondly, the easy availability of well water as an alternative source of supply provides a practical limitation to the rate which can be charged. Different rates for domestic and non domestic consumption are therefore assumed in the future.

In Table 15.14 possible combinations of domestic and non-domestic rates required to achieve the overall average rate in the worst year (1984/85) under different funding and debt service assumptions are given.

Before assessing the ability of consumers to pay these rates, however, a further adjustment should be made for inflation. Over time, the effect of inflation is to reduce the real burden of debt and hence the real level of tariff required. Assuming that incomes rise in line with inflation this results in an increased ability to pay. While the likely

TABLE 15.14

COMBINATIONS OF DOMESTIC AND NON-DOMESTIC RATES (RP/M³)
WHICH GIVE THE AVERAGE RATE REQUIRED IN 1984/85 - CON-
STANT 1979 PRICES

Loan terms Loan/ Grant mix	100% Loan		75% Loan/ 25% Grant		50% Loan/ 50% Grant	
	Domes- tic	Non- domestic	Domes- tic	Non- domestic	Domes- tic	Non- domestic
15 yrs/10%	70	240	58	215	50	200
20 yrs/ 8%	60	220	55	190	45	190

rates of inflation over the period under review cannot be accurately predicted, it can be assumed with some confidence that inflation will occur. For purposes of illustration a compound rate of 10% has been assumed. If the rates required in such circumstances (see Tables 15.10 - 15.12) are expressed in 1979 constant prices the rates summarised in Table 15.15 for domestic and non-domestic consumers can be derived.

TABLE 15.15

COMBINATIONS OF DOMESTIC AND NON-DOMESTIC RATES (RP/M³)
WHICH GIVE THE AVERAGE RATE REQUIRED IN 1984/85 - CURRENT
1984 PRICES EXPRESSED IN 1979 PRICES.

Loan terms Loan/ Grant mix	100% Loan		75% Loan/ 25% Grant		50% Loan/ 50% Grant	
	Domes- tic	Non- domestic	Domes- tic	Non- domestic	Domes- tic	Non- domestic
15 yrs/10%	50	215	44	190	35	175
20 yrs/ 8%	45	197	38	180	33	165

If the rate of inflation does not exceed 10%, the required unit rates will rest somewhere between these and the comparable figures in Table 15.14. For ease of analysis, the averages have been taken in calculating typical monthly bills, viz. Rp. 60 or Rp. 52 per m³ for domestic under 100% loan conditions, and Rp. 51 or 46 per m³ under 75% loan/25% grant financing.

15.5.2.2 Affordability of required tariff rates

Examples of monthly domestic bills

The average per capita consumption for existing domestic connections (excluding standpipes) is in the range of 150 - 200 litres per day. If an average of 8 people per connection is assumed, per capita consumption in 1978 was 182 litres per day. Although the average household size is smaller than this (6), it is common practice to provide water to non-household members. This, and an allowance for single meter multi-household properties, would tend to reduce the per capita allocation.

The above estimates are based on consumption among high and medium income households; lower rates of per capita consumption can be expected as house connections are extended into lower income areas. For planning future water supply requirements the following per capita rates have been adopted for Repelitas III & IV.

TABLE 15.16

PLANNED PER CAPITA CONSUMPTION RATES - DOMESTIC CONNECTIONS

Residential type		Litres per capita per day		
Income	Density	1980	1985	1990
High	Low	265	275	285
High	Medium	265	275	285
Medium	Low	215	225	240
Medium	Medium	215	225	240
Medium	High	145	160	175
Low	Low	145	160	175
Low	Medium	100	115	125
Low	High	35	35	35

In estimating the affordability of the tariff rates in 1984/85, selected per capita consumption targets for 1985 have been taken. Low income consumers in high density areas have been excluded as it is assumed they will be dependent on standpipe supplies; high income

consumers have been excluded as it is assumed that they will have the ability to pay. The remaining consumption levels of 115, 160 and 225lpcd have been taken for varying household sizes to calculate monthly bills at rates necessary to meet the rate of return criterion under 100% loan and 75% loan/25% grant funding conditions (see tables 15.17 and 15.18).

TABLE 15.17

EXAMPLES OF MONTHLY BILLS (RP) - 100% LOAN
15 YEARS REPAYMENT @ 10%

Persons per connection	Per capita consumption per day		
	115 litres	160 litres	225 litres
6	Rp. 1263	1757	2471
8	1684	2342	3294
10	2105	2928	4118

20 YEARS REPAYMENT @ 8%

Persons per connection	Per capita consumption per day		
	115 litres	160 litres	225 litres
6	Rp. 1115	1552	2500
8	1487	2069	2910
10	1859	2586	2637

TABLE 15.18

EXAMPLES OF MONTHLY BILLS (RP) - 75% LOAN/25% GRANT
15 YEARS REPAYMENT AT 10%

Persons per connection	Per capita consumption per day		
	115 litres	160 litres	225 litres
6	Rp. 1073	1473	2406
8	1431	1991	2800
10	1789	2489	3500

20 YEARS REPAYMENT AT 8%

Persons per connection	Per capita consumption per day		
	115 litres	160 litres	225 litres
6	Rp. 989	1376	1935
8	1319	1835	2580
10	1649	2294	3226

Ability to pay - domestic: Various sources of data on household income and expenditure levels have been available to the project. These are discussed in detail in the Long Term Development Strategy report and the Technical Memorandum on household incomes and expenditure. Based on these data the following breakdown of families by income range has been derived (Table 15.19).

TABLE 15.19
FAMILY INCOME IN MEDAN - END 1977

Monthly income (Rp)	% of families	Cumulative %
< 20,000	4.0	4.0
20,001 - 30,000	10.7	14.7
30,001 - 40,000	14.4	29.1
40,001 - 50,000	14.6	43.7
50,001 - 60,000	11.5	55.2
60,001 - 70,000	11.2	66.4
70,001 - 100,000	16.8	83.2
>100,001	16.8	100.0
Total	100.0	-

These income ranges are in end 1977 prices. To update these to 1979 prices the only appropriate price index available is the cost of living index for Medan. This increased by 13.7% between the last quarter of 1977 and the first six months of 1979. It is reasonable to assume that incomes moved in line with general cost increases, although there could be a lag effect in the period following devaluation of the the rupiah (November, 1978) as the index thereafter has risen sharply.

Bearing in mind that around 20% of the population in the service area will be dependent on public standpipes and making some allowance for increases in incomes, the minimum family income level at the low consumption rate of 115 lpcd could reasonably be taken as Rp. 35,000 per month. The higher consumption rates (see Table 15.16) will clearly relate to the higher income levels and in Table 15.20 likely charges as a percentage of minimum incomes at each consumption level are shown. The charges are based on the stiffest financing terms assumed, that is, 100% loan at 10% interest repayable over 15 years.

TABLE 15.20
MONTHLY INCOMES COMPARED TO MONTHLY WATER BILLS
6 PERSONS PER CONNECTION

Consumption		Income Rp./month	Water bill Rp./month	Charge as % of income
Ipcd	Litres/mth			
115	21045	35000	1263	3.61
160	29280	55000	1757	3.19
225	41175	75000	2471	3.29

8 PERSONS PER CONNECTION

Consumption		Income Rp./month	Water bill Rp./month	Charge as % of income
Ipcd	Litres/mth			
115	28060	35000	1684	4.81
160	39040	55000	2342	4.26
225	54900	75000	2928	3.90

A guideline often adopted in determining what low income groups should pay for water is that the water bill should not exceed 5% of family income. As can be seen from Table 15.20, in none of the examples cited is this figure exceeded. In the majority of cases, the percentage figures would be well below those shown as worst case situations have been selected for illustrative purposes.

From this analysis, the domestic unit rate required to ensure that sufficient revenue is generated to cover operating costs, depreciation, and debt service (principal and interest repayment), assuming 100% loan finance at 10% over 15 years, is likely to be affordable.

Comparative rates: The average domestic rate derived from Tables 15.14 & 15.15 was Rp. 60 per m³ (100% loan, 15 years repayment at 10%). This is compared with domestic rates in other major cities in Indonesia in Table 15.21.

TABLE 15.21

DOMESTIC WATER RATES (RP) IN SELECTED INDONESIAN CITIES

City *	Consumption Blocks		
	First Block	Second Block	Third Block
Jakarta	< 15 m ³ Rp. 25	> 15 m ³ Rp. 50	-
Surabaya	30 m ³ Rp. 30	> 30 m ³ Rp. 60	-
Padang	< 15 m ³ Rp. 33	> 15 m ³ Rp. 60	-
Semarang	All m ³ Rp. 40	-	-
Bogor	< 10 m ³ Rp. 25	11-20 m ³ Rp. 45	> 20 m ³ Rp. 62.5

* Where different rates apply for different categories of domestic consumers, the highest have been taken.

Clearly, Rp. 60 per m³ as an average rate is higher than existing rates in other cities. In Surabaya this rate comes into effect on consumption over 15 m³ per month, and in Bogor on consumption over 20 m³. It must be remembered, however, that the projected rate of Rp. 60 for Medan is in 1985 and that the real costs of water supply, and therefore tariff rates, are likely to increase in other cities during the next 5 years.

While rates in other cities are useful for cross-reference purposes, these should not be the determinants for fixing rates in Medan. The financial requirements of the utility and the ability of the local community to pay for water services should be the main considerations. Any reduction in this rate would require either easier loan conditions and/or an element of grant finance. For example, the average domestic rate drops to Rp. 52 per m³ if the loan repayment period is extended to 20 years and interest charged at 8% and not 10%. If, in addition, instead of 100% loan the funding mix is 75% loan and 25% grant, the average rate drops further to Rp. 46. In other words, to the extent that any constraint is exercised over tariff increases, so concessional financing will be necessary if P.A.M. Tirtanadi is to achieve reasonable financial objectives.

Willingness to pay: Although ability to pay the required rate exists, willingness to pay cannot automatically be assumed. With the easy availability of free groundwater as an alternative source, there will be a reluctance to connect to the public system, particularly if connection charges are excessive and unit rates unreasonably high.

It is clear that the existing practice of making excessive charges for house connections (see 15.4.2.1) will have to cease once reasonable tariff levels are introduced. The capital costs of service connections have been included in the overall water supply loan requirement; the unit rates calculated above thus recover those costs, but it is questionable whether these should be recovered through the general tariff. This would mean that existing connections subsidise new connections and in more practical terms, moving from a charge in excess of Rp. 200,000 to nothing is unlikely to be acceptable. The justification of general recovery is that it ensures that the less well off benefit from the new investments and are not prevented from connecting to the public system because of high initial charges. A way around this problem is for new consumers to put down a small percentage of the connection fee and pay the balance over a reasonable period of time. This will naturally add to the monthly water bill over the period of repayment but should not necessarily be prohibitive. Such a payment can also be associated with a stepped rate structure with a low price initial consumption band to ensure that

minimum consumption levels can be afforded by the poorer consumers. These points will be considered in detail and firm recommendations made as part of the tariff studies in the Feasibility report.

Willingness to pay higher tariff rates as opposed to ability to pay will also be engendered the more that the benefits of protected supplies are perceived. This will require a concerted effort of publicity and education to highlight the health benefits of public piped water compared to traditional polluted sources.

Non domestic water rates: The non-domestic rate required on average to fulfil the stiffest funding conditions discussed would be Rp. 227 per m³. This compares with an average industrial rate of Rp. 87 per m³ at present. Industrial rates for major industries in other Indonesian cities are given in Table 15.22.

TABLE 15.22
INDUSTRIAL WATER RATES (RP) IN SELECTED INDONESIAN CITIES

City	Consumption Blocks		
	First Block	Second Block	Third Block
Jakarta	All m ³ Rp. 125		-
Surabaya	All m ³ Rp. 250		-
Padang	< 30 m ³ Rp. 100	> 30 m ³ Rp.200	-
Semarang	All m ³ Rp. 120		-
Bogor	2 m ³ p.c.Rp. 75	> 2 m ³ p.c.Rp.150	-

As with the required domestic rate in 1985, Rp. 227 per m³ is high compared with existing rates in most other Indonesian cities. Only Surabaya has a higher rate but as noted in respect of domestic charges the real rates in those cities are likely to increase over the next five years. In terms of willingness to pay the same consideration as with domestic consumers applies in respect of alternative sources. Presently many industries use private groundwater and/or surface water for their requirements. No control over this is exercised by any public authority.

If effective water resource management is to be exercised, there is clearly a case for some form of licensing and allocation to be introduced. Similarly, use of this economic resource should not be free. By the end of Repelita III most of the major private extractors will have the alternative of public supplies; if they do not opt for this and are not forced to do so, charges should be introduced, and even when public supplies are not an alternative source, metering and charging for private consumption should be effected.

For the overall financial viability of P.A.M. Tirtanadi, all major water users must pay for their water, from whatever sources; with the introduction of higher tariffs the possibility of opting out should not exist.

15.5.2.3 Summary

Under the assumptions made in respect of consumption and inflation, average unit water rates of Rp. 60 per m³ for domestic consumers and Rp. 227 per m³ for non-domestic consumers (in 1985 rates at constant 1979 prices) would enable P.A.M. Tirtanadi to cover its recurrent costs, depreciation, interest and loan repayments, under 100% loan conditions. These are high rates compared to the very low existing charges and are high compared to charges in other major cities in Indonesia. While it is considered that they will be affordable by the majority of consumers there may be reluctance to pay these higher prices as long as well water is available. While this can be controlled and charged for in the case of bulk users, it is not administratively feasible to regulate domestic groundwater consumption. A progressive block rate with an initial cheap band will help to encourage at least minimum consumption of piped potable supplies, and term payments for connection charges, based on actual costs, should ensure that hook up to the public system is within range of the majority.

An important assumption made is that standpipe supplies would be made available to poor people either free or at heavily subsidised rates and that P.A.M. Tirtanadi would receive payment for the water at the domestic rate from Medan municipality. If this were not the case then higher rates would have to be charged to other water consumers. This would put further pressure on what is likely to be strained willingness to pay.

Detailed tariff proposals will be presented in the Feasibility report. What has sought to be established here is the general level of tariffs necessary for P.A.M. Tirtanadi to achieve a reasonable financial performance. While it has been shown that 100% loan finance can probably be supported, the doubts which must exist about willingness to pay (as opposed to ability to pay), would make it prudent to adopt the easier debt service conditions assumed (8% over 20 years) and to allow a more generous moratorium period than the 3 years assumed here.

15.5.3. Wastewater

15.5.3.1. Method of charging

At present there is virtually no piped sewerage system provided in the city and no established method for paying for such a service. Under the wastewater management proposals, piped sewerage connections would commence in 1982 and charges would need to be introduced at the latest by that time.

There are several types of charges which are often used, either separately or in combination, for the provision of sewerage services, namely taxes, flat rate fees, and surcharge on water bills.

Taxes: These can take many different forms. Where the metering of water supply is not in force, a tax based on property value is common. This form of charging has the disadvantage of not relating the amount paid to system usage; many properties with high rates of taxation would be responsible for only small amounts of wastewater. It can, however, be a useful method of collecting from people who are not connected to the sewerage system but who benefit from the general environmental and sanitary improvements resulting from it.

Another form of tax is benefit tax. This recovers part, or all, of the cost of new investments from those properties which benefit directly from the new service and is usually based on property front footage. Often this will take the form of a special assessment against the properties adjacent to lateral sewers rather than a tax as such. The property owner thus pays directly for having a sewer in the street, to which he can connect his property if he so desires. The ability

to connect is a convenience to the owner and is likely to add substantially to the value of his property. Also, assessments based on frontage probably reflect not only the actual cost of the sewer installed, but the owner's ability to pay. Recurrent costs are then recovered through a monthly charge based on water consumption.

Flat rate fees: This is often used in combination with a tax based on property value. The tax is collected from all properties, whether sewered or not. An additional charge is then made on connected properties in respect of the additional direct benefits which they receive. The charge may be varied in accordance with the number of water closets, sinks, bathrooms or a combination of such fixtures.

Surcharge on water bill: A surcharge on the water bill is probably the most equitable charging method when metering is used. A periodic payment is determined by metered water consumption, which may vary with usage blocks, sewage strength, property value or some other consumer related characteristic. This method of charging is based on recognition of the interdependence of water use and sewerage needs and has the advantage of apportioning costs according to demands placed upon the system, at least as long as the relationship between water use and sewage flows is constant across consumers.

As water supply is metered in Medan, it is recommended that this method of charging for sewerage services be introduced. This should only be supplemented by a general sewerage tax if the unit charge required to be charged is deemed excessive when related to income levels. While such a tax can be justified in terms of the general environmental benefits which accrue to the community through installation of a sewerage system, the lack of tradition of such a tax in Medan and the possible resultant collection inefficiencies vitiate against reliance on this as a dependable revenue source.

15.5.3.2. Unit charge required

As with water supply, the unit charge required depends on the financial objectives set and the terms on which investment funds are made available. For illustrative purposes the same range of assumptions regarding funding and financial objectives has been used as for water (see 15.5.3.1); the resulting rate requirements are summarised in Table 15.23.

TABLE 15.23

UNIT RATES (RP/M³) REQUIRED TO COVER RECURRENT COSTS, DEPRECIATION, INTEREST AND CAPITAL RE-PAYMENTS IN CONSTANT 1979 PRICES

% Loan/Grant Loan Terms	1984/85		1988/89	
	15 yrs/10%	20 yrs/8%	15 yrs/10%	20 yrs/8%
100% Loan	14	12	21	18
75% Loan/25% Grant	11	9	17	15
50% Loan/50% Grant	8	7	13	12

Unlike the water unit rate, the required sewerage rate does not fall away in the second half of the 1980's but increases by around 50 percent between 1984/85 and 1988/89. This reflects the later phasing of the proposed sewerage investments.

The sewerage unit rate has also been calculated assuming a 10% rate of inflation until the end of Repelita IV. If these rates are readjusted to 1979 prices the rates shown in Table 15.24 result.

TABLE 15.24

AVERAGE UNIT RATES (RP/M³) IN 1979 PRICES
ASSUMING 10% COMPOUND INFLATION

% Loan/Grant Loan Terms	1984/85		1988/89	
	15 yrs/10%	20 yrs/8%	15 yrs/10%	20 yrs/8%
100% Loan	11	9	13	11
75% Loan/25% Grant	8	7	11	10
50% Loan/50% Grant	5	5	8	7

If inflation is greater than 10%, this will reduce further the unit rates required in 1979 prices; if it is less than 10% the rate will lie somewhere between those shown in Table 15.23 and 15.24.

15.5.3.3 Affordability of required tariff rates

It is being recommended that the sewerage charge is based on water consumption and is paid with the water bill. Leaving aside the organisational implications of this, will the combined bill be affordable ?

The ability and willingness to pay the water rates has already been discussed (15.5.2.2). It was concluded that to cover recurrent costs, depreciation and debt service on the basis of loan finance alone would require soft loan terms. Any additional charge for sewerage is likely to necessitate similar terms and also a grant element in the financing. Although the additional unit charge for sewerage would be a relatively small percentage of the water charge (around 20% of the domestic rate in 1984/85, but increasing thereafter) when the amortised sewerage connection charge is included, it would put strong pressure on willingness to pay. Even with a 25% grant, the additional unit rate under the 20 year repayment/8% interest conditions would be Rp. 8 per m³ in 1984/85 & Rp. 12 in 1988/89 (assuming an average of the rates shown in Tables 15.23 & 15.24).

15.5.3.4 Summary

It is recommended that a grant of at least 25% be incorporated into the funding package for sewerage, with the balancing loan finance on terms similar to that suggested for water.

The alternative would be to attempt to recover full loan finance and all other costs through a sewerage tax additional to specific user charges. As noted in 15.5.3.1, such a tax can probably be justified on the basis of the general sanitary improvements from which all members of the community benefit. There are doubts, however, about whether such a tax could be successfully implemented. A grant would therefore be the most appropriate alternative course.

15.5.4 Solid wastes

15.5.4.1 Introduction

In sub-section 9, alternative waste collection systems have been considered in detail and different levels of service recommended for different household expenditure categories. By tailoring the services

provided to what is affordable there is, ipso facto, in-built customer ability to pay. But this is subject to three caveats; firstly, is the criterion adopted for establishing what is affordable, reasonable; secondly, can the poor afford even the lower level of services which they would receive and thirdly, although they could afford it, would the higher income groups be willing to pay for the high level of services proposed.

15.5.4.2. Affordability and willingness to pay

In respect of the overall criterion for determining affordability, 1% of household expenditure was adopted. This would seem a reasonable yardstick to set but, even so, on the basis of the analysis undertaken in Section 9, around 58% of the population would still be unable to afford even the lowest level of services proposed. In fact, the percentage is probably somewhat lower than this as recent income information for Medan has just become available to the project (see Table 15.19) which shows income at a higher level than originally assumed. This does not alter the fact, however, that a significant segment of the population will be unable to contribute at the 1% level. This therefore means that either cross-subsidisation or some other form of subsidy will be necessary to provide a service to the poor people.

Clearly, cross-subsidisation will result in the higher income groups paying in excess of 1% of their incomes for solid wastes services. How acceptable this would be depends, in part, on the amount of cross-subsidisation required. In the period of Repelita III, 20% of total costs would be for the provision of services to people with poor ability to pay. If it is assumed that no contribution is forthcoming from these people (the possibility and desirability of this will be examined as part of the tariff studies in the Feasibility report) this would be the proportion of additional costs which would have to be passed on to other users. In the case of industrial and commercial concerns this should be quite feasible but it may prove more difficult in the case of other domestic users.

The question also arises of whether they will be willing to pay for the high level of service proposed. At present the official charge for waste collection from permanent domestic properties is

Rp. 550 per month. Under the service levels proposed the monthly charge based on 1% of top monthly incomes would double this. Although this is a sharp increase there is every likelihood that it would be acceptable as rates similar to this (Rp.1000) are currently paid for private collection services. It is also possible that part of the cross-subsidy element could be added to this rate in due course without seriously affecting willingness to pay but it is likely that most of the subsidy will have to be borne by industrial and commercial users.

15.5.4.3 Summary

As with the recommended investments in water supply, the proposed solid waste disposal services should be financially viable on the basis of 100% loan funding. In the case of water, the provision of water to the poor was assumed to be paid for by Medan Municipality; in the case of solid wastes this possibility exists but it is more likely that the community service can be financed directly through cross-subsidisation.

15.5.5 Drainage

15.5.5.1 Introduction

As discussed in 15.4.2, although drainage charges exist, in practice they generate a very low level of income. The result is that the current drainage services are almost entirely funded out of a mixture of local and national taxation.

The funding of the proposed drainage investments will need to be undertaken on the basis of a combination of loan and grant finance. The exact structuring of the financing package will be determined by the extent to which local tax receipts allocated to drainage can cover costs and debt service commitments. Unlike the other sectors already considered in this section specific user charges for drainage are not particularly suitable for revenue generation. The current experience in attempting to impose such charges has been almost a complete failure (see 15.4.2). With improved services, collection rates may improve but, as drainage is a community service, taxes are a more appropriate method of recovering costs.

15.5.5.2 Tax Revenue Required

The question still remains, however, of just how much tax revenue could reliably and regularly be made available for drainage. As discussed in detail in Section 26 of the Long Term Urban Development Plan Report, Medan's tax resources are severely strained under current practices and conditions; but considerable scope exists for improving this position, particularly in the areas of enumeration, assessment and collections. If the recommendations made are acted on, it should be possible to increase the tax allocation to drainage to well beyond the existing local contribution of Rp.98 million.

The tax revenue requirements under the same combination of funding and other financial assumptions used in the financial analysis of water and sewerage operations have been calculated.. In Table 15.25 the annual tax revenues at constant 1979 prices are shown for selected years and in Table 15.26 the same data is shown assuming 10% inflation, but converting back to 1979 prices.

TABLE 15.25

ANNUAL TAX REVENUE REQUIRED (RP. MILLION) TO COVER
RECURRENT COSTS, INTEREST AND CAPITAL REPAYMENTS
IN CONSTANT 1979 PRICES

% Loan/Grant	1980/81	1984/85	1988/89
100% Loan	75	1220	2584
75% Loan/25% Grant	75	938	1962
50% Loan/50% Grant	75	514	1026

TABLE 15.26

ANNUAL TAX REVENUE REQUIRED (RP.MILLION) TO COVER
 RECURRENT COSTS, INTEREST AND CAPITAL REPAYMENTS
 ASSUMING 10% INFLATION, EXPRESSED IN 1979 PRICES

% Loan/Grant	1980/81	1984/85	1988/89
100% Loan	83	903	1630
75% Loan/25% Grant	83	700	1246
50% Loan/50% Grant	83	319	861

Taking the averages of the two Tables, even under 50% loan/50% grant conditions the tax revenue requirement would increase to Rp.4.16 million in 1984/85 and to Rp.9.44 million in 1988/89. Under 100% loan conditions the figures become Rp. 1,062 and Rp. 2,107 million.

If the recommendations made in Section 20 of the Long Term Urban Development Plan in respect of implementing a more effective urban revenue program are accepted and acted upon, significant increases in tax receipts could be expected. Assuming that the percentage of local taxation receipts available for drainage services continues at the current level of around 3%, higher drainage revenues would accrue. But to attain the level required, even under 50% grant funding conditions, would require a four-fold increase in the local tax take. Alternatively, the percentage allocation to drainage could be increased. This may be possible, but given the clamour of competing claims for slices of the tax cake, it would be imprudent to rely on any substantial increase in the drainage share.

15.5.5.3 Summary

The conclusion must be, therefore, that a sizeable grant element will be required in the funding mix for drainage investments. The precise proportion this should be depends on an unknown, namely, the success that is achieved by Kotamadya Medan in increasing its tax receipts. As this cannot be forecast with any accuracy, but assuming some improvements, it is recommended that a mixture of 50% grant/50% loan funds be adopted for financial planning purposes.

15.5.6 Summary of proposed funding services

In Table 15.27, the sources of funds discussed above for the investment recommended in water and sanitation in Repelita III are summarised.

TABLE 15.27
SUMMARY OF PROPOSED FUNDING OF
RECOMMENDED INVESTMENTS 1979/80 - 1983/84 (RP.MILLION)

Section	Recommended Investment	Source of Finance	
		Loan	Grant
Water	20773	20773	-
Wastewater	3994	2996	998
Drainage	8311	4155	4156
Solid wastes	3686	3686	-
Total	36764	31610	5154

Over half of the proposed investments (57%) are in water supply, which should be funded entirely by loan finance. Similarly for solid waste investments. Grants would be required for 25% of wastewater investments and 50% of drainage investments. In terms of the total investment of Rp. 36.8 billion, however, grants only represent 14%. No account has been taken at this stage of any internal contribution; should this occur, it would go towards reducing loan requirements in the case of water and solid wastes and towards reducing government grants in the case of wastewater and drainage.