

**CHAPTER 8**  
**FINANCIAL AND**  
**ECONOMIC ANALYSIS**



## **CHAPTER 8 FINANCIAL AND ECONOMIC ANALYSIS**

### **8.1 Present Financial Situation**

#### **(1) Financial Situation of ASA**

##### **1) Water Sales**

Water sales include both metered and non-metered sales. Metered sales are based on the tariff multiplied by the quantity measured by the meter, while non-metered sales are based on the tariff multiplied by the assumed consumption.

##### **2) Production Unit Costs**

The main components of the water production cost are personnel expenses and power costs, accounting for around 60 % of the total O&M cost. The population served by one employee of ASA is 350 as shown in Table 10.1.2. This reveals the fact that the productivity per employee is low when compared to other developing countries. The power cost is the cost of electricity needed to operate the various water supply facilities. Field surveys conducted in this Study reported that a high percentage of the electricity consumption is caused by inefficient pump facilities.

##### **3) Losses and Cash Ratio (cash + cash-equivalent assets / current liabilities)**

ASA has appropriated losses since 1997. These losses have cumulated and caused a decrease in net assets and accordingly, the cash ratio has been low since 1997. Typically, a ratio of more than 0.2 is favorable. This indicates that ASA does not have enough cash or cash-equivalent assets to pay its current liabilities. Under these circumstances, ASA, in a sense, is insolvent as an independent company.

##### **4) Inflation Accounting**

In spite of the fact that there has been a drastic increase in prices in Kazakhstan from 1997 to 2000, ASA has not revised the acquisition cost of fixed assets. Therefore, this acquisition cost does not reflect the current costs and the amount of depreciation does not match the current price level. It is clear that the present method of depreciation based on the historical acquisition costs cannot reserve sufficient funds to replace the fixed assets.

#### 5) Accounting System

The Study Team encountered difficulty in determining the availability of data for purposes of financial situation assessment of ASA. The accounting system requires improvement for timely provision of the financial data in order to assess the capability of the present management of ASA.

#### (2) Water Tariffs and Tariff Collection System

##### 1) Current Tariff

Followings are the main features of current tariff situations.

- Flat rate water charge is applied for the majority of customers because there are very few water meters installed.
- Analysis of current tariffs, setting method and calculations shows that full cost recovery cannot be presently achieved

##### 2) Present Situation of Tariff Collection

The operating cycle for the normal collection procedures should be approximately two months, but according to data as of end of June 2000, the turnover period for accounts receivable of ASA was 18.9 months, resulting in a significant amount of overdue water charges.

##### 3) Ability to Pay for Connected Users

The Study team was informed by the Head of the Sales Department that the majority of the unpaid water bills were from low-income consumers, which include unemployed persons. According to statistic data of Astana City and the affordability results in past water projects in other countries, the current water service charge may not be a burden to the majority of consumers but may be a burden for low-income customers. In order to eliminate unpaid overdue charges and compensate for low-income customers, Astana City or Republican Government may have to take measures such as providing subsidies for the payment of utility services.

##### 4) Problems with Tariff Collection

The current tariff collection system has some problems in terms of customers with overdue accounts. Stopping the water supply to delinquent users would be an effective countermeasure for overdue bills in principle. However because of the construction practices adopted in the past it is practically impossible to cut supply to single apartments without shutting the supply to

the whole block. In addition to this technical difficulty ASA is also under pressure from a political and moral point of view.

**(3) Governmental Subsidies for ASA**

Akimat of the Astana City acting through a subordinated entity of Astana-Finance is currently responsible for financing all major capital investments of ASA and therefore, the funds necessary for the capital investments are accumulated by Akimat. Financing of the capital investments of ASA can be also carried out directly by the Republican Budget or by ASA itself.

As part of the social safety net, allowances on payments for communal services including water bills should be provided to certain categories of people of the City (e.g. invalids, veterans, etc.) in accordance with the current legislation. For financial accounting purposes, these allowances represent book losses to ASA.

**(4) Financial Condition of the City and the Republic of Kazakhstan**

The official data shows that Astana City has a balanced financial budget. This balanced figure is mainly due to assistance by the central financial. Furthermore, Astana City has been enjoying the benefits of having the status of Special Economic Zone since January 1, 1997. This status however, was abolished at the end of December 2000. At the moment it is difficult to forecast what the consequences for the City budget will be by this change.

Future perspectives of continuing the existing practice to subsidize ASA depend, first of all, on the general financial condition and in particular the external debt of the Republic of Kazakhstan. As it follows from the data about the Republic of Kazakhstan, the gross foreign debt of Kazakhstan compared to the GDP has experienced significant increase in the past years, even though the situation with state finances has been improved.

**(5) Recommendations Proposed for ASA**

- 1) **Tariff System**
  - a) **Consumption-Based Water Charge System**

Water meters should be installed in all households and a progressive consumption-based charge should be introduced. This will in turn, strengthen the water saving consciousness of the user.

b) Full Cost Recovery

At present, the tariff is not set to recover the overall cost for water and sewerage services. In calculating the tariff needed to improve the financial situation of ASA, all the components should be included in the tariff setting calculation.

2) Improvement of ASA's Management

a) Decrease in Operation and Management (O&M) Costs through Improvement of Facilities

The O&M cost has become high because of the high leakage ratio and advanced deterioration of facilities described in earlier chapters. In order to decrease the O&M cost, improvement and rehabilitation of existing facilities are needed

b) Complete Application of Inflation Accounting

Since ASA does not apply inflation accounting in a timely manner, the book value of fixed assets does not reflect the current value, which leads to the lack of depreciation charge. Depreciation charges of current price levels have the useful function of retaining enough funds for future investments and rehabilitation of facilities. Therefore, inflation accounting should be applied in a timely manner.

c) Accounting System

The accounting system needs to be further improved for timely provision of the financial data. The timely provision of financial data is indispensable to assess the strength of the present management of ASA. As an element of improving the creditworthiness of ASA, Akimat needs to employ an internationally recognized audit company to carry out a full scope audit of ASA.

d) Accountability to Customers

The management of ASA is not adequately accountable to the public for its financial and operating results. Therefore, more transparency to the public in respect to the financial and operating results of ASA is required.

### 3) Subsidy for ASA from Akimat

The subsidy from Akimat to reimburse operating losses of ASA should be abandoned in the future, as revenue from taxes should not compensate inefficient management. Tariffs should be set at such a level that would allow ASA to operate at least at break-even and any subsidies from the budget should be redirected to the low-income groups. In other words, all customers, including invalids and veterans, etc., should pay the full tariff to ASA and be subsidized thereafter, based on their level of income.

## 8.2 Evaluation of the Project

### (1) The Purpose of the Evaluation

An evaluation of the proposed project is necessary to determine whether the support of international funding agencies can have a positive effect on its implementation. Financial Internal Rate of Return (FIRR) calculations were carried out to evaluate the feasibility and sustainability of the project.

### (2) Basic Assumptions

The following general assumptions have been made for the economic and financial evaluation of the project:

- i) The cash flows presented are only those of ASA. Evaluation is carried out in nominal US Dollars at current prices with no adjustments for the effect of inflation and exchange rate fluctuations.
- ii) The average economic life of new assets provided under the project is 40 years after completion. Existing facilities will have reduced production as a result of deterioration and will be unable to provide any services after 2020.
- iii) The project is aimed at providing water supply and sewerage services only for the residents living within the area of the City to be developed by the year of 2010.
- iv) A "Do Nothing" option is considered for comparison purposes. This option will assume that the proposed project will not be realised and no further capital investment will be carried out. The existing facilities will be used until the cost of operation and repairs exceed the revenue generated and is assumed to occur in 2020.

### **8.3 Financial Analysis of the Project**

#### **(1) Assumptions and Considerations**

##### **1) Financial Revenue**

The "With Project Option" will increase water sales, decrease O&M costs. Water sales will increase as a result of more efficient monitoring of sales through the installation of water meters and additional volumes of water for sale following reduction in leakage. Cost of sales will decrease as O&M costs are reduced following improved leakage and system reliability. On the other hand water volume available for sale will decrease as system availability and reliability decreases and leakage increases in the "Without Project Option". Cost of sales will increase because of increasing maintenance and leakage.

##### **2) Financial Costs**

The financial capital cost for the "With Project Option" is estimated at US Dollars 282.4 million (excluding price contingency).

Variable O&M unit cost per m<sup>3</sup> in the "With Project Option" after completion of construction have been calculated on the basis of projected energy usage and repair costs and is estimated at US Dollars 0.067, assuming that existing energy and repair costs will stay the same. In the case of "Without Project Option", variable O&M unit cost per m<sup>3</sup> is estimated at US Dollars 0.087 due to the increase in repair costs. However, the annual volume of water production is assumed to decrease due to the deterioration of facilities. Annual fixed O&M cost of US Dollars 700,000 based on the recent financial statements is assumed for both scenarios.

In order to introduce and maintain the consumption-based water charge system, replacement of deteriorating water meters is indispensable. The estimated replacement cost of water meters is around US Dollars 735,000 per year. This figure is based on the unit cost of installing a water meter (US Dollars 40), the number of customers (147,000) and the economic life of the water meter (eight years). The cost of installing the supply pipe and the connection pipe will be determined after completion of installation of the main pipe proposed by the project. The sum of these costs is calculated to be around US Dollars 28.8 million and it is assumed that these costs occur after the completion of the construction of the project and the installation will be



completed over seven years.

### 3) Financial Management

A simple cash flow analysis shows that present tariffs cannot sustain the capital expenditure required for the project. The total sales is insufficient to even cover the capital expenditure. Thus reduction of O&M costs will not be sufficient to recover the total costs. The only measure which can be adopted is to increase tariffs for sound financial management.

#### 4) Tariff setting

##### a) Ability to Pay for Domestic Water Charge

According to the study about the affordability of customers in Astana City, it is expected that tariffs can be doubled without affecting the ability to pay of the average household. This increase will be relieved by the expected increase in the Gross Regional Domestic Product (GRDP) which is expected to double by the time of the completion of the project according to the Master Plan. In parallel with the increase in GRDP, average monthly income per household is also expected to increase. On the basis of these analytical results, gradual doubling of the tariff should be affordable to the majority of the population.

##### b) Basic Water Charge System

It is proposed that a basic charge be levied to cover the fixed cost for installation of a water meter, meter reading and tariff collection. Preliminary calculations show that this basic charge should be 60 TG (0.42 US Dollars) per connection or about 0.3 % of the monthly average household income and should be easily affordable.

##### c) Tariff for Enterprises

Generally speaking, enterprises have greater affordability to pay than individual customers do. According to the Public Awareness Survey conducted in this Study, it appears reasonable that the tariff level of enterprises could be set at a higher rate than the rate for individual customers.

In most countries where differing tariffs are applied between individual customers and enterprises, the tariff for enterprises is generally double that for the individual customer. This means that the tariff for

enterprises will be four times the present tariff. As for domestic customers, considering customer affordability, tariffs should be increased gradually.

d) Other Water Tariff System

With the limited water resources situation in Astana, reduction in demand is strongly recommended so therefore the progressive water tariff is more appropriate.

However the application of such a progressive tariff is complicated especially given the lack of reliable information on usage. It is therefore proposed that such a system be considered after installation of meters on most customer pipes and collection of sufficient data to devise the most effective tariff level. A typical complication is presented below.

The present average sales per household is between 15 and 20 m<sup>3</sup> per month. A threshold of 20 m<sup>3</sup> can be set such that higher tariffs are applicable to consumption above this threshold. However large families may be penalized in such circumstances.

e) Connection Fee System

An additional source of revenue is the introduction of a connection fee for provision of a new service connection. The connection fee system is the system that collects the part of cost related to new connections from new customers. This fee is often introduced in newly developing areas. It is proposed that new customers share costs related to new connections. Costs related to new water and sewerage connections, excluding the cost of the water meters are estimated at 23,040 TG (160 USD) per connection. A connection fee of 23,040 TG is therefore proposed.

(2) FIRR Calculation

The results of sensitivity analysis of tariff levels is presented on Table 8.3.1. The results show that to achieve a FIRR of at least 2.6% the minimum tariff for domestic consumers is 200% existing and for enterprises it is 400% of existing. It also shows that domestic tariff can be made lower but tariffs for enterprise will have to be increased to a very high 4.5 times the present tariff. In this analysis of tariff change the O&M costs are assumed to be constant.

**Table 8.3.1 Sensitivity Analysis Table**

(Unit: Percentage)

Tariff increase for enterprise \ Tariff increase for individual customers	2.5 times	3.0 times	3.5 times	4.0 times	4.5 times
1.0 times	Negative	negative	0.7	1.4	2.0
1.5 times	Negative	0.7	1.4	2.0	2.6
2.0 times	0.7	1.4	2.0	2.6	3.1
2.5 times	1.4	2.0	2.6	3.1	3.6

This project is financially feasible if the project is implemented with the tariff increase recommended above and ASA can raise funds with lower interest rate than the FIRR.

Capital costs funding from commercial banks normally attract interest rate of about 10% and calculations show that tariffs will have to be increased to about 760% of existing tariffs. Such a tariff rise is clearly beyond the means of the customers. The lower interest rate provided by international donor agencies is more interesting because the lower funding cost can contribute to project feasibility. Projects with low FIRR are not acceptable to any donor agency who will not provide funds for such cases.

The base scenario of increasing domestic tariff to 200% of existing tariff and the tariff for enterprise to 400% of existing tariff which provides a FIRR of 2.6% is recommended.

In addition to the sensitivity analysis of tariff change, sensitivity analysis of cost is conducted in Table 8.3.2. In this analysis, increasing domestic tariff to 200% of existing tariff and the tariff for enterprise to 400% of existing tariff is assumed.

**Table 8.3.2 Capital and O & M Costs Sensitivity Analysis Table**

(Unit: Percentage)

Capital Cost \ O&M Cost	Increase by 20 %	Increase by 10 %	No change	Decrease by 10%	Decrease by 20%
Increase by 10 %	1.7	1.9	2.0	2.2	2.3
No change	2.2	2.4	2.6	2.7	2.9
Decrease by 10%	2.8	3.0	3.2	3.3	3.5

Table 8.3.2 shows that the project is not sensitive to change in O&M cost but sensitive to change in capital cost. Reduction of capital cost is an effective way, in addition to increasing tariffs, to increase the project feasibility.

### (3) Financing Procurement and Repayment

An analysis has been carried out to determine whether the cash flow expected from tariffs can cover O&M costs and service the proposed debt. It has been assumed that VAT, import duties and administrative expenses will not be funded by the proposed loans, as is usually the case with funding agencies. The 21.6% allowed for such items will have to be funded by the Government or Astana City Akimat.

The loan conditions, which is typical for a particular funding agency, assumed for this analysis is presented on Table 8.3.3.

**Table 8.3.3 Assumption of Loan Agreement**

Maturity of Loan	30 years (including 10 years grace period)
Interest Rate	2.2 %

According to this analysis, the estimated free cash flows will be sufficient to cover interest payments and repayment of the principal without any negative cash flow. For comparison purposes, the marginal rate, in other words the interest rate at which negative cash would arise, was also calculated. The calculation showed that the marginal rate was 2.9%. A loan greater than this rate will cause a negative cash flow during the time span of this project.

## 8.4 Economic Evaluation of the Project

In order to assess the economic viability of the project, EIRR has been calculated based on the estimated economic benefits based on the comparison between "With Project" and "Without Project". The economic benefits generally include tangible and intangible benefits that can be quantified and not quantified. The above mentioned EIRR calculation is based on only the tangible benefits.

### (1) Economic Benefits

#### 1) Quantifiable Economic Benefits

In the case of "Without Project", ASA have to continue serving for water supply and sewerage until the year 2020 without any new facilities. After 2020 when the existing facilities terminate their functions, customers have to

purchase water by some method or other and also treat and dispose sewage by themselves.

The followings are the estimation of economic benefit considered.

a) O&M and Expansion Cost for Existing WTP Operation

Until the year 2020 when the existing facilities turns beyond repair, the O&M cost for the existing facilities has to be taken into account. For this purpose, the variable cost is assumed to be 0.087 US\$/m<sup>3</sup> and the fixed cost is 0.7 Mil.US\$ annually as the same as those used for the FIRR calculation. Expansion cost for "Without Project" case has been assessed based on locally available unit cost of 3.11 US\$/m<sup>3</sup>.

b) Cost for Purchase Water after 2020

After termination of the existing facility's function by 2020, customers have to purchase water by themselves. In Astana City, 19 liters commercial bottled water is available. However, this bottled water of highly qualified in quality includes large commercial profit of venders and not suitable as alternative to take place for the "Without Project" case.

Another possibility is purchasing and transportation of water from the neighboring cities such as Kokshtau, and this alternative method is taken into account for calculation of EIRR for "Without Project" case. The cost of water per m<sup>3</sup> and the cost of transportation per m<sup>3</sup> between Astana City and Kokshtau are estimated at 400.2 TG (2.8 US\$) and 2.89 US\$ respectively.

c) Compensation Cost for Water Delivery

At present, around 26.8 % of the individual customers are not connected to the centralized water and sewerage system, and the customers have to bring water from communal taps to their homes. This rate is expected to decrease to 15.8 % after 2007 when the improvement works will complete under the "With Project" and continues when the existing facilities terminates under "Without Project" in 2020. The balance between "With Project" and "Without Project" will be counted as the benefit for EIRR calculation. When the existing facilities terminate after 2020, all the customers including enterprises have to carry water by themselves.

Labor cost for the time required to fetch water is converted to an opportunity cost. In this regard, 0.5 hour per day per person in average will be appropriate. Assuming that the average monthly income per household is 19,152 TG, the

average hourly income of 120 TG is multiplied to 0.5 hours amounting to 21,900 TG per year.

**d) Treatment Cost of Sewage by Individual**

When the existing WWTP terminates by 2020, all the customers including enterprises have to treat sewage individually for the case of "Without Project". In this case, cesspit, septic tank and community plant should be indispensable to conserve surrounding environment. The cost for provision of these facilities is estimated at 159.4 Mil US\$.

**2) Intangible Economic Benefits**

Other than the quantified economic benefit mentioned in the previous sub-section, intangible economic benefits are not included in EIRR calculation because of lack of reliable data, technical difficulty or negligibility of benefits.

The added values provided by the project over and above the pre-project situation have been aggregated as follows.

**a) Health Benefits**

Health benefits are realized mainly from introduction of improved sanitation and waste disposal facilities. Economic benefit brought by the project is difficult to estimate because the future risks in the case of "Without Project" cannot be easily estimated. However, reduction in the risks to public health leads to the intangible economic benefits.

**b) Amenity Benefits**

The benefits will be mainly in newly developed areas where the real estate value will be orders of magnitude higher than in the pre-project situation. The amount of benefits is included in the overall holistic economic benefits.

**c) Agricultural Benefits**

Reusing of sludge and treated wastewater for agriculture will create certain economic benefits in the future. The digested sludge can be used as fertilizer and the treated wastewater can be used for agricultural products. However, these economic benefits are premature for the EIRR calculation in this Study.

(3) Economic Costs

The project cost estimate have been converted into economic capital costs by eliminating customs duties, VAT and price contingency reserves from the cost estimate. The total economic capital costs are calculated to be 224.9 Million US Dollars. O&M and connection costs are the same as mentioned in Financial Costs.

(4) EIRR Calculation

As previously mentioned, health, agricultural and environmental economic benefits are excluded from the EIRR calculation. The calculated EIRR for the project has resulted in 15.7 %. Assuming that opportunity cost of capital in Kazakhstan is 10 %, this project is acceptable.

(5) Economic Evaluation

The economic evaluation of the project shows that the calculated EIRR for the project has resulted in 15.7 %, which prove this project economically feasible.

It is expected that there is drastic increase in GRDP per capita, compared to other area in Kazakhstan. Therefore, in the case of "Without Project", there is not enough capacity to meet the future demand of water and sewerage services, and increase in number of population and enterprise might be limited. The shortage of water supply and sewerage services would become one of major constrains for the growth of GRDP in Astana City. In other words, improvement of water and sewerage system in Astana City prepares the basis of industries and contributes to the economic development of the capital, which might generate the drastic increase in GRDP of Astana City.





**CHAPTER 9**  
**IMPLEMENTATION**  
**ARRANGEMENT**



## **CHAPTER 9 IMPLEMENTATION ARRANGEMENT**

### **9.1 Requirements for Project Implementation**

The main institutional and organizational recommendations for the project and for arrangement of financing from international sources are:

- Strengthening of the management of ASA
- Reform of tariffs in order to provide financial security for ASA and to achieve full cost recovery

It is recommended that these recommendations are implemented immediately to show commitment of the Government of Kazakhstan and of Akimat to the project.

### **9.2 Project Funding**

Given the fiscal constraints of the Government of Kazakhstan, it is expected that financing for the project will be through an international funding agency. Such agencies usually have conditions to be fulfilled prior to loan closure that can include the following:

- Legal framework for the borrowing agency (Assumed to be the Ministry of Finance)
- Commitment of Government to funding local portion of costs
- A repayment guarantee
- A counterpart agency for project implementation
- Implementation of institutional reforms as recommended in this Feasibility Study

It is recommended that negotiations with funding agencies are started as soon as possible.

### **9.3 Project Implementation Framework**

The existing organizations do not have the capacity to take on the management of a project of this nature. A new agency, Project Management Unit for Water Projects (PMUWP) shall be created by statute to have all the legal status to enter into contracts in the name of the Government of Kazakhstan. This organization and its board of directors will be responsible for appointment of consultants, contractors and other supervisory agencies. Day to day running of the PMUWP

shall be carried out by a Project Executing Agency (PEA) headed by a project manager. The PEA shall be responsible for coordinating all administrative, financial and technical matters.

Figure 9.3.1 shows a conceptual management structure for project implementation and execution. The components are described below.

Supervision and control of the activities of PEA is to be carried out by three committees to be appointed by the Board of Directors of PMUWP. The three committees are as follows:

- Audit Committee to oversee financial matters
- Tender Committee to recommend appointment of contractors
- Technical Committee to agree on technical matters

The members of the committee could include appointees from ASA, Construction Committee, Sanitary and Epidemiological Department etc.

#### **9.4 Financial Control**

A project account is to be arranged with the Ministry of Finance for exclusive use of the project and into which project funds either from international funding agencies or from the Government are to be deposited.

Funds are to be disbursed for payment to consultants, contractors and suppliers on the presentation of payment certificates approved by the PMUWP. Funds for the running costs of the PMUWP are also to be disbursed from the same account.

The Project Manager and his accounting department are responsible for all usual financial management including fund disbursements, expenditures, accounting and monitoring. The actual delegated powers will be defined in the charter of the PMUWP or in the letter of appointment of the Project Manager.

All financial activities should be subject to periodic examinations by the Audit Committee who is responsible directly to the Board of Directors.

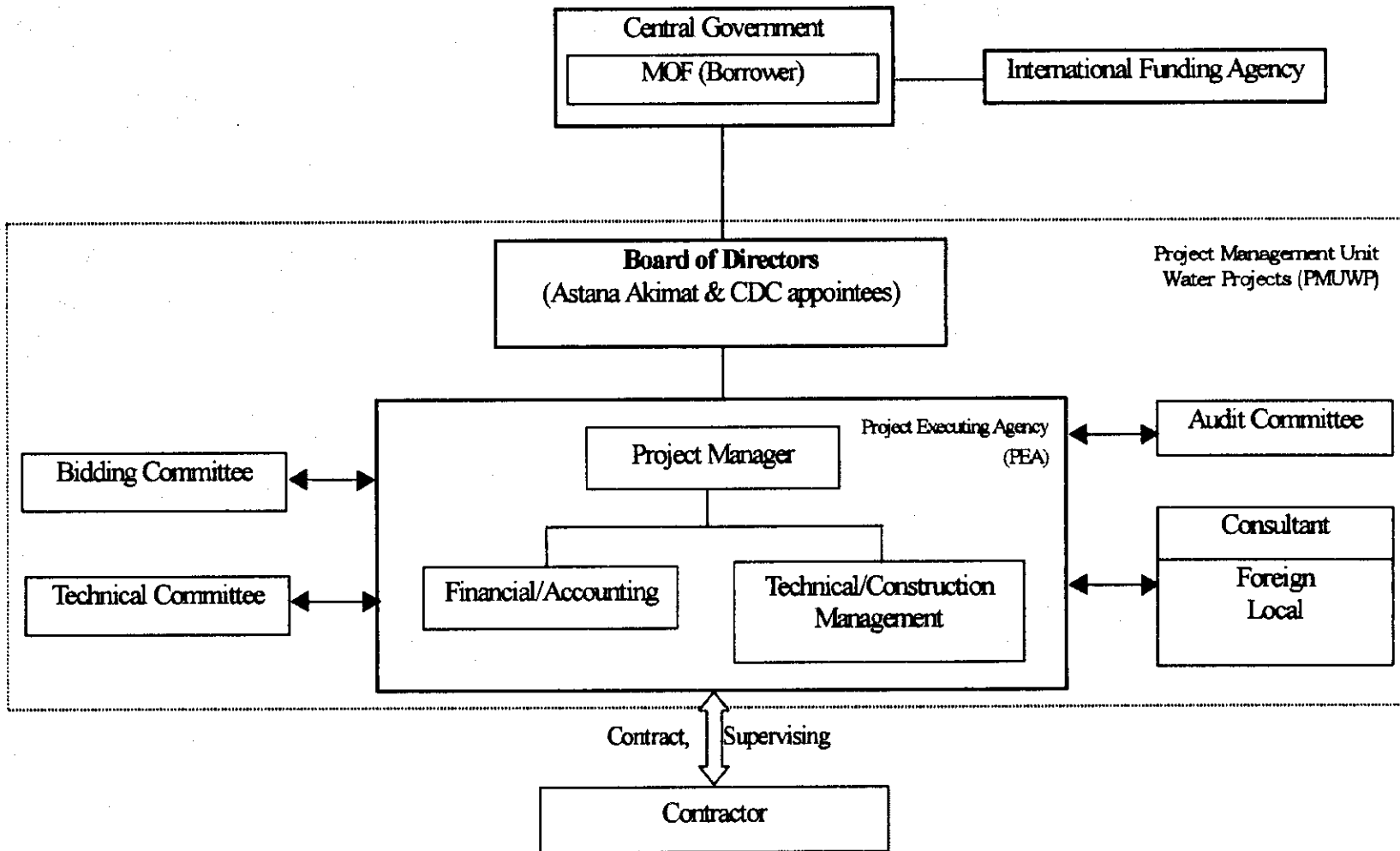


Figure 9.3.1 Conceptual Management Structure for Project Implementation

## **9.5 Implementation Schedule for Pre-construction Activities**

The following activities are considered essential during the period prior to construction:

- Implementation of Tariff Reforms
- Strengthening of ASA management
- Establishment of the PMUWP
- Loan negotiations
- Selection of consultant
- Appointment of Project Manager, Tender, Technical and Audit Committees
- Detailed design and preparation of bid documents
- Selection of Contractor

Figure 9.5.1 presents a tentative schedule for implementation of all the above activities. The duration of each activity has been based on experience acquired on similar projects. However some of the activities can be shortened with rapid implementation of some of the measures.

Year	2001				2002				2003			
	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q
Implementation of Tariff Reforms	█											
Strengthening of ASA management	█											
Organization of PMUWP		█										
Loan Negotiations	█											
Loan Closure				▼								
Selection of Consultant			█									
Appointment of Project Manager			█									
Appointment of Tender Committee				█								
Appointment of Technical Committee				█								
Appointment of Audit Committee				█								
Detailed design					█							
Preparation of bid documents									█			
Selection of Contractors									█			

Figure 9.5.1 Pre-construction Activities Schedule

1

1

1



**CHAPTER 10**  
**CONCLUSION**



## **CHAPTER 10 CONCLUSIONS**

### **10.1 Basic Policy of Development**

The Republic of Kazakhstan has been investing a great deal of national budget to the City of Astana for its development in recent years. Taking into account the tight financial situation, the water supply and wastewater disposal system development in this Feasibility Study was achieved in compliance with the basic policy of cost saving and maximum use of existing facilities, a great many of which were envisaged to be functional until around the target year 2010.

The facility plans, therefore, were focused mainly on the rehabilitation of the existing facilities and minimum expansion was considered particularly on the left side of the Ishim River.

### **10.2 Water Supply**

On the basis of the above basic policy, achievement of sound management of the water supply system by 2010 was targeted by addressing technical, operational and managerial aspects. On the technical aspect, first of all, a facility plan, starting with replacement of pipes, is to be carried out because current non-revenue water due to leakage from pipes amounts to more than 26%. At the same time, meter installation was considered as one of the most effective remedial measures for leakage protection and water consumption control by each consumer, and more than 65,000 units are to be installed. This meter installation is expected to show benefits not only for water management from the technical viewpoint, but also financial savings, financial management and operation and maintenance aspects.

Secondly, future population that will reach about 500,000 by 2010 and the great majority of new residents will live on the left side of the Ishim River. At present few people reside in the area which has little infrastructure. Therefore, construction of new facilities or expansion of the existing facilities will inevitably become necessary. Furthermore, in the initial stage of development at around 2003, a large part of the government city on the left side of the Ishim River is expected to be constructed, and subsequent provision of facilities will also become necessary. However, the extent of facility expansion in this Study is limited to a minimum requirement.

As for new facilities, construction of a new water treatment plant of 100,000 m<sup>3</sup>/d

and simultaneous construction of intake facilities and expansion of distribution facilities are planned. The transmission line between the intake and the treatment plant is to be constructed urgently, and funds for this facility have already been committed within the domestic budget of Kazakhstan. The Feasibility Study and subsequent detail design are therefore required to be implemented as soon as possible.

In parallel with the project implementation, Kazakhstan Government should, as one of the significant issues, review the design and planning criteria of SNiP. Especially, the design criteria that is applied for water demand should not be a general criteria that is used country wide, but be the particular criteria to Astana City that reflects regional characteristics. Further, the criteria for construction method should be also modernized to reflect modern construction method or technology used world wide. In order to achieve this objective, a committee consisting of relevant organizations key persons should be established to take prompt action.

Furthermore, the development of the left bank is still under the master plan level, except the government city area, and none of the practical reclamation plan has been implemented. For this reason, the design in this Feasibility Study is only a preliminary level. Therefore, appropriate review of this Feasibility Study should be carried out at the time of the subsequent detail design stage, and substantial examination by the Kazakhstan side is inevitably necessary before commencement of the detail design.

### **10.3 Wastewater**

The wastewater disposal facilities currently being in operation for collection and treatment have not suffered from serious problems and only rehabilitation and upgrading of them are necessary to meet the target requirement. The targeted development by 2010 is largely divided into two categories. One is improvement of deteriorated collection pipes, pump facilities, manholes and wastewater treatment plant and the other is the expansion of collection pipes to the left bank of the Ishim River.

The improvement and rehabilitation works of the collection pipes were selected primarily based on the existing data compiled by ASA, and the pump facilities identified in the reconnaissance survey in this Study were determined to be replaced with a modern type due to inefficiency of the pumps resulting in excessive energy consumption. For the wastewater treatment plant, improvement of grit removal

facilities, sedimentation pond and sludge digesters, and expansion of the sludge drying bed were planned. There is at present no examination of sludge quality. It is recommended that sludge produced at the WWTP be examined regularly to determine its characteristics, especially the concentrations of heavy metals. This characterization will help towards management of the disposal to agriculture of the sludge.

One of the key issues for the wastewater plan is the disposal of treated wastewater. A study of treated wastewater reuse verified a large potential for utilization for agricultural purpose, thus reuse of treated wastewater for agricultural development was proposed. A practical study for agricultural development itself has not been implemented however, and verification by executing a feasibility study under the relevant Kazakhstan authority should be carried out as soon as possible. Due to the fact that implementation of a feasibility study is a prerequisite for treated wastewater reuse for agricultural development, pipe and pump facilities necessary for this purpose are not included in this Study.

Finally, improvement of the current design criteria and construction standards for wastewater will be necessary.

#### **10.4 Environmental Impact Assessment (EIA)**

There is a provisional guideline for procedures regarding EIA which was stipulated in 1993 in Kazakhstan. However, a concrete method for assessment is not shown, nor is the implementation of public hearing by means of mass-media is included in the scope of work of this Study. Therefore, the EIA was carried out based on JICA EIA guidelines which satisfactorily cover the Kazakhstan guideline.

As for water supply related aspects, no particular EIA problems were found except minor problems of noise and vibration. These will be easily solved by selecting the appropriate construction method to be proposed at the time of the detailed design.

For wastewater disposal issues, the increase of treated wastewater amount was identified as the only problem. But this will be solved by adopting a scheme for reuse of treated wastewater for agriculture as aforementioned. As for the minor problems of noise and vibration during the construction period, they will also be solved by appropriate construction methods just as for water supply.

## **10.5 Organization and Institution**

All the major organizations necessary for the management and control of the water cycle are present, however some rules and regulations are constraining the ability of ASA to achieve the objective set out in its charter, namely provision of a financially sustainable and efficient water supply and sewerage system.

The tariff system is a major such constraint. Amongst the many difficulties are the low tariff levels and collection ratio, the inability of ASA to correctly support a request for tariff increase and the over zealous application of rules by the Regulation Agency for Natural Monopolies. A new tariff schedule based on ability to pay is proposed and designed to achieve cost recovery. Direct subsidy to low income population is proposed to compensate for tariff increases. Relaxation and practical application of some rules by the Regulation Agency are necessary to enable ASA to achieve its self supporting objectives.

ASA's problems originate mainly from its managerial weakness, lack of commercial awareness and poor information availability at most level within ASA resulting from lack of training in new technology and techniques, as well as inadequate motivation or rewards. Debt management and collection has improved recently through strengthening of the legal department but further improvements are still necessary through the roll-out to all customers of the new service contract with inclusion of a non-payment penalty clause. A programme of staff training, recruitment of competent managers and the introduction of a motivation scheme is recommended to achieve ASA's self-management target.

Customer service is poor with little done to inform the customer and to make payment of water tariffs easier. Additional education programme and three new branch offices are proposed. Prior to tariff increases public opinions are to be assessed through surveys and focus groups.

Project implementation capacity within existing organizations is practically non-existent. A Project Management Unit for Water Projects is proposed for the implementation of this project.

## **10.6 Cost Estimate and Construction Plan**

On the assumption that the priority projects proposed in this Feasibility Study are expected to be financed by international funding agencies, cost estimates and construction plans were performed. Keeping in mind that the Kazakhstan

Government previously requested financing for the project from the Japanese Government, the method of cost estimate and financing and implementation procedures were based on Japanese guidelines.

The total project cost estimate amounted to 300 Million US Dollars and can be divided into the categories of foreign and local portions. The foreign portion can basically be considered as the base amount of the loan, but the details will have to be finalized after discussion between the Kazakhstan Government and the donor agency. As for the cost estimate, no up to date unit costs are presently available in Kazakhstan and the organization responsible for providing unit rates is not familiar with international tendering procedures. Therefore, updating and review of the unit costs are inevitably necessary at the time of preparation of tender documents.

The implementation schedule for the pre-construction stage of three years was prepared based on the method hitherto. This period, however, can probably be shortened after discussion between the responsible Kazakhstan organization and the donor agency.

The construction was targeted to be completed within a short period of time. The project has therefore been packaged such that the water supply project is divided into four packages, intake, treatment plant, distribution pipes and meter installation. The wastewater disposal project is divided into two packages, wastewater treatment plant and collection pipes.

An alternative project with reduced scope was considered. The reduced scope takes into account the areas of expansion for which funds have been committed by the Kazakhstan Government to date, namely the Government City of the left bank of the Ishim River. For this scenario, the project cost was estimated to be 265 Million US Dollars.

## **10.7 Economic and Financial Evaluation**

ASA, the water supply and wastewater disposal operation and management organization body has been currently suffering from the problem of water loss due to leakage. This loss of revenue from water leakage is compounded by financial deficit due to inappropriate tariff collection, inadequate asset management and poor managerial strength. All these make it difficult to procure funds for project implementation.

ASA has many problems which have to be solved before establishing a sound water

and wastewater management by the target year 2010 through national or city government with the help of international funding aid. In order to achieve this, the following improvement program should be performed covering economic and financial aspects in parallel with the improvement program currently managed by ASA

The first is the establishment of a tariff system comprised of a progressive water charge system and self-supporting financial system. The second is the improvement of ASA's business management capability including O&M cost reduction through facility improvement, asset management, implementation of an audit to international standards and improvements in customer services.

In this Study, a financial and economic project evaluation was performed, taking into account the funding for the project from the international donor agencies in parallel with ASA's self-supporting efforts for economic and financial improvement currently being carried out. The evaluation was conducted by a 'With Project' and 'Without Project' approach.

In the financial evaluation, as capital cost always exceeds present water sales, a deficit will always occur. The only remedies available are decreasing capital cost, increasing the proportion of water paid for, and increasing tariffs. In real terms, tariff increasing is the only way to improve the financial situation and thus the Financial Internal Rate of Return was tabulated.

Five alternative methods of increasing tariffs were examined: 1) increasing domestic water charge, 2) introduction of basic fixed cost water charge, 3) increasing enterprise water charge, 4) introduction of progressive water charge, 5) introduction of a connection fee. Herein, the introduction of a progressive water charge is highly recommended for the future tariff system, but it is still premature to apply this method to Astana city at present, further detailed tariff study is required before starting this method. Therefore, progressive water charge is not included in the calculation for FIRR. The tariff increase was by two to domestic consumers and by four for enterprises, resulting in a FIRR for the project of 2.6% which is considered viable if the financing is from international donor agency.

In the economic evaluation, Economic Internal Rate of Return has been calculated on the estimated economic benefits in compliance with the comparison between "With Project" and "Without Project". In this Study, calculation of the EIRR was carried out based on only the tangible benefits. In order to estimate the economic benefit, these quantifiable items as 1) O&M and expansion cost for existing WTP



operation, 2) cost for purchase water after 2020, 3) compensation cost for water delivery, and 4) treatment cost of sewerage by individual were taken into account.

While, intangible economic benefit are not included in EIRR calculation because of lack of reliable data, technical difficulty or negligibility of benefits. Nonetheless, if these benefits are included in the EIRR, the EIRR will be higher. These are 1) health benefit, 2) amenity benefits and 3) agricultural benefits. The calculated EIRR for the project has resulted in 15.7 %. Assuming that opportunity cost of capital in Kazakhstan is 10 %, this project is acceptable.

It is expected that there is drastic increase in GRDP per capita, compared to other area in Kazakhstan. Therefore, in the case of "Without Project", there is not enough capacity to meet the future demand of water and sewerage services, and increase in number of population and enterprise might be limited. The shortage of water supply and sewerage services would become one of the major constraints for the growth of GRDP in Astana City..

## **10.8 Implementation Arrangement**

The main institutional and organizational recommendations for the project and for arrangement of financing from international sources are: 1) strengthening of the management of ASA, 2) reform of tariffs in order to provide financial security for ASA and to achieve full cost recovery. It is recommended that these recommendations are implemented immediately to show commitment of the Government of Kazakhstan and of Akimat to the project.

Given the fiscal constraints of the Government of Kazakhstan, it is expected that financing for the project will be through International Funding Agency, who usually has conditions to be fulfilled prior to loan closure. It is recommended that negotiations with funding agencies are started as soon as possible.

The existing organizations do not have the capacity to take on the management of a project of this nature. A new agency, Project Management Unit for Water Projects (PMUWP) should be created by statute with all the legal status to enter into contracts in the name of the Government of Kazakhstan. This organization and its board of directors will be responsible for appointment of consultants, contractors and other supervisory agencies. Day-to-day operations of the PMUWP should be carried out by a Project Executing Agency (PEA) headed by a Project Manager.

Supervision and control of the activities of PEA is to be carried out by three committees to be appointed by the Board of Directors of PMUWP.

A project account is to be arranged with the Ministry of Finance for exclusive use of the project and into which project funds either from international funding agencies or from the Government are to be deposited.

Funds are to be disbursed for payment to consultants, contractors and suppliers on the presentation of payment certificates approved by the PMUWP. Funds for the running costs of the PMUWP are also to be disbursed from the same account.

The Project Manager and his accounting department are responsible for all usual financial management including fund disbursements, expenditures, accounting and monitoring. The actual delegated powers will be defined in the charter of the PMUWP or in the letter of appointment of the Project Manager.

All financial activities should be subject to periodic examinations by the Audit Committee who is responsible directly to the Board of Directors.

JICA