

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

Ministry of Macroeconomics and Statistics
Ministry of Communal Services
City of Tashkent

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THE REPUBLIC OF UZBEKISTAN

The Study Report
for Improvement of Management and Tariff Policy
in Water Supply Services
in the Republic of Uzbekistan

FINAL REPORT

SUMMARY

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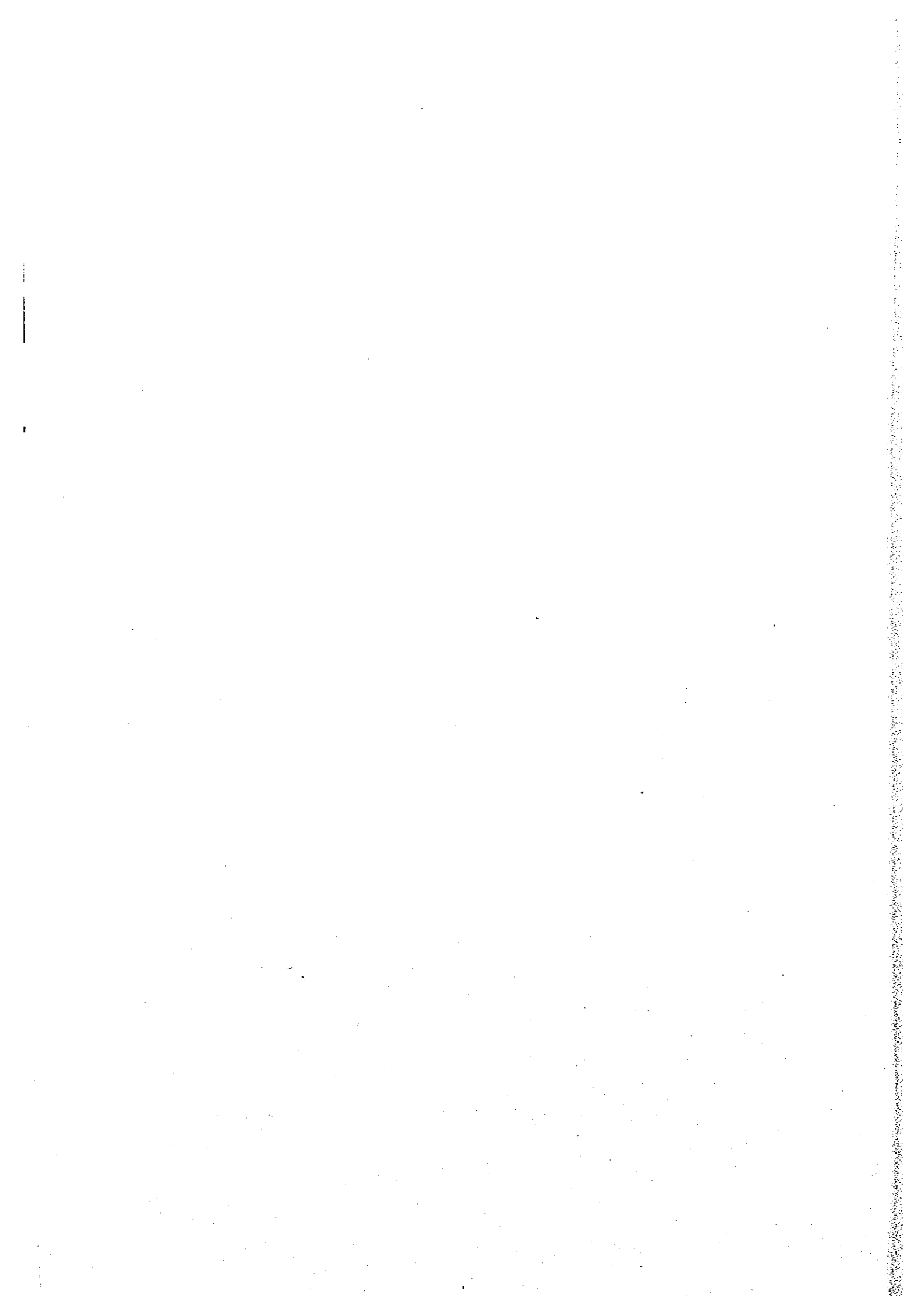
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MARCH 2000

Showa Ota & Co.

Nippon Jogesuido Sekkei Co., Ltd.

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MAIN REPORT Separate Volume

SUPPORTING REPORT Separate Volume

DATA BOOK Separate Volume



PREFACE

In response to a request from the Government of the Republic of Uzbekistan, the Government of Japan decided to conduct a development study on Improvement of Management and Tariff Policy in Water Supply Services and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Kenji Yoshino of Showa Ota & Co., which consisted of Showa Ota & Co. and Nippon Jogesuido Sekkei Co., LTD. to the Republic of Uzbekistan, three times between June 1999 and March 2000. In addition, JICA set up an advisory committee headed by Mr. Masaaki Kinoshita, Chief Executive of Fukuoka District Waterworks Agency between June 1999 and March 2000, which examined the study from specialist and technical points of view.

The team held discussions with the officials concerned of the Government of the Republic of Uzbekistan and conducted field surveys at the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of this project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Republic of Uzbekistan for their close cooperation extended to the Team.

March 2000



Kimio Fujita

President

Japan International Cooperation Agency



March 2000

Mr. Kimio Fujita
President
Japan International Cooperation Agency
Tokyo, Japan

Dear Mr. Kimio Fujita

Letter of Transmittal

We are pleased to submit to you our Study Report for the Improvement of Management and Tariff Policy with respect to Water Supply Services in the Republic of Uzbekistan.

This report presents our Study Team's understanding of the current status of the water supply services in Tashkent City and Chirchik City, the related issues identified as a result of the analysis made by the Study Team, and the proposed solutions to the issues identified by the Study Team.

The Republic of Uzbekistan has taken many steps towards implementing new policies for the transition to a market economy since its independence in 1991. The water supply organizations in both cities should conduct their water supply services as self-supporting systems. Certain reforms are already underway, such as the installation of water meters and a revision of the tariff policy. However, the project for the installation of water meters has not proceeded as expected because the method for bearing the total cost of installation has yet to be determined and certain technical problems in installing the meters in apartment blocks have arisen. The Study Team regards water conservation and the replacement of aging facilities as the most important issues to be resolved for the efficient operation of water supply services.

The Study Team has proposed various solutions to resolve these issues including a proposal for how the total cost of the installation of water meters could be allocated. Some of the solutions proposed by the Study Team have already been incorporated into the policy of the water supply organization in Tashkent.

We wish to take this opportunity to express our sincere gratitude to the Ministry of Foreign Affairs for your cooperation. We also wish to express our deep gratitude to the Ministry of Macroeconomics & Statistics, the Ministry of Communal Services, Tashkent City and the Vodokanals for the many courtesies extended to us during the course of our

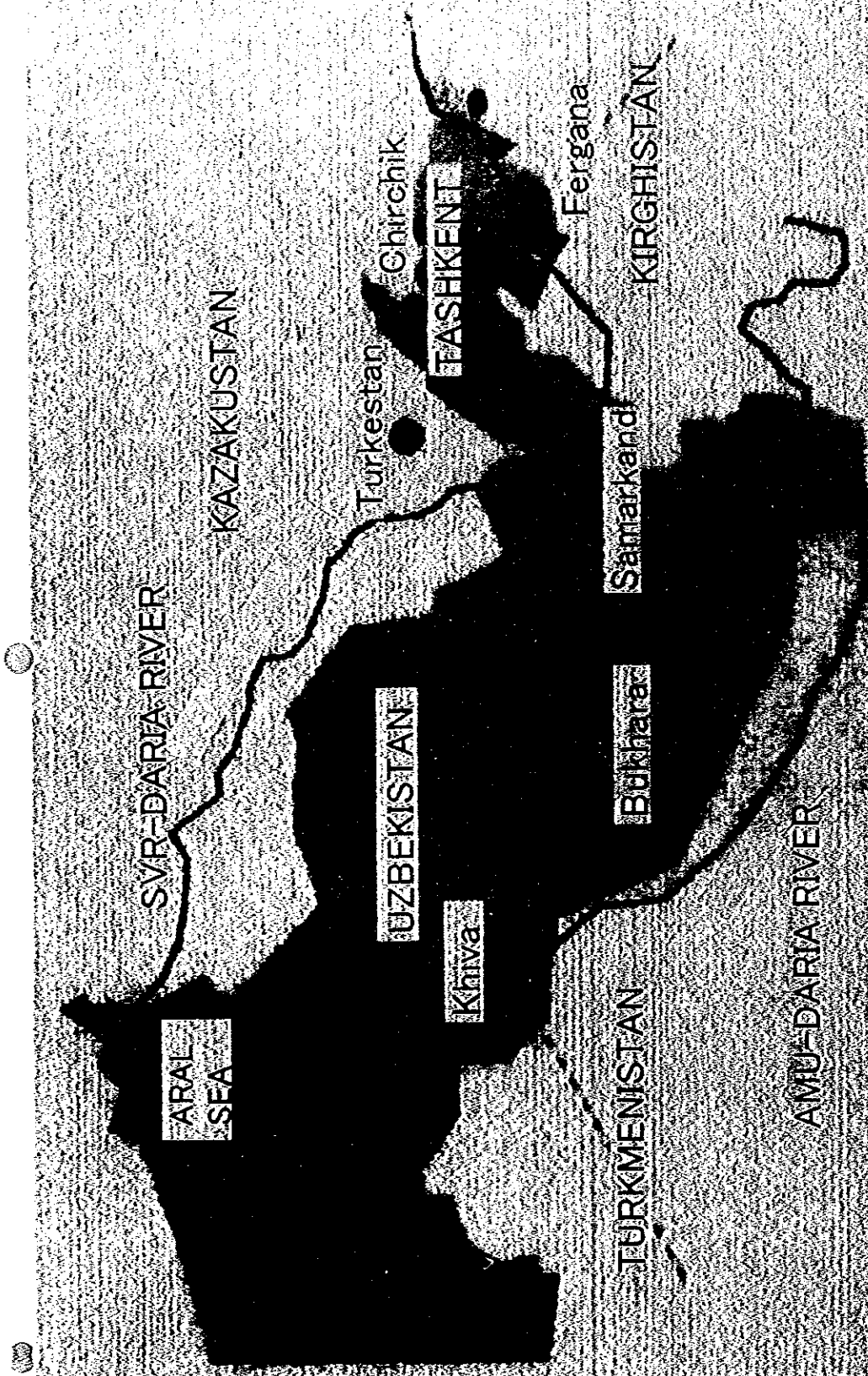
research and study in the Republic of Uzbekistan. Finally, we hope that the tentative solutions which we have proposed will contribute beneficially to the management of water supply services enabling them to operate, to a great extent, as self-supporting entities within an emerging and vibrant market economy.

Very truly yours,

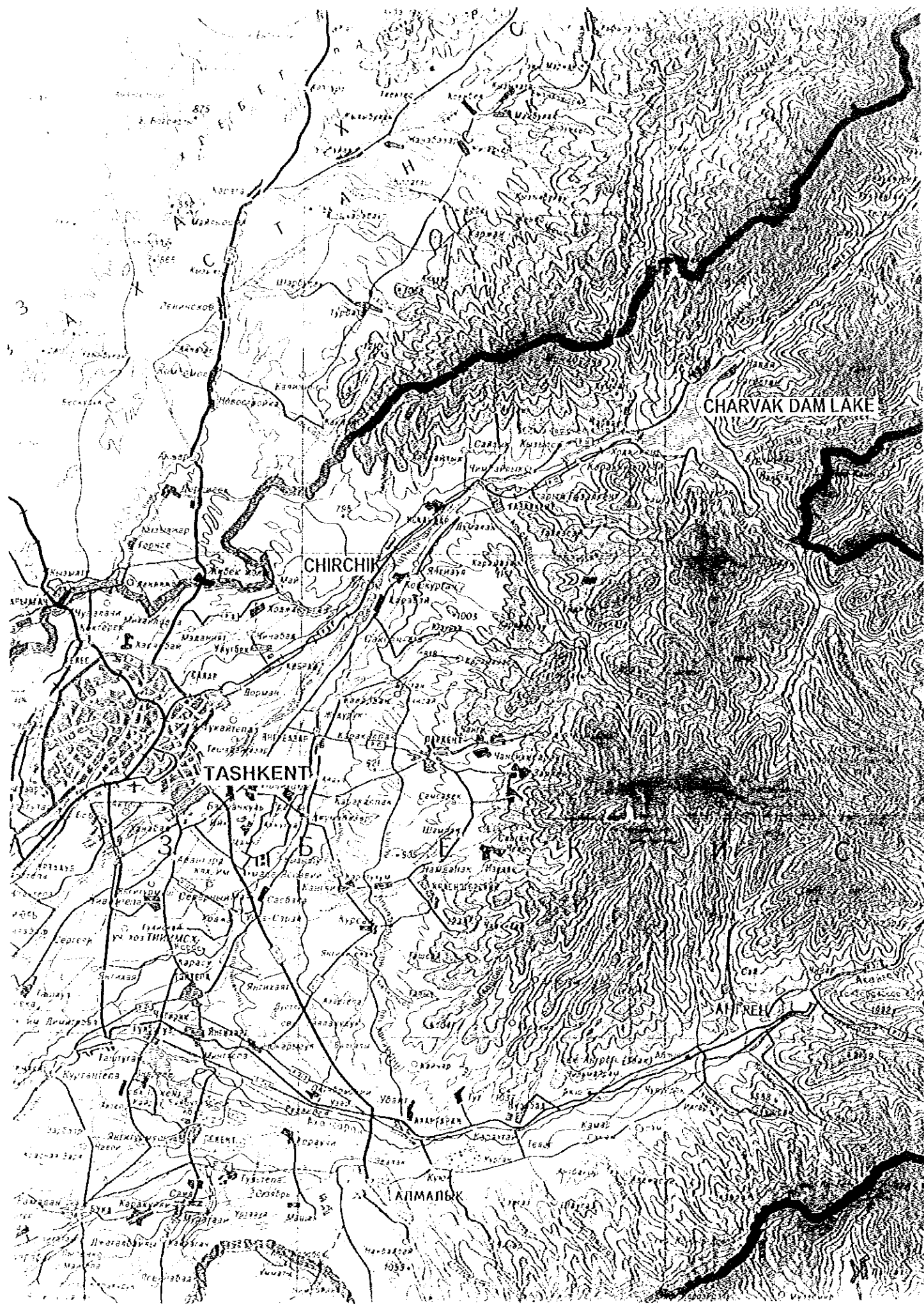


KENJI YOSHINO, Leader of Study Team

Study Report for the Improvement of Management
and Tariff Policy with respect to Water Supply
Services in the Republic of Uzbekistan.



MAP OF THE REPUBLIC OF UZBEKISTAN



Executive Summary

1. Background of the Study

Until the independence of the Republic of Uzbekistan (hereinafter referred to as "ROU") in 1991, communal services including such utilities as drinking water and sewage services were provided by government agencies, and the water tariff was required to be maintained at low level for all users. In addition, the calculation of the charges levied on the general public was based on the number of members in each household. Thus, the level of users' awareness of water conservation was low and no effective actions was taken to create an awareness of the need to conserve water. Accordingly, the volume of water consumption per capita has been extremely high.

Since its independence, the ROU has been implementing new policies for the transition to a market economy. The goal of the water supply organizations (hereinafter referred to as "Vodokanal") in Tashkent City and Chirchik City is to operate each city's water supply services as a self-supporting system. Projects for the installation of water meters at each household as well as for revisions to the tariff policy have been underway to promote water conservation. However, the meter installation plan did not proceed as expected because of the problems of determining how the total cost of the installation should be borne as well as certain technical problems which were encountered in installing the meters in the apartment blocks.

2. Objectives of the Study

The objectives of the Study are :

- (1) To formulate an improvement plan for management as well as a tariff policy for drinking water supply services; and
- (2) To transfer technology related to planning methods and other skills to the counterpart personnel during the course of the Study.

3. Current Status of Vodokanal in Tashkent City

- (1) The City of Tashkent is the capital of the ROU with a population of 2.2 million. The two largest industrial sectors, machinery and metal works account for 35.6% of the City's GDP. These are followed by the food industry at 24%, and other light industries at 11%.
- (2) The annual average volume of water distribution was 2,465 thousand cu.m/day for the year ended July 1999.
- (3) The rate of water service pervasion is 98.5%.
- (4) The water supply facilities of Tashkent Vodokanal include two water treatment plants (WTPs) which use canal water and five groundwater intake pump stations (PSs). Most of these facilities were constructed in 1960, 1970 and 1980 and have already exceeded their service lives for calculating depreciation.
- (5) The total length of the water pipelines is 3500 km and one-third of those have been in service for more than 30 years.

4. Current Status of Vodokanal in Chirchik City.

- (1) Chirchik City is located in Tashkent Province about 20 km northeast of Tashkent City with a population of about 145 thousand. Chirchik City is one of the five large cities in Tashkent Province, excluding Tashkent City. The industrial production of Chirchik is dominated by five big plants: chemical, metallurgical, machinery for the chemical, oil and gas industries, agricultural machinery and machinery for electrical industries, which were relocated from Moscow and Ukraine during World War II.
- (2) The annual average volume of water distribution was 106 thousand cu.m/day for the year ended March 1999.
- (3) The rate of water service pervasion is approximately 100%.
- (4) The centralized water supply system of Chirchik City was constructed in 1930, with groundwater and canal water as its water resources. A WTP which uses only canal water started operations in 1991. Although a recent project was designed to extend the construction of this WTP to handle future increases in the local water demand, it has not been implemented to date.

- (5) The total length of the water pipelines is 212 km and 73% of those have been in service for more than 18 years.

5. Overview of Managerial Issues and Solutions for Vodokanal in Both Cities.

- (1) The Study Team believes that the principal managerial issues could be resolved by achieving water conservation.
- (2) An increase in demand of water consumption is anticipated in future as the rate of population growth is increased by 2% in the ROU and there can be found a tendency of migration into cities. On the other hand, the present plants operate at maximum level to supply water and the volume of water intake reach the agreed level in summer. If there is a need to supply more volume of water than the present level in future, it will involve new projects to develop new water resources and build additional plants and equipment. Accordingly, it requires enormous amount of investment and financial burden to implement these projects. Therefore, achieving water conservation is a significant issue not only for management of Vodokanal but also for the government.
- (3) Achieving water conservation would require the installation of water meters at each household and a revision of the water tariff policy. In order to promote the meter installation project which is the basis of Vodokanal's original plan, the Study Team suggests that Vodokanal itself purchase the meters and collect the installation costs from all users over a long term. In terms of revisions to the tariff policy, a system of incremental charges could produce greater incentives for water conservation among the users and, at the same time, this system would incorporate the concept of maintaining the social safety net for the general public.
- (4) On the other hand, the Study Team contends that Vodokanal should not simply demand that the general public bear these increases, but that it must also increase management efficiency by improving its own operations. The Study Team's proposed solutions also include certain ways to increase the level of management efficiency, such as employing electronic devices to read the meters, introducing a more effective system of charge collection, enhancing its disclosure of information, setting up a Department of Public Relations.

- (5) If revisions to the water tariff policy and the meter installation project are in progress, the general users will try to decrease their volume of water consumption. It can be anticipated that there will be an increasing demand among the general users that water facilities inside the houses, i.e. toilet tanks, be repaired in order to prevent them from leaking and wasting water. Vodokanal should be prepared to deal with these demands.

6. Overview of Issues and Solutions Relating to Vodokanal' Facilities in Both Cities

- (1) The Study Team regards the replacement of equipment and water pipes as the most important issues in terms of Vodokanal's management of its facilities.
- (2) Vodokanal should replace the existing equipment and water pipes which have been in service for a long period in order to ensure provision of steady and safe water supply in future.
- (3) In order to replace aging and deteriorating equipment and water pipes, Vodokanal should not embark on additional new construction, but should remodel and repair the existing facilities in order to promote the concept of conservation.
- (4) If the tariff policy is revised and the meter installation project proceeds, the volume of water consumption by the general users will decrease and, accordingly, the total distribution of water from the WTPs will also decrease. This decrease in itself could influence a change in the total volume of distribution of water in the daytime and at night. The Study Team estimates that potentially 55% of the total volume of water distribution in Tashkent and 50% in Chirchik could be conserved.
- (5) It is necessary for Vodokanal to estimate the timeframe in which the effects of water conservation will occur and then introduce a kind of automatic control device for the volume of distribution. The facilities such as the WTPs and the pump stations need to be remodeled to adjust to the changing water supply demand. Thus, the total volume of distribution of water from Vodokanal could be decreased on the whole and certain PSs can then be taken out of use. The necessity of WTPs and PSs and the main connecting pipelines should be reexamined so that a water supply system which makes use of the well-balanced

natural gravitational fall can be constructed to incorporate the idea of management efficiency in supplying water.

- (6) Any long-term investment in facilities should not focus on constructing additional facilities, but should be directed towards remodeling the water supply system itself, incorporating management efficiency with a view to promoting conservation.
- (7) In terms of water meter installation, Vodokanal itself should buy the meters and install these as suggested by the Study Team. Vodokanal can easily replace any broken meters and maintain the meters in good condition over a long period. In addition, the Study Team has suggested that Vodokanal establish specific guidelines for installation, for example, preparing the specifications for the design of the boxes which cover the meters and selecting optimum locations for the meters to prevent breakage and to ensure that they can be read easily. These policies and specifications should be stated in the water supply contracts signed by the users.

7. A Summary of Issues on Water Supply Services

The following issues should be especially focused for operating water supply services in Tashkent and Chirchik City.

1. Issues

- (1) The meter installation program has not proceeded as planned. The charge system for the general public is a fixed rate and will not lead to positive actions regarding conservation of water.
- (2) As a result, a large extent of the precious water resources is wasted and accordingly needless costs of water treatment and supply are being generated.
- (3) A lag in adoption of a water tariff policy has led to the situation where the financial foundation becomes weaker as sufficient water charges can not be collected to offset these wasted costs. Also, the facilities and equipment are not adequately maintained as required.

2. Future

The financial and technical aspects of the water supply services may fall into the following conditions if the above issues are ignored.

- (1) Failure to balance income and expenditure, and eventual financial bankruptcy
- (2) A decrease in the quality of the water supply services due to the lag in implementation of a program to maintain facilities and equipment
- (3) Increasing levels of reliance on development of water supply services

8. A Summary of Immediate Solutions

(1) Revised tariff policy

- 1) Early transition into a metered rate system in order to give an incentive to users to conserve water
- 2) Setting up systems for adequate repair costs and metered rate usage in order to offset the new investment costs, including a policy on maintenance and improvement of water supply services (as mentioned in section 4 below)
- 3) Improvements in cost management and the efficiency of operations
- 4) A tariff system which incorporates the concept of the social safety net
- 5) As a precondition to the implementation of the metered rate system, a reexamination of the way to collect the costs of meter installation and the method to install the meters, and an investigation into the relevant technical aspects, for example, regarding improvement in the reliability of the water meter structure
- 6) Introduction of computer technology in order to improve the level of efficiency in collecting the water charges

(2) Fair accounting system

- 7) Introduction of an accounting system which conforms to the actual situation and implements an adequate measure regarding financial information disclosure
- 8) Reexamination of the introduction of inflation accounting in order to adequately earmark depletion

(3) Cost management and improvement in the level of efficiency in operations

9) Introduction of computer technology in order to improve operations

10) Introduction of management accounting

11) Introduction of improvement in other operations

(4) Improvement and Maintenance of water supply services

12) Improvement in the water pumping system and in the construction of the water distribution network, e.g. construction that can deal with a change in the volume of water distribution in the future.

13) Improvement in water quality and reconstruction of aging facilities and equipment in order to prevent water leakage.

(5) Improvement in public awareness of the importance of water conservation

14) Strengthening the publicity that advocates water conservation to general public

15) Enlightenment and education

9. A Revision in Policy of Tashkent Vodokanal

The Tashkent Vodokanal has changed the water policy effective as of February, 2000 as follows: Tashkent Vodokanal is to employ the revised tariff table effective in March 2000 and will uniformly charge 6.75 sum/m³ to the users. With this policy, the proposed solutions regarding the method of collecting installation costs are included. Also, Vodokanal examines the possibility of setting up a Department of Publicity and having employees wear uniforms. The data in our main report is referred to in their future investment plan on facility and equipment.

10 Conclusion

- (1) Some of the solutions proposed by the Study Team have already been incorporated into the policies drafted by Vodokanal in Tashkent City. In order to reflect our proposed solutions into the water supply services, further expertise and adequate funds are necessary. The framework proposed by ODA (Overseas Development Assistance) will be extremely useful in the following fields for these needs.

Technical Advice from Experts

- 1) Improvement of the Tariff Policy and Rate Tables and Business Operating Activities
- 2) Study of how to install meters and establishing guidelines
- 3) Improvement of maintenance of the buildings and prevention of water leakage
- 4) Improvement of the tariff collection system by Computerization
- 5) Improvement of operating facilities (including pumping operation)
- 6) Introduction of a Public Relations Program for Enlightenment and education to conserve water and to establish good relationships with the users

Improvement and Replacement of Facilities

- 7) Replacement of pipelines
- 8) Construction of reservoirs
- 9) Improvement and replacement of water treatment plants and pumping stations

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LIST OF ACRONYMS

B/S	Balance Sheet
CIS	Commonwealth of Independent States
cu.	cubic
FSU	Former Soviet Union
GOJ	Government of Japan
GOU	Government of Uzbekistan
hr.	hour
JICA	Japan International Cooperation Agency
MCS	Ministry of Communal Services (of the Government of Uzbekistan)
MMS	Ministry of Macroeconomics and Statistics (of the Government of Uzbekistan)
MOF	Ministry of Finance
O&M	Operation and Maintenance
P/L	Profit and Loss Statement
PS	Pump Station
ROU	Republic of Uzbekistan
sq.	square
TCMA	Territorial Communal Services Maintenance Amalgamation
USAID	United States Agency for International Development
VAT	Value Added Tax
WHO	World Health Organization
WTP	Water Treatment Plant



Chapter 1 Introduction and Scope of the Study

1.1 Introduction

1.1.1 Background of the Study

The Republic of Uzbekistan was founded as an independent state on August 31, 1991. Until the independence of the Republic of Uzbekistan, communal services in this country, including the drinking water and sewage services, were provided by government agencies. Utility ("tariff") charges for drinking water and sewage services were required to be maintained at a low level for all users. In addition, the calculation of the charges especially for the population (the general public) was based on the number of members in each family and at a predetermined volume (the so-called "norm") regardless of the volume of water actually delivered. Accordingly, not only the population, but also the communal service sector and other corporations have not been conscious at all of the concept of conserving water, and any effective actions intended to create an awareness of the need to conserve water have not been received positively by water supply organizations ("Vodokanal"). Then, the volume of water consumption per capita has been extremely high.

After independence, the Government of Uzbekistan determined the following basic requirements for Vodokanal as a part of their reform program for the transition to a market economy:

- (1) Water supply organizations should conduct the water supply business as a self-supporting system.
- (2) Meters to measure users' water consumption should be installed at the users' sites by 2004.
- (3) The water tariff table should be revised by each water supply organization to eliminate cross subsidy by 2003, subject to approval of local government

The water supply organizations have been attempting to proceed with the implementation of the basic requirements outlined above and have encountered various problems to be resolved such as a problem of determining how the total cost of the installation should be borne and technical problem in installing meters in apartment blocks, because the methods employed in implementing these reforms are either completely new or relatively unfamiliar for the users and also for the management of the water supply organizations.

Based upon a request by the Government of Uzbekistan under the above situation, the Government of Japan sent a study team to the Republic of Uzbekistan and discussed with the Government of Uzbekistan. As a result of these discussions, the Government of Uzbekistan and the Government of Japan agreed to proceed with a research project on water supply services in the Republic of Uzbekistan and that a team would be sent by the Government of Japan to Uzbekistan.

1.1.2 Request for the Study

(1) Scope of Work for the Study

Upon the above agreement, the Government of Japan sent a Preparatory Study Team (hereinafter referred to as the "Preparatory Team") for the Japan International Cooperation Agency (hereinafter referred to as "JICA") to the Republic of Uzbekistan in November 1998. After discussions, an agreement entitled "Scope of Work for the Study" was signed both by the Uzbekistan side (i.e. the Ministry of Macroeconomics and Statistics, the Ministry of Communal Services and the Tashkent City) and by the Preparatory Team as the representative of JICA in Tashkent City on November 11, 1998.

(2) Inception Report

In accordance with the above "Scope of Work for the Study," JICA sent a study team (hereinafter referred to as the "Study Team") to the Republic of Uzbekistan in June 1999. The Study Team submitted their Inception Report describing their plan for the Study to the Uzbekistan side. After a discussion of the Inception Report, the Uzbekistan side expressed

its satisfaction with the Inception Report and promised to offer the Study Team as much cooperation and assistance as possible. The Ministry of Macroeconomics and Statistics, the Ministry of Communal Services and the Tashkent City agreed to act jointly as a counterpart agency to the Study Team. They also assigned key personnel as their members on the Steering Committee, which is the coordinating liaison body designated to communicate with the relevant departments and organizations in order to proceed smoothly with the Study.

1.2 Scope of the Study

1.2.1 Objectives of the Study

The objectives of the Study which the Study Team aimed to accomplish were as follows:

- (1) To formulate an improvement plan for management as well as a tariff policy for drinking water supply services; and
- (2) To transfer technology related to planning methods and other skills to the counterpart personnel during the course of the Study.

1.2.2 Study Areas

The study areas for the Study Team were the drinking water supply services in Tashkent City and in Chirchik City. Tashkent City is the capital of the Republic of Uzbekistan. Chirchik City is one of major cities located in Tashkent Province. It is expected that the solutions to be proposed by the Study Team as a result of their analysis of the issues found by researching present situation in Tashkent City and Chirchik City will have a strong influence, not only on these two cities, but also on other cities in Uzbekistan.

1.2.3 Schedule and Approach for the Study

The Study Team's schedule is spread over 10 months from June 1999 to March 2000 and the Study has been divided into three stages as follows.

- (1) The primary objective of Study is to understand the present situation surrounding the drinking water supply business and the related organizations and their circumstances in Tashkent City and Chirchik City.

The Study Team visited Uzbekistan at end of June 1999 and continued to conduct the above Study until the end of September after submitting their Inception Report to their counterparts in Uzbekistan.

The major procedures to accomplish the purposes of the above Study were to perform;

- 1) data collection and hearings with respect to the management of water supply services and on the socioeconomic and institutional conditions,
- 2) an investigation into the existing water supply facilities,
- 3) to conduct various field surveys such as the measurement of water consumption and water leakage, and
- 4) to administer a survey in the form of a questionnaire to the water users.

After returning to Japan, the Study Team prepared an Interim Report which reflected their understanding of the present situation and the current issues identified as a result of the analysis by the Study Team.

- (2) Discussion of the appropriateness of the Study Team's understanding of the present situation and the current issues described in their Interim Report and of the effectiveness of the solutions proposed by the Study Team to resolve their issues.

The Study Team stayed in Uzbekistan for one month after the middle of October 1999. During their stay in Uzbekistan, the Study Team tried to find solutions to resolve the

existing issues, and asked the representatives of the Uzbekistan side whether the issues analyzed by the Study Team were appropriate or not. In addition, they discussed the effectiveness of the solutions tentatively proposed by the Study Team with the representatives of Uzbekistan.

After their return to Japan, the Study Team prepared a Draft Final Report to reflect the results of the discussions in Tashkent City and Chirchik City including the proposed solutions to the issues analyzed by the Study Team.

(3) Presentation of the Draft Final Report, decision to hold technical transfer seminars and completion of the Final Report.

The Study Team will stay in Uzbekistan for one month from the end of January 2000. They plan to explain and discuss the Draft Final Report with the Steering Committee. The minutes of the meeting on the Draft Final Report are to be signed in February 2000. Comments on the Draft Final Report are to be submitted to the Study Team within one month after its submission.

In addition, technical transfer seminars are to be held in February 2000.

After returning to Japan, the Study Team will prepare the Final Report within one month after receiving the comments from the Steering Committee.

Chapter 2 Present Status of Water Supply Services in Uzbekistan

2.1 Socioeconomic Conditions

2.1.1 Overview of the Country

The Republic of Uzbekistan ("Uzbekistan" hereinafter) is located in the middle of Central Asia and covers an area of 447,000 km². The population of Uzbekistan is about 24 million and the average annual growth rate is 1.9 %. On August 31, 1991 the independence of Uzbekistan was proclaimed. Since then, the certain measures to transit towards market economy have been carried out by step-by-step approach. The real GDP for the year 1998 increased by 4.4% over that of to 1997. Specifically, agriculture sector accounts for about one fourths of GDP in Uzbekistan in 1997, and is an essential sector of the economy. The industrial growth amounted to 5.8% in 1998, with the fastest growth being achieved in the chemical and oil-chemical industry (24.6%) and the food industry (10.5%).

2.1.2 Transition to a Market Economy

The central government structure of the ROU has been reorganized since its independence in 1991 to promote a market-oriented economic system and to implement political and economic reforms. The major changes which have been realized are summarized as follows:

- (1) Abolition of agencies matched under the old Soviet-style political system and agencies only purposeful under a centrally planned economy;
- (2) Abolition of agencies engaged in resources allocation;
- (3) Priority on the improvement of communal services in rural areas.

Other legislative structures of business, for example, economic reform, privatization and acquisition of state-owned enterprises (SOE) have been formulated..

2.1.3 Summary of socioeconomic Conditions

Among the five CIS countries in Central Asia, the ROU has been regarded as having the highest

potential for development. But the ROU has faced the challenges of macroeconomic management since its independence in August 1991. Its progress in economic reform, privatization and foreign direct investment had lagged behind the neighboring CIS countries. However, adverse effects of the sluggish economy worldwide, especially the Asian economic crisis which started in the middle of 1997 and the Russian crisis which started in August 1998, were less rampant in the ROU compared to their impact on neighboring CIS countries.

As the "Denationalization and Privatization Law" dated November 19, 1991 defines, the ROU adopted a strategy aimed at bringing about gradual changes and creating an efficient, socially-oriented free market economy. It rejected the "Big Bang" approach and instead opted for a gradual approach to transition and structural reform. Due to delays in the implementation of measures to open its markets, and inefficient legislative and institutional structures, more and more enterprises already operating in the ROU and potential foreign investors have begun to look toward other countries. Insufficient and unsecured currency convertibility of the local currency, the sum, to hard currency is the most serious problem for foreign investors.

2.1.4 Socioeconomic Conditions in the Study Area

(1) Tashkent City

Tashkent City has a population of 2.2 million and occupies a territory of 340 sq. km., which is divided into 11 administrative regions ("rayons"). The city's contribution to the total GDP of the ROU is about 14%, which is more than that of any province of the ROU. About 38 thousand enterprises (including the providers of public services) are registered in Tashkent City, which represents about 20% of all enterprises registered in the ROU.

(2) Chirchik City

Chirchik is a medium-sized city with a population of about 145 thousand located in Tashkent Province about 20 km north-east of Tashkent City. Industrial production in the city is dominated by five big production plants, which were relocated there from other regions of the FSU during the World War II. About one-fifth of Chirchik's labor force works for the five plants. Chirchik City Vodokanal was founded in the early 1950s based on water supply units of the biggest industrial plants located in Chirchik, mainly Elektrohimprom.

2.2 Institutional and Management Aspects of Water Supply Services

2.2.1 Legal Foundation

The most urgent and challenging tasks at the moment for the MCS in the water sector are understood to be: 1) improvement of water supply in rural areas, 2) acceleration of installment of water (and gas) meters in private houses and apartments. The related regulations were categorized into two groups: 1) improved administration of water supply services, 2) development of water supply services in agricultural and rural areas.

2.2.2 Overall Sector Administrative Structure

With the reorganization of the sector, major roles of MCS have been reduced to the overall coordination of the sector and technical assistance to the sector's agencies. Responsibilities for day-to-day services and related administrations now fall on local governments and their respective Territorial Communal Services Amalgamation (TCMA). MCS takes care of the formation and implementation of the state policy of the water sector and its overall coordination.

MMS is responsible for the investment plan of public works and distribution of the fund, while the Ministry of Finance (MOF) is responsible for budgeting and financing plan. The water sector development program through 2005 is now being reviewed in order to develop a longer-term program with 2010 as the target year. MOF recognizes the water sector as one of the priority sectors amongst all public works and communal services; in particular, the water supply to agricultural areas is deemed significant and is given priority.

(1) Housing Maintenance Office (JEK)

JEK is a type of enterprise responsible for providing of communal services to the residents living in blocks of apartments. Each block of apartments is assigned to a certain JEK. Thus, JEK is responsible for the repair and maintenance of the buildings, for the supply of water, heating, gas, electricity, and for other similar communal services as well as relevant tariff collection. The responsibilities of JEK with regard to repair and maintenance are limited to work inside the buildings, whereas responsibility for maintaining the water supply outside the buildings remains with

Vodokanal.

(2) Mahallinskye Committees

The Mahallinskye Committees (or the "Committees") have existed all over the ROU as community organizations for a long time. Their present situation is based on a law entitled "Institutions for Self-Governing of Citizens" dated April 14, 1999. Recently additional function has been given to the Committees by the central and local governments regarding the collection of communal services fees. This Law determines the rights and responsibilities of these Committees, which act as executive bodies and are elected at general meetings of the residents of respective territories. The level of involvement of the Committee in the collection process of tariff and overdue accounts, and the fees they receive from Vodokanal differ from region to region.

2.2.3 Transition to Self-supporting of Water Supply Utilities

The GOU's strategy toward self-supporting of communal services was initiated by the Presidential Decree No.UP-617 dated July 15, 1993, and then detailed in measures issued by the Resolution of the Cabinet of Ministers No.54 dated February 7, 1994. Tariff increases, especially residential tariff, and the transfer to metered rate system are understood to be the two major steps toward self-supporting.

2.2.4 Transition to a Metered System

The detailed installment program in each city/region has been issued by each respective local government.

2.2.5 Government Financial Assistance to Water Supply Services

The state subsidy rate in the ROU, which is currently 60%, is expected to be reduced by 10% annually until it reaches to 0% in 2003. "The cost of installation of meters shall be fully compensated at the expense of an owner of a private house and apartments" (Article 4 of Tashkent City Hokim's Decision No.111).

2.2.6 Overdue Accounts Settlement System

The central and local governments have addressed the problems of non-payment of tariff and over-due accounts by state-owned enterprises and public organizations. The Resolution of the Cabinet of Minister No.347 dated July 19, 1999 discloses dissatisfaction about inefficient work done by the related central government ministry/agency, local government and Vodokanal. In order to collect the over-due accounts from public organizations and state-owned enterprises, mutual off-set system has been implemented. It is reported that the GOU has commenced a certain treasury reform process within MOF with the foreign assistance of US AID.

2.2.7 Social Safety Net

The implementation of measures for the social protection of the population, first of all, its socially vulnerable people, has been officially declared in the ROU as one of the priorities of its economic policy. For water supply services, social protection takes the form of a reduced tariff granted to a selected group of people. It is noted that the "Indexation Fund" was made available only to registered vulnerable people for the payment of indebted tariff by the Resolution of the Cabinet of Ministers No. 347 dated July 19, 1999.

The responsibility for providing targeted support by identifying low-income families has recently been entrusted to the Mahallinskye Committees who determine the eligibility of families for social aid and who make payments to such families. The rate of reduction of the tariff varied according to the group of people. In the water sector, a rough estimate of the amount granted by the two Vodokanals studied were 48 million sum for Tashkent City Vodokanal and 7 million sum for Chirchik City Vodokanal. The Vodokanals have assumed the financial burden for these privileges.

2.2.8 Other Laws Related to Water Supply Services

A comparative table of water sector laws was prepared to give a perspective to the legal structure of the water supply services in the ROU in comparison with Japan.

2.3 Other Influential Aspects

2.3.1 Present Status of Computerization in the Country

One of the ways to increase the level of managerial efficiency is to introduce a computer system. The present situation of computerization in the ROU, including information technology and communication services, education on information technology and the computerized banking system in the ROU were studied. The following issues were considered as key elements of the environment when the computerization of the Vodokanals was analyzed.

(1) Training of Computer Specialists

As a number of computer specialists left the ROU after its independence, there is a difficulty in securing the human resources to design and develop application systems. In addition, foreign investors in the area of information technology are few and thus the latest technology has not been spread.

(2) Computerized Banking System (Automatic deduction of Tariffs from Bank Accounts)

The computerization of financial institutions lags behind that of other countries and the general public usually does not utilize the banks.

(3) Information Technology and Copyright Protection of Software

Due to insufficient copyright protection of computer software, pirated copies are widely circulated in the market. This results in an immature information technology sector in the country.

(4) Telecommunication Infrastructure

Telecommunication infrastructure in the country has not been well developed and very few facilities have been digitalized. It is thus difficult to set up an on-line Wide Area Network system ("WAN") linking various remote sites.

2.3.2 Foreign Assistance to Water Supply Projects

Many financial assistants including World Bank and Asia Development Bank, have been implementing several projects related to water supply services in the ROU. Water supply projects other than this JICA Study being implemented all over the ROU have been summarized. Right now, there are no other foreign assisted projects in the water sector in Tashkent and Chirchik City. Additional information provided by the World Bank and Asian Development Bank have been noted.

2.3.3 Coordination for Receiving Foreign Assistance and its Implementation

Ministry for Foreign Economic Relations is in charge of receiving the financial supports by foreign donors. Based on the experiences and lessons learned during the course of this JICA Study, the following points are advised for the effective coordination of future foreign assistance.

- (1) Expansion of institutional capacity and power including the number of staff in the Department of Foreign Economic Relations with Countries in Asia and the Pacific Region by the Ministry of Foreign Economic Relations, for the improvement of communication between the Department and donor countries' agencies.**
- (2) Transfer of the power and function of the related ministries/agencies (currently concentrated to a specific person of higher authority) to a lower and subordinated department/section/officer, for efficient communication between the agencies of the donor countries and the GOU to achieve well-coordinated project implementation. This will also contribute to sustained project formulation and management.**

- (3) Improved communication between the ministries/agencies as well as within each ministry/agency, to avoid unnecessary time being spent on communication/explanation from the donor side, including the foreign consultants to the GOU.

- (4) More openness in providing the donor side (including the foreign consultants) with related information and data.

Chapter 3 Present Status of Water Supply Services in Tashkent City

3.1 Organizational Management

Administrative structure of water supply services of Tashkent City was reviewed. Organizations and functions of TCMA and Tashkent City Vodokanal were analyzed. As part of organizational strengthening measure, reorganization of Rayon-Vodokanal is being planned. If implemented, Rayon-Vodokanals would collect water tariffs for their revenue and pay some portion out of them to their Headquarter as their contribution. Institutional and technical capabilities would also be upgraded.

3.2 Managerial and Financial Status

3.2.1 Structure of Tashkent City Vodokanal

The present organization of Tashkent City Vodokanal came into effect as of May 1, 1998. As of the same date, the Department of Capital Construction was separated from the original organization.

Tashkent City Vodokanal is planning to undertake restructuring and to introduce a self-supporting system in the twelve existing Rayon-Vodokanals and require them to issue their own financial statements. After its restructuring, major roles which Tashkent Vodokanal will play are ; to coordinate the rayon Vodokanals, to plan management strategies, to manage personnel affairs, and to administrate funds (common expenses) contributed from each rayon Vodokanal for stabilizing the organization.

There are 4,490 employees working for Tashkent Vodokanal as of July 1, 1999 including the Repair and Construction Sector. Including the number of employees in the Capital Construction Department, the total number is 4,545. The numbers of employees in administrative sector account for 355 out of 4,490 employees. The rest of the number, 4,135 employees belong to the Production Sector.

3.2.2 Managerial Status

Tashkent City Vodokanal is an entity which is owned and controlled by GOU. The government generally exerts considerable influence on such amenity; however, the representatives of Vodokanal manage their operations with relative independence. The present Tashkent City Vodokanal is permitted a certain amount of leeway for further improvement because it is still in the process of restructuring as it shifts from a planned economy to a market economy.

(1) Property Rights (Ownership)

The funds necessary for future investments by Tashkent City Vodokanal are covered by the Hokimiyat's budget. The assets are booked on the balance sheet (B/S) and depreciated through the profit-loss statement (P/L) of Tashkent City Vodokanal when a construction is completed. Even though the assets are booked on the B/S of Tashkent City Vodokanal, the ownership to these assets is still retained by GOU. It is observed that assigning the property rights to the government could discourage Tashkent City Vodokanal from making an effort to operate the assets effectively and improve business performance.

(2) Investment Plans

Tashkent City Vodokanal drafts an annual investment plan while the Hokimiyat draws up the mid-term and to long-term plans. Tashkent City Vodokanal is requested to propose a draft plan (a mid-term and long-term plan) to the Hokimiyat but does not bear the responsibility for future operations based on such a plan.

(3) Accountability

The current disclosure requirements for Tashkent City Vodokanal may not be sufficient and this may be caused by the following factors:

- 1) The property rights are held by the government.
- 2) Significant management-making decisions are handled by the government.
- 3) As a result of the above, Tashkent City Vodokanal may not feel accountable and responsible.
- 4) There are currently no laws requiring full financial disclosure.

(4) Cash Flows

Tashkent City Vodokanal may not care about positive cash flows because it is not required to reserve funds for new investments.

(5) Business Operating Status

The business operating status of Tashkent City Vodokanal is reported and discussed at management meetings held every Tuesday and Thursday. In addition to the weekly meetings, two other regular meetings are held at the Tashkent Hokimiyat. One of these is held weekly and the other is held monthly.

(6) Concept of Planned Economy

Tashkent City Vodokanal has not yet completely eliminated the concept of a planned economy. For example, sales forecasts are based on desirable income and do not include an estimate of potential bad debts. It could seem that the idea of a planned economy makes Tashkent City Vodokanal rely on tariff increases as an easy solution to any financial problems. In other words, Tashkent City Vodokanal appears to expect the government to solve its financial problems.

3.2.3 Financial Status

Table 3.1 presents the income statements of Tashkent City Vodokanal for the years ended December 31, 1998.

Table 3.1 Tashkent City Vodokanal Income Statement (Units: million sum)

	12/31/1998		12/31/1997	
Sales	3,429		2,394	
Value Added Tax (VAT)	(514)		(346)	
Net Sales	2,915	100%	2,048	100%
Cost	(2,142)	73%	(1,373)	67%
Gross Margin	773	27%	675	33%
Administrative Expenses	(65)		(47)	
Other Expenses	(289)		(123)	
Income Before Income Taxes	419		505	
Income Taxes etc.	(205)		(196)	
Net Income (Loss)	214	7%	309	15%

Table 3.2 Compositions of Water Supply Services – Tashkent Vodokanal

	Unit	December 31, 1998	%		December 31, 1997
Water Supply Services					
Volume of water supply and distribution					904
Volume of water supply	million m ³	899		100	760
Volume of water distribution		687		42	324
Population	million m ³	289		50	378
Communal Enterprises	million m ³	341		8	58
Industry, Transportation and Construction.		58		100	1,568
Revenue	million sum	2,065	71	10	106
Population	million sum	210		72	1,183
Public organizations,	million sum	1,482		18	279
Industry, Transportation and Construction.	million sum	373			
Water sewage services					
Revenue	million sum	848	29	100	672
Total revenue	million sum	2,912	100		2,240

(1) Cross subsidy

Water users are classified in view of present water tariff structure as follows:

- 1) Population;
- 2) Communal Enterprises; i.e. state owned corporations, and Corporations, i.e. restaurants
- 3) Industry, Transportation and Construction.

Water sales to the population (in terms of sum) represent only 10% even though their percentage of the water supply volume is 42%. On the other hand, the proportion of water sales to Communal Enterprises is 72% even though their percentage of the water supply volume is 50%. The portion of water sales to Industry, Transportation and Construction is 18% even though their percentage of the water supply volume is only 8%. Sewer services show a similar trend.

(2) Tariff Collection

The balance of accounts receivable as of December 31, 1998 was 615 million sum and sales amounted to 3,429 million sum. The turnover period for tariff collection is approximately 2.2 months, however, accounts receivable are netted against advance payments. Major delinquent account receivable (over 60 days past due) is Tapoich, an aircraft factory. Tapoich has not paid its water tariff since 1996 and Tashkent City Vodokanal on one occasion stopped the supply of water. However, Tashkent City Vodokanal reinstated Tapoich's water supply under a government order.

(3) Capacity and Breakdown of Costs

Table 3.3(2) presents a comparison of capacity and a breakdown of costs among Tashkent and other cities/countries.

Table 3.3 (1) Comparison of Capacity and Breakdown of Costs

Location	Uzbekistan		Japan (1997)		Developing Countries
	Tashkent	Chirchik	Tokyo	Nagano	
GDP per capita	510 US\$				2,861 US\$
Population Served (thousand)	2,110	145	11,103	565	5,827
Water supply service ratio	98.5		98.5	32.0	81
Number of Employees	4,490	433	5,540	58	3,138
Population Served by One Employee	490	334	2,176	3,477	1,856
Production unit cost (per cu.m)	2.11 sum	3.92 sum	210 yen (1.98 US\$)	162 yen (1.53 US\$)	0.172 US\$
Personnel Expenses (%)	10	4	16.7	16.6	
Depreciation (%)	10	3	18.9	25.9	
Electricity (%)	48	72	2.9	5.5	
Materials (%)	6	5	0.6	0.5	
Repairs (%)	4	2	21.4	11.8	
Outsourcing Expenses (%)	0	0	6.7	2.1	

(4) Production Unit Costs

The production cost per unit is 2.11 sum/cu.m, as calculated (1,447 million sum/ 687 mil cu.m) from Table 3.3(2). If the expenses for the period were included in calculation, the production cost per unit would be 2.53 sum/cu.m (1,739 million sum/ 687 million cu.m). The principal variable costs consist only of materials, electric power and the variable production cost per unit is 1.1 sum/ cu.m.

Table 3.3(2) Compositions of Costs

Items	Water Supply			Water Sewage		Total	
	Million sum	%	Sum/m3	Million sum	%	Million sum	%
Material	89	6	0.13	40	6	128	6
Electric Power	691	48	1.01	195	28	886	41
Production Salary	149	10	0.22	90	13	239	11
Charge	58	4	0.08	35	5	93	4
Repair cost	56	4	0.08	55	8	111	5
Depreciation	150	10	0.22	156	23	307	14
Transportation	89	6	0.13	40	6	130	6
Inner expenses	52	4	0.08	52	7	104	5
Others	113	8	0.16	31	5	144	8
Sub total	1,447	100	2.11	695	100	2,142	100
Period cost	292		0.42	22		314	
Total	1,739		2.53	717		2,456	

(5) Net Income

Tashkent City Vodokanal appropriates net income from the bonus or salary payments for each employee and does not reserve net income as retained earnings. As a result of this, there is no capital stock.

Table 3.4 presents the balance sheets of Tashkent City Vodokanal as of December 31, 1998.

Table 3.4 Balance Sheet of Tashkent City Vodokanal (Units: million sum)

	12/31/1998	12/31/1997
ASSETS		
Fixed Assets:		
Acquisition Costs	4,946	3,570
Accumulated depreciation	(1,137)	(822)
Net Book Value	3,809	2,748
Others	45	0
Total Fixed Assets	3,854	2,748
Current Assets		
Inventories etc.	295	112
Accounts Receivables	795	531
Total Current Assets	1,089	643
Total Assets	4,943	3,392
CAPITAL		
Charter Capital	99	99
Additional Capital	3,857	2,657
Reserve Capital	798	584
Total Capital	4,753	3,339
LIABILITIES		
Accounts Payable	189	53
Total Liabilities	189	53
CAPITAL AND LIABILITIES	4,943	3,392

(6) Increase in Amount of Investments

The above investments appear to represent a dramatic increase when compared with the amount of the fixed assets in current B/S. The reason for this increase is mainly attributable to inflation in ROU.

(7) Inflation Accounting

Government-owned companies, including Tashkent City Vodokanal in ROU, revise the acquisition costs of their fixed assets once every few years. Over the past several years, acquisition costs were revised in 1995 and 1997. The revised acquisition costs do not indicate the accurate replacement costs of the underlying assets because the parameters used by the government are determined on a general basis and do not reach the costs which would be charged

to replace each asset.

(8) Depreciation

Depreciation is calculated at an average rate of 10%; however, this may not be sufficient to provide future investment funds.

(9) Cash Flows

When there is a shortage of cash, Tashkent City Vodokanal does not apply for loans from banks, but postpones payments to its suppliers, and so forth. Generally speaking, a private company in a market economy would go bankrupt in a similar situation.

(10) Investment Plan

As mentioned above, future investment costs in Tashkent City's budget are covered by the government. It is said that this scheme will continue in the future. In particular, investments for improving the distribution network are expected to increase.

3.2.4 Communication with Users

(1) Public Relation Activities for Educating Users' Awareness on Water Saving

1) Present Situation

The result of the questionnaire survey shows that the level of awareness on water saving is high among both individual and corporate users. However, this understanding of water saving does not necessarily lead to their action under the current fixed rate system. Therefore, users who pay the fixed charge seem to either consume enormous amount of water or waste water.

Vodokanal only makes appeals for the need to conserve water a few times a year by issuing newspapers and broadcasting externally consigned commercial films, but does not carry out any effective systematic publicity, e.g. education programs at schools which could persuade the people to take steps to conserve water.

2) Problems

- i) The wasted water is not consumed for the users' daily lives or in production activities by the individual and corporate users, but is consumed without creating any value from the water. From a long-term point of view, wasting water has a negative impact on the environment and impedes sustainable development and opposes the public interest. The publicity of Vodokanal has not concentrated on educating the users to save water using the argument that wasting water impedes the public interest.
- ii) Wasting water bleeds water costs under the current fixed rate system, and these costs are not collected as profit. This is one of the elements that impede a self-supporting system as its profits are constantly decreased. Vodokanal has not raised the issue of public management in terms of wasting water in that this hinders public services which are based on a self-supporting system.
- iii) In order to reduce the level of annual water consumption by half, Vodokanal needs to carry out a large-scale publicity campaign including water conservation. The success of such a campaign cannot be expected without strategic publicity by the department of public relations and professional staff, or without estimating the budget for the campaign. The problem is the lack of a strategy which makes effective use of an organization, personnel, capital and the power of publicity.

(2) User participation management style

1) Present Situation

Vodokanal has not made any management of its decisions for by obtaining the users' opinions and, thus, this is not a public-participation style of management. Accordingly, a department of public relations, which would have contact with outsiders, e.g. the users, has not yet been established as an organization, and only the staff in the sales department has contact with the users. Communication between the sales department staff and the users is mainly made

during the tariff collection, and the staff does not report to the upper level managers as an aid to management.

Vodokanal also does not disclose any information on its general management situation. However, the results of the questionnaire survey show that both individual and corporate users express a high interest in the present state of public services. They answered that there is a need to disclose the condition of the water supply management, the organization, cost structure of the water tariff, and current issues on public services. The users also expressed a need to communicate with the Vodokanal, so as to receive any information on the use of water in daily life. Therefore, no meaningful communication about matters related to the water supply business has occurred between the two parties, so far.

2) Problems

As Vodokanal has not adopted a public-participation style of management to actively reflect the users' opinions in management decisions, an opportunity cost, as shown below, has been generated and management has become rigid.

- i) By not reflecting the users' opinions about water supply services, additional public interest has not been realized and it impedes the improvement of the quality of public services .
- ii) Not reflecting the users' need in management's decisions lowers the users' level of satisfaction; therefore, the level of their support for the management of Vodokanal is not high and future measures such as a water conservation campaign and a smooth transition towards a self-supporting system are regarded as insecure.
- iii) As information on water supply services is not disclosed without inspecting/examining the level of efficiency of management, it is difficult to increase the rate of earnings because it is hard to put pressure on to cut costs. This is not positive in terms of developing a self-supporting system. Moreover, they would be at a disadvantage in terms of public trust in raising money from outside agencies, such as financial institutions, except for the government

3.3 Tariffs

3.3.1 Current Water Tariffs and Tariff Policy

(1) The current tariff table

The current tariff table as of August, 1999 in Tashkent City is presented in Table 3.5.

Table 3.5 The Current Tariff Table – Tashkent

Tariff system	Users	Water supply system	Water sewage system
Fixed rate	Population	31.08 sum/m^3 $= 1.81 \text{ sum/ m}^3 \times 0.33 \text{ m}^3 \times 30 \text{ days}$ $+ 1.02 \text{ sum/ m}^3 \times 0.43 \text{ m}^3 \times 30 \text{ days}$	
Metered rate	Population	1.81 sum/ m^3	1.02 sum/ m^3
	Budget Organizaitons	3.0 sum/ m^3	1.86 sum/ m^3
	Public Organizations operating a self-supporint system	8.22 sum/ m^3	5.42 sum/ m^3
	Corporations	8.22 sum/ m^3	5.42 sum/ m^3

The present factors used in calculating the tariff table are as follows:

- 1) Estimating the total costs based on the production plan;
- 2) Forecasting the necessary revenues as the total costs plus an appropriate margin;
- 3) The tariff for the general population is determined politically by the government of Tashkent City and the revenues to be generated from the population is estimated at this tariff times the forecasted volume of consumption;
- 4) Revenues from Budget Organizations, Self-accounting Communal Organizations, Production, Transportation, and Construction, etc. are calculated by forecasting the necessary revenues (2) and subtracting this amount from the revenues to be generated from the population (3);
- 5) The tariff for Budget Organizations, Self-accounting Communal Organizations, Production,

Transportation, and Construction, etc. is calculated by dividing the projected revenue (4) by the forecasted volume of consumption.

The tariff for the population is determined politically and is currently 1.81 sum/cu.m. However, the calculation of production unit costs is based on the revenue statement as of December 31, 1998 which came to 2.1 sum/cu.m and, thus, the tariff for the population cannot fully cover the unit costs. There is presently a differential of approximately 4.5 times between the utility fees charged to users in the general public and to other users. This, in effect, amounts to a "cross subsidy" for the population.

(2) Government Plan for the Improvement of Water Tariff Policy

The government of Tashkent has developed a plan for its water supply which is outlined in the following:

- 1) To end the cross subsidy to users in the population (whose costs are currently the borne by other users) by the year 2002 under orders of the mayor of Tashkent.
- 2) To install meters for all users by the year 2004.
- 3) To charge the installation cost of these meters back to the users; and
- 4) To continue funding new investments from the government's budget.

The Study Team examined the global standards regarding the water supply business with reference to our proposal of revised tariff table. We propose the revised tariff table in 7.4 with consideration of the current water tariff policy, the plan developed by the government of Tashkent, and the global standards for the water supply business.

3.3.2 Tariff Collection System

The present situation and problems regarding a tariff collection system in Tashkent City, being in a transitional period to a metered rate system, are described below:

(1) Present Situation

1)As for the tariff collection system, a fixed rate system is mainly adopted for the residents (population), whereas a metered rate system is mainly adopted for the communal service and industry categories. The metered rate system, however, is not yet functioning sufficiently since it was adopted only recently. Furthermore, the meter reliability is very low due to the poor quality of the meters installed. The location of the meters is also a problem as many of them are installed where access is difficult.

2) For the apartment category, JEK is responsible for tariff collection and inner apartment repair/maintenance services. Commission of JEK is services for tariff collection and repairs/maintenance is 54 % of the collected sum, which seems quite high.

3) Payments of users are received at post offices (34 %), banks (35 %) and directly to the collectors of the Vodokanal (31 %).

4) For the tariff collection rate, the resident category shows 64 %, which is lowest compared with the other categories.

(2) Problems

1) In the case of the fixed rate system, the actual water consumption of each user cannot be ascertained grasped so that the water tariff cannot be set at proper level.

2) Computerization is still far below the required level so that the efficiency of computation is very low and inaccurate.

3) Although the transition to a metered rate system is in process, the progress is low mainly due to the various constraints in the budget.

4) For the metered rate system, which at present is enforced only in part, the system itself is not trusted by the users and the operation of the system is not stable because of the lack of installation standards and the poor quality of the meters.

5) With respect to tariff collection, JEK is in charge of services for apartments and the present commission is so high that the Vodokanal is affected in the business management. The collection except for apartments is done by Vodokanal's collectors and resulted in poor efficiency. Besides, the settlement by offset, which does not have cash income, is common and has a serious influence on the salary payment for the Vodokanals' staff.

3.3.3 Water Tariff Setting Process

The Current water tariff setting process and related items including the departments responsible, the points to be taken into account in setting the tariffs, and public relations activities in Tashkent City and Chirchik City are summarized. The process and other corresponding items adopted in Japan are also studied and summarized for the purpose of comparison and future improvement.

3.3.4 Tariffs for Other Communal Services

To trace tariff increases for water supply and other communal service, and to compare the trends of tariff increases, relevant data on all tariff rate changes from 1993 to the present in Tashkent City were collected from TCMA Tashkent City. Based on these data the JICA Study Team developed a table and figures showing the tariffs for communal services at the end of each year, from 1994 to 1999 (July).

3.4 Present Status of Computerization

3.4.1 Computer Systems at Tashkent City Vodokanal

The Study Team studied seven computerized systems at Tashkent City Vodokanal and reviewed the Water Customer System (the computerized tariff collection system) in particular detail.

The computerized Water Customer System not only stores digital information on all the users, but also issues payment orders to banks. The local area network of the computer system is situated in the Water Sales Department of Vodokanal. It consists of six computers to handle settlements with the users. The processing functions of the users' database include registration of new users, and tariff calculation from the three groups of users: industry, communal services sector (municipal enterprises), and the general population (residents living in houses and apartment buildings).

3.4.2 Tariff Collection Procedures

The Study Team studied how the computerized tariff collection system is actually functioning, by reviewing the tariff collection procedures: applications, changes in conditions, billing procedures, receipt of tariff revenue and management of overdue account .

3.4.3 Analysis of Tariff Collection System

(1) Analysis of Present Computer Systems

It is observed that the current collection system generally covers the functions required for tariff collection procedures. In the future, however, performance may decline on account of the increased volume of data as the installation of the meters at all houses and apartment buildings progresses. The computer hardware currently in use is outdated. There are many duplicate tasks which are also being performed manually, which should be redesigned. In conclusion the present computer section also needs to be strengthened with additional staff.

(2) Analysis of Tariff Collection Procedures

Currently, one controller (a kind of service staff member) provides most of the services for a particular user group in terms of meter reading, billing and tariff collection. This system, from the viewpoint of internal controls, is incomplete in its segregation of duties. The Study Team also observed that it takes a lot of time to read the meters in the presence of the users. In addition, the management of outstanding tariff charges is not being handled effectively.

3.5 Water Supply System and Operation and Maintenance

3.5.1 History and Outline

The current water supply system in Tashkent was completed in 1988. The oldest facility, which was constructed as a modern water supply facility in May, 1931, is the Boz-su Water Treatment Plant (WTP). In 1955, the Kibray WTP, the groundwater intake facility and finally the Sergeri WTP were constructed. The old town of Tashkent and the above-mentioned existing facilities were heavily damaged by an earthquake in 1966, the repair and construction work supported by the USSR and the GOU restored these facilities rapidly. In 1968, the Kadirya WTP was commissioned and the distribution network designed for the new town area was completed. The entire system was also refurbished. An outline of water supply system is shown in Table 3.6.

Table 3.6 Outline of Water Supply System in Tashkent City

Item	Units	Value	Remarks
Service Area	sq.km	340	
Population Served	persons	2,260,000	Assumed
Water supply service ratio	%	98.55	
Number of Service Connections	number	568,768	
Total Length of Pipes	km	3,652	Jan.1999
Total Production Capacity	cu.m/day	2,296,000	Nominal
Total Annual Volume of Water Supply	10 ³ cu.m	899,706	Aug.'98-Jul.'99
Max Daily Volume of Water Supply	cu.m/day	2,830,000	
Average Daily Volume of Water Supply	cu.m/day	2,465,000	Aug.'98-Jul.'99

3.5.2 Water Supply Systems

The locations of the WTPs in Tashkent City are shown in Figure 3.1. The existing water sources are two surface water intake pump stations (PSS) at the surface WTPs, and five groundwater intake PSSs. The capacity of these plants, the water sources, the year of construction and the area of each site are shown in Table 3.7.

A flow chart of surface WTPs is shown in Figure 3.2. Distribution pumps and booster pumps are provided at each plant in addition to the 92 booster PSs. 92 booster PSs are located all around the city and most of them have a capacity of less than 1,000 cu.m/hr. The bigger ones with a capacity of 3,000 cu.m/hr consist of three units and there are two other units with a capacity of 7,200 and 30,000 cu.m/hr.

Table 3.7 Existing Water Sources and Treatment Plants

Name	Capacity (cu.m/day)	Measured flow (cu.m/day)	Water Sources	Year of Construction	Site Area (ha)
Boz-su	235,600	258,000	Boz-su Canal	1931	72
Kadirya	1,375,000	1,830,000	Boz-su Canal	1968	138
Kibray	455,200	478,000	Groundwater	1955	986
Sergeri	40,000	-----	Groundwater	1966	13
Bektemir	25,000	-----	Groundwater	1969	20
Kara-su	52,200	-----	Groundwater	1960	41
South	143,000	141,000	Groundwater	1961	60
Total	2,326,000	2,707,000			1,330

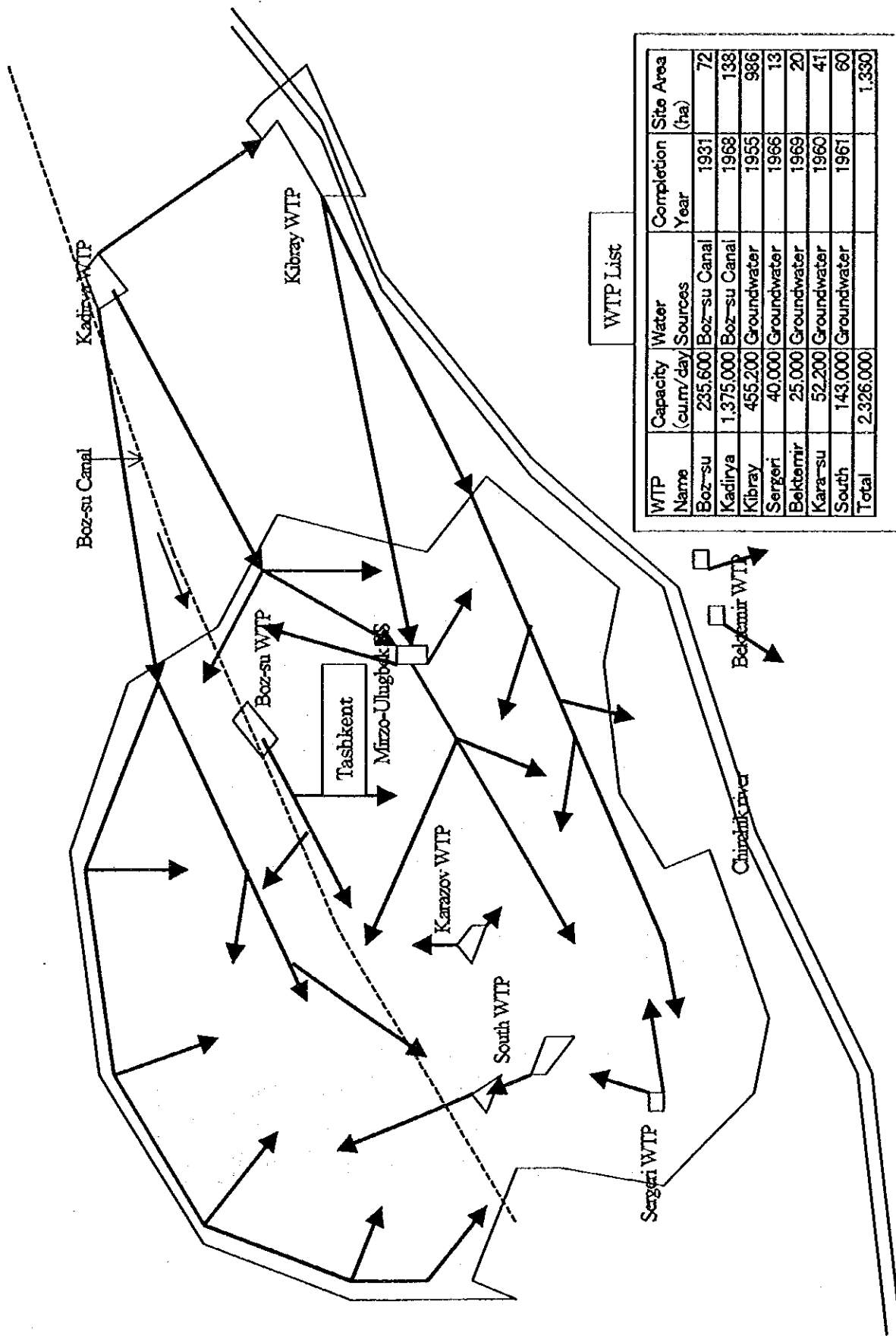
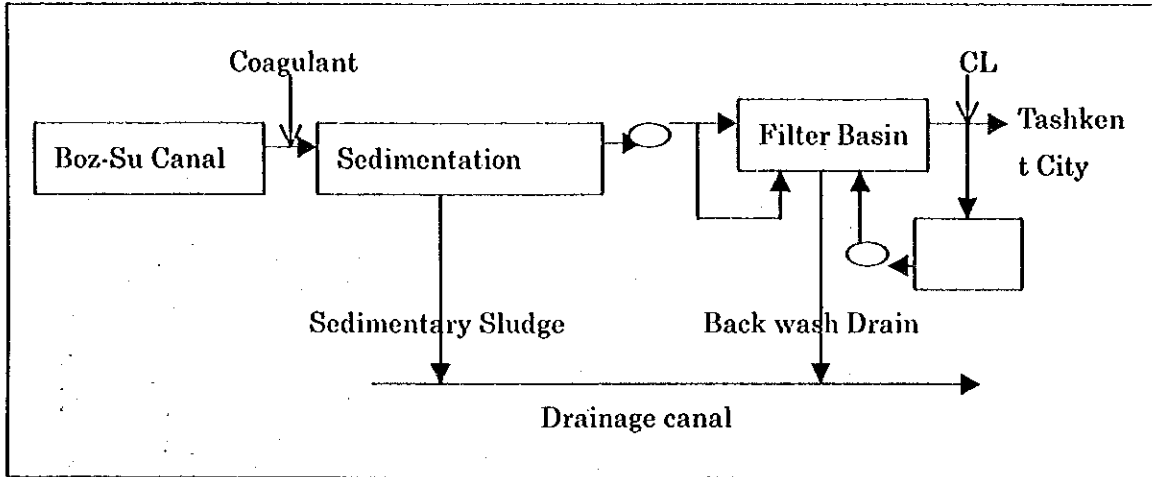


Figure 3.1 Location of Water Supply Facilities in Tashkent City

Figure 3.2 Flow Chart of Kadirya WTP



The total length of the transmission and distribution pipelines was 3,652 km in 1999. The diameter, material and years of usage are shown in Table 3.8 (1) and Table 3.8 (2).

Table 3.8(1) Diameter and Material of Pipelines (in 1998)

Diameters (mm)	Length (m)	Material	Length (m)
19 - 30	87,689	Steel	2,330,984
38 - 150	1,567,952	Ductile Iron	1,203,695
100 - 350	1,074,443	Others	7,002
300 - 500	198,799	Total	3,541,681
600 - 700	201,981		
800 - 900	56,494		
1000 - 1200	248,625		
1400 - 1800	105,698		
Total	3,541,681		

Table 3.8 (2) Usage Year of Pipeline

Diameter (mm)	Total Length (km)	Length per Year of Usage (km)					
		>5	>10	>20	>30	>50	<50
Total	3,652	259	310	703	1128	1082	170

3.5.3 Operation and Maintenance

(1) Staff

Some 1,695 staff are allocated to the WTPs and 51 to the repair work of Vodokanal and thus a total of 1,746 staff (equivalent to 39% of the total number) are engaged in the operation and maintenance (O&M) of the water supply system. They manage the WTPs, the PSs, the distribution pipelines and the other facilities in Tashkent City.

O&M staff are classified into the following levels: Managers, Electricians, Mechanics, Operators, Repair Technicians, Laboratory Technicians, Clerks, and others (i.e., cleaning and gardening staff), and so on.

(2) Water Volume Control

The annual average volume of distribution was 2,465 thousand cu.m/day from 1998 to 1999. The population served is about 2.26 million and the consumption is thus to 1.09 cu.m/capita/day.

Water is supplied mainly by the four major WTPs, namely the Kadirya, Kibray, Boz-su and South WTPs which distribute water equivalent to 62%, 18%, 10% and 6% of the total volume, respectively. Likewise, 96% of total volume is supplied by PSs at these WTPs. The ratio of the maximum to the minimum volume of monthly water consumption is 2,845/2,286 (=1.24).

(3) Water Quality Control

Water quality control for the surface water WTP is conducted as follows:

1) When the turbidity of the raw water is around 15 to 25 mg/L, coagulation is not practiced. Raw water flows through a flocculation chamber to a sedimentation tank and is then pumped to a rapid filter. Chlorine is injected into the filtered water at the reservoir inlet or at the starting point of the distribution pipe.

2) When the turbidity is consistently higher than the above figure, a 5% solution of solid alum, $Al_3(SO_4)_2 \cdot H_2O$ is dosed into the raw water at the inlet of the flocculation chamber. Pre-chlorination is applied at the intake pumps, if needed.

3) The chemical dosing ratio is determined based on the water quality tests which are performed every one to three hours.

In the case of groundwater WTPs, only chlorination is used for water quality control.

(4) Operation and Maintenance Costs

Table 3.9 shows the annual volume of distribution, electricity consumption, chemical consumption and costs incurred at the WTPs for 1998 to 1999. Based on this table, the annual costs for electricity and chemicals are estimated at 805 and 56 million sum, respectively.

A comparison of the WTPs' power consumption and their volume of water revealed that the power consumption in Sergeri, Karazov and Bektemir WTPs is noteworthy. The higher power consumption is attributable to the 92 booster PSs added to the Karazov and Sergeri WTPs.

Table 3.9 Cost of Electricity and Chemicals

Item	Units (x 1000)	Kadirya	Boz-su	Kibray	South	Sergeri, Kara-su, Bektemir	Total	
Distribution Volume	cu.m	555,843	92,042	164,777	52,206	34,848	899,716	
Electricity Consumption	Kwh	73,136	25,700	65,806	28,100	84,823	277,565	
Costs	Electricity	Sum	212,094	74,530	190,837	81,490	245,985	804,937
	Chemicals	Sum	41,239	10,982	2,307	526	527	55,582
	Total	Sum	253,333	85,512	193,145	82,016	246,512	860,519
Unit Costs	Electricity	Sum/cu.m	0.382	0.810	1.158	1.561	7.059	0.895
	Chemicals	Sum/cu.m	0.074	0.119	0.014	0.010	0.015	0.062
	Total	Sum/cu.m	0.456	0.929	1.172	1.571	7.074	0.956

The repair and improvement budget of Tashkent City Vodokanal is approximately 50 million sum per annum.

3.5.4 Study of Present Water Supply System

(1) Water Sources

The water sources of the Boz-su and Kadriya WTPs are located in the Boz-su Canal, downstream of the irrigation canal which starts at the Charvak Dam Lake, and the water supply rights are 3.19 cu.m/sec (=275,616 cu.m/day) and 21.2 cu.m/sec (1,831,680 cu.m/day), respectively. In the summer, the intake water volume virtually reaches the upper limit of Tashkent City's water rights.

Furthermore, due to the limited production capacity of the groundwater resources, the city cannot cope with any rapid increase in the demand for water. Therefore, the supply capacity cannot be increased rapidly in Tashkent City.

(2) Water Treatment Plants and Appurtenant Facilities

1) Present Problems

i) WTPs and PSs

- a Not even a primary sequential automation control system has yet been introduced, and thus most of the facilities are operated manually.
- b The majority of facilities have deteriorated and the budget for repairs and improvements is too low.
- c Most of the measuring equipment such as flow meters, pressure gauges and level meters, are not working, and therefore the operators of the plants cannot ascertain the basic operational data they require.
- d The reservoirs at the WTPs and the distribution system itself are too small, with the result that their retention time is too brief.
- e To cope with the increasing water demand and the low water pressure in the city, booster PSs have been added but the excessive number of these booster PSs is causing other difficulties.

f Electricity costs are very high because of the many PSs which operate at low efficiency but which are needed to maintain the certain pressure.

ii) Pipelines

- a Many of the pipes and accessories have deteriorated and have not been repaired properly due to budget shortages.
- b The pipes are primarily made of steel, which rusts easily, but no inner linings are provided for rust-proofing and thus the water quality has been aggravated by the rust accumulating in these steel pipes. "Faucet Joints", which tend to leak have been widely adopted for the connections for the cast iron pipes.
- c The distribution pipes were designed for a lower volume than the present flow, and has resulted in low water pressure in the city because of the excessive drop in dynamic pressure as a result of this high volume.

2) Future Problems

i) WTPs and PSs

- a The volume of distribution in Tashkent City cannot be increased due to the limited water rights from the Boz-su Canal.
- b A huge amount for repairs and replacement is needed to be budgeted in the near future.
- c If the water demand decreases, operation of the WTPs will be very difficult. They must deal with the hourly fluctuation in demand due to the lack of reservoir capacity and the manually controlled pumps.
- d If the volume of distribution decreases, the majority of the PSs will no longer be needed.
- e If the volume of distribution increases as even larger number of PSs must be constructed or the capacity of the existing PSs must be increased.

ii) Pipelines

- a In the near future, water leakage will increase and thus a huge budget for repairs and replacement will be needed.
- b Complaints from the users concerning rusty water, interruption of water supply and other problems will increase, in protest to the increased water tariff.
- c Water leakage and interruption of water supply will also increase as the pipes continue to deteriorate.

(3) Water Users

Present and anticipated problems from users are described below:

- 1) In spite of the huge water leakage at houses and buildings, the users do not initiate any repairs because most of them are not on a the metered rate system and their water tariff is low. In other words, even if they repaired the leaks, their water tariff would remain unchanged.
- 2) Users are wasting water because of cheap tariff and the fixed rate system.
- 3) Users do not notify Vodokanal of significant problems which cause leakage and waste of water.
- 4) By the introduction of a metered rate system and a new tariff table, water tariff will rise sharply especially for owner of houses where there are leaks and the users will be forced to repair their own leaking water equipment and pipes.

(4) Countermeasures for Improvement

1) Water Treatment Plants and Appurtenant Facilities

The proposed countermeasures for problems pertaining to the WTPs and the appurtenant facilities are described below:

i) WTPs and PSs

- a A reduction in the volume of distribution should be realized as a result of repairs of water leaks at houses and buildings, by the repair of the distribution pipelines, and by prohibition of irrigation and by water conservation.

- b When the volume of distribution in Tashkent City decreases, some WTPs with a small capacity should be abandoned.
- c The storage volume of the reservoirs in Tashkent City should be enlarged and new ones constructed.
- d Automatic operation systems should be introduced for the PSs and other facilities.
- e Equipment for measuring the distribution flow, the water pressure in the city, and the water levels of the reservoirs should be installed and the measured data should be transmitted to and monitored at the WTPs and at the remaining PSs.
- f Unnecessary PSs should be abandoned in anticipation of the increase in pressure to be realized by reduction of the volume of distribution .

ii) Pipelines

- a Replacement of pipes should be facilitated.
- b The new pipes should have an inner rustproof lining.
- c Plastic pipes should be adopted for pipes with a small diameter.
- d A pipeline replacement plan should be prepared, and an adequate budget should be ensured for this replacement program.

2) Water Users

Proposed countermeasures for problems relating to the users are described below:

- i) Installation of meters should be promoted and the repair of leaking equipment and pipes should be strongly encouraged.
- ii) A loan scheme for repair work should be implemented.
- iii) Criteria for the selection of appropriate water meters and accessories, for proper installation methods and for the location of the meter should be established.
- iv) Vodokanal should also initiate a campaign to promote the conservation of water.