7.4 Introduction of Suitable Tariff Table

7.4.1 Approach for Revised Tariff Policy

As mentioned in Chapter 3.3.1 we will consider a long-term tariff policy and goals for a self-supporting system under a market economy. Fig 7.4.1 shows our proposed tariff policy.

Fig 7.4.1 Proposed Tariff Policy

		Before 1999 Dec.	2000 Jan. ~2003 Dec.	2004 Jan. ~2004 Dec.	2005 Jan. ~2010 Dec.	After 2011 Jan.
Tariff Policy	Promotion of meters					
	Discontination of cross subsidy					
	Inclusion of reserve for repair costs					
	Inclusion of capital cost except for interest expense					
	Self-finance cost for construction					
	Inclusion of all capital costs					
	Preparation for privatization (Note 1)					
Composition of Tariff						
Operating Cost	Personnel costs					
	Power and chemical costs					
	Repair costs					
	Depreciation expense					
	Reserve for repair costs					
	Cost for meter installation					
	Cost for meter reading					
	Other					
Capital Cost	Cost for replacement of facilities (Note 2)					
	Cost for expansion and improvement of facilities					
	Interest expense					
Tax	Tax					
	In stead of Tax Payment, Stock for Legal reserve on Vodokanal B/S or Reserve amount paid for tax as Special Account on the Government Budget					
Preconditions						
	Improvement of management					
	Evaluation of existing facilities					
	Estimation of costs					
	Public relations regarding tariff policy					
	Introduction of investments from foreign countries					
	Agreement with the labor union (Note 3)					

Note 1 The government authority has already considered the introduction of private finance to Vodokanal. Therefore this "preparation for privatization" means that the Vodokanal will be reconstituted as a joint stock company and the government will make a concrete plan for reforming Vodokanal.

Note2 The government authorities say some cost for replacement have already been included in the tariff composition.

Note3 The government authorities agree with the labor union regarding conditions of employment every year. Therefore the purpose of the "Agreement with Labor Union" is to more towards privatization

(1) The Stage 1 –1st half (2003)

If the plan for meter installation by the government proceeds on schedule, approximately 80% of the population will have meters installed in their houses by the year 2003. It would be difficult to apply Vodokanal's management self-supporting system without meters and we would make it a number one priority to increase the number of meters. On the other hand, it is necessary for the tariff to cover a reserve for future repairs; in consideration of current obsolescence of the aging water facilities.

As mentioned above, our revised tariff policy for Stage 1 – 1st half is as follows;

1) Promotion of meters instrument
2) Discontinuation of cross subsidy
3) Inclusion of reserve for repairs

As a result of the tariff policy mentioned above, the tariff should at least cover all costs other than capital costs. At this point, the government should reconsider its taxation policy for Vodokanal because it is necessary for Vodokanal to fund future investments and to provide the following reserves:

1) Legal reserve on the balance sheet of Vodokanal
2) Reserve for special accounting regarding the water supply business on the government budget

(2) The Stage 1 – 2nd half (2003 - 2005)

If the plan for the installation of meters by the government proceeds on schedule, almost 100% of the population will have meters installed in their houses by the year 2005. It is possible in our opinion for the tariff to cover all basic costs. . However, it may be difficult for Vodokanal to

undertake self-financing because there is the possibility that the bond market may not grow as planned. . Therefore we have omitted interest expenses from the costs.

As mentioned above, our tariff policy for Stage 1 -- 2nd half is as follows;

1) Inclusion of capital costs except for interest expenses

2) The government maintains that the Vodokanal will succeed in obtaining financing from foreign banks which participate in "ODA", Official Development Assistance. If this can be achieved, the tariff should cover the related interest expense as well..

(3) The Stage 2 (2005 - 2010)

Vodokanal should improve and maintain stable business operations as a self-supporting system as the economic environment, including the bond market, has developed and matured

We have established a tariff policy for Stage 2 as follows:

1) Costs of construction should be self-financed
2) Inclusion of all capital costs

(4) The Stage 3 (After the year 2010)

Vodokanal will be ready to be privatized after Stage 2. This means that Vodokanal will become a public stock company, whose stock will be owned by private sector investors. The decision as to whether or not Vodokanal becomes a private company or stay as a public company or not should be determined by the government after consideration of the socioeconomic conditions and the impact on the employees. It is also necessary to obtain the agreement of the labour unions.

We have established the tariff policy for Stage 3 as follows:

1) Preparation for privatization

7.4.2 Revised Tariff Table

As mentioned in Chapter 3.3.1, we proposed a revised tariff table for a short-term period (e.g.. 2 - 3 years) and:

i) Applicable to users with and without meters.
ii) Consideration for low income families
iii) Incentives for water conservation
iv) Percentage of water tariff to total cost of living
v) Elimination of cross-subsidies
vi) Applicable for the next 2 to 3 years
vii) Comparison of costs used for the proposed table with actual costs in the future for measurement of efficiency of management
viii) Maintaining the current schedule for the installment of meters

(1) Kinds of the Tariff System

First, we examined several tariff systems to consider a revised tariff table.

Figures 7.4.2, 7.4.3 and 7.4.4 show the classification of the water tariff system., the basic idea of per-diameter charge and per-objective charge and a simple model of water tariff systems, respectively.

Fig 7.4.2 Classification of Water Charge System

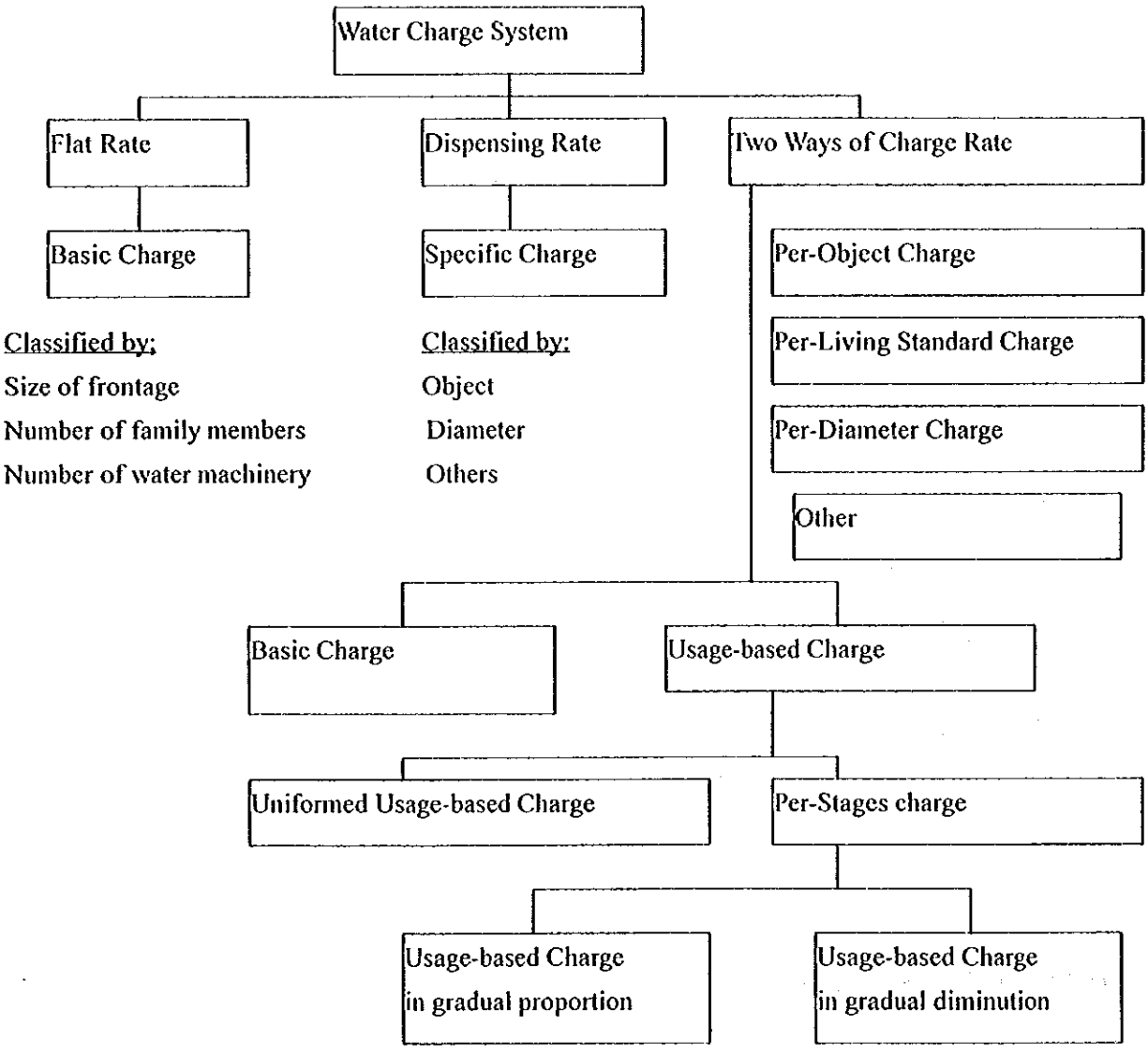


Fig 7.4.3 Basic Idea of Per-Diameter Charge and Per-Objective Charge

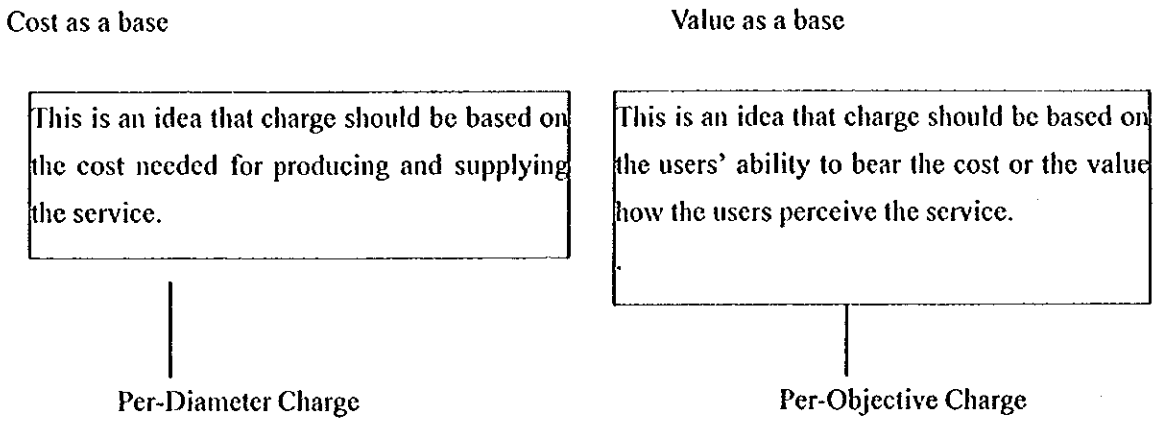
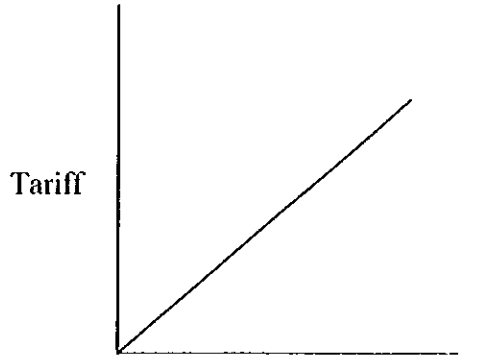
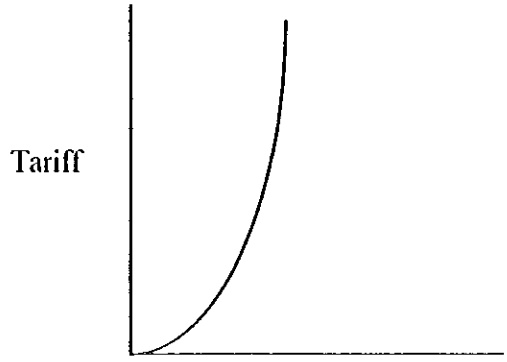


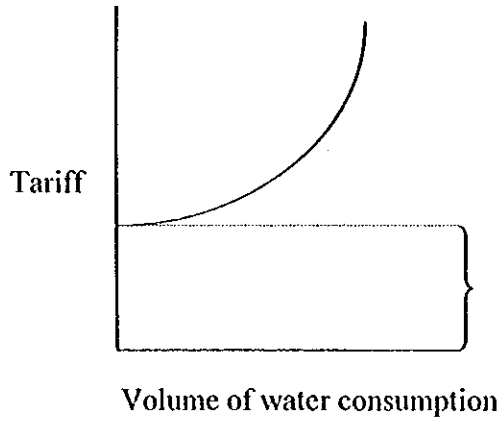
Fig 7.4.4 Simple Model of Water Tariff System



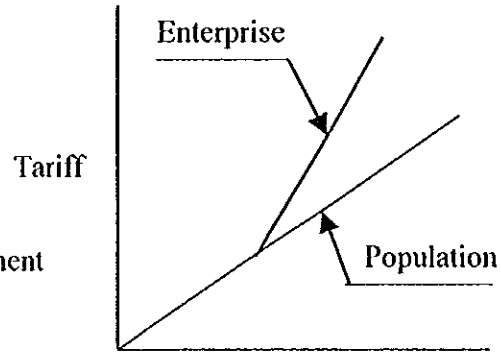
Case 1 Straight line - Meter rate



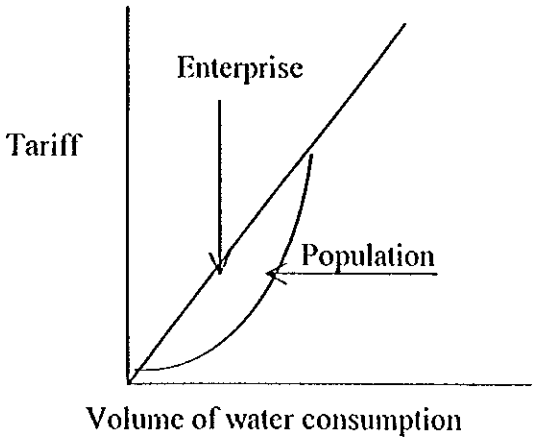
Case 2 Progressive line - Meter rate



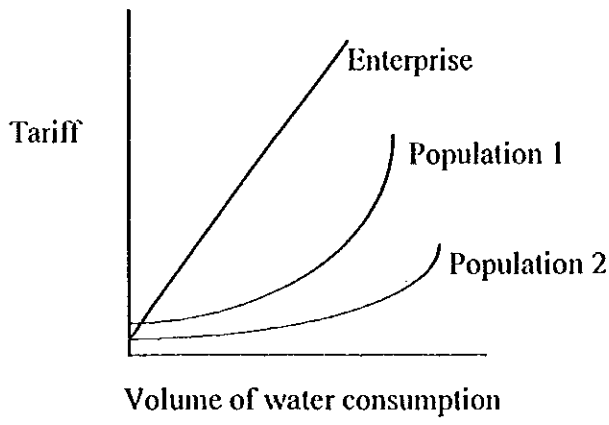
Case 3 Meter rate with Basic Payment



Case 4 Per-Object Charge



Case 5 Per-Diameter charge



Case 6 Per-living Standard

(2) Consideration of Revised Water Tariffs for Tashkent and Chirchik

We considered which model should be used for Tashkent and Chirchik as a new charge system.

A plan has been proceeding to install meters for the population by 2004 as the target data. This means that two types of users exist for the time being; those with meters and those whose meter are still to be installed. Therefore a tariff table for both types of users was prepared. This is the first half of the 1st Stage mentioned in (1) Approach for Revised Tariff Policy.

As far as the users with yet-to-be installed meters is concerned, the charge is collected at a flat rate based on the various elements shown in Fig 7.4.2, such as the area, asset value, number of family members and number of water appliances used. In the case of Tashkent, the charge is based on the number of family members. The Revised Tariff Table basically sticks to the current standards due to the limited information available. However if the trend of water usage can be clearly determined in relation to Private houses, such as watering the garden in summer, the area, asset value, presence or absence of swimming pools, these factors would have added to the flat charge. As to apartment buildings, since the survey found a high percentage of water leakage in the apartments, this can be reflected in the water tariff system by regarding the age of the apartment and the maintenance conditions as constants.

As for the users with meters, either dispensing rate or two ways charge rate; flat rate combined with dispensing rate, can be employed. However, reducing usage-based charge is used to encourage use of more water and does not apply to the case of Vodokanal who promotes water conservation.

Per-object charge is a system Tashkent employs today, that is to ask different water tariff to the population and the enterprises to pay in accordance with the ability to bear the cost. In this case the more water they use, the wider gap that exists in water tariffs between the two groups. Per-Diameter Charge does not consider the users' conditions and the only cost differentiated by the length of diameter is reflected in the charge. Per-living standard charge employs the different

to suit the users' living standards and this is regarded as an extreme case of per-objective charge. However, few projects have used this approach and Colombia is the one of the few as far as we know.

In these circumstances, water tariff system shown below is prepared for the users with meters.

Table 7.4.1 Matrix of Water Tariff System

	Uniformed usage-based charge	Increasing usage-based Charge
Usage-based charge	o	o
Basic charge + Usage-based charge	o	o

Per-object charge, Per-diameter charge and Per-living standard charge can be applied to each case.

The two charge system including the parts of basic charge, was adopted because of the need to collect the fixed expenses such as the cost for meter instrument etc. and depreciation expense. Also whether per-object charge or per-diameter charge, the latter is basically desirable as it calculates based on the cost needed for the water works production and supply. However, the former is rather appropriate after considered with the social-economic conditions in Uzbekistan where is in transition process towards market economy. Also increasing types of usage-based charge was adopted in order to stimulate the incentive for water conservation. However today there is a wide disparity in the charges between the population and enterprises, so the charge for the population has been modifying to correct it. Although the charge system is temporary getting closer to the per-diameter from per-object as a result of the modification, the charge to the enterprises will increase and there will be a need to employ the increasing types of usage-based charge if the inflation rate relatively rises and the charge to the enterprises decrease.

As a future plan for installing meters for the population in Tashkent and Chirchick, Vodokanal will buy and install the meters all private houses. This is strictly for the purposes of renting the meters to

It is desirable that Vodokanal hold the title to the meters because the meters need to be managed and inspected. If the related administrative cost is collected from all users in the form of a type of water tariff, the expenses should not become too finanically burdensome for Vodokanal. The load on the population will also be lessened, since they will not have to buy and install the meters by themselves.

In the case of apartment buildings, Vodokanal can buy only the meters to be installed on the shared incoming pipes and thus does not deal with each household in the apartments. In other words, Vodokanal will sign a water supply contract with the representatives of each apartment building and administer the water tariff by reading the meter installed on the shared incoming pipes. Accordingly, Vodokanal will receive payment for the charge from the representatives. However, in order not to create any unfairness among the users who have in apartment buildings and those who have in private houses, the procedure below will be adopted to calculate the charge fairly for apartment dwellers.

1) The volume of water usage is measured by reading the meters installed on the shared incoming pipe of each apartment buildings.

2) In order to obtain the average water usage, the total volume(1) consumed is divided by the by number of households in each apartment building.

3) The average water usage is checked against the tariff table to determine the average water tariff.

4) To determine the total water tariff, the average water tariff (3) is then multiplied by the number of households in the apartment building.

The charge determined by the above procedure (4) is submitted to the representatives of each apartment building for payment. It is up to them to decide whether they will divide the charge by the number of households or install a meter for each household in order to collect the components of the

total charge from the residents. In this case, the representatives or administrators of the apartments buildings would include JEK, the Mahalia Committee, the president of independent body and the head of the association.

(3) Simple Model for the Revised Tariff Table

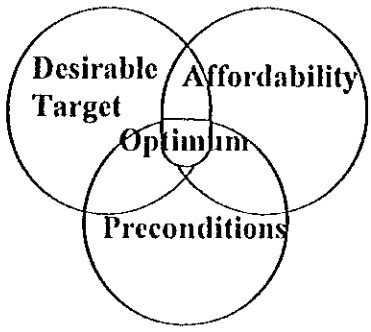
A simple model for the new charges were prepared as follows.

The calculation period should be in the neighborhood of 3-5 years as mentioned earlier. However, 3 years is regarded as the limit for Uzbekistan because of the uncertain social-economic conditions in the future. In short, a term of 3 years is equivalent to a term extending to 2003; the first half of the 1st stage of our revised Tariff Policy Plan.

The total revenue and expenditure are basically balanced in each calculation period and the revenue should not come below the level of expenditures. Therefore, the necessary revenue in total is multiplied an estimated inflation rate and other facters.

Moreover, the standards of the population's affordability refer to the global standards mentioned in Chapter 3.3.1. To conclude the points made so far, water tariff scheme can be set up based on the following concepts:

Fig 7.4.5 Base Idea for Establishment of the Tariff Policy



Thus, the simple model of the revised tariff table was prepared as the following page.

Table 7.4.2 Proposed Revised Tariff Table for Tashkent City

(Applicable Years : 2000-2002)

	Users		Water supply
Fixed rate	Population 80 soum		Soum/month/person 5 soum/m3×0.534m3×30days
Metered	Population 0 10m3 11 20m3 21 30m3 31 40m3 41 50m3 51m3		Basic payment of 40 soum/mont 4.5 soum/m3 5 6 7 8.22
	Budget Organizations		5 soum/m3
	Self-accounting Communal Organizations		8.22 soum/m3
	Production, Transportation, Construction, etc..		8.22 soum/m3
Collection of costs of the meters	For all users		55 soum
Social Safety Net	Fixed rate	Monthly living expenses 0-5,000 soum	To Cost of the meters amounting 55 soum is free. Soum/month/person 40 soum
		5,001-10,000	To Cost of the meters amounting 55 soum is free.
	Metered	Monthly living expenses 0-5,000 soum	To Cost of the meters amounting 55 soum is free. A Cost of basic payment amounting 40 soum is free.
		5,001-10,000	To Cost of the meters amounting 55 soum is free.

Value Added Tax (VAT) is charged on the above amounts.

7.4.3 Explanation of the Processes for Setting Proposed Revised Tariff Table

The process for setting proposed revised tariff table is as follows:

(1) Estimation of the Cost for 3 years extending to 2003

(2) Calculation of Average Unit Cost (soum / m3)

(3) Examination of the Revised Tariff Table with consideration of the Global Standard

(4) Consideration of Social Safety Net

(1) Estimation of the Cost for 3 years extending to 2003

1) Estimation based on the current situation

The reasonable tariff table is determined based on the necessary revenue and the revenue should at least cover the cost needed in the period when the revised tariff table will be applied . We will consider the revised tariff table, which is available for 3 years extending to 2003. Therefore firstly we estimates the expenditure for 3 years extending to 2003 to find the necessary revenue amount.

Fig 7.4.6 and Table 7.4.3 shows our estimated cost for 3 years and Table 7.4.4 shows the historical fluctuation ratio of the cost composition of the Tashkent City Vodokanal. We project the future cost by multiplying the current cost with some factors, referring to the historical fluctuation ratio of the cost composition.

Applying the meters will decrease the volume of consumption. We calculate the amount of reducing variable cost due to saving water by applying metered rate system and we deduct it from the total cost. The deducted cost is mainly due to electric power expenses and it is 287 million soum. As a result of our estimation, the cost composition in the year 2010 will be shown by the Fig 7.4.7.

Fig 7.4.6 Estimated Cost for 3 years

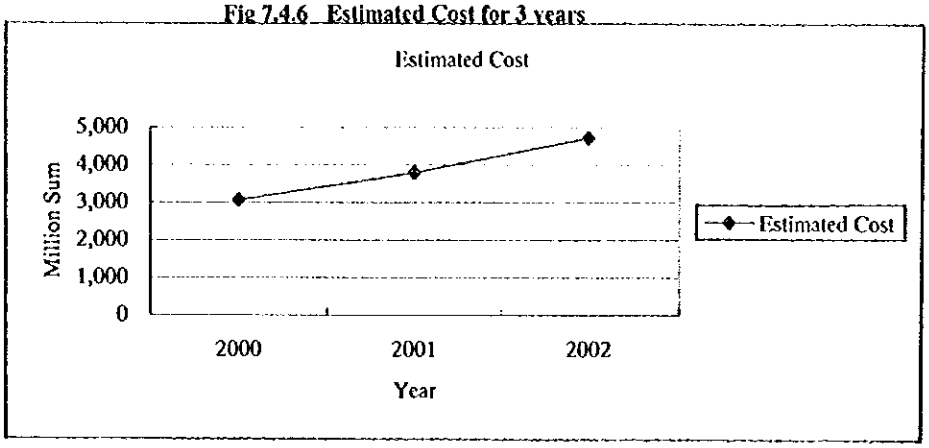


Table 7.4.3 (1) Estimated Cost for 3 years

Item	2000	2001	2002	For 3 years
Materials	325	377	438	
Electric power	1,129	1,277	1,446	
Wage for Production departm	281	397	551	
Charges	107	145	196	
Capital repairs	208	314	475	
Depreciation	294	396	533	
Motor transportation	0	0	0	
Inner house expenses	0	0	0	
Commercial expenses	0	0	0	
Expenses for the period	375	438	511	
Others	360	454	572	
Total	3,078	3,797	4,721	
(Expenses for the period)	0	0	0	
Total	3,078	3,797	4,721	11,597
Fluctuation Ratio	30%	23%	24%	

Table 7.4.3 (2) Example of Estiamtion

Item	1999	A	B	C	2000
Materials	245	30.0%	2.0%	0.0%	325
Elect. power	875	26.6%	2.0%	0.0%	1,129
Main produc. salary	198	34.9%	0.0%	5.0%	281
Charges	79	35.2%	0.0%	0.0%	107
Capital repairs	137	51.4%	0.0%	0.0%	208
Depreciation	218	34.7%	0.0%	0.0%	294
Motor transportation	0	0.0%	0.0%	0.0%	0
Inner house expenses	0	0.0%	0.0%	0.0%	0
Commercial expenses	0	0.0%	0.0%	0.0%	0
Expenses for the period	322	11.1%	0.0%	5.0%	375
Others	286	26.0%	0.0%	0.0%	360
Total	2,360				3,078

Note:
The figures in column of "2000" is calculated as follows;
"2000"="1999" x (1+A) x (1+B) x (1+C)

" A " is the historical fluctuation ratio in "1999"of table 7.4.4. However the ratio of "Materials" and "Capital repairs" includes unusual factors and so we put other ratio in Table 7.4.3 (2). The figures of 30.0% is current inflation ratio and 51.4% is average fluctuation ratio.

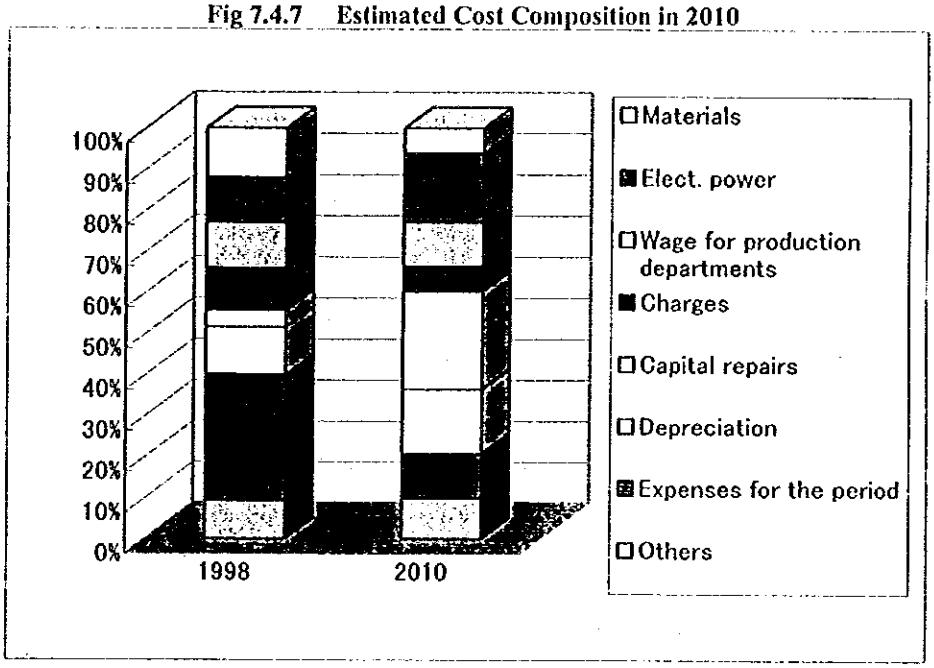
" B " is the estimated increase ratio of volume of water supply. This ratio mainly relates the volume of "materials" and "Elect. Power"

" C " is the estimated increase ratio of salary due to increase IT experts. This ratio mainly relates "Main product. salary" and "Expenses for the period"

Table 7.4.4 The Historical Fluctuation Ratio of the Cost Composition

Item	1997	1998	1999	Average
Materials	45%	93%	176%	105%
Electric power	9%	48%	27%	28%
Wage for Production departm	59%	41%	35%	45%
Charges	51%	49%	35%	45%
Capital repairs	-68%	103%	120%	51%
Depreciation	127%	87%	35%	83%
Expenses for the period	175%	105%	11%	97%
Others	6%	57%	26%	30%
Total	21%	65%	36%	41%

Fig 7.4.7 Estimated Cost Composition in 2010



2) Estimated Volume of Consumption

We assume some factors shown by the Table 7.4.6 to estimate volume of consuming water and the total cost. As a result of calculation, the estimated volume of consuming water is shown by the Table 7.4.5.

Table 7.4.5 Estimated Volume of Consumption (m3)

	2000	2001	2002	For 3 years
Householder with the Meter	10,962,900	19,062,900	27,162,900	
Householder without the Meter	103,510,368	85,090,646	66,723,730	
Families living in the Apartment With/Without the Meter	379,976,620	345,019,605	309,363,450	
Enterprise	345,095,100	345,095,100	345,095,100	
Total (m3)	839,544,988	794,268,251	748,345,180	2,382,158,419

Table 7.4.6 Assumption

	2000	2001	2002
The number of population	2,338,053	2,384,815	2,432,511
Rate of increase of population	2%	2%	2%
Rate of coverage of water supply	98.5%	98.5%	98.5%
Rate of increase of enterprises	-7%	0	0
The average number of persons per one family			
- Householder	3.9	3.9	3.9
- Apartment	5.1	5.1	5.1
The average number of volume of water consumption after installing the meter (liters/one person/one day)	250	250	250
The average number of volume of water consumption before installing the meter (liters/one person/one day)	650	650	650

(2) Calculation of Average Unit Cost (sum / m3)

We calculate the average unit cost from a result of calculation at the (1). The total cost for 3 years is 11,597 million sum shown by the Table 7.4.3 and the total volume of consuming water is 2,382 million shown by the table 7.4.5. The average unit cost is approximately 5 sum/m3 (11,597 million sum /2,382 million m3). The revised tariff table should cover this estimated average unit cost.

(3) Examination of the Revised Tariff Table with consideration of the Global average

The present tariff for enterprises is 8.22 sum /m3 and this figure is much higher than the average unit cost. On other hand, the present tariff for populations is 1.81 sum /m3 and this figure is much lower than the average unit cost. The government's tariff policy is getting rid of "cross subsidy" from the enterprises to populations. Therefore this time we focus increasing tariff for populations.

We mentioned the Global average in the (6) of the chapter 3.3.1 and we refer to the Global average when we consider the revised tariff table.

1) Metered rate system

With reference to the Global average, we set the standard volume of consuming water per one family is 20m3 /month and we consider it is necessary for tariff to cover the average unit cost at the standard point. Therefore we determine 5 sum/m3 from 21m3/month to 30m3/month, volume of consuming water.

We propose progressive tariff for the metered rate system to make users to save water, however in the case of exceeding 50m3 /month, the tariff almost becomes flat tariff and equals to every users on the Global average. We determine the same tariff level as the enterprises in case of exceeding 50m3 /month, which is 8.22 sum/m3.

On the other hand, we care a percentage of living expenses and we set the percentage approximately 2.0 % at the standard volume of consumption. Monthly income of Tashkent City in Dec. 1998 is approximately 13,000 sum on the official report and we suppose living expense,

80% of monthly income. This means the water tariff should be less than 208 sum/month at the approximately 40m3 which is standard volume of consumption. These figures are calculated as follows;

Reasonable water tariff

=Monthly income x 0.8 x 2%=208sum/month

Standard volume of consumption per one family

= 330Liter/person/day x 30days x 4persons =40m3/month/family

As a result of examining conditions mentioned above, we determine metered rate each volume of consumption as follows:

0-10m3	Base payment	40 sum
11-20m3	4.5 sum/m3 x 10m3=	45 sum
21-30m3	5.0 sum/m3 x 10m3=	50 sum
31-40m3	6.0 sum/m3 x 10m3=	60 sum
	Total	195 sum (approximately 2% for living expense)

We determine metered rate system for populations as follows:

Metered	Population	
	0 10m3	Basic payment 40 sum/month
	11 20m3	4.5 sum/m3
	21 30m3	5
	31 40m3	6
	41 50m3	7
	51m3	8.22

2) Fixed rate (Flat tariff)

We have to consider the flat tariff for population without meters and it is called "Norm" in Uzbekistan. It is necessary to determine appropriate fixed rate. On the other hand, it is necessary to promote installing meters for population without meters. Therefore we set the fixed rate to be higher than the metered rate system, assuming the population without meters does not save water.

As a result of these analysis, we propose the fixed rate for population without meters as follows:

Fixed rate	Population 80 sum	Sum/month/person 5 sum/m3×0.534m3×30days

3) Budget Organizations

We are informed that the budget organization usually has financial problems and it may be difficult to charge high tariff to the budget organization. On the other hand, it is necessary for tariff to cover production cost. Therefore we determine 5 sum /m3 for the budget organization.

4) Enterprises

We don't revise and increase the tariff for the enterprises because it is already extreme high. However next time the revision of tariff for the enterprises should be considerable.

(4) Consideration of Social Safety Net

We propose some tariff exemption for low-income population. We consider the tariff exemption with reference to a percentage of living expenses as shown in the Table 7.4.8 and we determine as follows:

Social Safety Net	Fixed rate	Monthly living expenses 0-5,000 sum	A Cost of the meters amounting 55 sum is free. Sum/month/person 40 sum
		5,001-10,000	A Cost of the meters amounting 55 sum is free.
	Metered	Monthly living expenses 0-5,000 sum	A Cost of the meters amounting 55 sum is free. A Cost of basic payment amounting 40 sum is free.
		5,001-10,000	A Cost of the meters amounting 55 sum is free.

7.4.4 Potential Impact of the Proposed Revised Tariff Table

The potential impact of the revised tariff table on the financial status of Vodokanal and on the living lifestyle of the present population may be summarized as follows:

(1) Impact on the Financial Status of the Vodokanal

The Fig 7.4.8 shows the potential impact of the revised tariff table on the financial status of the Vodokanal and the detailed calculation is are summarized in the Supporting Report. As a shown in Fig 7.4.8, it is anticipated that there will be retained earnings by the year 2003 and this means that the revised tariff table will have been implemented by 2003.

The Fig 7.4.9 shows the revenues and costs, for the meters. Our proposal is as follows:

Vodokanal will buy and install the meters for private houses. This is strictly for the purposes of renting these back to the population and it is suggested that the cost of the meters be collected with the water tariff as a whole.

In the case of apartments, Vodokanal will buy only the meters to be installed on the shared intake pipes and does not have to deal with each household in the various apartments. In other words, Vodokanal signs a water supply contract with the representatives of the apartment buildings and manages the water tariff by reading the meter installed on the shared incoming pipes. Vodokanal receives the charge from the representatives.

Fig 7.4.8 Impact on the Financial Status of Vodokanal

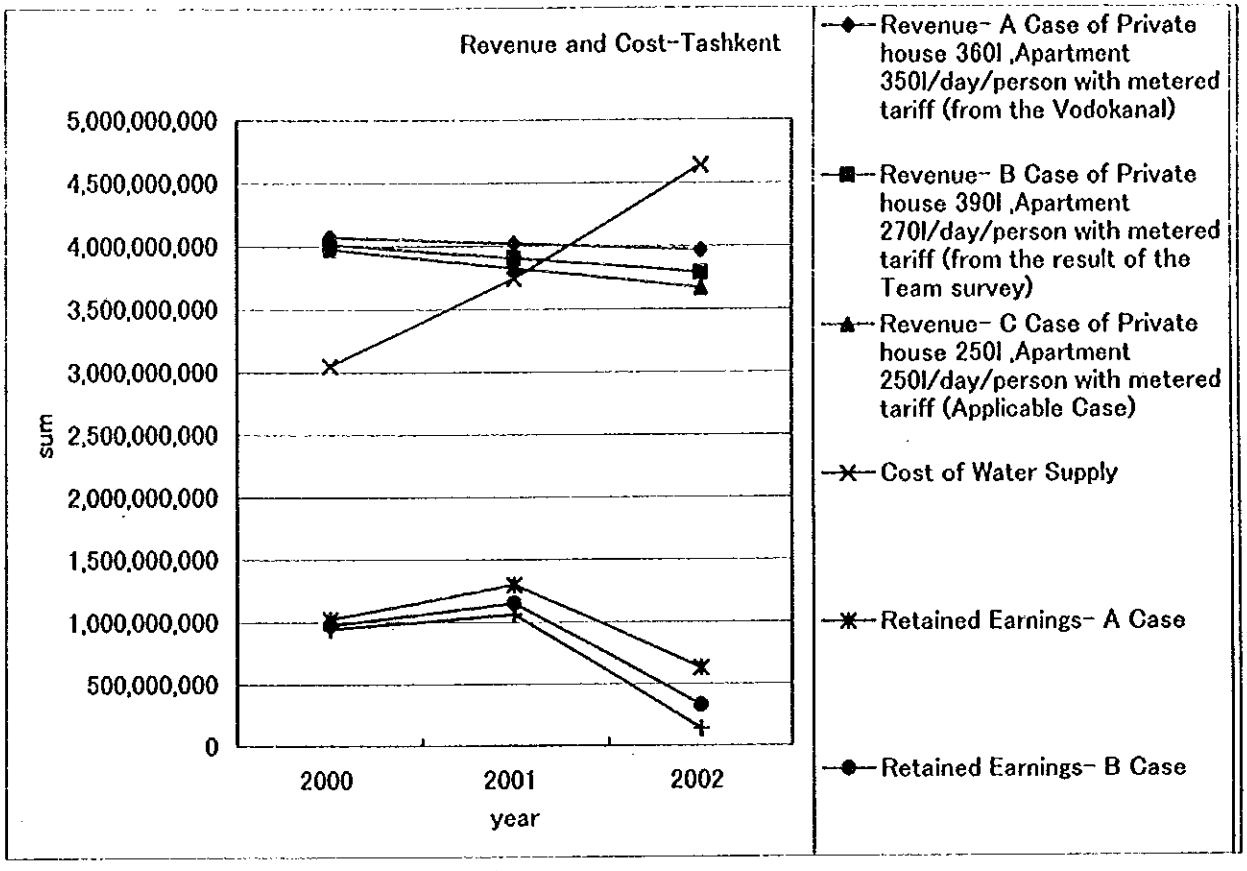


Fig 7.4.9 Revenue from and Costs for Water Meters

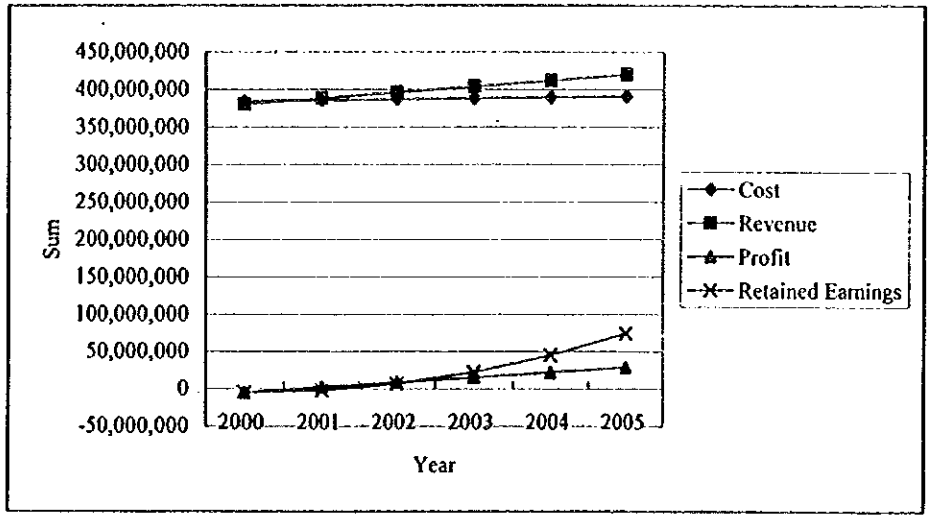


Table 7.4.7 Revenue from and Costs for Water Meters

	1999	2000	2001	2002	2003	2004	2005
Householder							
The number of householders	110,620	112,832	115,089	117,391	119,739	122,133	124,576
The number of water meter installations per year	0	18,000	18,000	18,000	18,000	18,000	18,000
Balance of houses with meters	6,362	24,362	42,362	60,362	78,362	96,362	114,362
Balance of houses without meters	104,258	88,470	72,727	57,029	41,377	25,771	10,214
Apartment							
The number of families living in apartments	454,844	463,941	473,220	482,684	492,338	502,184	512,228
The number of water meter installations at intake	0	1,516	1,546	1,577	1,609	1,641	1,674
Balance of apartments with meters	30	1,546	3,093	4,670	6,279	7,920	9,594
Balance of families living in apartments with mete	1,500	77,307	154,631	233,501	313,948	396,004	479,702
Balance of families living in apartments without m	453,344	386,634	318,589	249,183	178,390	106,180	32,526

Cost and Collection

The cost of water meter installations per year (Not	Sum	384,645,862	385,858,779	387,095,955	388,357,874	389,645,031	390,957,932
The revenue of water tariff per year (Note 3)	Sum	380,670,342	388,283,748	396,049,423	403,970,412	412,049,820	420,290,817
Profit	Sum	-3,975,520	2,424,969	8,953,469	15,612,538	22,404,789	29,332,884
Retained Earnings	Sum	-3,975,520	-1,550,551	7,402,917	23,015,455	45,420,244	74,753,128

Assumption
Note 1 : One apartment has 50 families on the average.
Note 2 : The cost of installing one meter is 18,000 sum for householder and 40,000 sum for intake pipe of apartment.
Note 3 : Monthly 55 sum is charged to every users for covering the cost of installing meters..

(2) Impact on Lifestyle of the Population

The Fig 7.4.10 shows the monthly living expenses for the population in Tashkent City as compiled from the results of our questionnaire. Table 7.4.10 shows the percentage of the water tariff for each level of monthly living expenses. We believe that the revised tariff table is affordable even at the low-income level and that the difference between quota and the metered rate system will serve to the installation of meters.

Fig 7.4.10 Monthly Living Expenses for the Population in Tashkent City

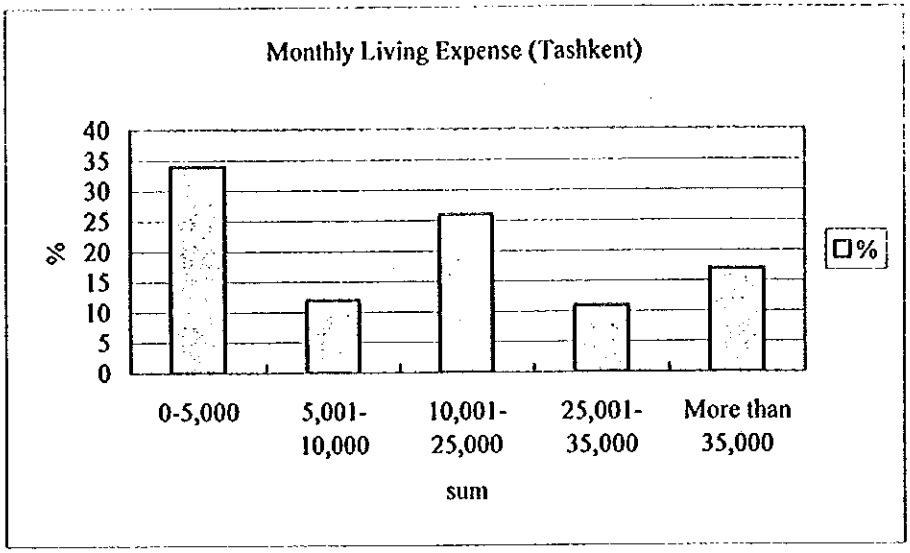


Table 7.4.8 Water Tariff as a Percentage of Monthly Living Expenses

Monthly Income	Per Living expense		
	Norm		Metered tariff
	(Apartment)	(Householder)	
0-5,000	6%	16%	4%
5,001-10,000	4%	5%	2%
10,001-25,000	2%	2%	1%
25,001-35,000	1%	1%	1%
More than 35,000	1%	1%	0%

(3) Improving the Imbalance between the Population and Enterprises

1) Quota

The imbalance between the population and enterprises will be reduced to 1.64 (8.22/5).

2) The Metered rate system

The imbalance between the population and enterprises will be reduced to 1.83 (8.22/4.5) assuming a volume of consumption of 20m3／month.

These figures appear to be similar to the global level.

(4) Budget Organizations

Budget Organizations may be permitted to have a lower tariff than other users, considering their benefit to the public. However, as it is necessary to cover a minimum of the unit costs, the tariff will be 5 soum/m3.

The revised tariff table has been calculated for the next 3 years; however, it may be necessary to re-examine it in the short-term depending on local socioeconomic factors.

(5) Cost of meters

The government is considering making the users purchase the meters. In foreign countries, the property rights to the meters may be held by the water supply utility companies. The reasons why the property rights to the meters are held by the water supply utility companies are that this makes it convenient to read the meters and easier to manage the meters. On other hand, there are several

other ways to make users bear the cost of the instruments. For example, there are some cases where the user is charged a connection fee or a rental fee for the meter, etc. in addition to the standard water tariff. We propose that Tashkent City Vodokanal retain the property rights to the meters.

(6) Difficulties in Installing Meters

Many public households and users living in apartment buildings are supplied with water via several intake pipes from the main pipeline to the house. It is difficult for Tashkent to install a meter on each pipe to record the accurate volume of water consumed by each household.

We have conducted that it will be necessary to replace multi-pipe systems with single intake pipes when installing the meters. This is important for the future management of the water supply business. Therefore, we propose that the following regulations be established:

1) Users must either replace their multi-pipe systems with single intake pipes or install meters on each of the pipes.

2) If the users choose to install a meter on each pipe, the users must bear the entire expense.

3) If the users choose to replace the multi-pipe systems with single intake pipes, the government will cover a portion of the expense for the replacement.

4) It will be necessary to enact new laws to enforce these regulations, and to impose penalties for any violation of these laws.

However, it may be difficult for all users living in apartment buildings to abide by the above regulations. Therefore as an interim countermeasure, consideration may be given to allocating the total volume of consumption in the apartment buildings to each occupant based on certain appropriate guidelines. Tashkent City Vodokanal should determine and publicize these guidelines.

(7) The Social Safety Net

As shown in Table 7.4.2, we have considered certain tariff exemptions for low-income users.

Generally speaking, the government should ensure that the social safety net is maintained and shall cover the cost of doing so. The government should bear the cost of the social safety net or give subsidies to these low-income users, considering the inclusion of the tariff from other public services.

(8) Concept for Future Revised Tariff Table

We have proposed a concept for a future revised tariff table as shown in Figures 7.4.11 and 7.4.12. Vodokanal and the government authorities should examine the flow when considering future revisions to the tariff.

Figure 7.4.11 The flow Chart of Revising Tariff Table

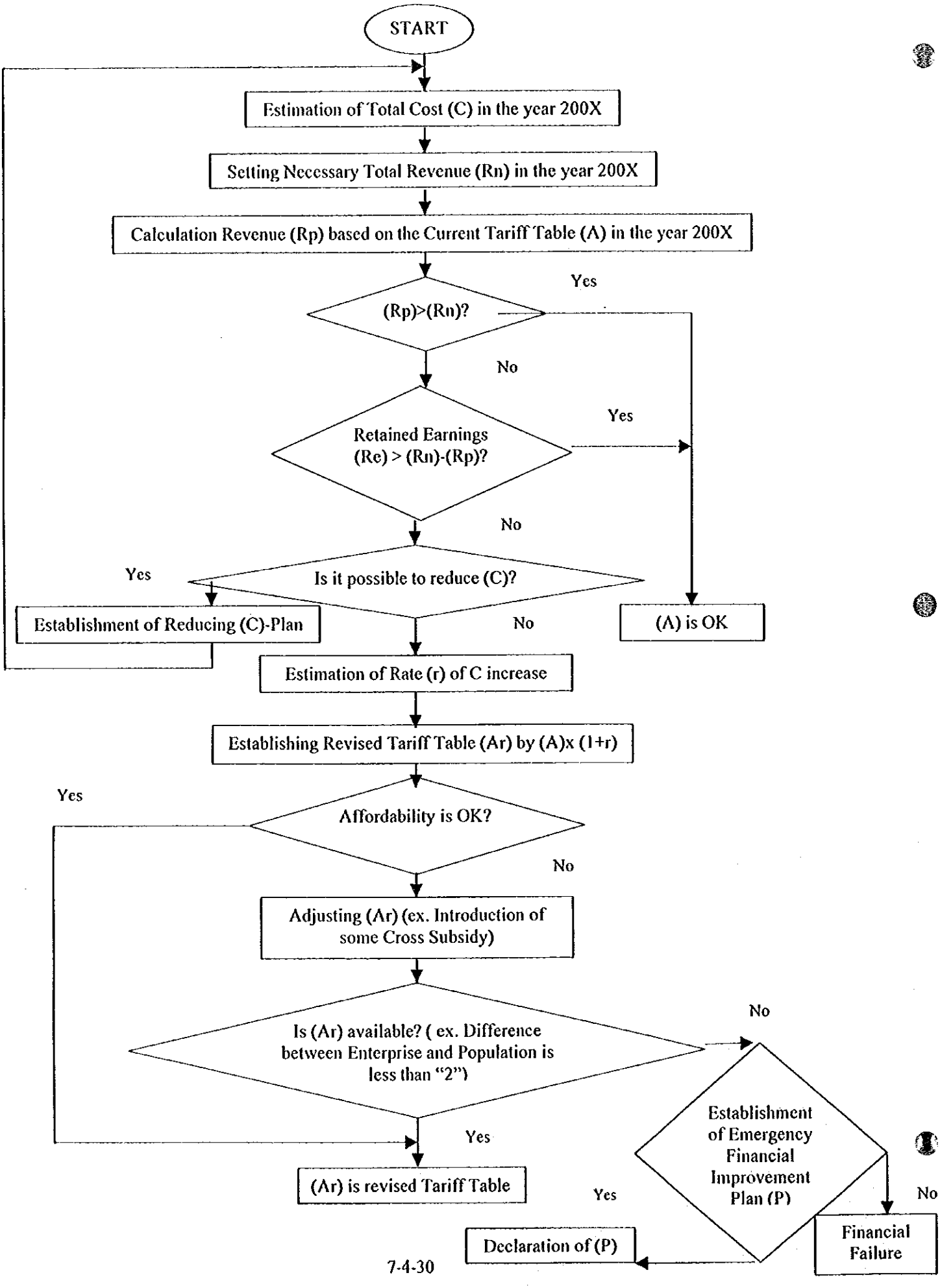
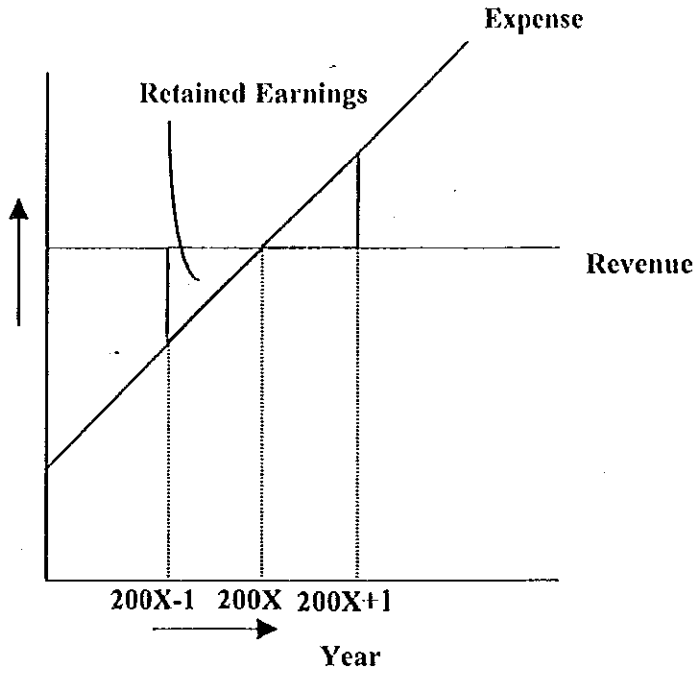


Fig 7.4.12 The Basic Concept for Future Revised Tariff Tables



1) **Flow for Future Revised Tariff Table**

Our proposal regarding the flow for future revised tariff table is follows:

i) Estimation of future cost

It is necessary to estimate future cost, which is needed to keep water supply in the future (the year 200X).

ii) Estimation of future revenue

The necessary future revenue (Rn) is calculated based on the estimated future cost. On the other hand, the future revenue (Rp) is calculated based on the current tariff table (A).

iii) (Rp)>(Rn) ?

If (Rp) is more than (Rn), the current tariff table (A) is applicable in the future (the year 200X). If (Rp) is less than (Rn), we will consider whether the shortage can be covered by the retained earnings (Re), or not . The shortage means (Rn) minus (Rp). If (Re) is more than the shortage, the current tariff table is applicable in the future. If (Re) is less than the shortage, Vodokanal will have to consider the possibility of reducing the cost (C).

iv) Establishing Revised Tariff Table (Ar)

If Vodokanal can not reduce the cost (C), the current tariff table must be revised and it will be done considering the rate of (C) increase. However the affordability of users and the cross subsidy are considerable when the revised tariff table is established.

Establishment of Emergency Financial Improvement Plan (P)

If they cannot establish the revised tariff table satisfying the conditions mentioned above, the Vodokanal or the government must establish the emergency financial improvement plan for water supply services. If there are not such plans, the financial failure will happen.

2) The Consideration of the Retained Earnings

The Fig 7.4.12 shows the retained earnings, which is necessary concept for future revised tariff table. The retained earnings will be used for future operation and the revised tariff table can be stable for the period the retained earnings existing.

7.5 Computer Aided Tariff Collection System

In this section the Study Team proposes improvement plan of tariff collection by using computer aided system.

Firstly, we propose the appropriate tariff collection procedure, in which computer systems are efficiently used. Secondly we propose the improvement plan about software and hardware of the computerized tariff collection systems, which conform to the appropriate procedure. Finally we describe how the improvement plan should be implemented, including estimation and analysis of cost and benefit of implementation of the proposed computer system.

7.5.1 Proposed Computer Systems

In this section the detail specifications of proposed computer systems for tariff collection in Tashkent Vodokanal are described.

(1) Overview

It is observed that the current Tariff Collection System at Tashkent Vodokanal generally covers the functions required for tariff collection procedures as stated in Chapter 3. In the future, however, the systems performance may decline on account of increased data volume as the progress of installation of water meters at all houses and apartments. It is thus crucial to make and carry out a comprehensive long-term plan which aims to reform the current Tariff Collection System in concurrence with implementation of water meter installation plans.

It is important to design and develop an effective computerized tariff collection system which can process more data transactions with less human resources. It is thus necessary not only to install a computer system which conforms to the specifications of software and hardware described in this section, but also to reform staffing and business procedures to operate the computer systems efficiently as stated in the previous section.

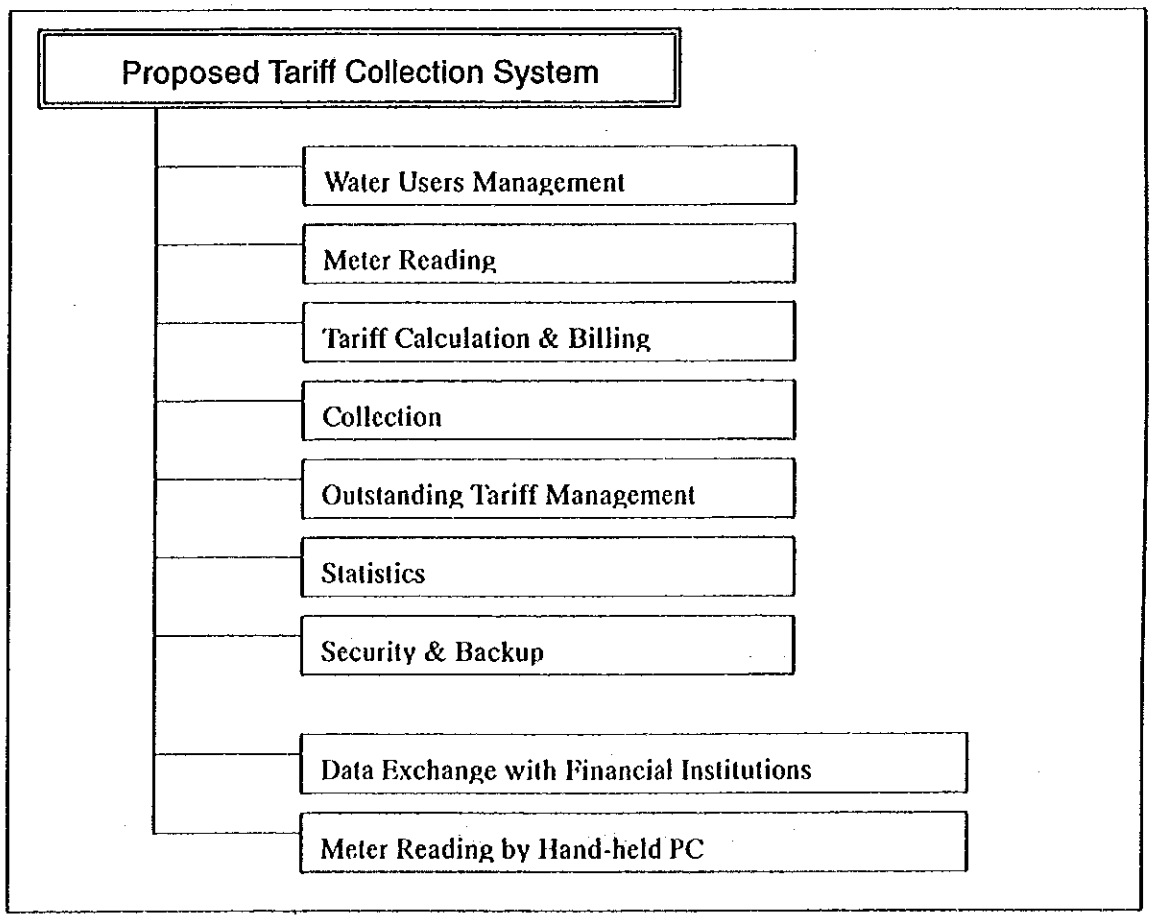
(2) Functions of Proposed Tariff Collection System; Database

1) Study and Proposal Approach

The common method to determine the specification of computer systems is to analyze the functions of main application software to be used and thereafter to decide the specifications of computer hardware which is suitable to the application software. At first our explanation also starts from the analysis of application software, i.e., the functions of Tariff Collection System.

In addition to the functions of current Tariff Collection System, we propose that the computer system provide some extra features including various queries, production of statistical reports, and bulk data input by batch processing. These features are expected to facilitate more accurate and effective data processing without increasing the number of computer terminals and operators.

Fig 7.5.1 Proposed Tariff Collection System Function Diagram



For Tashkent Vodokanal, which serves over two millions water users and overwhelms other cities in terms of data volume to process, it is specifically required to evaluate the systems performance and capability in order to reduce the workload of data input and tariff collection. Unless the aspect of systems performance and capability is analyzed, the computer system may require more computer and human resources than the initial estimation, and thus operation and maintenance costs may become unacceptably high. We therefore scrutinize some functions that currently complies with the needs of tariff collection business, and proposed improvement plans in preparation for future requirements.

Our proposals in this section are based on the assumptions specified in Fig 7.5.1. i.e., number of installed water meter, number of staff in charge of meter reading, and frequencies of meter reading. Some data may be subject to the tariff collection policies to be implemented.

Most of the functions of the proposed system are based on on-line processing, but there should be some batch processing partially to input bulk data in order to achieve the effective utilization of computer resources and the efficient business procedures. The batch processing applicable to the Tariff Collection System includes data input from floppy disk or other medium, production of periodical reports, etc.

The proposed functions of the Tariff Collection System will include, but not limited to, the following items: -

- Water Users Management;
- Meter Reading;
- Tariff Calculation and Billing;
- Collection;
- Outstanding Tariff Control;
- Statistics;
- Security and Backup;
- Data Exchange with Financial Institutions; and

- Meter Reading by Hand-held PC.

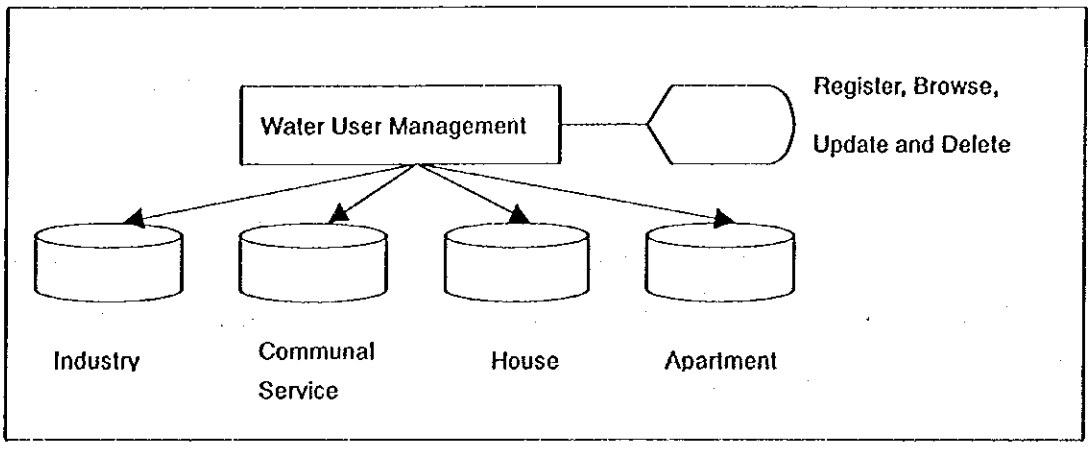
2) Water Users Management

There are two possible elements as the key item of the database of the Tariff Collection System, namely, Water User and Water Meter. Some software packages used for water tariff collection are designed to set up the Water Meter as the key item, but they are applicable only if almost all houses and apartment buildings have a water meter. In consideration of the current situation of Tashkent Vodokanal, it is more appropriate to set up the Water User as the main key item of database.

The current Tariff Collection System has separate databases for industry users, communal service users, house users and apartment users. In future these groups should be unified to simplify the tariff collection business, but at this stage, it will be reasonable to design separate databases grouping by type of users as specified in Fig. 7.5.2

For the purpose of administration, a customer code should be allocated automatically when the application for water use from a new user is processed by the computer system. The automatic allocation of user code will provide the Tariff Collection System with a useful database system.

Fig 7.5.2 Concept of Water User Management Module



The user attributes to be saved in the database will include user name, address, number of fam-

ily, ward name, number of water meters installed, staff in charge of meter reading, date contract made, method of payment, reduction and exemption of water tariff, etc.

It is important to optimize the database structure when a large amount of data is included in the database. We propose the following processes, which are generally used: -

- to draw up images of input screens and output lists through interviews with systems users;
- to extract the items to be included in the databases from the images;
- to analyze the relationship between items and come up with the database structure.

This process is called normalization of database and it is essential when a database is designed.

We observe that the current system needs to improve in terms of query functions. When a particular water user is searched, various attributes should be used as key items so that the database can be utilized most strategically. Therefore we propose that the database be designed through the process stated above.

3) Meter Reading

The volume of meter reading data will be enormously increased as more water meters are installed. Although the current Tariff Collection System complies with meter reading functions, we propose that the system be reformed in order to accelerate the processing speed. There are two concrete solutions proposed; one is to re-design the input screens to reduce the number of key touches, and the other is to utilize some input devices and feed bulk data through a batch processing. The latter includes data input from hand-held terminals for meter reading, and we will mention it in a later section.

The systems functions of meter reading includes Management of Water Meter, Management of Staff in charge of Meter Reading, Management of Meter Reading Schedule, and Inputting Volume of Water Consumption.

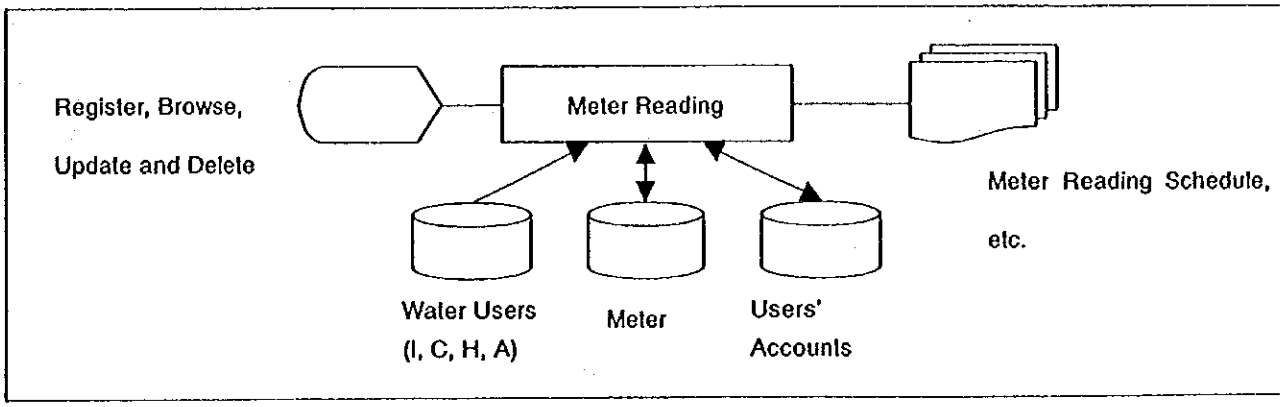
The main function of Management of Water Meter will be to register, update and inquire and delete various attributes regarding water meters, e.g., water meter serial number, type of water

meter, date the meter installed, date the meter to be updated, etc.

Management of Staff in charge of Meter Reading and Management of Meter Reading Schedule are meant to support the staff in charge of meter reading to visit more users in a shorter time, as there will be more users who have water meters according to the installation plans of water meters. We propose that the computer system produce a schedule of meter reading by staff in charge of meter reading on a daily or weekly basis.

As for Inputting of Volume of Water Consumption, it is estimated that inputting there is a need to input the result of meter reading about forty seconds per a user. We propose that the system be refurbished for operators to input the data at above speed, e.g., reform of input screens and short-cut keys.

Fig 7.5.3 Concept of Meter Reading Module



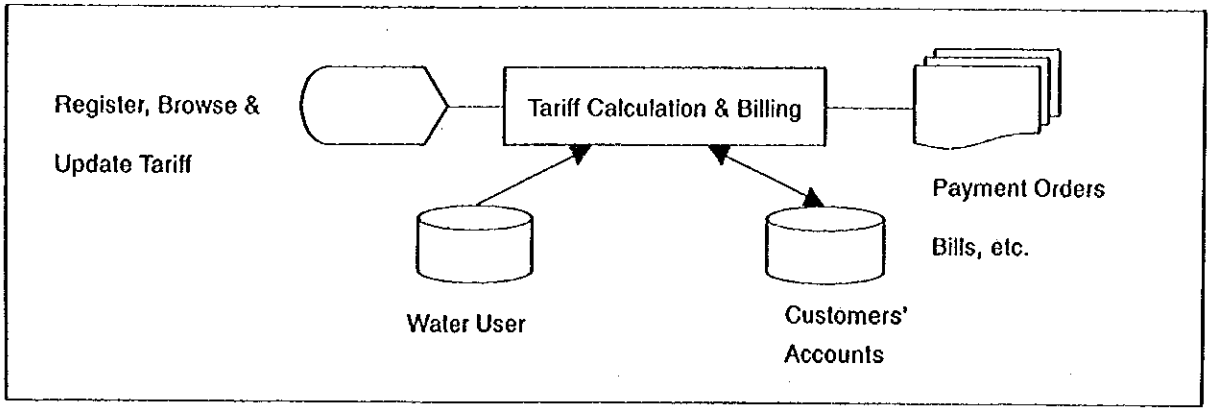
4) Tariff Calculation & Billing

The current Tariff Collection System conforms to the calculation of penalty which is adapted for users who exceed the limitation of water use but there is a need to modify some programs to adapt for the progressive water tariff table proposed by the Study Team.

As for billing of the current system, Akt is currently used for industry and communal service users while Customer Book is used for house and apartment users. The processing time of tariff calculation is expected to extend if the progressive tariff table is adapted. We suggest that the

meter reading process be simplified as much as possible and that tariff calculation and billing be conducted separately so as to save processing time.

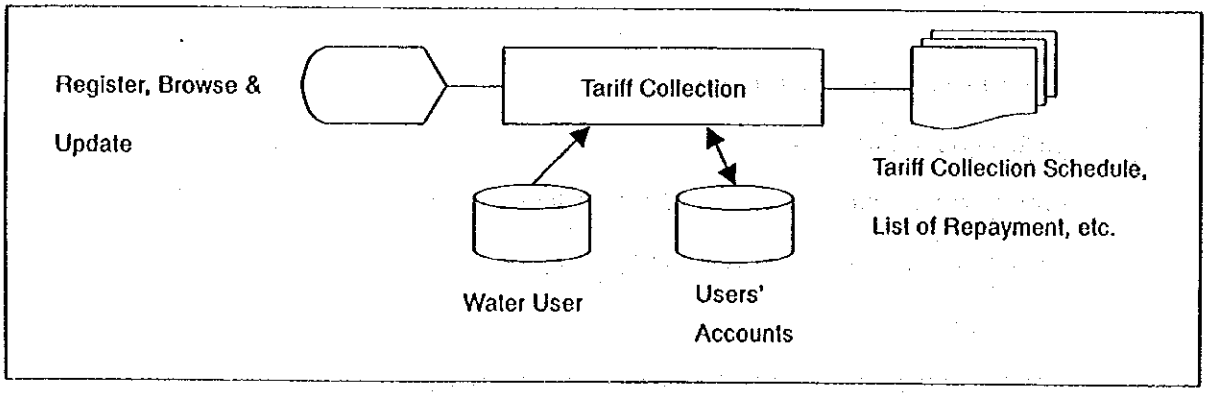
Fig 7.5.4 Concept of Tariff Calculation & Billing Module



5) Collection

We learnt that industry and communal service users pay tariff from their bank accounts, and that house users pay mainly at People's Bank while apartment users pay through JEK. The list of repayment received from banks are input into the system and it takes about one minute to input one transaction according to the interview surveys, and there is a need to achieve more speedy data input. We propose that the input screens be reformed as stated above and that digital data be received from the bank.

Fig 7.5.5 Concept of Tariff Collection Module

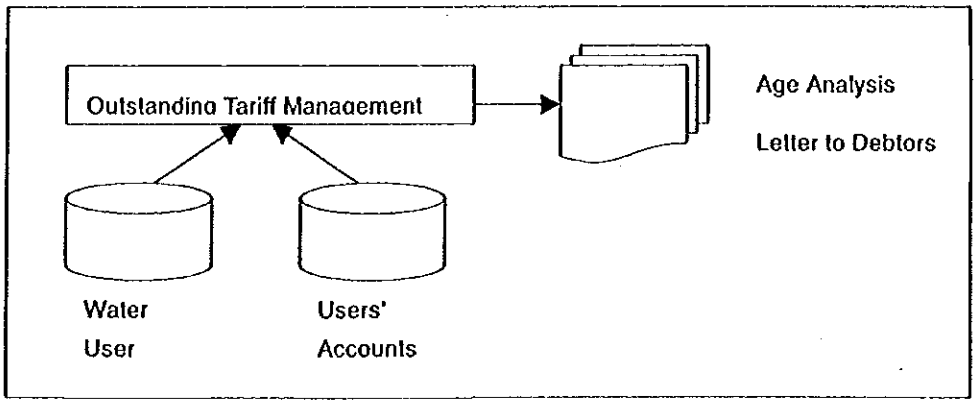


6) Outstanding Tariff Management

In consideration of the plight of current social and economic situation in the country, it is estimated that there will be more amounts of outstanding tariff in the future. It is therefore thought that outstanding tariff management should be enhanced among the Tariff Collection System.

The outstanding tariff collection is a difficult task. It is difficult to standardize the collection procedures and the collection is highly dependent on expertise of the staff in charge of tariff collection. The proposed system should provide the staff in charge of tariff collection with information regarding the outstanding tariff instantly. We propose that the computer system automatically produce age analysis of outstanding tariff, notification of outstanding tariff, and the visiting schedule of staff in charge of outstanding tariff collection, who would be able to be dedicated to visiting users. Then the collection rate is expected to improve.

Fig 7.5.6 Concept of Unpaid Tariff Management Module



7) Statistics

The current Tariff Collection system can search for information on a particular user, i.e., volume of water consumption, payment and outstanding balances, etc. It is however necessary to enhance the system by adding the functions which will enable Tashkent Vodokanal to obtain summarized statistics. The key personnel of Tashkent Vodokanal require such statistics for analysis to determine various plans regarding overall management and planning of facilities constructions. We propose that the following outputs be produced regularly.

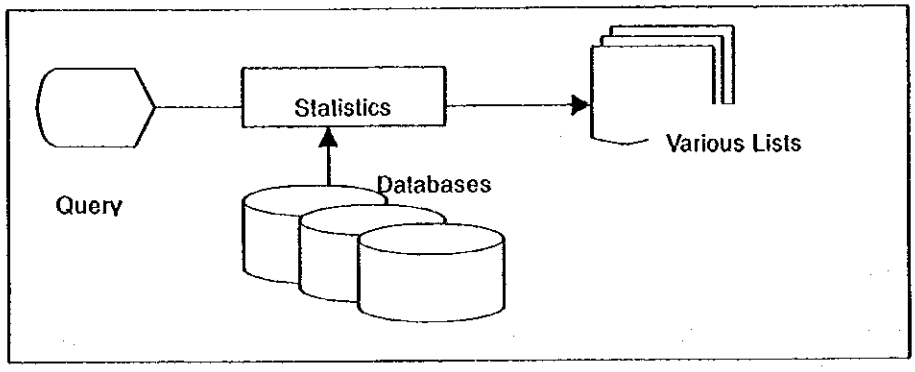
- Statistics on Customers (number of customers by user type, ward, method of payment and

staff in charge, etc.);

- Statistics on Water Meters (number of water meters by ward, age and model, etc. number of broken meter, number of repairs);
- Statistics on Tariff Calculation and Billing (number and total amount of tariff calculation and billing by user type, ward, method of payment, financial institution, staff in charge, etc.);
- Statistics on Collection (number and total amount of collection by user type, ward, method of payment, financial institution and month etc.);
- Statistics on Outstanding Tariff Collection (number and total amount of outstanding tariff collection by user type, ward, method of payment, financial institution and month etc.)

We propose, as mentioned above, that a robust database be implemented by customizing a relational database software package in order to produce such statistical documents as easy as possible. It is possible to develop particular computer programs to produce such statistical documents, or alternatively, some database software such as Oracle can work in conjunction with popular spreadsheet software such as Excel and produce ad-hoc statistical documents on request.

Fig 7.5.7 Concept of Statistics Module



8) Security & Backup

It is critical to build the functions of security and backups in the computer system. The current Tariff Collection System is well designed in terms of security and backup, and further attention is required if data volume and number of terminals increase.

We especially propose that an anti-virus software package be installed on the computer system to prevent malicious programs from entering into the system through various medium such as floppy disks and modem transmission. Of course the functions which the current system have should be achieved by the proposed system.

If possible, it is suggested that on-line help facilities be provided for users who do not know how to operate the systems.

9) Data Exchange with Financial Institutions

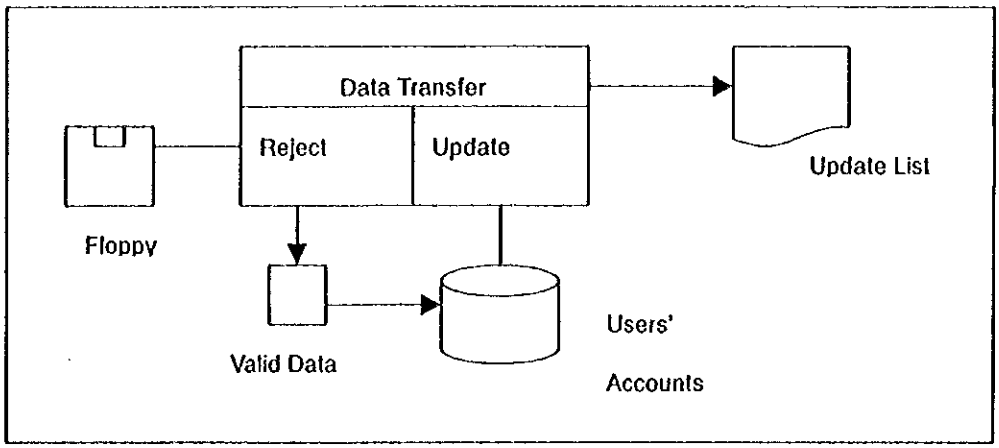
The next two sections describe the additional functions which will significantly reduce the data processing time. This section describes the data exchange with financial institutions while the next section describes hand-held terminals for meter reading.

Tashkent Vodokanal currently receives a list of payment from water users from the bank on a daily basis, and an operator inputs the information from the list. There are about one hundred transactions on an average day, more than three hundred transactions on a busy day, according to the interview with the staff in charge. It takes more than five hours to input all the data on a busy day. We propose that, in consultation with the bank, digital data be received from the bank. The data input through floppy disk will reduce not only the processing time but also operation errors.

Of course, this will be done only when the bank agrees to provide the information on payment by digital data. The Tariff Collection System will need to add some functions, i.e., data validity check, production of list from floppy disk, and updating database. It is technically possible to receive data through modems, but it will not be an appropriate solution as public lines are still under-developed in this country.

If the bank can not provide digital data, optical character readers (OCR) may be considered as an alternative solution. The OCR equipment can read the data on paper and convert it electronically so that it is not necessary to type from keyboard.

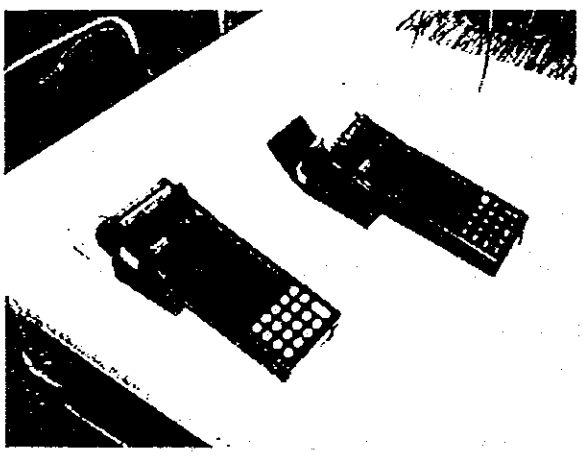
Fig 7.5.8 Concept of Data Transfer from Financial Institutions Module



10) Meter Reading by Hand-held Terminals

Hand-held terminals are widely used for meter reading of water as well as electricity and gas in the world. The main advantage of hand-held terminals is that it is not necessary to input data twice so that the efficiency of procedures will be improved. In case of manual recording at meter reading, it is necessary to transcribe the information after going back to the Vodokanal office. On the other hand, the hand-held terminals can memorize the information electronically and transmit the information to the database directly. The hand-held terminals can also improve the accuracy of data.

Fig 7.5.9 Hand-held Terminals designed for Meter Reading



We describe the technical specifications of water meter reading by hand-held terminals as follows. The hand-held terminals usually accommodate a rewrite-able memory card, which can be directly connected with the database server. The necessary information should be downloaded from the database to the memory card every morning and the staff in charge of meter reading should read the water meter by using the hand-held terminals. The data is input into the hand-held terminal at the site of meter reading. After the end of schedule of meter reading of the day, the hand-held terminal will be taken back to the Vodokanal office and the information saved on the memory card will be transmitted to the database. Therefore there must be at least two programs prepared for hand-held terminals, namely, one is the program to transfer data to the terminal, and the other is the program to transfer data from the terminal.

The hand-held terminals were invented recently, but they are becoming popular. They can be connected with not only mainframe computers but also affordable personal computers. On condition that the hand-held terminals are customized for Russian languages and a local agency provides the maintenance services, we propose that hand-held terminals be implemented to accelerate the meter reading.

The water consumption data is usually captured through an input device such as keyboard or touch panel, but the latest hand-held terminals which are equipped with remote data transfer facilities can read water meters without looking at the figure of the water meters and typing digits. These gadgets can prevent human errors on typing and shorten the time of meter reading because it will be needless to look at the water meters. However, in order to utilize the remote data transfer facilities, there will be a need to install expensive water meters which have interfaces with computers, and therefore this will be a realistic solution when the price of these water meters becomes affordable in the future.

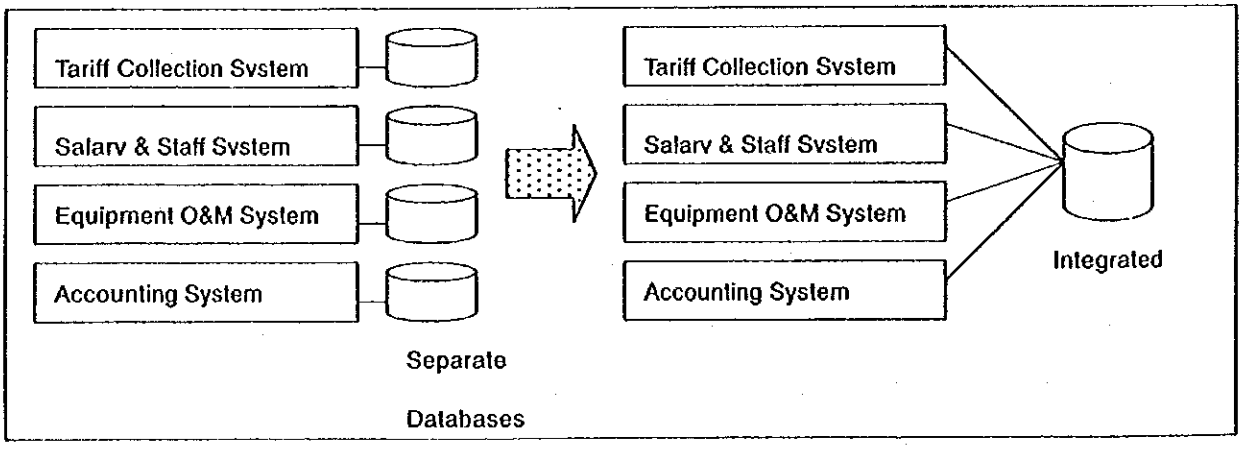
11) Integration with Other Systems

The software specifications of proposed Tariff Collection Systems are stated as above. On the other hand, Tashkent Vodokanal has developed and operated several other computer systems as specified in Chapter 3. The software and hardware platforms for other systems are similar with

those used for Tariff Collection System, and we learnt that there is no data exchange between the systems.

Some systems may access the same data if two or more computer systems are operated concurrently. We will explain about water meter as an example. The Tariff Collection System will require the information on water consumption indicated by water meters while the hardware maintenance system will require the information on the installation sites. The fixed assets control system will require the information on the number of hand-held terminal held, broken and repaired, while the accounting system will require the information on the prices and depreciation of hand-held terminals. We propose that in future all the programs of computer systems of Tashkent Vodokanal access the common database, rather than the separate database dedicated for each system, so that the duplicated data is minimized and computer resources are more effectively used. In addition, the common database will be able to prevent the disagreements between databases and thus it is easier to administer the computer system.

Fig 7.5.10 Concept of Integrated Computer System



It is true that there are many steps to integrate the separate databases designed and developed up to now into the common database. But we believe that this will be a good and effective investment in consideration of the size of Tashkent Vodokanal. We propose that the concrete plans be drawn up and that after the thorough analysis the application systems be gradually replaced. We will discuss some plans later in this chapter.

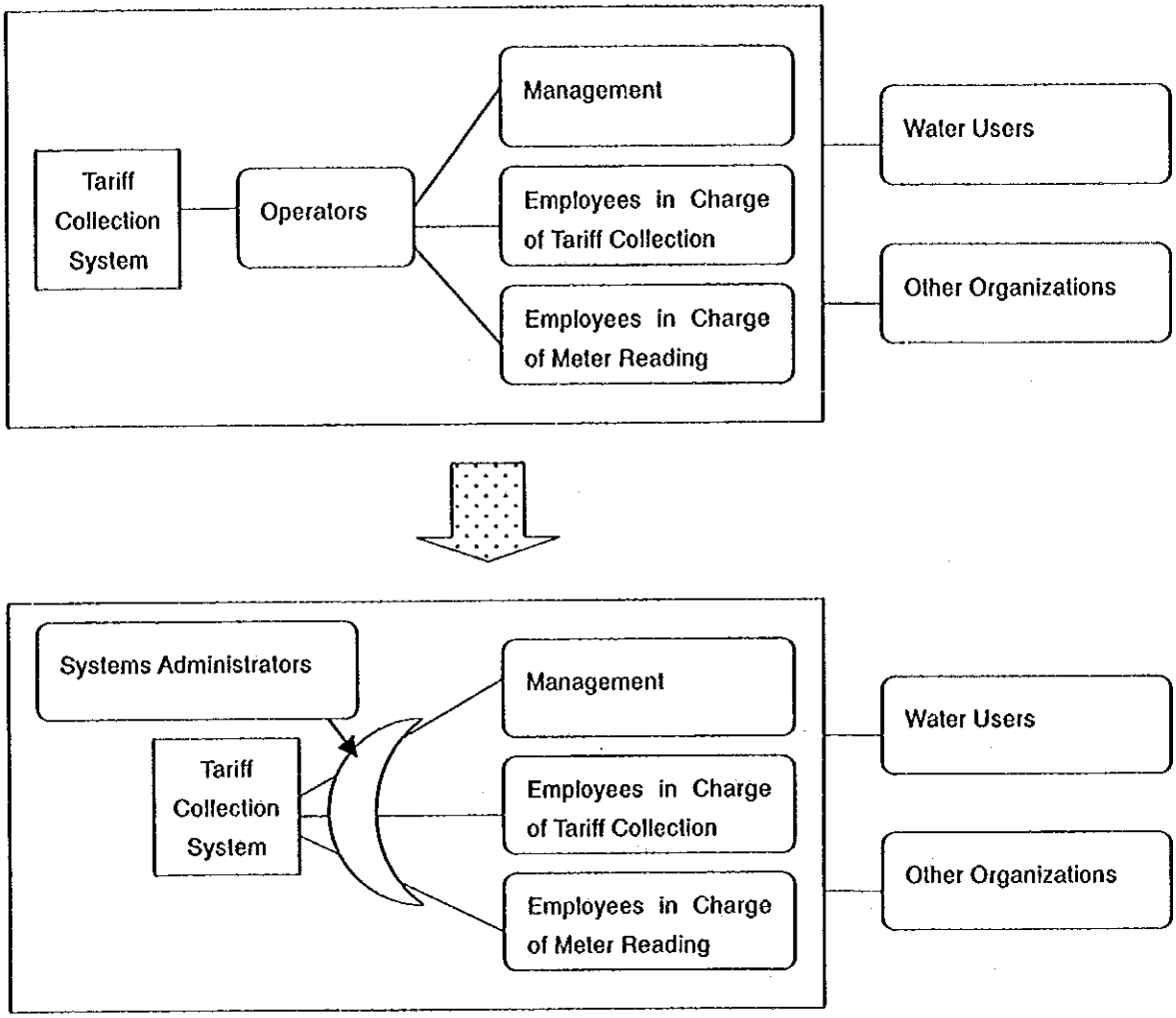
(3) Functions of Proposed Tariff Collection System; Networking

In this section we describe our proposals on specifications of networking of Tariff Collection System.

The current Tariff Collection System consists of a local area network (LAN) within the office of Tashkent Vodokanal only. The main advantage of the current LAN is that the systems are easy to maintain as it is simple. However, the number of computer terminals is insufficient and the systems users are dedicated operators, and thus it is observed that the business tends to be inefficient. We believe that the computer systems should be accessed by managers and key personnel, staff in charge of meter reading and tariff collection before the number of transactions grow up to the alarming level. Therefore we propose that the current networking be enhanced.

We also propose that systems administrators be assigned to control the future LAN, which is expected to be a huge system in terms of numbers of computer terminals connected. The duties of the systems administrators will include, but not limited to, overall computer security management, daily backup of database, recovery of the systems in case of malfunctions, introductory training for systems users, liaison with computer programmers and hardware suppliers in case of hardware breakdowns. By assigning systems administrators, systems analysts and programmers can be dedicated to design and develop new application systems with high quality.

Fig 7.5.11 Context Diagram of Proposed Tariff Collection System: Networking



(4) Proposed Tariff Collection System: Database and Programming Tools

In the next two sections we propose computer hardware resources necessary to operate the application software discussed in the previous section. Firstly in this section we analyze the middleware such as database and programming tools. We then propose the appropriate computer hardware including database server, terminals and peripheral equipment, and finally we propose the networking components that integrate all the computer resources.

1) Comparison between Custom Software and Package Software

There are two kinds of application software: one is custom software, which is designed and developed for a particular user in conformity with the user requirements. The other is package

software, which is designed and developed for unspecified number of users and available on the market. There are a lot of package software designed for water tariff collection. (Note: We have not confirmed that Russian version of such package software is available or unavailable.)

The main advantage of package software is that the program is tested and used by other users of water works sector and especially the software upgraded many times is usually versatile and user-friendly. Another advantage is that the period to implement the system is generally shorter than that of custom software, in most cases all the systems users have to do is to input some parameters into the system. On the other hand, however, package software may not address several user requirements if they are specific and unlike those of other users. In addition, if there is any change of legislation or protocols, it may be necessary to modify the source code of programs. The copyright and patent of computer software is usually reserved by the company or person who developed the software, and the systems users may not modify the programs without permission of the developer. Hence, it is common that if a user purchase package software he has a maintenance contract with the developer or its agent.

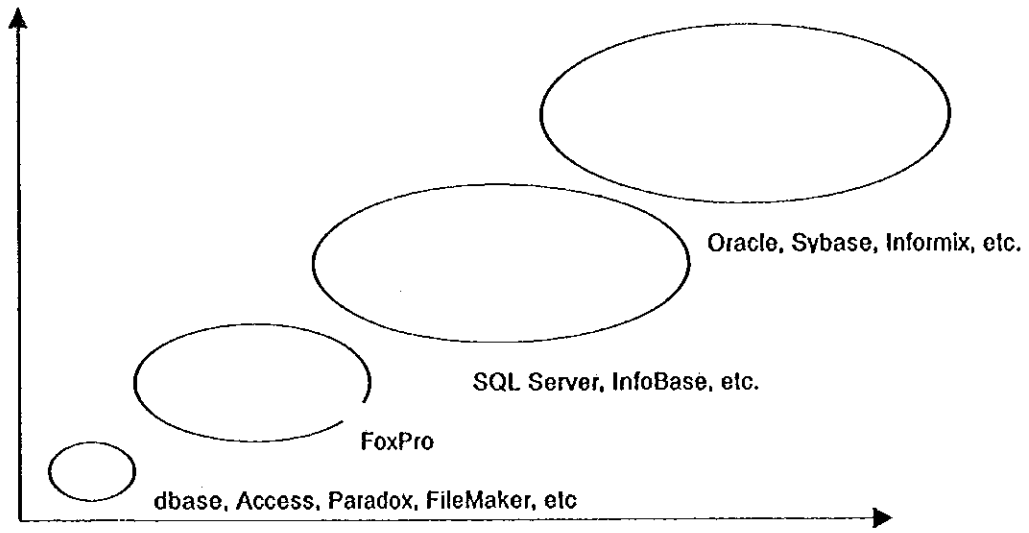
Tashkent Vodokanal has designed, developed and operated its computer systems by its internal staff, and likewise in future. In view of the situation of computer industry in Uzbekistan, it is observed that it will be easier to find companies which will develop custom software. It is questionable to maintain the package software whose market is still immature in this country. We therefore propose that the custom software be designed and developed by the internal human resources of Tashkent Vodokanal, in conjunction with external advisory staff.

2) Database and Programming Tool for Custom Software

In this section we then propose the database and programming tools suitable to develop the Tariff Collection System for Tashkent Vodokanal.

There are various kinds of database software. They can be classified by suitable data volume and number of users who concurrently access to the database. The following diagram indicates the appropriate data volume and number of systems users of the major database products.

Fig 7.5.12 Appropriate Number of Systems Users and Data Volume of Major Database Products



The database of the current Tariff Collection System is Microsoft FoxPro. This database product is relatively easy to develop application programs and there would be no problem if data volume and number of systems users remained in future. We however estimate that there may be a serious problem in terms of performance of the database system when data volume and number of connected terminals increase.

We therefore propose that more robust database with higher capacity, such as Microsoft SQL Server, be utilized as the database system of the proposed Tariff Collection System. Moreover, if Tashkent Vodokanal envisages implementing a common database across all computer systems, the high-end products, such as Oracle, should be considered for the core database product.

It is necessary for systems developers to have advanced knowledge on the database product installed, and therefore we propose that training of database products be conducted prior to the implementation.

As for the programming tools, we propose the products which are compatible with the database

products installed. The popular programming tools, such as Delphi which is based on Pascal language, provides the systems developers with the graphical users interface (GUI) environment and various built-in parts which can shorten the development period significantly.

3) Operating System

We conclude this part by describing the operation systems to be used for the proposed Tariff Collection System. The current network operation system is Microsoft Windows NT 4.0, which is proven and suitable for a variety of networking systems. As there is no necessity to use mainframe computers or proprietary mini-computers, we propose that the network operating system of the Tariff Collection System be Windows NT or equivalent product under current situation, while the operating system of the terminals be Windows 95 or its successors. The compatibility with the current system will also be ensured.

(5) Proposed Tariff Collection System: Computer Hardware

In this section we propose the computer hardware to be used for the Tariff Collection System.

1) Overview

We believe that the hardware components should be determined by the data volume and number of users.

We firstly discuss the type of database server which should hold all data. There are two options for database server, namely, mainframe and personal computer (PC) server. The former overwhelms the latter in terms of capacity and performance, but it is expensive and requires special skills to operate.

According to our tentative estimation, the total storage of data and programs will exceed 300 megabytes (MB) by the time when the installation of all water meters completes.

The number of database servers is dependent on the magnitude of database and the frequency of database access. We estimate that one database server is sufficient for the proposed Tariff

Collection System.

The systems users who access the database of Tariff Collection System should include key personnel and managers, systems administrators, staff in charge of meter reading and staff in charge of tariff collection. We propose that at least one terminal be allocated per two systems users in the future.

In consideration with the magnitude of data volume, there is no need to install a mainframe based database server, and we conclude that a PC server is appropriate for the Tariff Collection System.

Other computer hardware required for the proposed Tariff Collection System includes computer terminal, input devices such as floppy disk drives, and other peripheral equipment. We discuss their specifications in the following sections.

2) Specifications of Database Server

In the following paragraphs we discuss the detail specifications of a PC server, which we propose as a database server for the proposed Tariff Collection System in the previous section.

The specifications of the PC server currently used for the Tariff Collection System are described in Chapter 3. The performance of the PC server is satisfactory so far, because the data transaction is not so voluminous and the database used is FoxPro, which is not memory hungry. However, if the application software is upgraded as stated above, the current PC server may not be able to achieve the required performance. It is therefore desirable that a new database server be implemented in accordance with the development and implementation of the application software. The specification of the proposed database server is described as follows, although it should be reviewed and modified when the new system is implemented, as the information technology improves day by day.

Proposed Specifications: -

Processor(s)---should be compatible with Windows NT and the clock speed should be at least 500 MHz (e.g., Pentium or its compatible processor, Alpha processor). Dual processors preferable.

Main Memory (RAM)---At least 256 Megabyte (MB)

Storage Devices---At least 8Gigabyte (GB) hard disk drive with a disk mirroring function complying with RAID 5.

Interfaces---to recognize other storage devices such as floppy disk and CD-ROM drives.

3) Specifications of Computer Terminals

In the following paragraphs we discuss the specifications of computer terminals which are to be used by systems users.

There are two kinds of computer terminals on the market, namely intelligent terminals and dumb terminals. The latter is no longer popular as it does not function unless it is connected with the server. On the other hand, intelligent terminals can be utilized as a standalone computer as well and have become affordable. The specifications of computer terminals should run on the operation system of Windows 95 or its successors. If the application system adopts the Graphical User Interfaces (GUI), more main memory will be required while the minimum specifications of such computer terminals are described as follows: -

Proposed Specification

Processor---Pentium series or its compatible processor with at least 100 MHz speed;

Main Memory (RAM)---at least 16 MB, preferably 64 MB or more;

Interfaces with networking

It is generally observed that the computers at Tashkent Vodokanal manufactured after 1995 will conform to the minimum specification proposed as above. It is therefore proposed that outdated computers be gradually discarded and displaced by new machines, or upgraded if possible.

4) Specifications of Peripheral Equipment Excluding Networking Components

In the following paragraphs we discuss the specifications of peripheral equipment to be used for the proposed Tariff Collection System of Tashkent Vodokanal. The peripheral equipment includes printers, optical character reader (OCR), hand-held terminals.

Printers are output devices which can generate various documents from computers. There are several kinds of printers on the market, namely, high-speed impact printer, dot matrix printer, laser printer, inkjet printer, receipting printer, etc. Appropriate printers should be selected according to the functions of software and user requirements.

The high-speed impact printers are suitable to generate bulk documents such as payment orders, repayment schedule, etc. Tashkent Vodokanal has several Epson DFX-series printers which are still popular and compatible with many types of computers. It is thus proposed that these printers continue to be used for the future. However, if it becomes necessary to print more documents, higher-speed printers may be required.

As for input devices, as specified in the previous sections, an optical character reader (OCR) and hand-held terminals may be required, depending on how the input data is captured. While the main input device of the current and proposed Tariff Collection System is keyboard, an OCR and hand-held terminals can reduce the workload of input operations dramatically.

A storage device such as 4mm-tape streamer will be required for backup and recovery purposes. The currently used device may be continued to be used or upgraded if data volume becomes large.

It is also essential to install an uninterruptible power supply unit (UPS) in order to protect the database server and other important gadgets from power interruption.

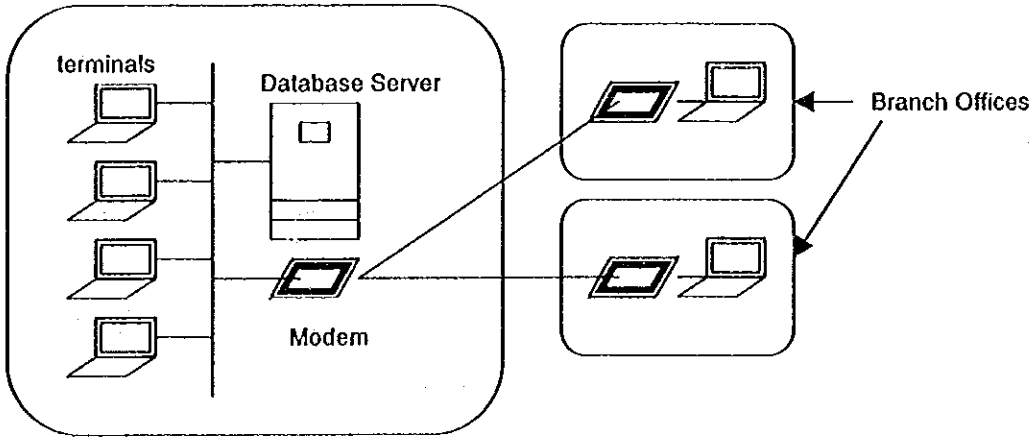
(6) Proposed Tariff Collection System; Networking

In the following paragraphs we discuss the networking components of proposed Tariff Collection System.

The current Tariff Collection System is centralized at Tashkent Vodokanal offices. In the event that staff in charge of meter reading needs to access the computer terminals as proposed in the previous section, it will be convenient of such staff to access the computer terminals at the nearest branch offices to their designated sites of meter reading. It is therefore proposed that a long-term plan be developed to implement a wide area network (WAN) in future.

However, it is noted that this solution may not be feasible at this stage due to the lack of robust telecommunication infrastructure in this country. This proposal should be considered only when the public lines are enhanced and empowered.

Fig 7.5.13 Concept of Proposed Wide Area Network (Long-term Plan)



The proposed WAN should link between the Local Area Network (LAN) at Tashkent Vodokanal Offices and remote computer terminals situated at branch offices spread throughout the City. As for the lines between offices and stations, a simple modem connection is proposed. The leased line facilities, which are widely used in other countries for general purposes, may not be available for common users like Vodokanal. The digitalization of public telephone line is slow in this country and connection by modems is the most realistic solution at this stage.

If the data traffic between the central LAN and remote sites tends to become congested, a remote server should be implemented in the LAN so that the processing volume is dispersed to two servers. The remote access server should be replicated from the database server periodically.

(7) Training

In this section we discuss the aspects of computer training required to design, develop, operate and maintain the Tariff Collection System.

1) Overview

Tashkent Vodokanal intends to utilize its internal human resources for the design, development, operation and maintenance of the Tariff Collection System and other computer systems. For the implementation of new technology and products, the staff must be trained according to their roles.

We propose three types of computer training as specified below, that is, one is the training for systems analysts and programmers, another is the training for systems administrators, and the other is the training for systems users.

2) Training Programs for Systems Analysts and Programmers

The staff who design, develop and maintain the computer systems will require comprehensive skills of operating systems, programming tools and database implemented at Tashkent Vodokanal, while a snap survey revealed that no training program has been offered to the systems analysts and programmers. On-the-job training (OJT) is the chief method of training currently. However, the effectiveness of OJT method is limited while the innovation of information technology never stops.

It is therefore proposed that technical assistance from donor countries be sought so that Tashkent Vodokanal may always catch up with the modern technology. The donor countries like Japan provide technical assistance programs in various fields including information technology, and such programs include training of staff at the donor countries and dispatch of technical consultants. Tashkent Vodokanal should decide a long term plan to import the technical skills from donor communities. When a proposed Tariff Collection System is installed, it is proposed that a technical specialist be attached to Tashkent Vodokanal for a certain period to assist the

Vodokanal's programmers to design and develop the system and that some programmers who have enough qualifications of information technology be dispatched for training programs.

3) Training Programs for Systems Administrators

Secondly, there is a need to provide computer training for systems administrators whose duties will include provision of first line maintenance and basic training for systems users, daily backup of databases, allocation of user-id and password for systems users according to the user level. The systems administrators require fundamental skills of operating systems and database package, and we observe that such training courses are available in this country.

4) Training Programs for Systems Users

Finally, the systems users need to be computer-literate in order to operate the system. In this country, the basic computer training is provided even at primary education, and there will be no need to provide introductory training such as keyboard awareness. All the systems users need is how to use the Tariff Collection System, and it should be provided by programmers and systems administrators.

7.5.2 Master Plans and Feasibility Analysis

In this section the Study Team proposes the master plans of refurbishment of computer systems at Tashkent Vodokanal.

In the first section we propose the following plans. In a short term Vodokanal will need to modify the current Tariff Collection System according to a new tariff table and empower some hardware. But in a long term a system should be almost replaced by a new computer system which adapts a new technology.

We propose the long-term master plan which has two phases, the first phase is the plan towards 2004 and the second phase is the plans towards 2010. The Study Team proposed the first stage target year 2005 in the previous section, the systems regarding sales management therefore should be completed by 2004 and be used from 2005. During the second phase, the overall management system should be

completed. The overall management system should include accounting system, public relation system, and fixed assets system and so on.

Secondly we estimate the approximate costs for the implementation of the computer system in the first phase.

Then we explain the main effects expected by introducing the proposed computer system. We also estimate the number of employees regarded for tariff collection.

(1) Master Plans of Implementation of Proposed Computer Systems

The Master Plan of Improvement of Tariff Collection by Using Computer Aided System for Tashkent Vodokanal is shown in this section. We have two types of proposals: one is for the short-term, and the other is for the long-term strategy.

The long-term strategy has two phases. The first phase extends to Year 2004, when the implementation of water meters installation at all houses and apartment buildings are expected to complete. Since a computer system should be modified according to the users' requirements and business procedures from time to time, the Tariff Collection System should be developed and modified gradually in accordance with the implementation of other proposals of the Study Team.

We also propose the second phase whose goal is Year 2010. In this section however we focus on the first phase.

1) Short-term Plan

In this section we describe a short-term plan to overcome the immediate problems.

i) Modification of Tariff Table

The first priority may be given to the modification of tariff table. The current Tariff Collection System does not conform to the progressive tariff table proposed by the Study Team, and it is necessary to amend some computer programs by the time the new tariff table is im-

plemented. We observe that the programmers of Tashkent Vodokanal are able to understand the logic of new formula and modify the programs by themselves. We estimate that this process will take place within a few weeks.

ii) Replacement and Enhancement of Computer Equipment

We understand that Tashkent Vodokanal faces the severe lack of computer equipment for their systems and that there is a need to add some terminals in order to process the input data. Through this project, some computer equipment is transferred to the counterpart of the Study Team. Each computer has a network interface card so that it can be easily utilized as a computer terminal of the current and proposed Tariff Collection Systems. We propose that more computer equipment be installed gradually, as specified in the Master Plan.

2) Long-term Plan; the First Phase

In this section we describe the long-term plan of Tariff Collection System.

i) Replacement of the Current Tariff Collection System

We propose that the current Tariff Collection System should be replaced by a newer technology in order to improve the systems performance and capability. This component should also include the implementation of new databases with higher capacity, hand-held terminals for meter reading and data exchange with financial institutions through diskettes.

We propose that a waterfall model should be used as the methodology of systems design and development. In this model, the entire project is divided into the steps according to the level of human and computer systems interfaces, that is, the first step starts from the subjects regarding the human interfaces, and the user's requirements are gradually translated into the computer terms such as programming.

Table 7.5.1 Typical Waterfall Model of Systems Development

STEP	DESCRIPTION
Feasibility Study	1) Study of background, current business procedures and computer systems, user requirements, managerial and clerical issues; 2) Analysis of feasibility of the project; 3) Establishment of goal and target; 4) Evaluation of costs and expected benefits; 5) Compilation of Feasibility Study Report.
Requirements Analysis	1) Detailed and supplemental study of background, current business procedures and computer systems, user requirements, managerial and clerical issues; 2) Specifications of systems components including software, hardware and networking; 3) Re-evaluation of costs and expected benefits; 4) Compilation of Specifications Analysis Report.
Detailed Design	1) Development of systems flow and procedures; 2) Segmentation of user requirements into modules; 3) Description of systems functions by modules; 4) Design of databases and files to be used; 5) Design of input screen and printouts.
Development & Testing	1) Development of application software by using programming languages and tools; 2) Functionality test; 3) Performance test.
Transition Arrangement	1) Development and testing of conversion programs; 2) Data conversion from old computer systems; 3) Data input from manual records.
Training	1) Training for systems users;

STEP	DESCRIPTION
	2)Training for systems administrators.

We propose the development of the proposed Tariff Collection System should be divided into six stages, namely, Requirements Analysis, Fund Raising, Detailed Design, Procurement of Hardware and Networking, Development and Testing, and Transition Arrangements and Training.

a Requirements Analysis

We propose that the Requirements Analysis be conducted after the completion of JICA Study and approval of our countermeasures and solutions. During this stage, the following tasks should be undertaken: -

- review of countermeasures proposed by JICA Team;
- collection of supplemental information of the current Tariff Collection System through interviews with systems developers and users, as well as study of the input screen, source code, output list and related documentation;
- collection of supplemental information of the future requirements pertaining to the future Tariff Collection System;
- detailed estimation of system's performance and data volume at least for the next five years;
- final specifications of software, hardware and networking and installation plans. These should include the database, operating systems, programming tools to be used, type and quantity of hardware, networking topology and range;
- strategy of systems development;
- necessary arrangements on business procedures including the impacts on other computer systems;
- detailed training plans;
- possible sources of funds to the project;
- expected effects from the project;

We propose that external consultants who are familiar with business on Water Works and computerized tariff collection or billing systems should be engaged to organize the Requirements Analysis. The staff of Tashkent Vodokanal, in conjunction with some local programmers, should also be involved in this stage. We also propose that during this stage, a prototype application system should be developed so that the system users would be able to imagine the images of the future Tariff Collection System. The output of this stage should be compiled as a Specifications Analysis Report, which would be used to seek sources of funding. We estimate that this stage will take approximately five to eight months.

b Fund Raising

We estimate the total initial cost as specified in the next section. Soon after the Requirements Analysis stage, there is a need for the authorities concerned to seek the source of funding for the project. The above-mentioned Specifications Analysis Report or an alternative document which clearly describes the project magnitude in terms of financial investments should be used to seek the sources of fund. We propose under the current circumstances that the donor community, whether bilateral or multilateral, be requested to sponsor the entire project, because the total estimate cost is quite huge. We estimate that this stage will take place approximately three to twelve months, depending on the priority of this project.

c Detailed Design

The stage of Detailed Design should be conducted in parallel with above-stated Fund Raising. During this stage, the following tasks will be undertaken: -

- review of Specifications Analysis Report;
- development of systems and procedural flow chart;
- description of systems functions;
- design of databases and files;
- design of input screens, printouts and other human-computer interfaces.

We propose that the same technical staff who would conduct the previous stage, i.e., Requirements Analysis, be continuously engaged in the Detailed Design, so as to maintain the consistency of specifications of the computer systems. We estimate that this stage will take place approximately six to nine months.

d Procurement of Hardware and Networking

Some computer equipment should be procured prior to the development of application systems. We propose that the procurement and installation of computer hardware and networking be undertaken at one time, as it will not be a huge installation. We also propose that a local supplier be engaged to install the computer equipment and maintain the systems thereafter to ensure smooth operations. We estimate that this stage will take place approximately three to five months, including the selection process of supplier(s).

e Development and Testing

After the detailed design and installation of computer equipment are completed, the development and testing of the application system (Tariff Collection System) may start. The following tasks should be undertaken during this stage: -

- programming;
- systems functions test;
- systems performance test.

This stage should be undertaken by the systems analysts and programmers of Tashkent Vodokanal, who should be assisted by external consultants if necessary. It is needless to say that the systems analysts and programmers should have knowledge on software products to be used for programming, such as database software, operating systems and programming tools. We propose that their training should be provided at least six months before this stage starts. If the training is not available locally, we propose that the computer training courses be provided by some donor communities.

f Transition Arrangements

After completion of thorough test of the proposed computer systems, the stage of transition arrangements will take place. This component will consist of two main elements, namely, one is data transfer from the current system and the other is parallel operation with the current system.

- Data Transfer from the Current System

The current system has a database which holds a lot of information to be transferred to the proposed system. There are two methods to transfer the data, namely, one is the manual data capture and the other is to use computer programs for data transfer.

The manual data capture is tiresome and we propose this option only if it is difficult or impossible to develop the data transfer programs. The main disadvantages of manual data capture are that it will take a lot of time to complete the data transfer and that there is a lot of room of capture errors. Therefore we propose that some data conversion programs be developed and utilized for smooth databases transfer. We foresee that this stage will take place approximately three to six months until the data verification is completed.

- Parallel Operation with the Current System

We propose that the current and proposed systems be operated concurrently for a several terms to verify that the proposed system produces the correct results. The popular method to verify the results is to compare the outputs between the current and proposed systems. We estimate that the parallel operation will take place approximately one month, if no crucial problem of the proposed system occurs.

g Training

It is essential to provide adequate training to the personnel of Tashkent Vodokanal in order for them to utilize the computer systems effectively and efficiently. We propose the training courses for systems developers, systems administrators and systems users re-

spectively as specified in the previous sections.

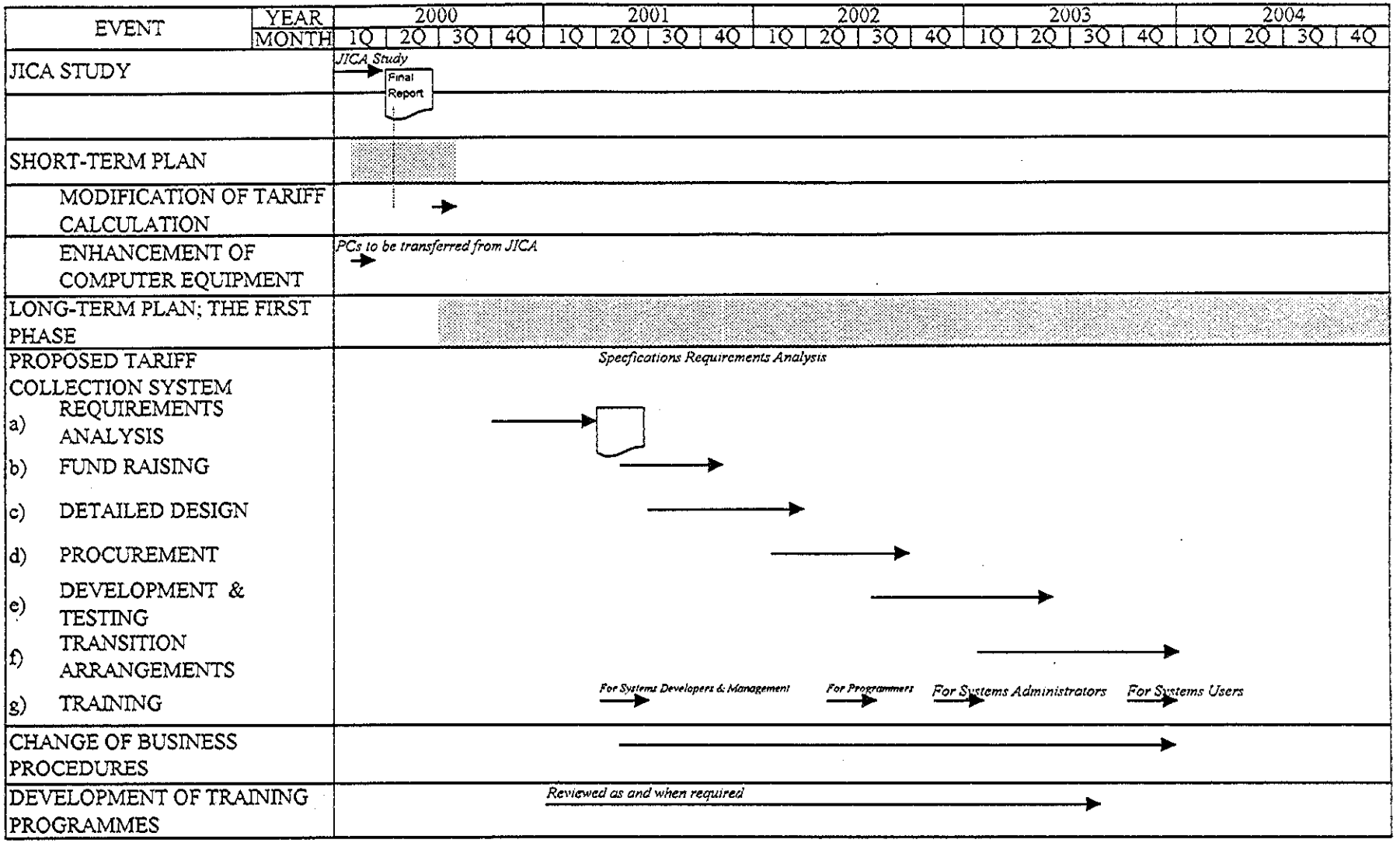
ii) Change of Business Procedures

We believe that any computerization project as large as this case should be implemented in concurrent with the change of business procedures including restructuring of Tashkent Vodokanal, review of personnel's roles, etc. We described some proposals in the previous sections, and it should be implemented in accordance with the implementation of proposed computer systems.

iii) Development of Training Programs

The information and computer technology is innovating day by day. It is therefore necessary for Tashkent Vodokanal staff to catch up with the modern ideas of computers to prevent the systems from being obsolete. We specified some training programs towards year 2004, but we also propose that they be reviewed every year in accordance with the change of information technology and user requirements.

Fig 7.5.14 Master Plans of Implementation of Proposed Computer Systems



3) Long-term Plan; the Second Phase

The computerization of Tashkent Vodokanal should not be restricted to the Tariff Collection System, but it should be extended to the overall business functions of the organization. We believe that the expertise acquired through the implementation of proposed Tariff Collection System will greatly contribute to the further design and development of other computer systems at Tashkent Vodokanal.

For example, the following ideas should be considered after the completion of proposed Tariff Collection System.

i) Improvement of Accounting Systems

On the managerial side, we propose that the accounting system be computerized in accordance with the implementation of administrative accounts. Namely, the computer system should produce various statistics and indexes pertaining to the accounts of Tashkent Vodokanal, for management to determine the financial plans of sales and investments.

ii) Public Relations

We emphasize the importance of water users' awareness towards saving water. The computer systems may be utilized for public relations, for example, public relations through Internet web-sites and production of leaflets regarding the campaign of saving water.

iii) Improvement of Salary Calculation System

We also propose that the current Salary Calculation System be enhanced to the Personnel System. The proposed Personnel System should process not only the information regarding the salary of Tashkent Vodokanal's employees, but also comprehensive information pertaining to the personnel, namely, recruitment, appraisals, qualifications, penalties, etc., in order for management to determine development plans in terms of human resources.

vi) Linkage with Other Vodokanals and External Organizations

We also propose that, if the plight of public telephone lines in the country improves, the

computer systems at Vodokanal be connected with other Vodokanals and external organizations such as banks, financial institutions, major water users, and government. We suggest that initially data be exchanged through floppy disks or other medium, but in the future on condition that security firewall is appropriately set up Tashkent Vodokanal should connect with other organization and exchange the important information.

(2) Estimated Costs

In this section we estimate the total cost of reform of the Tariff Collection System at Tashkent Vodokanal according to the specifications described in the previous sections. It is however noted that this estimate is tentative and that it should be scrutinized after thorough analysis at Requirements Analysis.

For initial cost, we divide the cost elements by stages described in proposed Master Plan, namely, Requirements Analysis, Fund Raising, Detailed Design, Procurement, Development and Testing, Transitions Arrangements and Training.

As we explain in the previous section, proposed Tariff Collection System should expand to Management System in the future and its data should be used for variable purposes. Because Requirements Analysis should especially consider not only tariff collection but also customer management, repair control, and management, we estimate the initial cost more than only tariff collection system. Even Detailed Design should consider other developing systems, for example interface, items of database, or networking.

The detail of estimation is described in Supporting Report. The following assumptions were made to calculate the cost.

1) Initial Cost

We estimate that the total initial cost is around USD 1,946,400 and the breakdown is listed as below.

i) Requirements Analysis

We assume that three expatriate consultant as a supervisor or an advisor and six local consultants as systems analysts will be engaged for three to six months. We estimate that this stage will cost approximately USD 522,000 and it covers more than only Tariff Collection System.

ii) Fund Raising

We assume that this stage will be carried out by internal human resources only. Hence no remarkable cost items are envisaged.

iii) Detailed Design

We assume that one expatriate consultant and six local consultant who have knowledge and experience on design of similar application systems will be engaged for six to nine months. We estimate that this stage will cost approximately USD 456,000.

vi) Procurement

We assume that meter reading takes place monthly for industry and communal services users and quarterly for house and apartment users respectively, and that one computer terminal will be distributed as per two staff who are supposed to access the computer system. The following table indicates the quantities of computer hardware per item. We estimate that this stage will cost approximately USD 488,400.

Table 7.5.3 Computer Hardware for the Proposed Tariff Collection System

Item	Quantity
Database Server with Backup Facilities	2
Computer Terminals (PC)	40
Computer Terminals (Hand-held PC for meter reading)	75
Fundamental Software (Operating System, Database, Programming Tool, Anti-virus etc.)	-
High-speed Line Printers	4
LAN Equipment (including Routers, Hubs, Cables, etc)	-
Security Equipment including UPS	-

v) Development and Testing

We assume that development and testing will be carried out by trained systems analysts and programmers who are staff of Tashkent Vodokanal. One or two external advisory consultants will be engaged for about eight months. In addition to that, there is a need to develop emulation software for hand-held terminals to conform to Russian language. It will be the extra cost because we think that it is too technical for Tashkent Vodokanal's programmers to develop such software. We estimate that this stage will cost approximately USD 390,000.

vi) Transition Arrangements and Training

We assume that two systems developers will be dispatched for overseas training whilst three systems administrators are to receive local training. We estimate that this stage will cost approximately USD 90,000.

2) Recurrent Cost for Operation and Maintenance

We estimate that the annual recurrent cost for operation and maintenance of the proposed Tariff Collection System is around USD 87,768.

i) Hardware Maintenance

We assume that the annual cost for hardware is 10% of its acquisition cost. Therefore we estimate that it will cost approximately USD 48,840.

ii) Software Maintenance

We assume that the application software will be maintained by systems analysts and programmers of Tashkent Vodokanal, and thus no additional cost is envisaged.

iii) Consumable and Necessary Arrangements

We assume that the annual cost for consumable including paper, ink cartridge, backup tapes, etc., and other necessary arrangements such as improvement of physical security is 2% of total initial cost. Therefore we estimate that it will cost approximately USD 38,928.

(3) Expected Benefits

It will need a huge investment to develop computer systems. It is necessary to analyze the benefits of introduction of the computer systems, although it is difficult to estimate the exact benefit. There are two types of benefit: one is the qualitative benefit, another is the quantitative benefit. The quantitative benefit is usually more difficult to estimate.

It may not necessarily be more valuable to be able to estimate the quantitative benefit. And we do not only decide investment because of the quantitative analysis effect. The organization may sometimes decide to investment in order to other factor, e.g. grade-up of control, management.

In this section we explain the main benefits expected from the introduction of computer systems: improvement of services, improvement of management, and reduction of the personnel expenses. There will be also a lot of other effects, for example, improvement of employees' morals, and improvement of quality of works by using computer system. In this section we detail such benefits.

1) Improvement of Services

Tashkent is a big city over 2.2 million populations. After each household is equipped with a water meter all over the city, it will be almost impossible to work manually, especially calculation and data storage.

The computer system will facilitate quick response to inquiry from users about tariff etc. A common database of the computer system will facilitate quick response to the request for repair of meter, pipes or equipment. Currently, Vodokanal maintains manual information for data search and transfer

The computer system will also decrease human errors, and it will result in good relationship with users. Even if a new staff serves particular users, it will be easy and smooth to take over the work from the predecessor because the computer system keeps all information about the users.

2) Improvement of Management

It will be also effective for Vodokanal management to introduce computer system. We explain the benefit at point of three management levels

i) Top Management

Top management will be able to get more information for their work. Since it is possible to know the necessary information to meter reading data, receivable data or collection data additionally, he will be able to get more valuable information. And it will be also possible to calculate various methods by using the data of established. For example, about the aging list which shows the receivable account in line up to an old order from the occurrence day of credit to present day, the computer system will be able to total with the various method such as house type difference, user difference, or area difference. These documents will help top management to make a good decision.

Moreover top management will be able to get the information earlier. Currently it takes long time to submit the information to top management, because most procedures are done manually, e.g. controllers write down the information into the paper, write the information into notebook and calculate them monthly. But after introduction of computer systems, the information of meter reading will be inputted into the computer on the same day, and calculation will be done by the computer system daily.

ii) Middle Management

The computer system should make personnel management more effective. Because middle management will be able to monitor the situation of meter reading or tariff collection, if he notices a problem on progress, he will be able to arrange adequate human resources easily and take action earlier. And he will be able to easily come up with strategic ideas requested from the top management.

The middle management will be able to accurately direct the plan to the subordinate staff. He should monitor the situation of meter reading and tariff collection, if he notices a problem, he will be also able to direct the action plan to the subordinate staff in charge.

And middle management will be able to communicate externally as well as internally in the section, by having the shared database. So middle management will be able to cooperate with each other across their sections.

iii) The Staff in Charge

The staff in charge will be released from complicated and tiresome jobs. The computer system will be able to conduct routine work instead of the staff, transcription of meter reading records, calculation, check easy cases. Naturally, careless mistakes will decrease and the staff can devote themselves to more important works.

If the staff is engages in not routine job but important work, the quality of work at whole Vodokanal should be improved.

3) Reduction of the Personnel Expenses

We assume the following conditions to calculate the expected personnel expenses: Water meters will be installed for all users, Vodokanal will conduct meter reading every month for industry and communal service users, once in three months for population users, and the condition of works is the almost same as current one. The Study Team then estimates the number of

water meters in future. We multiply the current total number of controllers and staff at Water Sales Department according to the estimation. The estimated number of needed employees is 484.

It will be impossible to continue to work and supply appropriately service by only about 100 staff in future. The number of employees will increase, though it may not be as many as 484.

Tashkent Vodokanal should not avoid introducing the computer system to conduct more meter reading, supply better services and improve management.

We estimate the number of tariff collection staff in 2004, when the computer systems are scheduled to complete and improvement of business procedure is done, as follows: 73 for the staff in charge of meter reading, 5 for the staff in charge of billing covering all sections, 14 for tariff collection and 24 for outstanding tariff control. These estimated numbers will depend on various parameters, for example, the elapse time of meter reading per one day one person, the rate of account receivable inconsistent with cash-in information from bank, rate of outstanding cases.

With proposed computer systems and tariff collection procedure, it will be possible to supply better services to user by only 120 to 140 staff. We estimate approximately USD 4.5 million* reductions of personnel expenses in ten years.

Note*: (484 - 130) x 16,000sum x 12months – 87,768sum) x 10years / 150sum = 4,525,349

7.6 Users' Awareness on Water conservation and User Participation

7.6.1 Our Recommendations for the Improvement

We identify the following objectives on our recommendation for Tashkent City Vodokanal in order to improve the present situation of Tashkent City Vodokanal.

(1) Objectives

1) To encourage users to save water and at the same time implement the metered rate system in order to decrease total annual water consumption volume to approximately half of the present level by conducting educational publicity from multilateral view points (i.e. environmental protection, efficiency of public services, economy for users, moral issues, etc.).

2) To make an earnest attempt at changing the present management system into an user participation style with Vodokanal management in order to develop both quality and efficiency of the public services on the water works sectors, and to move toward the self-supporting of Vodokanal, by introducing a mutual communication function with outsiders, such as users, and disclosing water works management in order to reflect positively valuable opinions from users for better management.

(2) Main Recommendations

We recommend 6 main proposals as follows in order to attain the objects above.

1) Establishment of a Public Relation section linked with the management strategy

2) Disclose issues of the annual Vodokanal's management report

3) Conduct the water conservation campaign effectively

4) School education for the young users to understand the need of water conservation from an early age.

5) Social education & opinion forums for opinion leaders

6) Provide useful information for increasing the users' contentment

7.6.2 Key Issues of Main Proposals

(1) Establish of Public Relation section linked with the management strategy

Vodokanal should establish a public relation section (the PR section: Fig 7.6.2.1) in the sales division for propelling a user participation management style. The PR section should focus on corporate communication work as a function of the board of management of Vodokanal and linked with management's visions for future improvement.

1) Mission

The PR section should have two missions below.

i) To effectively conduct any corporate communication activity in order for outsiders to be able to support and understand correctly Vodokanal management messages.

ii) To hear users messages about water works and report their valuable opinions in order for Vodokanal management to give feed back for better management decisions.

2) Staff Arrangement

The PR section should have a few Vodokanal staff members to be in charge of following 3 main working functions. They should work and cooperate with sales controllers. A manager of the PR section should supervise them to work systematically.

3) Main Working Functions

In order to achieve the mission of the PR section above, the PR section staff should devote themselves to the following 3 working functions,

i) Publicity

The publicity function should be aimed at two points. One is to make all employees understand management policies and measures that top management has decided. Another is to inform outsiders (i.e. users and government concerned, etc.) of any information Vodokanal requests so that users understand. The publicity work details are as follows:

a. Issuing annual management report

b. Providing useful information

c. Educating users

ii) Public Hearing

The public hearing function should be aimed to search for any signals from users (i.e. awareness, opinion, complain, request, etc.) about waterworks in order to reflect them in Vodokanal management policies and measures.

The public hearing work details are as follows:

a. Holding communication forums with the opinion leaders

b. Question and Answer corners

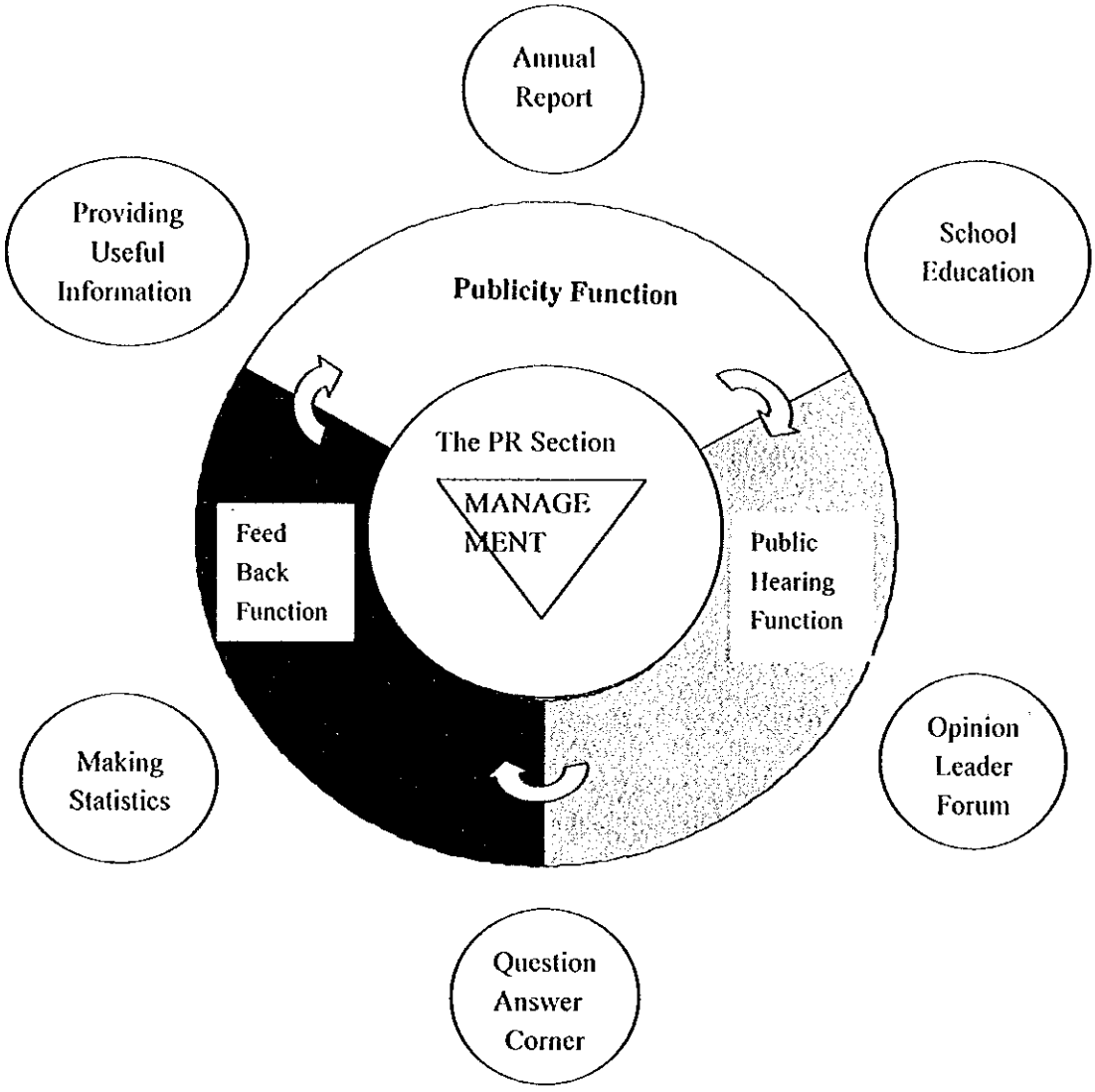
c. Checking users' sensitivity to Vodokanal messages

d. Monitoring users' requests of Vodokanal to improve services

iii) Feed Back to Management

The feed back function should analyze users' messages collected and make a report in order for Vodakanal management easily to find more practical ways of taking users' valuable opinions into consideration. This function also covers making statistics of users needs for future marketing or for utilizing future planning

Fig 7.6.1 The PR Section



(2) Disclose Issues of the Annual Vodokanal's Management Report

Vodokanal should issue the annual management report (Fig 7.6..2) to disclose their management.

1) Effect

We can show following effects on issuing an annual report:

i) To help each manager or staff clearly understand the working mission of their own section linked with other working sections toward management vision in order to improve efficiency of projects.

ii) To promote a proud feeling for Vodokanal corporate identification among staff.

iii) To have better understanding by outsiders regarding Vodokanal's management visions and key issues on management.

iv) To promote efficiency of all staff by the disclosing of management performance to outsiders.

2) Contents of Annual Report

The management report should be composed of key issues on Vodokanal management as follows:

i) Management visions

Vodokanal should state their management visions what they wish to be for the next quarter century based on public missions of waterworks (i.e. the reliable waterworks that meets user demand for safe and good quality, or the environmentally friendly waterworks that delivers safe and good quality water in a fair and economical way, etc).

This also shows in brief, basic waterworks improvement policies with basic measures that Vodokanal has decided with government concerned.

ii) Present condition of the Vodokanal

Present condition should be presented as following key sections.

a. Outline of the Tashkent City Vodokanal

This shows following items in brief: organization and system of Vodokanal, general water supply data (i.e. service area, population served, water supply service ratio, total production capacity etc.).

b. Outline of facilities

This shows the following items in brief: water resources facilities, purification plants, water supplying stations, transmission/ distribution facilities, service installations

c. Water quality management

This shows how Vodokanal preserves the water quality and supplies safe and good quality water.

d. Service activities

This shows the following items in brief: tariff collection activities, system of water tariffs, maintenance for leakage and unexpected accidents, public relations activities, etc.

e. Technical development

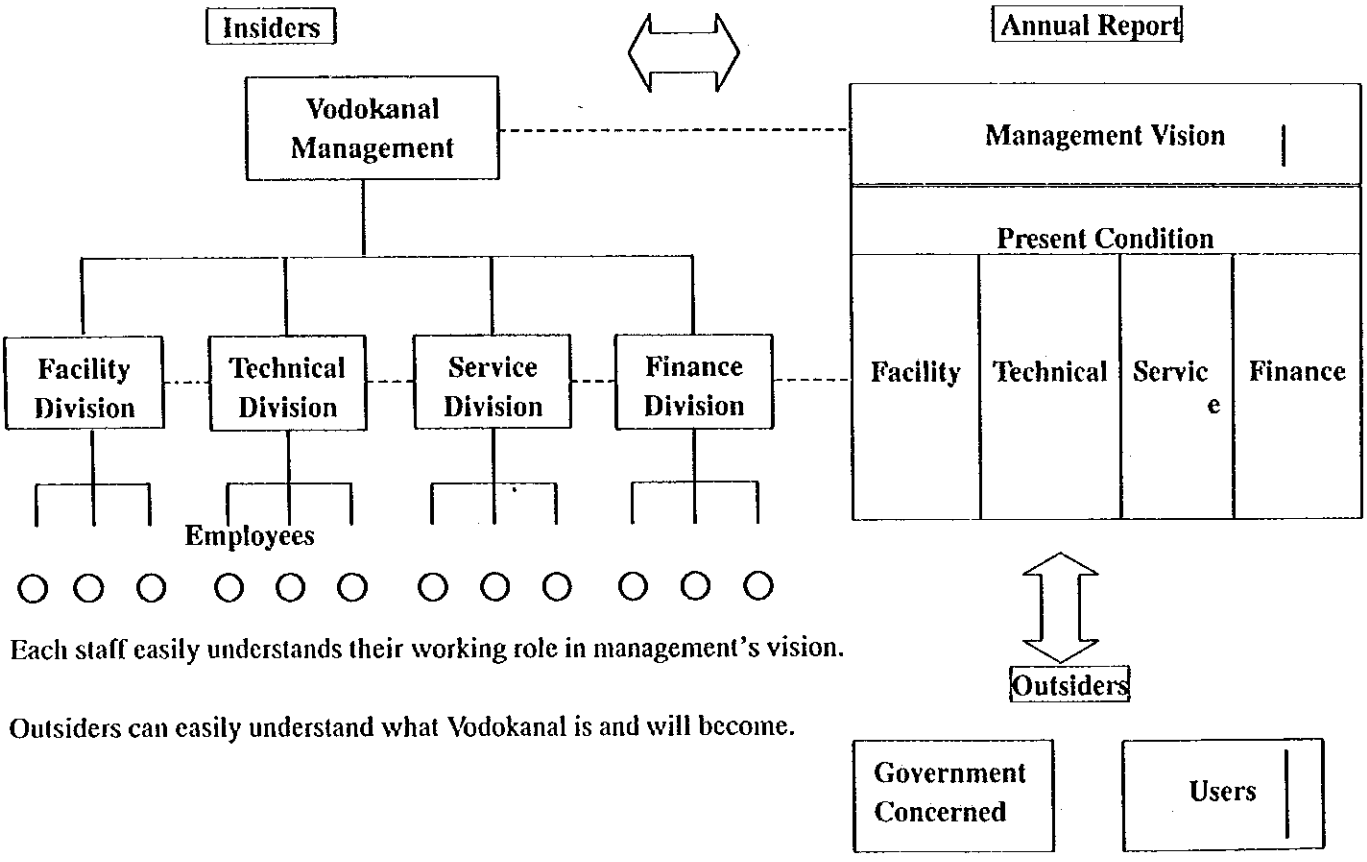
This shows in brief the technical development policy of Vodokanal and main achievements of technical development.

f. Finance

This shows in brief a financial system of how Vodokanal finances their management and discloses the performance of annual financial operation with the balance sheet, profit and loss statement and cash flow statement.

Fig 7.6.2.2

Annual Report



Each staff easily understands their working role in management's vision.

Outsiders can easily understand what Vodokanal is and will become.

(3) Water Conservation Campaign

1) Objective

Vodokanal should educate users to understand to stop wasting water and to have water conservation as a custom.

2) Effect

To increase financial profit from wasted water if the water can be consumed properly and charged.

To increase public social profits of environmental protection by utilizing water resources properly.

3) Approach

Vodokanal should conduct the Water conservation Campaign with new approaches, the so-called the mixed communication style, from a more effective promotion's point of view. The campaign should be planned to be conducted to a well segmented target area by an effective mixed communication approach.

i) Target Segment

Target area of users should be divided specifically as follows:

- General Mass Users
- Opinion Leaders (See (5))
- Children aged under 16

ii) Communication Approach

The Water conservation Campaign should utilize the following communication ways respectively for the above target areas:

a. Mass media

(TV/radio/newspapers/poster/newsletters) are effective communication tools for sending the messages to the general mass users.

b. Direct communication

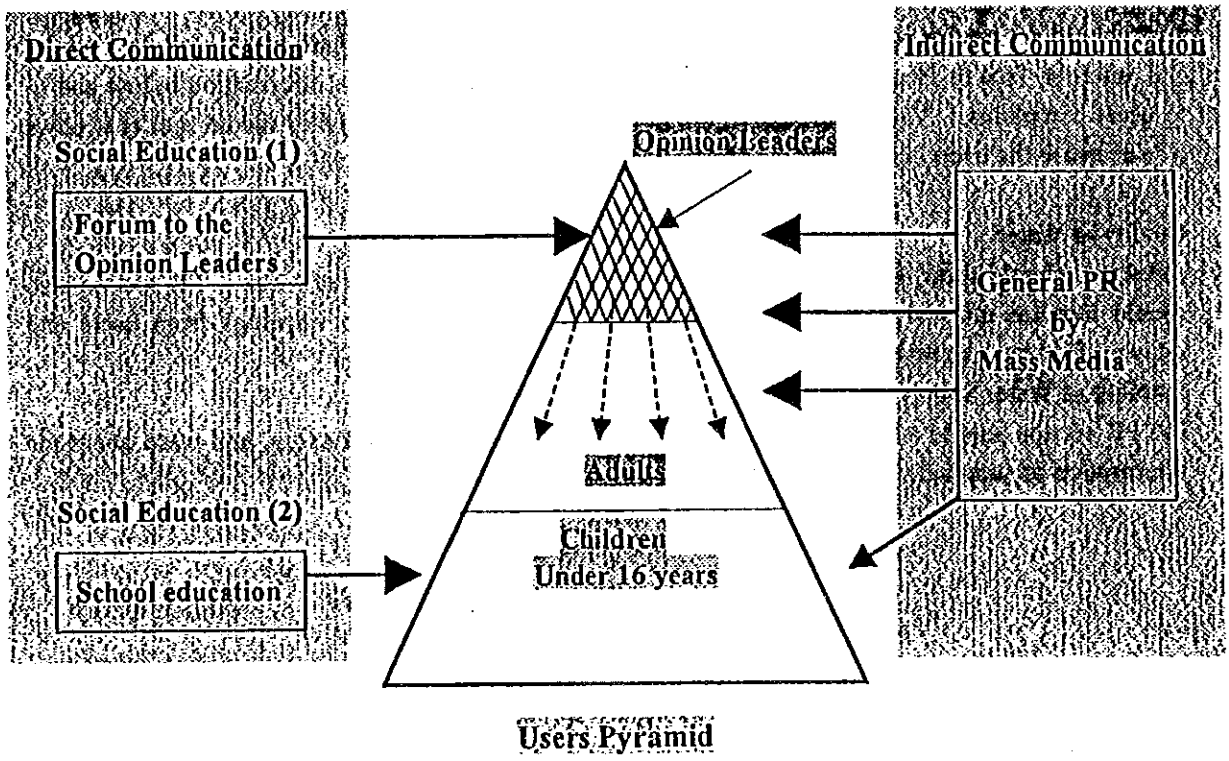
The following methods of direct communication between Vodokanal and users are effective for opinion leaders and students.

- Social education & opinion forum for opinion leaders (see (5) below)

- School education for the young users to understand the need for water conservation from an early age (see (4) below)

Fig 7.6.3 Water Conservation Campaign

- Mixed communication style -

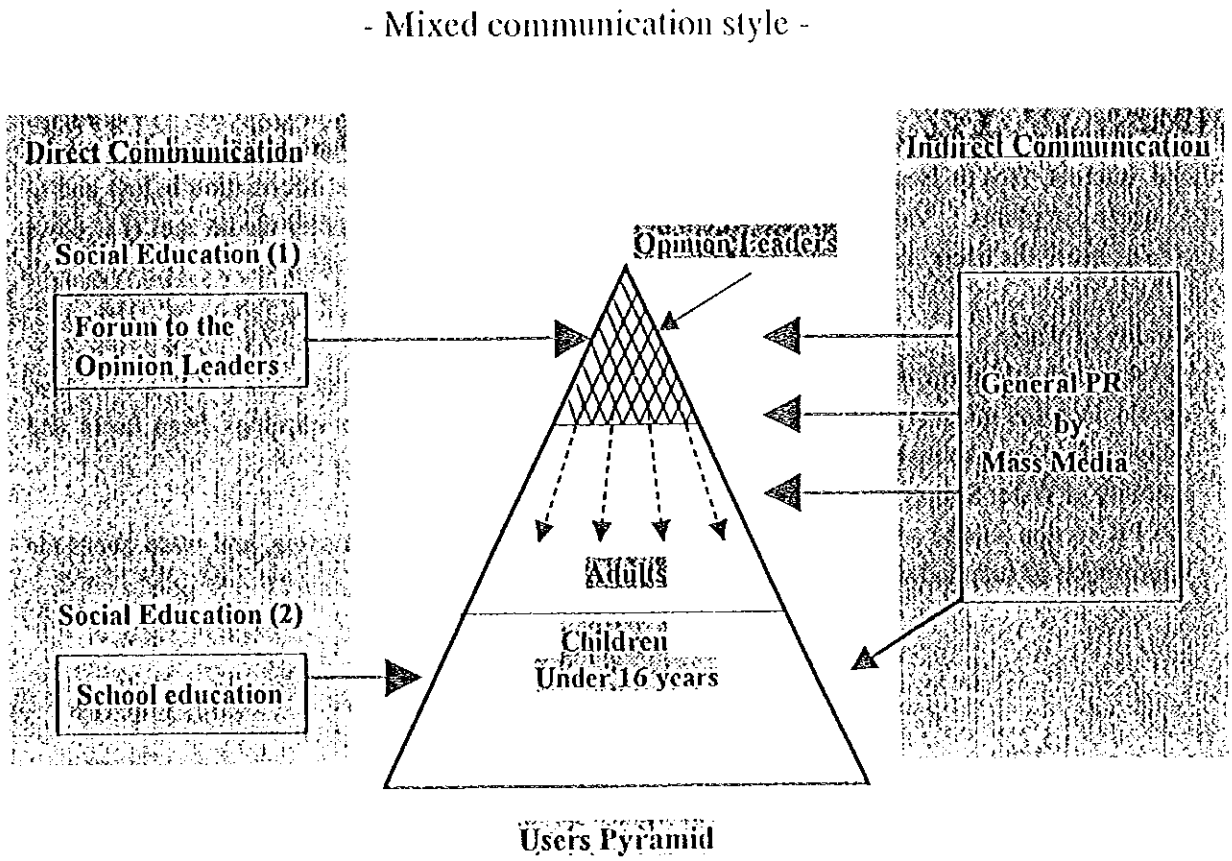


(4) School Education for the Young Users

Vodokanal PR staff should visit secondary schools to give lectures about waterworks and water conservation issues for younger users to understand the social public interests.

Vodokanal should also invite secondary students to their water supply facilities to help them understand how the water supply business works, how much it costs to make supplied water from natural resources (such as rain, snow and under ground water), and how necessary water conservation is for the protection of the earth's environment, as well as, for our social benefits.

Fig 7.6.3 Water Conservation Campaign



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(5) Social Education & Opinion Forum for Opinion Leaders

Vodokanal should hold social education forums or opinion forums for opinion leaders. It is important to make opinion leaders understand the key issues of Vodokanal management. The opinion leader is defined as a leader of a social group who can influence members' opinions or minds through daily direct communication. In case of Tashkent city, the opinion leaders may be considered to be chiefs of Makhallinsky committee for residents in local area, companies' directors for employees, school teachers for children, parents for family members, and so on. If these opinion leaders understand the need of water conservation and are willing to try, other members of his or her society, family, company will follow his or her behavior. The opinion leaders' actions to save water will impact on whole existing user groups to cooperate to save water.

The social education forums for opinion leaders can be arranged for example as follows:

1) Inviting to Vodokanal facilities

2) Having seminars with videos

3) Discussing key issues and exchanging opinions

4) Conducting questionnaire surveys to get their opinions (for checking whether they change or not)

(6) Providing Useful Information for Increasing the Users' Content

Vodokanal should set up the question & answer corners on the PR section where users can have easy access by telephone, internet, face to face talking, in order to provide useful water works information below and to listen to users complaints. Vodokanal should utilize this function as well as other media tools (i.e. news letters) to decrease the users' discontent, and to increase their contentment.

1) Quality of Water

Vodokanal should show users the results of the examination of the quality of water. The PR section also should monitor unusual issues on the quality of water by listening to warnings from users and relaying feed back to management to reduce water work loss in an early stage.

2) Stability of Water Supply

The PR section should announce the schedule of the water supply construction, and warn about the interruption of supplied water to users in advance.