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**STAFF APPRAISAL REPORT**

**TURKMENISTAN**

**Water Supply and Sanitation Project**

**April 24, 1997**

**Human Resources Division  
Country Department III  
Europe and Central Asia Region**

CURRENCY EQUIVALENTS

Currency Unit = Manat

AVERAGE EXCHANGE RATES

Manat per US\$1

	<u>Official</u>	<u>Commercial</u>	<u>Parallel Market</u>
1993 (end)	2	-	2
1994 (end)	75	-	200
1995 (end)	200	2484	2,500
1996(end,estimate)	4,070	5194	5,200

WEIGHTS AND MEASURES

Metric System

TURKMENISTAN - FISCAL YEAR

January 1 - December 31

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## LIST OF ACRONYMS

ASP	-	Aral Sea Program	TOR	-	Terms of Reference
ASPERA	-	Aral Sea Project for Environmental and Regional Assistance	TGC	-	Turkmen Geology Committee
ATTA	-	Assistance to the Turkmenistan Area	UFW	-	Unaccounted for Water
CC	-	Component Coordinator	UNDP	-	United Nations Development Program
COM	-	Cabinet of Ministers	UNEP	-	United Nations Environment Program
DRWASA	-	Dashkhovuz Regional Water and Sanitation Authority	UNICEF	-	United Nations Children's Fund
FSU	-	Former Soviet Union	USAID	-	United States Agency for International Development
GDP	-	Gross Domestic Product	WHO	-	World Health Organization
g/l	-	Grams per liter			
GoT	-	Government of Turkmenistan			
GOST	-	Russian Standards			
HCS	-	Housing and Communal Services			
IBRD	-	International Bank of Reconstruction and Development			
ICB	-	International Competitive Bidding			
IIP	-	Immediate Impact Project			
IMF	-	International Monetary Fund			
IS	-	International Shopping			
IMR	-	Infant Mortality Rate			
KAP	-	Knowledge, Attitudes and Practices			
KWH	-	Kilowatts per hour			
Mcm	-	Millions of cubic meters			
Mld	-	Millions of liters a day			
MMR	-	Maternal Mortality Ratio			
MOA	-	Ministry of Agriculture			
MOE	-	Ministry of Education			
MOH	-	Ministry of Health and Medical Industries			
MWR	-	Ministry of Land Reclamation and Water Management			
NA	-	Needs Assessment			
NCB	-	National Competitive Bidding			
NGO	-	Non Governmental Organization			
NS	-	National Shopping			
O&M	-	Operation and Maintenance			
PCC	-	Project Coordination Committee			
PA	-	Project Account			
PHRD	-	Japanese Policy and Human Resource Development grant			
PIU	-	Project Implementing Unit			
PPF	-	Project Preparation Facility			
RCC	-	Regional Component Coordinator			
RWSD	-	Rural Water Supply Department			
SA	-	Special Account			
SES	-	Sanitary Epidemiological Services			
SOE	-	Statement of Expenditures			



# STAFF APPRAISAL REPORT

## TURKMENISTAN

### Water Supply and Sanitation Project

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**MAP**    IBRD No. 28390

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## TURKMENISTAN

### Water Supply and Sanitation Project

#### LOAN AND PROJECT SUMMARY

Borrower:	Turkmenistan
Implementing Agency:	Ministry of Land Reclamation and Water Management (MWR)
Beneficiaries:	Ministry of Land Reclamation and Water Management (MWR) Ministry of Health and Medical Industries (MOH)
Poverty:	Program of Targeted Interventions
Amount:	US\$ 30.3 million
Terms:	Payable in twenty (20) years, including five (5) years of grace at the Bank's standard interest rate for LIBOR-based US dollars single currency loans.
Commitment Fee:	0.75 % on undisbursed loan balances, beginning 60 days after signing, less any waiver.
Onlending Terms:	Not Applicable
Financing Plan:	See para. 3.15.
Rate of Return:	22.2% IERR for urban and 10.6% for rural water supply systems
Staff Appraisal Report:	16142-TM
Map:	IBRD 28390
Project ID Number:	TM-PE-8867



# TURKMENISTAN

## Water Supply and Sanitation Project

### I. BACKGROUND

#### A. Country Context

1.1 **Country Profile.** Turkmenistan, the southernmost republic of the Former Soviet Union (FSU), is bordered to the west by the Caspian Sea, to the south by Iran and Afghanistan, to the east by Tajikistan and to the north and northeast by Kazakhstan and Uzbekistan. The country gained its independence on October 27, 1991. Turkmenistan lies in the midst of two of the largest deserts in the world, the Karakum and Kyzyl Kum, and 90% of its land is considered arid. With an area of 488,000 km<sup>2</sup>, it is the fourth largest country of the FSU.

1.2 Turkmenistan is one of the least urbanized of the FSU countries with 45% of the total population in urban areas. The country's small population of 4.5 million people is concentrated in a thin strip of land along the foothills of the South and in areas where the land is irrigated. The nation's capital, Ashgabat, is the largest urban center with an estimated population of 500,000. Compared to other countries of the FSU, Turkmenistan's health indicators are poor. Life expectancy is the lowest (62 for males and 69 for females); the infant mortality rate (IMR) is the highest (46/1,000); maternal mortality is the fifth highest; fertility rates are relatively high; rates of cardiovascular diseases are extremely high and increasing; and respiratory, digestive, infectious and parasitic disease are also among the highest of any FSU countries.

1.3 Turkmenistan's economy is dominated by energy and agriculture. It has 1.3 trillion cubic meters of proven and probable natural gas reserves and is the world's fourth largest natural gas producer. It also has 1.1 billion tons of oil reserves. Despite these energy reserves, the economy is still predominantly agricultural. Cotton, grains, fruits and vegetables are the major crops. At present, agriculture is experiencing low earnings, low yields, low efficiency of water use, and problems of soil quality. Nearly 50 percent of all irrigated land is defined as suffering problems of high water table, salinity, or both.

1.4 **Water Resources.** Turkmenistan is a desert country with average annual rainfall varying between 90 mm in Dashkhovuz (the project target area) to nearly 400 mm in the southwest highlands. Agriculture is entirely dependent on irrigation and most of Turkmenistan's limited water is used for irrigation. Of nearly 25 km<sup>3</sup> of water delivered in 1993, about 98 percent was used for irrigated agriculture (this includes losses estimated at approximately 50 percent) and the rest for domestic and industrial purposes. About 99.5 percent of the water supplied was from surface sources. Reuse in irrigation of drainage water from irrigated agriculture and reclaimed municipal wastewater is not practiced in Turkmenistan.

1.5 Four rivers provide surface water in Turkmenistan. The Amu Darya River, which supplies 90 percent of the water for all sectors, is the major source of water supplies. Within the country, water is further distributed by an extensive network of irrigation canals totalling more than 30,000 km in length, the majority of which are open and unlined. Groundwater resources cannot be fully utilized since most of the aquifers are relatively deep and remote from the main agricultural consumption areas making the

costs of extraction and conveyance prohibitive. The amount of groundwater presently utilized is very low.

1.6 Agriculture, a vital component of the Turkmen economy, is constrained by the availability of water. Declining soils and water quality/quantity will have significant implication for future agricultural development possibly thwarting plans to diversify the agricultural base from one almost entirely dependent on cotton to one that will enable the country's food requirements to be met. Agricultural regions lying close to the Aral Sea will be particularly affected. Improved management of water resources will be needed if agriculture is to grow on a sustainable basis<sup>1</sup> and would include a policy to improve the efficiency of water use. Currently there is no appropriate pricing policy for water for any sector. A draft Water Law is currently under consideration that would provide the legal basis for charging for water. In addition, under the Aral Sea Program-Project 1.1 (see paras 1.10 and 1.11) a draft National Water Management Strategy has been developed which proposes water pricing for all purposes. Turkmenistan has issued a water sector policy letter (Annex A-1) indicating a commitment to water charging for beneficiaries of the proposed project. The policy strategy has been further advanced by a Presidential Decree (Annex A-2) indicating water charges will be initiated as the project's water supply systems come on line.

1.7 **Macroeconomic setting.** At independence in 1991, based on expectations of an impending natural gas export bonanza, the Government put adjustment and transition issues on hold and launched a plan to modernize the capital city. In addition to free health and education, it proclaimed an extensive subsidy and entitlement program and strengthened centralized controls. It maintained distorted trade and foreign exchange regimes and retained state orders and price controls on many items. Results have been disappointing and over 1993-95 real GDP fell by more than 30 percent, gas production declined by three-fifths, and real minimum monthly wages by an estimated 80 percent. By the end of 1995, annual inflation exceeded 1000 percent and per capita income (US\$ 920 in 1995 according to the modified Atlas Method) was significantly below the FSU average. However, a serious stabilization initiative was pursued during much of 1996 and this made substantial inroads in reducing inflation. There were also a number of positive developments in structural and sectoral policies, especially in agriculture. Over the last year, the Government has outlined some of the main elements of a reform strategy in a concept document issued by the President. It has implemented a number of sectoral reforms and has stated its intention to accelerate efforts aimed at macroeconomic stabilization and structural adjustment.

## B. Regional Context

1.8 **The Aral Sea Basin.** The Aral Sea basin covers an area of 690,000 km<sup>2</sup> and is occupied by five Central Asian republics, Turkmenistan, Kazakhstan, the Kyrgyz Republic, Uzbekistan and Tajikistan and parts of northern Afghanistan and northeastern Iran. All of Turkmenistan lies in the Aral Sea Basin. The Aral Sea, an inland lake fed by the Syr and Amu Darya Rivers, lies between Kazakhstan and Uzbekistan and was once the fourth largest inland lake in the world. Over the past 35 years, intensive cotton farming and agricultural development have diverted so much water from the two rivers which feed the Aral Sea that its shore line has retreated by more than 120 kilometers; the sea level has fallen more than 16 meters; the surface area has decreased by nearly 50%; the volume diminished more than 70%; and salinity has risen to over 30 grams per liter.

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<sup>1</sup>"Turkmenistan Review of the Agrarian Sector" The World Bank, May, 1996

1.9 The quality of ground and surface water resources in the Aral Sea Basin has deteriorated as a result of these intensive agricultural water withdrawals combined with industrial and agricultural wastewater discharges; soil salinity; and erosion. The ecosystems of the Basin's deltas have suffered from spreading desertification, diminishing stream and groundwater levels, and increasing soil salinity. Once the location of successful commercial fishing, hunting, navigational and recreational activities, today the region in the immediate vicinity of the Aral Sea, including portions of Turkmenistan, is considered an environmental disaster zone and all traditional economic activities associated with the Aral Sea are terminated.

1.10 **Aral Sea Program.** In response to requests for assistance from the five Aral Sea Basin states, the World Bank first visited the environmental disaster region of the Aral Sea Basin in September, 1992. In partnership with local representatives, the Bank analyzed a range of sectoral problems in the region including environmental, economic, agricultural, and health. The five Aral Sea states have worked in cooperation with the United Nations Development Program (UNDP), the United Nations Environment Program (UNEP), and the World Bank to develop a plan of action, the Aral Sea Basin Program, to address the problems in the Aral Sea basin. The Bank has taken a leading role in the development and implementation of the Program, including donor coordination, technical assistance to all projects, and capacity building assistance to regional institutions. One of the three objectives of the Aral Sea Program is to ameliorate the conditions for the population in the disaster zone with a focus on the provision of improved drinking water supplies.

1.11 At a meeting of the Heads of Government of the five Aral Sea Basin states in February, 1994, it was decided to include the Turkmenistan Water Supply and Sanitation project in the Aral Sea Program. Three Water Supply and Sanitation projects for Turkmenistan, Uzbekistan and Kazakhstan, respectively, were presented to, and accepted by, the Heads of the Governments of the five Aral Sea States in Paris, June, 1994. At this meeting it was decided that the World Bank would take the lead in identifying and preparing a water supply and sanitation project focusing on the region of Turkmenistan most affected by the Aral Sea disaster, Dashkhovuz Velayet. Additional projects under the Aral Sea Program particularly the regional water resource management project were designed to identify the means and mechanisms of combining Basin states' development goals/interests with long term water resource and environmental management objectives.

1.12 **Dashkhovuz Velayet.** Turkmenistan is divided into five administrative regions, "velayet" one of which, Dashkhovuz, comprises the Turkmen portion of the Aral Sea disaster zone. The Velayet has an average annual rainfall of only 107 mm. As a consequence of its location on the lowest reaches of the Amu Darya River in Turkmenistan, the area is the most affected by conditions related to the Aral Sea Basin degradation. Dashkhovuz velayet has a population of 951,000 (1996) of whom 300,000 (32%) are classified as urban and 651,000 (68%) as rural. The region is characterized by families larger than the national average and high population densities. Approximately 50 percent are women and children under the age of 14.

1.13 Dashkhovuz velayet has a capital city, Dashkhovuz City, with a population 154,000, and eight administrative zones called "etraps." The urban population of Dashkhovuz live in the capital and in eight etrap centers, "city-type" settlements which are small cities of 10,000 - 32,000 population. Most of the rural population live in an estimated 104 collective farms. The farms are further divided into rural settlements or villages. There are an estimated 520 villages, or roughly five per collective farm. The average collective farm population is about 6,000 and the largest is about 16,000. The average village has a population of 1,200. In terms of water supply and sanitation characteristics, only a proportion of

the inhabitants of Dashkhovuz can be classified as urban. The etrap urban centers and collective farms both have similar levels of service which are effectively rural in nature.

1.14 **Health Indicators.** Health status in Turkmenistan is poor, as compared with other FSU countries and health status is poorer in Dashkhovuz velayet than in the rest of the country. The poor and declining health is attributed to degradation of the environment; qualitative and quantitative deterioration of the drinking water supply; poor sanitation and hygiene practices; protein and vitamin deficiency; and inadequate and declining health care services.<sup>2</sup>

1.15 The birth rate is higher in Dashkhovuz than in the country, and has been decreasing at a lower rate than the rest of the country. The infant mortality rate (IMR) in Dashkhovuz is the highest of any etrap in the country (47.5/1,000 live births). Maternal mortality is reported to be more than twice as high in Dashkhovuz (96.3/100,000 live births) than in the rest of the country. Malnutrition, anemia and goiter are common problems in Dashkhovuz. Local health authorities report that 100 percent of pregnant women and 80 percent of women have anemia although no specific studies of malnutrition and anemia have been conducted.

1.16 There is a high incidence of communicable diseases, and particularly water and sanitation related diseases such as diarrheal diseases and hepatitis A. Children below age 14 account for about 80 percent of registered cases of diarrhea, and 50 to 70 percent of hepatitis A cases. Data about salmonella and food poisoning indicate that food-borne diarrhea may be a greater problem than water-borne diarrhea.

1.17 **Socio-economic conditions.** Project preparation included a Social Needs Assessment to ensure that objectives and interventions would address the actual needs of the affected population and would be acceptable to all beneficiaries, especially the poor. The Social Needs Assessment, which was carried out in collaboration with local social science experts, included a community profile on overall socio-economic conditions in the project area; a survey of 790 households in all project etrap centers and fourteen collective farms; and a study of water supply and sanitation facilities in schools, health facilities, and enterprises. These activities were conducted in April-May, 1995. Results of the social needs assessment were used to: (i) provide baseline information on socio-economic conditions, water supply services, hygiene and sanitation practices; (ii) to help identify suitable community based demonstration projects and their location; and (iii) to guide project design. The community profile showed that the velayet as a whole can be characterized as predominantly rural. The main ethnic group is Turkmens, followed closely by Uzbeks, with very small populations of Kazakhs and Russians.

1.18 The needs assessment revealed that the major concern of the population in the project area is the lack of basic food products. Overall both rural and urban households spend about 85 percent of their earnings on food. Concerns about the quality of water ranked second as a household concern. Hygiene and sanitation related needs are not reported to be priorities. Close to 40 percent of households describe the general state of health of their family members as "not very healthy." Average annual household income was reported to be \$356 (\$376 rural and \$336 urban) and consists of various components: salaries earned by working persons, unemployment benefits, extra earnings from participation in the cotton harvest, earnings from the sales of home garden products and privately owned livestock, and income from other informal activities. The assessment revealed the importance of income from secondary and informal

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<sup>2</sup> World Bank Turkmenistan Health Sector Review, 1995

sources to Dashkhovuz households, especially to rural families. In collective farms part of annual income is paid in monthly installments, and the rest is paid as an annual bonus at the end of the fiscal year. For many rural families, this income system results in considerable uncertainty and financial vulnerability. Often monthly salaries are several months in arrears. Because of inflation and fluctuating prices for agricultural goods, especially cotton, it is difficult for many households to forecast the amount they can expect to be paid by farm management and to plan investments accordingly. Annex B provides more information on the needs assessment.

### C. Sectoral Context and Institutional Setting

1.19 **Institutional Setting: Water Supply and Sanitation.** Responsibility for the water supply and sanitation sectors is shared amongst over nine national organizations (Ministries of Water Resources, Agriculture, Environment, Health; Turkmen Geology committee; Institutes of Design, Chemistry; and Housing and Communal Services, Desert Research Institute); regional organizations including the Rural Water Department and city departments; and etrap level water and sanitation authorities. Annex C provides an institutional assessment including details of sector responsibilities.

1.20 With some relatively minor differences, Turkmenistan has followed the model of the FSU in providing water, wastewater, sanitation and health services to its people. The FSU model was based on strong control from Moscow (after independence, Ashgabat) in matters such as policies, planning and allocation of financial and other resources; with very limited input from the end-users of the services in the villages, towns and cities. The present water and sanitation institutional setting has the following weaknesses: (i) allocation of responsibility for the sector among too many government agencies; (ii) a wide range of responsibilities other than water and sanitation assigned to the principal agency charged with providing water supply; (iii) lack of technical and management skills throughout the sector; (iv) the absence of a coherent program for the effective operation and maintenance of water and sanitation facilities; (v) inadequate focus on the importance of providing effective means of excreta disposal; (vi) inadequacy of funding for both capital construction of new and replacement facilities, and for operation and maintenance of existing facilities; and (vii) a national policy which provides water services at no cost to the users.

#### Organizational Weaknesses

1.21 Lack of Focus on Sector Responsibilities Housing and Communal Services (HCS), before it was disbanded as a ministry, was responsible for the provision of water supply to the people of Turkmenistan. Since disbandment, that responsibility has not been represented at the ministerial level. The Ministry of Land Reclamation and Water Management (MWR) has the important responsibility of serving as the adjudicator of how the country's scarce water resources are to be allocated and it is presently the ministry most closely associated with the provision of public water supply. However, MWR has no department with responsibility for the public water supply sector. At the velayet level, HCS is responsible for public water supply and for wastewater collection and disposal. However, HCS has many other responsibilities, and water and wastewater is just one of many communal services in its portfolio.

1.22. Gaps in Responsibilities The most obvious gap in sector responsibilities is that for the provision of safe and convenient means of excreta disposal. Current analyses of health studies indicate that hygienic disposal of human excreta is one of the most critical requirements to assure the health of the people. The Housing and Communal Services department is responsible for the provision of piped sewerage systems for the disposal of wastewater, but there is only one such system in the entire velayet,

in Dashkhovuz City. As no other urban settlement has any significant levels of interior plumbing, there is currently no need for other piped sewer systems. HCS also has the responsibility for pumping out public latrines, but this is a very limited effort. There are no safe and economic means presently available for the sanitary removal and disposal of household excreta wastes. The great majority of the people in Dashkhovuz utilize very simple but unhygienic pit latrines, and no organization has responsibility for the design, construction or promulgation of adequate latrines, or programs for the education of the people in the importance and hygienic use of latrines.

**1.23 Overlapping Responsibilities** Some 68% of the population of Dashkhovuz live in rural areas, yet less than half of these people are served by the Rural Water Supply (RWS) department. In other velayets, MWR has responsibility for rural water supply. Even in Dashkhovuz, MWR has the responsibility for the construction of rural water systems, while RWS only has operational responsibilities. The water systems that RWS operates are very similar to those in the urban settlements, yet RWS and HCS, which operates the urban systems, function independently.

**1.24 National Sector Policy Problems** One of the problems with national policy is its failure to assign clear responsibility for the water, wastewater and sanitation sector. Another problem is the existing law preventing sector utilities from collecting fees for the services they perform. The lack of long term planning for the sector is one of the consequences of failure to assign overall sector responsibility to a specific government agency. The inadequacies of the existing systems and the large numbers of people without adequate water or sanitation services have several causes, but inadequate funding is one of the principal ones. National pricing policies and lack of focussed responsibility are among the principal causes of the lack of funding.

### **Operational Weaknesses**

**1.25 Planning and Management** There is little evidence of long term planning to overcome existing deficiencies. Even the current crisis of providing water only a few hours per day appears to be accepted with resignation, though there is evidence that water is being wasted under present procedures in volumes which considerably exceed the amounts required to meet the needs of the people 24 hours per day. In many tables of organization, far too many departments report to the head of the organization. Systems for the accurate collection of financial and technical operating data, and for the distribution of this information to managers are inadequate. Realistic budgeting and cost estimating are not practiced at the water supply utility level.

**1.26 Operation and Maintenance** The current financial difficulties contribute to severe operational problems. Critical parts and supplies are rarely available. Equipment is often cannibalized, and any but the simplest of repairs usually must be made in Dashkhovuz City or, more commonly, back in Ashgabat. Procurement procedures are centralized and complicated, and operators have little control over obtaining the equipment and supplies they require. There is little preventive maintenance, or the tools with which to accomplish it. On the other hand, there is often no budget for grease, pump packing, tools or other materials and supplies. Operators rarely have copies of the plans and specifications for the works under their responsibility, and no operating manuals or guidelines. Almost all the piped water systems in Dashkhovuz Velayet utilize water from shallow wells adjacent to irrigation canals. Some problems with degraded water quality from these wells result from operation of the wells in a manner that does not comply with recommendations from the authorities of the Turkmen Geology Committee's (TGC) hydrogeological companies.

1.27 **Human Resources** Salaries of employees in the water, sanitation and health sectors in Dashkhovuz Velayet are extremely low, particularly in relation to the Capital. For instance, employees of the carpet factory in Ashgabat earn twice the pay of a senior engineer in most departments in Dashkhovuz, where typical salaries at the senior levels are in the order of less than US\$ 20 per month. Working conditions are poor, with inadequate vehicles for transport, poor communications and sparsely equipped and furnished offices. Training programs are few and generally inappropriate. Training (most of it dating back to pre-independence) often seemed to focus on design and advanced technologies rather than meeting actual needs.

1.28 **Institutional Setting: Sanitary, Epidemiological, Health Education.** The Sanitary and Epidemiological Services (SES) of the Ministry of Health and Medical Industries (MOH) are responsible for drinking water quality monitoring for supplies from municipal water supply systems; and for sanitation and hygiene surveillance. The SES have major centers in Ashgabat and in the capital cities of the five Velayets including Dashkhovuz City, and stations in all etrap centers. SES has the responsibility for testing drinking water quality. Water samples are taken from public systems at the point of supply, the distribution systems, and selected users, including schools and homes. The frequency and number of tests depends upon the size of the system being monitored. Sampling is said to take place once or twice a month, on average. SES follow the Russian (GOST) drinking water standards developed by the FSU which cover about 28 constituents. SES normally only test for a few of these constituents particularly E-coli, salinity, hardness, taste and odor. SES has the authority to levy fines against communities which fail to chlorinate and to shut down systems which fail bacteriological tests. Officials whose systems frequently fail to meet the standards are subject to criminal prosecution. It appears these sanctions are rarely imposed. In Dashkhovuz, the SES have three laboratories in the capital (regional bacteriological laboratory, regional chemical laboratory, and city laboratory) and one bacteriological laboratory in each etrap center. Annex D provides limited water quality data.

1.29 The SES have scarce resources. Receiving only 3 percent of the total MOH budget, SES is seriously underfunded. As a result of severe budget limitations, SES suffers from buildings of limited size and poor quality; shortage of operable vehicles; and laboratories with failing equipment and inadequate supplies of chemicals.

1.30 The **Center of Health** is a Department of the MOH with branches in each Velayet. With responsibility for health promotion and health and hygiene education, they cover a wide range of topic in all kinds of institutions (schools, enterprises, polyclinics, hospitals) with the main educational method being the lecture. Although Turkmenistan has a strong tradition of health education, presently the activities conducted in the country and within Dashkhovuz are very limited due to financial constraints. The Dashkhovuz Center of Health is poorly equipped, lacks the most basic supplies such as paper and cartridges for a copying machine, and the staff need to be trained in modern methods of health promotion and health education.

1.31 **Intersectoral Action and Donor Coordination.** Cooperation between the water supply, sanitation, health and education sectors is not developed in Dashkhovuz, and, at the national level, the donor efforts in the sectors need to be coordinated. An interagency working group was formed on the national level to guide project preparation.

#### **D. The Government's Objectives and Strategy**

1.32 The Government has indicated its intention to advance the development of the water and sanitation

sector (Annex A-1) through achieving the following objectives: (i) increased access to potable water and improved sanitation facilities in particular those groups living in the most disadvantaged areas; (ii) development of the institutions in charge of production and distribution of potable water and sanitation services and improvement of their technical and financial capacities; (iii) protection of the environment and of public health; and (iv) protection of water resources and their optimum utilization. Key elements of the strategy to accomplish these objectives include: (i) restructuring of the institutions charged with the delivery of water and sanitation services; (ii) increasing the responsibility and accountability of the management of the water sector; (iii) initiation of cost recovery mechanisms including a tariff setting policy whereby revenues would cover the full cost of operation, variations in working capital requirement and regular preventive measures. The Government intends to initiate the institutional and cost recovery reforms in the water sector on a regional level first, followed, depending on progress, by reforms on the national water sector level with the objective of improving the effectiveness of the sector throughout the country.

### **E. The Bank's Strategy**

1.33 The Banks' program has developed slowly but steadily reflecting the limited but growing Bank-Government dialogue on development issues and approaches. A Country Economic Memorandum was issued May 31, 1994. The first loan was approved by the Board for the Institutional Building/Technical Assistance (IB/TA) project in FY95 and the IB/TA loan is now in implementation. A Country Assistance Strategy has been prepared, at the request of the Government, for discussion by the Board on May 27, 1997, together with this project and with the proposed Urban Transport project. As described in the CAS, the Bank's strategy is to proceed in phases based on the evolution of the Government's reform effort. The Bank's efforts would emphasize analytical work, technical assistance and policy dialogue to assist the Government to remove remaining distortions which could constitute barriers to the transition, and to the efficient development of its designed priority sectors which are agriculture, oil and gas, social sectors, and infrastructure.

1.34 The Bank's role in the potable water and sanitation sector is to support the Government efforts to improve the water supplies and sanitation facilities in the part of the country most severely affected by the consequences of the Aral Sea crisis and which are the most poorly serviced with regard to water supply and sanitation; and to strengthen the institutional and policy framework for potable water supply and sanitation services. The Bank has responded with the Water Supply and Sanitation Project, as agreed during the June 1994 donor conference in Paris.

### **F. Bank Experience in the Sector**

1.35 Lessons learned from Bank experience in Turkmenistan, other FSU projects, and the Bank's water supply and sanitation portfolio have been incorporated in the design of the Project.

1.36 **Turkmenistan and the FSU.** The IB/TA project, only project in implementation in Turkmenistan, experienced initial delays but currently ratings for development objectives, implementation progress and project management are satisfactory. Lessons learned from other FSU projects include (i) the need to identify a consistent counterpart team with sufficient authority to move the project forward; (ii) the difficulty of coordinating among interested parties, (iii) the importance of early detailed attention to procurement and other implementation issues; and (iv) the importance of including local institutes in project preparation and design.

1.37 **Water Supply and Sanitation Sector.** Major lessons learned from the Bank's past water supply and sanitation projects indicate that projects should include the following<sup>3</sup>: (i) an adequate regulatory framework and, linked to it, appropriate tariff levels and billing and collection mechanisms to generate the funds needed for financial autonomy and to signal the real cost of water to the consumers; (ii) reversal of the preference of decision-makers for new capital expenditure over proper operation and maintenance (iii) clear measures to reduce unaccounted-for-water, and (iv) user involvement in the setting of priorities to improve ownership and cost-sharing of operation and maintenance functions.

1.38 The project reflects concern for learning from past experience and reduction of risks. The proposed project has been developed through close collaboration with the Turkmen authorities at the national and velayet level and concerned sectoral ministries and institutes which will be involved in implementation. An interagency working group was formed at project identification and it has been involved in project preparation and design. Local social scientists were trained and engaged to conduct the Social Needs Assessment. To ensure that the Government assumes greater responsibility for the project and develops a sense of ownership and capacity for implementation, the Government fully executed the PHRD grant which funded project preparation. All preparation missions have conducted workshops for the Government and other stakeholders on Bank operations. The project includes close Bank supervision and monitoring and sustained assistance to authorities throughout implementation. A Project Implementation Unit (PIU) will be established using a Project Preparation Facility prior to appraisal and includes technical assistance. The PIU will include component coordinators representing the water supply, sanitation and health implementing agencies, respectively. User involvement has been extensive during preparation (para 3.2) and would continue into implementation.

1.39 One of the project's main components is institutional strengthening of the water and wastewater sector. The establishment of a specialized autonomous regional water and wastewater authority is one of the major outputs of the Project and capacity building of the water and health sectors at the regional level is a primary objective of the Project. The proposed project will assist in training and information dissemination through the national institutional strengthening component. The project's physical works concentrate on rehabilitation, the minimization of physical and commercial water losses and the correction of deferred maintenance as a means of improving efficiency. The project would emphasize strengthening of operation and maintenance capacities. The project will initiate water charges in Turkmenistan and, through the institutional strengthening component, assist in the development of appropriate tariff levels while strengthening the institutional capacity to establish and collect tariffs. Rehabilitation of the supply systems, redesigning of the faucets to provide automatic shut-off; and consumer education will reduce unaccounted for water.

### G. Donor Coordination

1.40 The project has been developed in close coordination with other donor activities in the region, particularly UNICEF, USAID, and UNDP. To ensure collaborative efforts which build on one another's activities, the project identification mission included representatives of UNICEF and USAID. Preparation of the project includes a school sanitation demonstration project which was developed by UNICEF staff to ensure similarity of strategy and approach. The project's sanitation and health component was

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<sup>3</sup> References for this section included:

1. *Water Supply and Sanitation Projects: The Bank's Experience, 1967-1989*, OED, June, 1992
2. *Annual Review of Portfolio Performance (ARPP) FY 93, Water and Sanitation Sector*, TWURD, April, 1994.
3. *World Bank Policy Paper on Water Resources*, 1993

designed to build on the activities of UNICEF's Aral Sea Project for Environmental and Regional Assistance (ASPERA) now in implementation in Dashkhovuz. USAID provided assistance during project identification on water quality data analysis and laboratory assessment. USAID has a water supply and sanitation project in one of the eight etraps in Dashkhovuz. The project chose the other seven etraps as project sites to avoid duplication. The World Bank has assisted the USAID project by supplying water tankers through the Immediate Impact Project (IIP). UNDP is implementing a small-scale pilot urban water supply project in Ashgabat.

## II. WATER SUPPLY AND SANITATION IN DASHKHOVUZ

### A. Water Supply

2.1 **Water Service Levels: Urban Areas.**<sup>4</sup> All of the etrap centers have a piped water supply which delivers water to communal street standpipes. Some households have individual yard taps but this varies widely amongst the centers from less than 10 percent to as much as two thirds. Very few residences have household connections. The piped systems theoretically serve approximately 108,000 people (75 percent of the total population in the seven etrap centers included in the project). However, the existence of these systems does not mean actual delivery of safe drinking water. Due to the enormous losses within the systems and the deteriorated conditions of the wells and pumping facilities, the piped system is unable to achieve the design pressures and supply volumes. Low pressure in the system leads to the deliberate removal of faucets from street standpipes in an effort to facilitate access to the small amount of water which arrives. Over pumping of the wells in an effort to compensate for losses in the system leads to increased salinity and accelerated depreciation of the pumps. Thus water is delivered only 3-4 hours per day, at very low pressures and is not disinfected. Focus group discussions determined that spending two hours per day in obtaining water from the piped systems was not uncommon for many families. Those who do not depend upon piped water supplies as their primary drinking water source resort to hand dug wells (12 percent) and bored wells with hand pumps (7 percent). About 9 percent of urban households use water purchased from a vendor as their primary source of drinking water. Approximately 60% of the urban schools have a piped drinking water supply. Hand dug wells are the second most common source of drinking water (24%).

2.2 **Water Service Levels: Rural Areas.** The most important source of drinking water in rural households is wells, often in a neighbor's yard (51 percent hand dug; 35 percent bored). Overall, about 20 - 30 percent of rural households have access to a functioning piped water system. Water vending is non-existent. Currently, only 20,000 people (24% of the total population in the villages of the nine kolkhoses in the project) have even limited access to piped supplies. There are virtually no house connections in the rural areas. The number of yard connections is unknown. Water delivery is similar to that of the etrap centers. There is no inventory of handpumps which are locally made. Based on field visits, it was concluded that due to the poor design of the handpump components, the water is unlikely to meet bacteriological water quality standards. In some collective farms, surface water (irrigation canals, ponds, rivers) is the primary source of drinking water. Household boiling of drinking water for disinfection purposes is generally not practiced. Piped water is generally unavailable to rural schools with wells being the most common source of drinking water (51%) followed by surface water sources (20%) usually irrigation ditches. Boiling of school water supplies is practiced sporadically.

2.3 **Water usage for drinking, other domestic purposes, livestock watering and irrigation of vegetable**

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<sup>4</sup> Information on household water supply and sanitation service levels and use comes from the "Turkmenistan Water Supply and Sanitation Needs Assessment" (NA) November, 1995. The household survey included 790 households. All of the etrap centers included in the project were in the household survey whereas 14 percent of the velayet's 104 collective farms were surveyed. The term "urban" refers to the etrap centers and is used to distinguish the centers from the collective farms which are classified as "rural." The etrap centers, however, do not show "urban" features and can be considered "rural" in nature.

gardens is determined by the user in accordance with the amount required and relative requirements for water quality for each purpose. In general, households switch from piped water and hand pumps to wells and surface water bodies to draw water for washing and cleaning. To water their home gardens, households use mainly water from surface water sources. However, water for livestock is usually drawn from the same source that supplies households with drinking water. In all etrap centers, piped water is the main source of water for livestock. The major water quality issue for most consumers appears to be the salinity.

**2.4 Piped Systems.** The piped water supply systems for both the etrap centers and the kolkhoses use shallow wells adjacent to, and hydraulically linked with, an irrigation canal as the water source. These wells are typically 10 to 25 m deep, and between 4 and 12 are provided for each system, depending on the size of the settlement and the well performance. The water is pumped to a nearby ground reservoir where chlorine is intended to be added, but rarely is because of lack of funds or equipment failure. The distribution pump station then draws water from the reservoir and pumps directly into the distribution system. Quality of the groundwater is highly dependent on the quality of water in the irrigation canals, and the principal effect of the shallow aquifer is limited to filtering out suspended solids. This type of piped water supply infrastructure is appropriate for the area but is in extremely poor condition. This is a consequence partly of inferior construction techniques, and partly of chronic low investment in maintenance.

**2.5 Quality of the Water Source.** Since much of the irrigation water abstracted from the Amu Darya River is returned as drainage water, surface water quality reflects the usage of pesticides and fertilizers. Water quality data prior to 1989 indicated excessively high concentrations of pesticide and fertilizer residues. However, since independence, the usage of these chemicals has subsided dramatically and significant improvement has been documented in water quality. Bacteriologically however the water quality continues to be very poor. In 1994, 54 percent of some 6,000 Dashkhovuz water samples failed to meet the bacteriological limits of 2 coliform/100 ml. Field investigations conducted during project identification found coliforms as high as 60/100 ml reported in SES laboratory records. Salinity is an area of potential concern. At present, salinity levels are generally below 1 g/l (the WHO guideline concentration and National Standard), but if the current trends continue, the salinity in some areas may reach 1.5 g/l by the year 2000. It should be noted, that the WHO guidelines on salinity are based on aesthetic (taste) considerations and not health and there is no epidemiological data indicating a direct impact on health for salinities in this range. However the taste may drive users to alternate, less-safe (bacteriologically) supplies. Annex D provides water quality data for Dashkhovuz. (Detailed water quality data and analysis of water quality laboratories can be found in Project Documents - "Project Identification Mission: Background Note, Appendix A Chapters B and C, Assessment of Water Quality and Laboratories.)

**2.6 Maintenance Problems.** Maintenance of the systems is unsatisfactory. This is a result of a combination of factors, including lack of spare parts and chemicals; inadequate funding for vehicles, repair tools and equipment; and substandard training. Very few of the systems have operating chlorination systems, with the result that water is delivered to users with no disinfection. Pumps and pump station pipework is usually a mixture of different sizes and types of equipment, much of it inoperable, which leads to frequent supply failures. In most towns, water is provided to users only two or three times a day, for a total of between 3 to 5 hours per day, and sometimes even less. Often this limited supply does not reach consumers at the extremities of the distribution systems.

**2.7 Distribution Piping.** The distribution piping systems are also in a poor state of repair, with high

leakage rates and frequent breaks. A mixture of pipe materials are used, depending on availability, which again gives problems for the operators. The majority of the population are supplied through street standpipes, although households with yard taps are not uncommon. In Dashkhovuz city there are a limited number of house connections. Because system operation is usually limited to less than 6 hours per day, the street standpipes are either broken or missing, so that a large proportion of the water supplied by the system runs to waste. Similarly, yard taps are often left on, and water collected in containers, or left to run into gardens. Freezing is sufficiently severe that little water is provided on an average of 20 days during colder winter months. The results of a demonstration project in Gubadagh, carried out as part of the project preparation, showed that when suitable taps are installed and maintained, pressures in other parts of the system increase, improving the overall system performance.

**2.8 Distribution Storage.** Storage capacity within the systems is extremely limited. In urban systems there is usually no storage apart from the balancing reservoirs provided at the site of the wells and pump station. All water is pumped directly into the distribution piping network. The rural systems frequently have very small elevated storage tanks in the system, but this usually serves to limit pumping pressures only, and provides no useful storage to balance diurnal demand variations, or provide water during interruptions in supply.

**2.9 Unaccounted for Water.** The level of losses in the urban distribution systems is very high. Officials report providing 100-200 liters per capita per day (lpcd) while observed and reported consumption is 15-25 lpcd. Project preparation consultants estimate only 15% to 25% of the water pumped into the systems reaches the users. Much of this extremely high proportion of unaccounted for water is believed to result from losses at the standpipes. Since they are not fitted with shut-off valves (taps or faucets), they run continuously when the distribution system pumps are operated. Even if the taps were repaired, the resulting increases in pressure would likely increase breaks in the distribution piping. A significant amount of system rehabilitation as well as new standpipes will be required before pumping pressures can be increased to a level which would provide a normal minimum pressure of about ten meters in the distribution system. For those users who have yard taps, the intermittent nature of the system operation results in the taps often being left open in order to maximize the amount of water they receive, and to determine when the water has been turned on. This results in high levels of wastage which could only be addressed by providing a continuous supply, and possibly by installing meters.

**2.10 Charges for Water.** Neither urban nor rural consumers are charged for water, as a result of a Presidential decree which states that water, gas and electricity<sup>5</sup> should be provided by the state free of charge. There is, therefore, no incentive for those with yard taps or house connections to conserve water, or for the remainder of the population to reduce wastage from the street standpipes. Given the present inadequacies of the water systems, it would be very difficult to justify any charges at this time but the project will initiate cost recovery of operation and maintenance costs as is discussed further in Annex E.

**2.11 Groundwater Sources Within the Velayet of Dashkhovuz.** Extensive exploration and research has been carried out to determine the availability of groundwater resources for use by the Velayet. There are ample groundwater resources in the project area. The restriction to groundwater use is the quality of the water, which by different processes and to varying degrees is mineralized and/or polluted. The confirmed estimate of availability of good quality (< 1 g/l salinity) water from the Quaternary alluvium is 280.000 m<sup>3</sup>/day. There are three aquifer levels in the Velayet. One is a shallow aquifer that in some

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<sup>5</sup> Up to KWH per month per family member is free, and a very small charge is made for usage above that amount.

areas is suitable for use for potable supplies. For the most part, the two deeper aquifers are highly mineralized (salinities between 34 and 60 g/l) and unsuitable for use without desalination. The shallow aquifer generally is hydraulically linked to the irrigation canals, and in these areas the water, while relatively saline, is suitable for use as potable supplies without treatment other than disinfection. Some use is made of groundwater from the shallow aquifer in areas remote from the canals, but the quality is poor (salinity over 15 g/l), and only limited quantities are available

**2.12 Consideration of Alternative Water Sources.** The deterioration in quality of the Amu Darya River water in the 1960s and, after independence, political considerations related to the fact that the river flows through Uzbekistan at times, resulted in the study and development of alternative water sources for the Velayet. Two regional schemes for augmenting water supply sources have been proposed by technical organization within the Government as solutions for the water supply problems of the Velayet. The schemes are the Tuyamuyun reservoir surface water scheme, and the Balqui aquifer groundwater source in the Velayet of Lebat. Extensive investigations have been carried out on both these schemes by local organizations, and construction began several years ago on the Tuyamuyun supply scheme. As part of the project preparation activities, a detailed review of the two schemes has been carried out and is summarized in Annex F.

**2.13 Tuyamuyun Reservoir.** The adopted scheme was based on the use of waters from the Tuyamuyun and associated reservoirs, which are located within Turkmenistan. Two options considered included (1) the use of water directly from Tuyamuyun reservoir, or (2) the use of waters from the Kaparas reservoirs, which would then be restricted for potable use only. In either case, a water treatment plant would be required which would pump water through a 180 km long pipe line to a storage reservoir near the city of Dashkhovuz. Other pump stations and transmission mains would be required to provide water for the etrap cities. Work began about 1989. About 90% of the un-lined, un-wrapped steel pipeline has been installed, and about 50% of the civil works for the treatment plant has been completed. A lack of funds has brought a virtual halt to construction since 1993. There are serious questions about the expected life of the completed pipeline, and the quality of civil works completed to date is poor. The estimated cost to complete the scheme as originally planned for all urban areas in the Velayet is \$515 million. The cost just to complete the works needed to supply the city of Dashkhovuz is \$215 million. Completion of the Tuyamuyun scheme, even if it were within the financial limitations of the proposed project, would not meet the objectives of the project in providing improved supplies in both urban and rural areas. The majority of the new water would go to Dashkhovuz City, at the expense of the etrap centers. The feasibility study concluded that the costs of the scheme are not justified by the improvement in quality.

**2.14 Lebat Balqui Aquifer.** There is a major groundwater resource in the neighboring Velayet of Lebat, although this would require a pipeline 250 km long to convey the water to Dashkhovuz. Further exploration is needed to define the yield of the source, but work carried out to date indicates that only a small proportion of this resource has salinity levels of less than 1.5 g/l, considered the maximum concentration for a marginally acceptable water supply. The combination of a limited volume of marginally acceptable water with the very high cost of transporting it to Dashkhovuz indicates that this cannot be considered as a viable source. The estimated cost to transport the water to the city of Dashkhovuz is \$85 million if the Tuyamuyun-Dashkhovuz pipeline is utilized, or \$240 million if the water is to be pumped independently to Dashkhovuz. The project feasibility study concluded this is not a viable option for the Velayet.

## B. Sanitation

**2.15 Sanitation Service Levels: Urban Areas.** Sanitation, as used in the project, refers to the safe disposal of excreta. Only Dashkhovuz city has a waterborne sewerage system, and this serves mostly high-rise residential housing units, industries and commercial developments that use large volumes of water. In the etrap centers, the sole method of sanitation is the basic pit latrine. Temporary latrines are those with a temporary hand dug sub-structure (unlined pits 1-2 meters deep) and a temporary super-structure. When the pit is full it is closed with soil and the super-structure is shifted. Permanent latrines are elevated pit latrines with a permanent super-structure and substructure which can be emptied either manually or by truck. The evacuation of the private latrines is the responsibility of the homeowners, and generally it is not done. Both types of pit latrines are used in public areas such as schools, markets and public buildings, and also in private homes. In urban areas outside of Dashkhovuz City, i.e. the etrap centers, 90 percent of urban households have a latrine (37 percent are permanent) typically used by 6-7 people; the other 10 percent of households rely on public latrines. Emptying public latrines is the responsibility of the Department of Housing and Communal Services in the Velayet. To carry out this task, they are equipped with pump trucks, tractor trailers, dumpers, and workers. At present, most of the required equipment is in disrepair. There is no independent budgetary provision for excreta disposal and expenditure is incurred for this purpose from the general budget of street cleaning works. Individual home owners either pay privately for emptying their latrines, or else the owner digs a new pit and moves the latrine superstructure to the new location. Whether public or private, the latrines are usually poorly constructed, most are highly unsanitary, most are without handwashing facilities adjacent to or even near the latrine, and soap is not available. All etrap center schools have pit latrines, generally permanent latrines, with approximately 100 students/latrine. Observation finds that the latrines are usually very dirty and no hand washing facilities are apparent.

**2.16 Sanitation Service Levels: Rural Areas.** The situation is similar for the rural areas, apart from the fact that there is no authority responsible for emptying the pit latrines. In rural areas 95 percent of households have pit latrines: 72 percent of households have temporary latrines, 23 percent have permanent latrines. Five percent use communal latrines. For those with "permanent" latrines (those with substantial buildings housing the latrine), it is usually the householder's responsibility to arrange for the collective farm's transport authority to transport the contents of the pit latrine to designated disposal areas, although there appears to be no formal obligation for the collective farms to assist in this way. Owners with temporary latrines fill in old pits when they are full, then dig a new pit and move the latrine's above-ground enclosure. This is done about once or twice a year. Rural schools are equipped with latrines, usually of the permanent type with about 50 students/latrine. Reported hand washing facilities are less common than in urban schools, and again, observation finds the latrines to be very dirty.

**2.17 Disposal of Latrine Wastes.** Reuse of human waste is not practiced in the region. There are no facilities for the proper treatment and disposal of wastes removed from latrines. As there is practically no use of flush toilets outside Dashkhovuz Velayet, the wastes to be disposed of are not liquid septage but relatively solid material. The present practice is to dispose of such wastes in areas on the fringes of the communities where most solid wastes and trash is taken for disposal. Neither the latrine wastes nor the solid wastes are covered. There is no effective regulation of this method of disposal of latrine wastes.

**2.18 Disposal of Wastewater.** Wastewater is generated only in Dashkhovuz city, which is not a part of this project. The collected wastewater is pumped to a location on the edge of the desert, some 10 km southwest of the city. About 1980 the wastewater was provided with primary treatment, but that plant was abandoned in 1985 after only five years of operation. The wastewater now is pumped to the former

sludge drying beds, which serve as heavily loaded anaerobic lagoons. Flow is believed to be in the order of 15,000 m<sup>3</sup>/day, and any overflow from the rough earth lagoons either seeps into the ground or evaporates in the desert.

2.19 On the household level, most households (78%) pour wastewater into a waste pit in their yard or in the vicinity of the house. Some (10%) use sullage to water their garden but sullage is never used to water animals. The rest (12%) pour sullage into surface water sources or only streets to reduce dust.

2.20 **Monitoring/Regulation of Sanitation and Hygiene.** Hygiene in the project is defined as the practice of keeping oneself and one's surroundings clean. The Sanitary-Epidemiological Services (SES) of the Ministry of Health (MOH) is responsible for sanitation and hygiene surveillance, but this function seems to have a low priority compared with monitoring water quality. No institution is responsible for construction and maintenance of handwashing facilities at public latrines, and SES does not require the construction of washing facilities adjacent to latrines.

### C. Health

2.21 Although much data exists on health conditions in Turkmenistan and in Dashkhovuz velayet, health data collection, analysis and reporting are unreliable. Most diagnoses are purely clinical, and are not confirmed by laboratory or other tests; autopsies are rarely performed; all data handling is done manually, accounting for many errors and data inconsistencies; data is not collected by gender and, as for age, only two groups are considered, the under and above 14 years of age. Therefore, data about all diseases needs to be interpreted and used cautiously. Results of the Needs Assessment were used to check correlation between child (age 0-15) diseases (reported in the survey) and primary source of drinking water. Statistically significant correlation was found between (i) intestinal parasites and hand pumps as primary drinking water source, and (ii) hepatitis A and surface water as primary drinking water source. Like official health data, these results need to be used cautiously. What is certain is that water supply, sanitation and hygiene are all very poor in the Velayet and these are factors commonly associated with poor health. Annex G provides relevant national and local health data.

2.22 **Factors Contributing to Poor Public Health.** Cost effective interventions with an impact on health including water quality monitoring and disinfection, breastfeeding, immunization, and treatment of diarrheal disease could significantly reduce the burden of communicable diseases in Dashkhovuz Velayet but the health services responsible for these interventions have not been able to perform an adequate job. An imbalance exists between preventive and curative services. While access to health care is universal, the concern for prevention appears to be low. Health promotion and health education are very limited. Neither the general populace nor the local health officials make an association between sanitation (proper excreta disposal) and personal hygiene with health. Nor do they consider diarrhea an important health problem. The general population and health authorities blame environmental factors, particularly the physical and chemical quality of the drinking water, as the most important cause of poor health. Interest in water quality far exceeds interest in sanitation and hygiene, and concern with water hardness and salinity exceeds concern with the bacteriological quality of water, which is extremely poor.

2.23 **Health Education.** The Centers of Health are responsible for health education activities. The Ministry of Health (MOH) is developing some health education activities, and is collaborating with the Ministry of Education in implementing a new health education curriculum that includes sanitation and hygiene. The MOH and UNICEF have been using health education materials developed by ATTA (Assistance to Turkmenistan Association), a local NGO with external support, and some of these concern

hygiene and sanitation. The Centers of Health, however, are severely constrained due to lack of supplies and equipment; and training and the impact of their activities is very limited.

**2.24 Constraints to Water and Sanitation Sector Development.** Progress in improvements to the water and sanitation sector may be limited by the following constraints: (i) the absence of a focussed responsibility for the sector at the national level; (ii) the weak enforcement abilities of MOH/SES in monitoring the acceptability of water quality, and of the Ministry of Environment in monitoring the acceptability of disposal of wastewater, septage and latrine wastes; (iii) most rudimentary requirements for a well-managed sector utility are missing; and (iv) the national policy of free drinking water. In the absence of the ability to charge users for the services performed, the sector utilities are dependent upon grants from the national budget for both capital and operating costs. Since independence, the only significant expenditure for new water facilities in Dashkhovuz Velayet has been for the Tuyamuyun water transfer project. That project is incomplete and no additional funds have been made available for about three years. More critically, funds for operating and maintaining the existing works have been acutely inadequate for several years, resulting in the premature loss of benefits from previous investments.

### III. THE PROJECT

#### A. Project Origin and Formulation

3.1 This proposed project forms Component 5.2 of the Aral Sea Program drawn up to address the environmental impacts of the Aral Sea crisis. The project was specifically intended to improve the health of the population in the region most affected by the Aral Sea disaster by investing in water and sanitation infrastructure. The project would be the first infrastructure investment operation in Turkmenistan, therefore it was designed to be focused and simple to implement both technically and administratively. Project identification and preparation determined that piped water systems, already in place in many parts of the region although in a state of disrepair, were appropriate for the region and the service of choice. Since the loan amount could not rehabilitate and expand the piped water system for the entire velayet, it was decided that the project would focus, in an equitable fashion across the etraps, on under-served areas with particular attention to the rural population. Noting significant sector institutional weaknesses on the national and regional level, the project was designed to include institutional restructuring and strengthening.

3.2 **Participatory Approach.** The proposed project incorporates an extensive amount of participation by stakeholders at all levels. During Project preparation, nine workshops were held with project stakeholders to discuss the project concept and design, and key project issues including cost recovery, reorganization of the water and wastewater sector, community participation components, and project implementation arrangements. In these workshops, stakeholders endorsed the project concept and design and agreed upon the approaches taken within the project design to address the key issues. Beneficiaries indicated willingness to participate on a household and community level in operation and maintenance of the water systems and sanitation activities. A Rapid Needs Assessment was conducted during project identification followed by a Social Needs Assessment which included 790 household surveys; inventories of communal water supply and sanitation facilities; and fourteen focus group discussions. Results were used to provide baseline information and guide project development and were presented at Stakeholder Workshops. During preparation additional focus group discussions were used routinely to guide two demonstration projects conducted under preparation and to provide additional background information. Additionally, a local NGO has been actively engaged in project preparation and implemented the community components of the two demonstration projects. The demonstration projects successfully utilized community based approaches to water supply systems and sanitation and these approaches have been incorporated into the project.

3.3 **Project Preparation.** The Ministry of Water Resources has undertaken project preparation with technical assistance from Electrowatt Engineering. Feasibility work has been financed by a PHRD grant of Yen 85.6 million (about US\$800,000). The feasibility work included two demonstration projects: the installation of effective taps on street standpipes in Gubadagh; and the construction of improved latrines and handwashing facilities at a school in Boldumsaz. Results of the street standpipe demonstration form the basis for the standpipe rehabilitation component and the development of community involvement in operation and maintenance. The results of the sanitation project were used to design the community-based school sanitation component, as well as the hygiene and health education activities. Annex H describes the demonstration projects in detail.

## B. Objectives

3.4 The objectives of the proposed project would be to: (i) improve water supply and sanitation in seven etrap centers and nine collective farms in Dashkhovuz velayet; and (ii) initiate institutional changes in the water and sanitation sector to ensure that the project is financially and technically sustainable.

## C. Description

3.5 **Project Components.** The proposed project comprises four main components: (a) water supply improvements; (b) sanitation and health; (c) institutional strengthening; and (d) project management and construction supervision. The components and their estimated costs are described in the following sections.

3.6 **Water Supply Improvements** (US\$ 20.1 million, or 70 percent of project base cost.) The aim of this component is to rehabilitate and expand water systems to seven etrap centers and nine collective farms (spread out amongst the etraps), and to provide a supply of spare parts and repair materials to assist in operating these systems for the first year after completion. Project identification and preparation determined that the piped water systems already in place, although in a state of disrepair, were appropriate for the region and the least cost solution for improving drinking water supplies. The household survey revealed that piped water systems were the service of choice. Furthermore, from a public health perspective the piped water systems offer the best quality water and the opportunity to disinfect the public water supply. During project identification it was determined that improvements to Dashkhovuz City water supply system would 1) be of such magnitude that there would be little financing available for the rural areas; and 2) require major rehabilitation of the wastewater collection and treatment facilities. Since the major needs for access to a safe water supply are found outside the capital city, it was determined to focus the project on the secondary cities, etrap centers, and rural farms. The three subcomponents of the water supply improvements include:

a. **Urban Water Supply System Improvements** Rehabilitation of water facilities in urban towns (US\$ 8.7 million). This subcomponent will rehabilitate the water supply systems in seven etrap centers in the Velayet (Akdepe, Boldumsaz, Gubadagh, Kune-Urgench, Niyazovsk, Tagta and Yilanly) from the water source to public street standpipes. No yard or household connections would be included. The project would repair existing street standpipes and provide new taps as required to provide spacing of about 70 m between taps, which was the Soviet standard. This amounts approximately to 3-5 households per standpipe. The project will include the rehabilitation of 26 km of transmission mains with diameters ranging from 400 mm to 250 mm, and 211 km of distribution pipework between 300 mm and 100 mm in diameter. The existing wellfields will be rehabilitated and new borehole pumps and controls installed. The water distribution centers will be renovated, and new electrical systems, mechanical plant, and appropriate chlorination equipment will be installed. The present street standpipes will be replaced with an improved design that will reduce wastage and freezing during winter months. This subcomponent will reduce water losses, reduce operation and maintenance costs, improve water quality by reducing the risk of groundwater infiltration to the system, as well as providing extended hours of supplying water under pressure to the towns. These improvements will allow chlorinated water to be supplied to 108,000 consumers throughout the daytime hours (at least 15 hours per day, with the goal of 24 hrs/day) instead of the few hours per day that unchlorinated water is now available. The component would finance civil works and technical assistance.

b. Rural Water Supply System Improvements Rehabilitation and expansion of water supply systems in collective farms (US\$ 10.4 million). This subcomponent will rehabilitate and expand the water supply systems in 47 villages in nine collective farms (Ersarieva, On Yil Abandanlik, Bereket (Gubadagh etrap), Maslahat, Shodlik, Magtimguli, Andalip, Kirk-Giz, and Darjalik), distributed amongst the seven etraps. Delivery will be through public street standpipes. It will include rehabilitation of 64 boreholes in nine wellfields, including installation of new pumps and control equipment. A total of 94 km of transmission main will be rehabilitated, and 31 km of new mains installed. The seven water distribution centers will be renovated and new mechanical and electrical equipment installed. In the distribution systems, 125 km of new mains will be constructed, and 2,025 km rehabilitated, along with upgrading of 1,800 existing street standpipes and installation of 3,400 new standpipes. This subcomponent will reduce water losses, reduce operation and maintenance costs, improve water quality by reducing the risk of groundwater infiltration to the system, as well as providing extended hours of supplying water under pressure to the collective farms. These improvements will allow chlorinated water to be supplied to 82,000 people (including 62,000 not previously served by a piped water system) throughout the daytime hours (at least 15 hours per day, with the goal of 24 hrs/day) instead of the few hours per day that unchlorinated water is now available to only 20,000 people in these collective farms.

c. Operational Support Provision of supplies to operate and maintain the water systems (US\$ 1.0 million). This subcomponent will provide additional spare parts (beyond those provided by manufacturers of equipment), tools, chemicals and other equipment which are essential for operation and maintenance of the systems. The items provided will include pipe tapping equipment, spare pipes and fittings, repair clamps and other spares. Chemicals for two years operation will also be provided. This subcomponent will protect the investment in the water supply systems by allowing the operators to maintain the systems using the stocks provided until normal purchasing channels can be arranged with neighboring countries.

3.7 **Sanitation and Health** (US\$ 3.4 million or 12% of project base cost). The objective of this component is to optimize the project's health benefits by improving sanitation facilities and hygiene practices; health promotion and hygiene education; water quality monitoring; and hygiene surveillance. The component will utilize the community based approaches to the provision of basic sanitary services developed under the school sanitation demonstration project. Since preparation results found low demand on the household level for improved sanitation but very poor sanitation and hygiene conditions, this component was designed to target under-served, communal facilities and to demonstrate, and educate, with strong community participation, to larger audiences the benefits of improved sanitation facilities. It will rehabilitate and construct latrines and install handwashing basins in rural schools and markets in the areas covered by the project. The three subcomponents include:

a. Improvement of Sanitation, Hygiene and Water Supply Facilities Utilizing Community-Based Approaches (US\$ 0.8 million). The objective of this subcomponent is to improve sanitation and hygiene. This subcomponent will finance the rehabilitation of latrines and installation of handwashing basins in about 35 schools in the nine collective farms for which water supply improvements are being provided, and in one market in each of the etrap centers included in the water supply component. The community involvement model developed during the school sanitation project will be utilized in the sanitation and hygiene school program. The community involvement model developed during the community water supply demonstration project will be utilized and further expanded to include community activities in the operation and maintenance of the new systems. The subcomponent will be managed by the Department of Housing and

Communal Services assisted by local and foreign sanitation engineers and community development specialists. . The component would finance the purchase of one vehicle and equipment for each etrap, workshops and local study tours.

b. Health Promotion and Hygiene Education in Rural Areas (US\$ 0.7 million). This subcomponent aims at changing knowledge, attitudes and practices related to water, sanitation and health. Health promotion and hygiene education will be carried out in the schools and markets covered by subcomponent (a) above, and also in other rural areas. This subcomponent includes the rehabilitation of the Dashkhovuz Center of Health, provision of equipment, training of trainers, workshops and a study tour.

c. Water Quality, Sanitation, Hygiene and Health Services in the Dashkhovuz Velayet (US\$ 1.9 million). This subcomponent aims at improving SES capabilities to test water quality , to survey sanitation and hygiene conditions, and to conduct environmental epidemiological studies. It would improve the performance of the Sanitary and Epidemiological Services (SES) division of the Ministry of Health in the Velayet through purchase of equipment and supplies, technical assistance, and training. This subcomponent will:

(i) Improve water quality monitoring system and sanitation and hygiene surveillance systems. Responsibility for this activity would rest with the Dashkhovuz Velayet SES, with assistance from local and foreign specialists. This item includes purchase of vehicles and equipment, as well as workshops for SES staff.

(ii) Upgrade SES laboratories in Dashkhovuz Velayet. The existing 8 SES laboratories, one per etrap, will be refurbished and equipment for bacteriological and chemical analysis purchased. This subcomponent would finance workshops, training, and local and foreign technical assistance.

(iii) Improve data collection, analysis and reporting; and conduct epidemiological studies. Training will be provided to SES staff in data collection and analysis methods. Reporting procedures will be revised. Equipment will be furnished to improve data analysis. Technical assistance and training in environmental epidemiology will be provided. Epidemiological studies will be conducted as a training vehicle as well as to investigate linkages between water and sanitation and health, and to document impacts of the project's interventions. This subcomponent would finance technical assistance and training from local and foreign epidemiologists and statisticians, workshop training, a study tour, and one epidemiological study per year for 5 years.

**3.8 Institutional Strengthening** (US\$ 2.4 million, or 8% of project base cost.) The objective of this component is to improve the effectiveness of the delivery of water and sanitation services to the population of Dashkhovuz Velayet. The component is designed to address the principle sector weaknesses which are: (1) allocation of responsibility for the sector among too many governmental agencies, (2) the wide range of responsibilities other than water and sanitation assigned to the principal agency charged with providing water supply, (3) lack of technical and management skills throughout the sector, (4) the absence of a coherent program for the effective operation and maintenance of water and sanitation facilities, (5) inadequate focus on the importance of providing effective means of excreta disposal, (6) inadequacy of funding for both capital construction of new and replacement facilities, and for operation and maintenance of existing facilities, (7) inadequate communication between management and consumers, and (7) a

national policy which provides water and sanitation services at no cost to the users. The Institutional development component of the project will finance a two-year program of technical assistance, training and equipment to strengthen the capacity of the government to manage, operate and maintain the facilities which provide water and sanitation services to the people of Dashkhovuz. The centerpiece of this component is the establishment of a Dashkhovuz Regional Water and Wastewater authority (DRWASA). Four sub-components for building capacity for the effective provisions of water and sanitation services are: (1) identification of national sector reforms; (2) reorganization of the water and wastewater sector in Dashkhovuz velayet; (3) strengthening of the newly established DRWASA; and (4) a public awareness campaign. Annex C describes these activities in detail.

- a. National Sector Reform Study. (US\$ 0.2 million) The objective of this sub-component is to recommend improvements and develop an action plan to strengthen, on the national level, the capacity in Turkmenistan to provide water and wastewater services. Technical assistance will be provided to conduct a study which will identify the most serious constraints at the national level, recommend legislative or other reforms where the national constraints are the most serious and recommend a plan of action for transferring responsibility for the sector from the national level to Dashkhovuz velayet.
- b. Establishment of the Dashkhovuz Regional Water and Sanitation Authority. (US\$ 1.0 million) The objective of this sub-component is to establish a specialized regional water supply and wastewater authority under the jurisdiction of the Dashkhovuz velayet, which would be granted the responsibility and powers to provide sector services to all the people of the Velayet. A provisional table of organization for the new regional authority is presented in Annex I. Results of the National Sector Reform study are expected to guide development of the Authority. Technical assistance and equipment would be financed to develop: (1) reporting relationships between the Authority, Dashkhovuz velayet, and the national government; (2) the legal form of the authority (3) transfer procedures for personnel, equipment and responsibilities of the existing sector organization to the Authority, (4) new laws and regulations to strengthen the sector; (5) sector planning; and (6) a program for strengthening the Authority (to be conducted under the following sub-component).
- c. Institutional strengthening of the Regional Authority. (US\$ 1.1 million) The objective of this sub-component is to strengthen the capability of the newly established water and wastewater authority to meet its responsibilities. The regional and local organizations that would be included under the new regional organization have few of the skills or resources required to develop an effective utility, e.g. operation and maintenance of facilities; management; collection and dissemination of information; finance; administration; personnel; customer relations. This sub-component will support the Government in analyzing options for cost recovery and in reaching a decision on which option is most suitable. This sub-component would finance technical assistance, training, equipment and supplies.
- d. Public Awareness Campaign. (US\$ 0.1 million) This subcomponent will carry out a public awareness campaign to inform the population in the project area about improvements in service provision and cost-recovery, as well as to educate the general population about water conservation; safe practices for water collection and storage; linkages between water, sanitation and health; and the role of the household and community in properly operating and maintaining the systems. This last item will be linked with the community development activities for community participation in water supply and sanitation systems. Feedback from numerous

community focus groups and stakeholder workshops has found that beneficiaries want more public education regarding the new systems so that they can identify specific and appropriate mechanisms for their participation.

3.9 **Project Management and Construction Supervision** (US\$ 3.0 million or 10% of project base cost). This component will cover the costs of project management (US\$1.9 million) and supervision of construction of the water supply improvements (US\$1.2 million). Overall project management will be provided by personnel in a Project Implementation Unit (PIU), which will have personnel in both Ashgabat and Dashkhovuz. The construction supervision team will be based in Dashkhovuz. It will consist of two full time expatriate foreign construction supervisors for about 20 months, short-term construction specialists, about 12 full-time local construction supervisors, and local support staff. The details of the Project Management portion of this component are presented in Chapter IV. The project implementation plan is presented in Annex J.

#### D. Estimated Costs

3.10 The total cost of the Project is estimated at US\$33.7 million equivalent. The estimated cost and foreign exchange by components are shown in Table 3.1. Detailed cost estimates by type of expenditure are contained in Annex K.

**Table 3.1: Estimated Project Costs  
(US\$ Million)**

	Local	Foreign	Total	% Foreign Exchange	% Total Base Costs <sup>a/</sup>
Water Supply	4.78	15.36	20.14	76%	70%
Sanitation and Health	1.27	2.17	3.44	63%	12%
Institutional Strengthening	0.69	1.74	2.43	72%	8%
Project Management and Construction Supervision	0.81	2.22	3.03	73%	10%
Total Base Costs	7.55	21.49	29.04	74%	100%
Physical Contingencies	0.80	2.45	3.25	75%	
Price Contingencies	0.11	1.30	1.41	92%	
<b>TOTAL PROJECT COST</b>	<b>8.46</b>	<b>25.24</b>	<b>33.70</b>	<b>75%</b>	

a/ Base cost date April, 1997

3.11 **Basis of Cost Estimates.** Project costs have been estimated in US dollars. Civil works and equipment costs have been derived from a detailed feasibility study delivered in November, 1996 during preparation of the Project. Cost for consulting services have been derived on the basis of recent cost estimates for comparable services in other Bank financed projects in Turkmenistan including training (both local and overseas). The costs of consulting services would include, fees, recruitment/relocation costs,

housing, subsistence, and overheads.

**3.12 Foreign Exchange Component.** The foreign exchange component has been estimated as follows: (a) civil works (75%); (b) goods consisting of water supply and sanitation equipment, vehicles, educational materials and chemicals (100%), furniture (80%) and local supplies (70%); (c) international consultants and studies (100%); (d) overseas training (100%); (e) local consultants (0%); and (f) local training (30%). These percentages have been determined assuming that basically all goods (equipment and related supplies) would be imported, and that international consultants would be recruited internationally. Including contingencies, the resulting foreign exchange component is estimated at US\$ 25.2 or 83% of total project costs.

**3.13 Contingency Allowances.** Price contingencies, representing about 3.6% of the total project cost, are based on estimated inflation rates of 2.2% for 1998, 2.6% for 1999, 2.8% for 2000, 2.6% for 2001, and 2.5% for 2002. Price contingencies on local costs (expressed in US dollars) are therefore based on the same international inflation rates. Physical contingencies were estimated at 15% of civil works and equipment, 10% of training and 5% of supplies and materials.

**3.14 Taxes and Duties.** All Goods (equipment and related supplies) specifically imported for the Project would be exempt from custom duties and taxes. International consultants would be exempt from the Government's personal income tax. Civil work contracts would be subject to all applicable local taxes which will be paid by the Government as part of their contribution.

### E. Project Financing

**3.15** The total project cost is estimated at US\$33.7 million with a foreign exchange component of US\$25.2 million. The financing plan is shown in Table 3.2 below. The proposed Loan of US\$30.3 million would finance 100 percent of the foreign exchange costs and about 60 percent of local costs excluding taxes. The proposed Loan of US\$30.3 million would finance about 90% of total project costs and the Government would contribute US\$3.4 million equivalent or about 10% of total project costs.

**Table 3.2: Financing Plan  
(US\$ Million)**

	Local	Foreign	Total	% Foreign Exchange	% Total Project Costs
Government of Turkmenistan	3.40	0	3.40	0%	10%
Bank	5.06	25.24	30.30	83%	90%
<b>TOTAL PROJECT COST</b>	<b>8.46</b>	<b>25.24</b>	<b>33.70</b>	<b>75%</b>	<b>100%</b>

**3.16 Operating Costs.** Operating costs for the PIU, rental of offices, office supplies, and miscellaneous

operating costs have been included in the project. Operating costs for operation and maintenance of the water systems are discussed in the Economic and Financial Analysis, Annex R. The institutional strengthening component will include technical assistance to develop a tariff structure sufficient to recover operation and maintenance costs of the new systems, as has been agreed with the Government (Annex A-2).

3.17 The total Government contribution is estimated at US\$3.4 million. During negotiations, assurances were obtained that the Borrower would deposit its counterpart funds for the Project annually and in advance in the project account, establishment of which in a commercial bank is a **condition of effectiveness**.

## F. Environmental Impact

3.18 **Requirements for Environmental Review.** For the purposes of the Bank's guideline OD.4.01, the project is classified as Category B, which requires only a limited environmental review to determine potential negative environmental impacts and suggest mitigation measures as required to overcome any identified negative impacts. The required limited review was initiated during project preparation and concluded by the preparation team and Bank consultants. The review concluded that the project would generate significant environmental benefits with no negative impacts of consequence anticipated.

3.19 **Environmental Consequences of the Project.** The project is expected to have a positive impact on public health while maintaining or improving quality and quantity of regional water resources. Rehabilitation of disinfection systems; leak repair; improved sanitation facilities; and increased water delivery periods would reduce levels of bacteriological contamination in the drinking water supplies. Currently, operation of well fields often does not follow well field rules (due to malfunctioning equipment). Such operation may lead to disruption in the design flow regime and increases the chance of drawing water of relatively poor quality. By improving the well field equipment and operation, the project would ensure that the highest quality water is delivered. Technical improvements to the distribution system including leak repair and the provision of automatic shut-off valves on public standpipes combined with public awareness and education efforts would promote water conservation.

3.20 The project would have no adverse environmental impacts. No resettlement, international waterways or property rights issues are involved since the project focuses on rehabilitation of existing facilities. All works would be executed either within the premises of existing facilities, existing public streets or publicly owned property. The project will not affect any archeological or historical sites. Contractors will be responsible for notification to authorities of the discovery of any previously unknown archeological or historic sites, and the suspension of work until decisions are taken concerning necessary steps to protect such sites.

3.21 Under the terms of the bidding documents, the contractors would be responsible for keeping worksites pollution free, returning sites to their original condition, and minimizing dust, noise or other work-related nuisances, and for utilizing environmentally sound practices when handling materials and chemicals. Water soluble hypochlorite will be used for the water disinfection systems. The two year supply of hypochlorite provided under the project will be packaged in non-hazardous small packages and containerized as appropriate. The construction contractor shall conform with the manufacturers recommendations for safe storage and handling of the chemicals. The project includes training in the safe handling and storage of chlorination equipment and chemicals.

3.22 The project recognizes that water pollution control of the region's waterways is key to water resource management and the sustainability of the drinking water supplies. It is beyond the scope of the project to address the causes of water pollution but the public education program will include information regarding water pollution control at the household and community levels. Furthermore, it is envisioned that future environmental dialogue with the Government will include discussions on water pollution control. A National Environmental Action Plan has been discussed and would provide an excellent opportunity to advance water pollution control initiatives.

## IV. PROJECT MANAGEMENT AND IMPLEMENTATION

### A. Overall Project Management

4.1 Responsibilities for Project Implementation and Management Responsibility for the implementation of the three major components of the project would rest with the specific implementing agencies: the Ministry of Health (MOH) for the Sanitation and Health component, and the Ministry of Water Resources (MWR) for the Water Supply and Institutional Strengthening components. The local authorities in Dashkhovuz Velayet and the participating etraps will also be assigned responsibilities for specific components of the project as appropriate. Overall responsibility for project management would rest with a Project Implementation Unit (PIU) which has been established within the MWR. Details of the PIU are presented in Annex M. In addition to overall coordination, the PIU would be responsible for implementation functions such as project accounting, procurement, disbursements, consolidation of quarterly and annual progress reports, annual work programs and budgets. The PIU will also provide training and technical assistance coordination, project supervision, and assistance to the Component Coordinators (CCs).

4.2 **Organization of the PIU.** The PIU will report to the Deputy Minister of the MWR responsible for Construction and Operations. The PIU will be staffed with a director (local), an economist/planning specialist (local), an accountant/disbursement specialist (local), an interpreter/translator (local), a secretary (local), a project management specialist (foreign), and a procurement specialist (foreign). In addition, the project will provide a limited number of short-term foreign consultants, including a financial specialist. Annex M presents the organization of the PIU.

4.3 **Role of the Foreign Project Management Specialist.** The lead foreign specialist will provide overall project management support and guidance to the PIU. The specialist's tasks will include an emphasis on capacity building, as well as coordination of long-term and short-term technical assistance, consolidation of quarterly and annual progress reports, work programs, budgets, and project accounts. Contracting of consulting firms to assist with the implementation of the project will be coordinated by the PIU and initiated under financing of a Project Preparation Facility (PPF).

4.4 **Assurances were obtained at negotiations** that as a condition of **Loan Effectiveness**, the Borrower would have employed consultants to provide the technical assistance services to the PIU for project management and construction supervision. **Assurances were obtained at negotiations** that the PIU will be maintained throughout the project implementation period with staffing, funds, facilities, and other resources in a manner satisfactory to the Bank.

4.5 **Preparation of a Project Implementation Manual.** A Project Implementation Manual (PIM) will be required in order to facilitate the management and implementation of the project. The PIM will summarize procedures for monitoring project implementation, processing of withdrawal applications under the loan, various methods of procurement to be followed according to the Procurement Schedule in the Loan Agreement, use of Statement of Expenditures and overall project funds, procedures for replenishment of project special and project accounts. The PIM will be prepared by the foreign project management and procurement specialists in the PIU, and will be translated into Russian. The PIU's foreign specialists will be required to organize training for the PIU's local staff, and the Component Coordinators, in order to ensure an understanding of the procedures specified in the PIM. Submission of a satisfactory draft of the PIM to the Bank is a **condition of Loan Effectiveness**. The Borrower would adopt the PIM by December 31, 1997. Between effectiveness and the adoption of the PIM, the Borrower

adopt the PIM by December 31, 1997. Between effectiveness and the adoption of the PIM, the Borrower would implement the project in accordance with the draft PIM.

**4.6 Project Coordination Committee.** The PIU will be supported by a Project Coordination Committee (PCC), already established, whose main task will be to oversee project implementation. The PCC will be an inter-ministerial committee to provide policy guidance for the implementation of the project. The PCC is chaired by a senior management official in the Cabinet of Ministers (COM). Membership in the PCC will include high-level representatives from the COM, the Ministries of Finance and Economy, Water Resources, Health, Education, Environment and velayet authorities. The PCC would be expected to meet quarterly, or more frequently if necessary. CCs will be invited to participate in these meetings and the PIU will serve as the Secretariat of the PCC. The PCC will review and help resolve all issues raised during project implementation that cannot be resolved by the responsible implementing agencies or the PIU. **Assurances were obtained at loan negotiations** that the PCC will be maintained for the duration of the project.

## **B. Component Coordination**

**4.7 Appointment and Purpose of Component Coordinators.** The implementing agencies have appointed Component Coordinators (CCs) at the velayet level to assist the in managing the project. The CCs will work under the direction of a Regional Component Coordinator (RCC), who will also be linked to the Dashkhovuz Velayet. The RCC and the CC responsible for coordinating construction supervision of the water supply component of the project have been appointed by the MWR. The two CCs responsible for coordinating the health and sanitation component of the project will be appointed by the MOH, specifically the Sanitary and Epidemiological Services and Center of Health divisions of the MOH. In addition to directing the work of all the component coordinators, the RCC will be responsible for coordinating the institutional strengthening component of the project. The relationships between the CCs and the PIU, and to each other, are shown in the organization chart in Annex M. **Assurances were obtained at loan negotiations** that the RCC and CCs will be maintained with resources and under Terms of Reference satisfactory to the Bank for the duration of the project.

**4.8 Overall Role and Training of Component Coordinators.** The CCs will be the focal points for all project activities related to their components. The CCs will be the first point of contact between their respective implementing ministries, the PIU, and the PCC. These arrangements will remove the need to create separate structures within each implementing ministry. A project launch workshop with the participation of all CCs and key officials of the member ministries of the PCC, to ensure a clear understanding of the project, proposed implementation arrangements, and the Bank's procedures and practices will be organized immediately after Board Presentation.

**4.9 Duties of the Component Coordinators.** With support from technical assistance financed under the project, all CCs will be responsible for coordinating the planning and implementation of project activities in their respective components. Specifically, the CCs would be responsible for the preparation of the annual work programs and budgets, ensure that project accounts and records are maintained, and that supporting documentation is kept in an organized manner for the preparation of funding requests from the Special Account. In addition, they will be responsible for the preparation of quarterly and annual progress reports. The CCs also would be responsible for coordinating the planning and implementation of project activities at the etrap level, consolidating the annual work programs and budgets and ensuring that the project financing requirements are incorporated in the velayat budgets before they are sent to the PIU, and subsequently to the MOF, during the annual budget preparation

process. They will also review and consolidate the annual programs and annual reports before they are sent to the PIU.

### C. Project Reporting

**4.10 Work Programs (WPs).** Implementation of the project will require the preparation of annual work programs and budgets. Separate work programs would be prepared for the components under the two implementing ministries. WPs would also be prepared for each participating etrap. The first draft WPs would cover the period July through December 1997. Subsequent WPs would be prepared and submitted to the Bank by **October 31 of each year** to coincide with the normal Government budget cycle. The draft WPs would be submitted to the Etrap Council as part of the etrap budget for approval. In the budget proposals, project activities would be clearly identified and set aside for any follow-up. The WPs would be forwarded to the Velayet Administration through the Velayet CCs, who would consolidate all the WPs from the etraps. The Velayet Council would then approve the consolidated WPs and forward them to the PIU through the CCs.

**4.11 Contents, Submission and Review of Work Programs.** The WPs would include the following: (1) a statement of the objectives to be pursued for the coming year; (2) an up-dated inventory of all works/services to be undertaken during the period; (3) total costs for the budget year for rehabilitation, equipment, supplies, and recurrent costs; and (4) conclusions and recommendations of the work program. The details of the investment costs included in the work programs would be clearly identified. The PIU would review and consolidate the WPs received from the velayet (and etraps) through the MOH and MWR CCs. The PIU would be responsible for submitting the consolidated report on WPs and budgets to the Ministry of Finance for inclusion in the national budget to ensure that appropriate allocations are made for the financing of the share of project recurrent costs that is the responsibility of the velayat/etraps. The WPs would be submitted to the Bank for review and comments at the same time they are submitted to the PIU. The Bank would review the WP report and make comments and suggestions as appropriate. The consolidated WP would form the basis for the implementation of project activities in any given year.

**4.12 Quarterly Progress Reports.** Quarterly progress reports must be prepared by the PIU and presented to the Bank and the PCC. The first report would be issued three months after Loan Effectiveness. The reports would include: (1) a summary of project activities by component; (2) a description of the main achievements against agreed implementation targets and disbursement schedules, and the problems encountered; (3) recommendations on how to solve problems and comments on progress in implementing previous recommendations; (4) a description of component activities; (5) a presentation of the financial situation of the project in terms of actual versus budget for the major expenditure categories and the financing of these categories; and (6) a presentation of the financial situation of each component. Each implementing ministry would prepare an annual implementation progress report by **February 15, 1998** and by the same date each subsequent year, which would then be made available to the Bank through the PIU. The quarterly and annual reports would be prepared by the CCs in each implementing agency. The reports would be prepared for each etrap, including the etrap city and the kolkhos, and would include a summary describing the major achievements and problems. These reports would be consolidated by the CCs before being submitted to the PIU for final clearance. The reports cleared by the PIU would be forwarded to the Bank. **Assurances were obtained during the Loan Negotiations** that, within one month from the end of each quarter, each implementing ministry would prepare such quarterly reports.

4.13 **Mid-Term Review.** At the time of the estimated mid-point completion of the project, the Borrower would be required to undertake a mid-term review of the implementation of the project. This review would be undertaken in consultation with, and in a manner satisfactory to, the Bank. By March 31, 2000, the Borrower would prepare and furnish to the Bank a report regarding the results of the mid-term review, including progress achieved in the implementation of the project and measures recommended to ensure the achievement of the project's operational and development objectives during the remainder of the project life. By July 31, 2000, the Borrower shall review this report with the Bank.

#### **D. Project Monitoring**

4.14 **Project Monitoring.** Project Monitoring would be carried out in five main areas: (1) the procurement and physical delivery of goods; (2) the physical implementation of project activities; (3) the impact on service delivery; (4) the financial management and control of project funds; and (5) the capacity building under the project. A continuous assessment of these activities would be carried out under the context of the Project Implementation Plan described in Annex J, and, more specifically, the annual work programs. Project implementation programs and the effective utilization of project resources would be monitored through well defined Performance Monitoring Indicators similar to those listed in Annex O.

#### **E. Bank Supervision**

4.15 **Bank Supervision.** Intensive supervision by the Bank would be required for the first year following Loan Effectiveness, principally because the implementing agencies and other responsible government agencies lack experience, not only with the Bank, but also with project management and procurement methods. Initially, supervision would focus on project management, procurement, project financing, Bank disbursement procedures, and methods of payment and reporting. In the second year, attention would focus on the institutional and financial aspects of the project. The Supervision Plan in Annex N estimates a requirement of 37 staff weeks for the first year of the project (PY1), spread over three missions, and 72 staff weeks for eight additional supervision missions, two missions for each subsequent year. The Bank's Liaison Officer would participate in important meetings during missions and would facilitate day-to-day communications with the PIU. The Performance Monitoring Indicators (Annex O) would be used for measuring progress in project implementation by the Bank's supervision missions. Electronic mail would be installed at the PIU to facilitate communication with the Bank in Washington.

#### **F. Procurement**

4.16 **Summary of Procurement Procedures.** The Project Implementation Unit would be responsible for managing procurement for overall project management and coordination. Specialized Procurement Consultants would assist the PIU in development of technical specifications. Procurement of civil works, goods and services would be in accordance with the World Bank's "Guidelines, Procurement under IBRD Loans and IDA Credits" dated January 1995 and Revised January and August 1996 and "Guidelines for the Use of Consultants by World Bank Borrowers and by the World Bank as Executing Agency" dated August 1981. Standard Bidding Documents and Form of Contracts issued by the Bank would be used as appropriate for the Civil Works, Goods and Services to be procured. Both works and goods would be grouped in the most efficient manner possible and the proposed packaging would be reviewed by the

Bank. Table 4.1 summarizes the proposed procurement arrangements. Detailed procurement arrangements indicating the number of procurement packages, their value and method is presented in Annex P.

**4.17 Procurement of Civil Works (US\$24.8 million).** Civil works are for the rehabilitation and upgrading of facilities (7 etrap centers and 9 collective farms) as well as sanitation facilities and testing laboratories in the eight etrap centers. The contractor will supply all necessary equipment. The following methods of procurement would be followed:

- (a) **International Competitive Bidding (ICB)** procedures would be used for contracts estimated to cost more than US\$ 300,000. Approximately \$24.0 million will be procured under international competitive bidding. The Government will contribute approximately US\$2.5 million. Given the size of the contract, the contract will be based upon unit costs and the contractor will supply all necessary goods. Given the size of the contract and the complexity of works, prequalification will be required.
- (b) **Procurement of Small Works** procedures would be used for contracts estimated to cost less than US\$ 50,000. Approximately \$0.5 million for small scale civil works (pit latrines) will be procured under lump sum, fixed price contracts awarded on the basis of quotations obtained from three qualified domestic contractors in response to a written invitation. The Borrower shall use bidding documents developed in the ECA region. The invitation shall include a detailed description of the works, including basic specifications, the required completion date, and relevant drawings where applicable. Short letters of invitation and a brief standard form of contract will be developed and reviewed and accepted by the Bank (sample invitation and contract will be included in the PIM). The award shall be made to the contractor who offers the lowest price quotation for the required work, and who has the experience and resources to successfully complete the contract.

**4.18 Procurement of Goods (US\$2.6 million)** consisting of water supply and sanitation equipment and related supplies, furniture, and vehicles would be grouped to the extent practical to encourage competitive bidding. The following methods of procurement would be followed:

- (a) **International Competitive Bidding (ICB)** procedures would be used for goods estimated to cost US\$0.8 million related to contracts estimated to cost more than US\$300,000 equivalent each;
- (b) **International Shopping procedures (IS)** would be used for the procurement of goods that cannot be grouped in packages above US\$300,000. Quotations from at least three suppliers from at least two different eligible countries would be required for contracts estimated to cost less than US\$300,000 and more than US\$50,000. An aggregate limit of US\$1.5 million worth of goods would be procured through IS; and,
- (c) **National Shopping (NS)** procedures for contracts up to US\$50,000 each would be used for locally available, off-the-shelf equipment and furniture items of small value and standard specifications up to an aggregate amount of US\$0.3 million; three quotations would be required.

4.19 **Preference for Domestically Manufactured Goods.** For contracts for goods, to be awarded on the basis of ICB, the Borrower may grant a margin of preference of 15% or the amount of applicable customs duties, whichever is lower, to qualified domestic manufacturers of goods in accordance with World Bank Procurement Guidelines (January 1995 and Revised January and August 1996).

4.20 **Procurement of Consulting Services (US\$4.7 million).** Specialists and/or consulting firms financed under the Project would be hired in accordance with the "Guidelines for the Use of Consultants by World Bank Borrowers and by the World Bank as Executing Agency" dated August, 1981. Consultants will be sought for the sanitation and health component (\$1.7 million), the institutional strengthening component (\$1.7 million), and project management (\$1.3 million - of which \$0.3 is technical assistance under the PPF). Most of the consultants contracts shall be awarded on the basis of shortlist of firms.

4.21 **Training (US\$0.4 million).** For local and overseas training and study tours financed under the Project, the qualifications of candidates along with their course of study, and proposed training institutions and costs, and in-country local training courses would be subject to prior review and approval by the Bank. Candidates would be selected on the basis of established criteria, to be agreed upon with the Bank as part of the annual reviews.

4.22 **Operating Costs (US\$1.2 million)** will comprise sanitation facilities maintenance, PIU staff salaries, utilities, office rent and office operating costs including supplies and equipment. The Bank will finance 28% of operating costs and the Government will finance 72% of operating costs over the life of the Project.

4.23 **Notification of Business Opportunities.** A General Procurement Notice was published in the February 16, 1997 edition of the UN publication *Development Business* and, as appropriate, would be updated and published annually thereafter. For goods to be obtained by ICB, individual bidding opportunities would be advertised in *Development Business* and in a major local newspaper 30 days prior to availability of bidding documents and transmitted to potential bidders who expressed interest in bidding in response to the published General Procurement Notice. The local advertisement procedure would be repeated for all bidding packages utilizing ICB. These advertisements would be in the English language.

4.24 **Project Preparation Facility (PPF).** PPF P-3120-TM in the amount of US\$0.43 million was signed on November 4, 1996 to help finance the establishment of the PIU. Work includes consulting services to the PIU for the preparation of procurement arrangements. Study tours, local training and a limited amount of equipment and supplies are also eligible expenses. Procurement of consultants will follow Bank Guidelines.

4.25 **Prior Review By the Bank of Procurement Decisions.** The documentation for all procurement transactions not subject to prior review by the Bank would be subject to ex-post review during the Bank's periodic project supervision missions. To ensure compliance with the World Bank's Procurement Guidelines, the following procurement actions would be subject to prior Bank review: (a) with respect to each contract under international competitive bidding for goods or works estimated to cost the equivalent of \$300,000 or more; (b) the first two contracts for small works awarded under procurement of small works estimated to cost the equivalent of \$20,000 or more; and (c) for the first three contracts for goods awarded under international shopping, the procedures set forth in paragraphs 2 and 3 of Appendix 1 to the Guidelines shall apply. The PIM prepared by the PIU (para 4.5) will be submitted to the Bank for prior review.

Table 4.1: Detailed Procurement Arrangements (in US\$ million)

	Procurement Method			Total Cost
	International Competitive Bidding	National Competitive Bidding	Other	
1. Works				
1.1 Rehabilitation	23.13 (20.85)		1.64 <sup>a</sup> (1.50)	24.77 (22.35)
2. Goods				
2.1 Equipment			1.03 <sup>b</sup> (1.03)	1.03 (1.03)
2.2 Vehicles			0.33 <sup>c</sup> (0.33)	0.33 (0.33)
2.3 Supplies	0.83 (0.83)		0.23 <sup>d</sup> (0.23)	1.06 (1.06)
3. Consultant Services				
3.1 Technical Assistance			4.40 <sup>e</sup> (4.40)	4.40 (4.40)
3.2 Training			0.43 <sup>f</sup> (0.30)	0.43 (0.30)
4. Operating Costs			1.24 <sup>g</sup> (0.40)	1.24 (0.40)
5. PPF			0.43 <sup>h</sup> (0.43)	0.43 (0.43)
Total	23.96 (21.68)		9.74 (8.62)	33.70 (30.30)

**Figures may not total due to rounding.**

Figures in parentheses are the respective amounts financed by the Bank.

a/ Includes Sanitation Civil Works \$0.46 million to be procured by National Shopping and Construction Supervision Staff \$1.18 million to be procured per Guidelines for the use of Consultants, August, 1981.

b/ Includes Water Supply and Sanitation equipment \$0.75 million and office equipment \$0.28 million to be procured by International Shopping

c/ Vehicles to be procured by International Shopping

d/ Includes furniture of \$0.02 million and other supplies of \$0.02 million to be procured by National Shopping and Laboratory Furniture \$0.13 million and water supply and sanitation supplies \$0.06 million to be procured by International Shopping.

e/ Includes Local TA of \$0.88 million and Foreign TA of \$3.52 million to be procured per Guidelines for the use of Consultants, August, 1981.

f/ Includes workshops/seminars \$0.29 million and study tours \$0.14 million to be procured per Guidelines for the use of Consultants, August, 1981.

g/ Includes office rent to be financed by the government \$0.79 million; PIU personnel salaries after effectiveness \$0.25 million procured per Guidelines for the use of Consultants, August, 1981; and office operation, maintenance and communication costs \$0.08 million and miscellaneous expenses \$0.12 million to be procured by National Shopping.

h/ Includes phase I of PIU consulting contract \$350,000; local consultants \$35,000; office equipment (National Shopping) \$30,000; training \$10,000; and recurrent costs \$5,000.

(a) **Civil Works:** Civil works (including repairs to existing facilities and installation of equipment) shall be procured using the Standard Bidding Documents, Procurement of Works, January, 1995. All prequalifications, bidding documents, evaluation reports, awards and contracts will be subject to prior Bank review. For the sanitation rehabilitations (pit latrines) the PIU will use a simplified version of the standard bidding documents, developed by ECA region, which would be based on a simplified bill of quantities including, inter alia, the method of payment and a form of contract. The PIU would be responsible for the evaluation and recommendation of award of contracts. Technical verification of the work carried out would also be the responsibility of the PIU in cooperation with the MOH. Prior to award the Bank would review the first two rehabilitation contracts for works on sanitation facilities (see para 4.25 above) and monitor other awards and works on a selective basis during project supervision.

(b) **Goods:** In general, pre-identified master lists of goods, indicating grouping, along with estimates of cost and proposed method of procurement would be pre-reviewed by the Bank. Items would be grouped to the extent practical to encourage competitive bidding and to permit bulk procurement. Bidding documents, evaluations and recommendations of awards for goods procured under ICB and first two contracts under IS would be subject to prior review by the Bank.

(c) **Consultants:** The selection of consultant firms and individuals would be in accordance with the World Bank Guidelines for Use of Consultants (August, 1981). Terms of Reference for all consulting assignments would be subject to prior review by the Bank. Terms and conditions of contracts for all technical assistance assignments, invitation packages and evaluation reports of assignments costing more than US\$100,000 each for firms, and US\$50,000 each for individual consultants would be subject to prior review by the Bank.

4.26 After award, should any material modifications or waiver of the terms and conditions of a contract result in an increase above 15% of the original price, the Bank would reserve the right of prior review of such modifications (included would be modifications in contracts for consulting services).

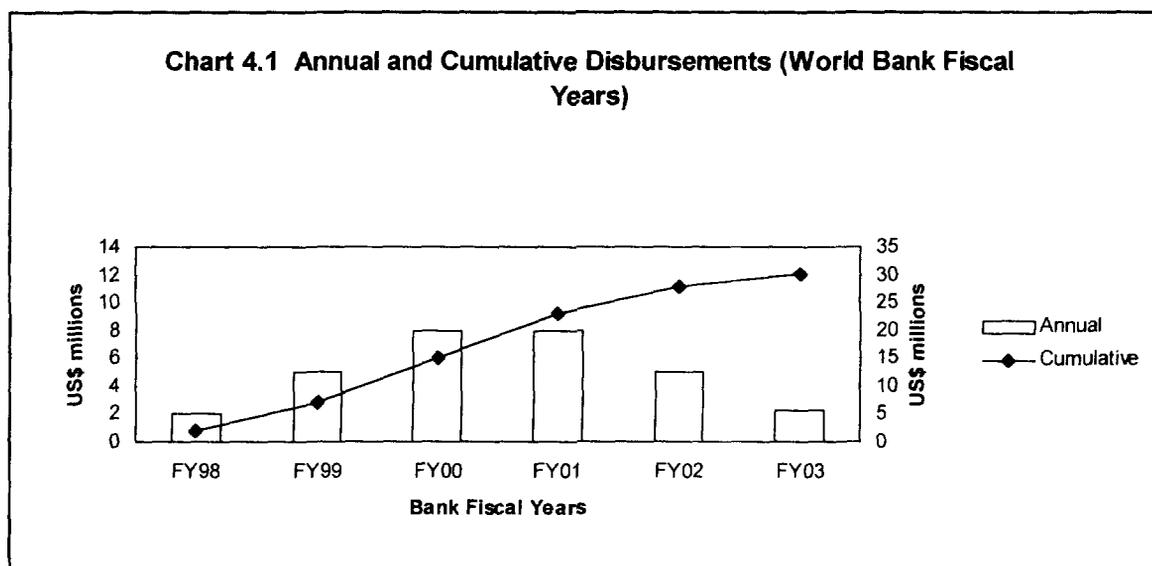
4.27 **General Review:** The Bank would monitor procurement activities, contract management, and project record-keeping during supervision missions. The Bank would undertake a focussed project launch workshop in July, 1997 and a comprehensive mid-term review of project progress; both activities would place special emphasis on implementation including procurement matters.

4.28 **Procurement Monitoring and Reporting.** The PIU would be responsible for establishing and maintaining a computerized procurement monitoring and reporting system acceptable to the Bank. Status reports from this system would accompany the PIU's regular quarterly project progress reports sent to the Bank.

4.29 **Country Procurement Assessment Report (CPAR).** There are no plans for a Country Procurement Assessment Report (CPAR) for Turkmenistan. A quick review will be done under the public procurement reform initiative under a recently approved IDF grant which is expected to be implemented during 1997. In general experience with competitive bidding is limited and close supervision by the Bank and the consultants will be exercised.

## G. Disbursements

4.30 **Schedule.** The proposed Loan would be disbursed over about six years which includes six months for the finalization of accounts and submission of withdrawal applications and other reports. No standard



disbursement profile exists for Turkmenistan. The Project is expected to be completed by August, 2003 with a Loan Closing Date of February, 2004.

4.31 **Disbursement Percentages.** The proceeds of the Loan would be disbursed as shown in Table 4.2:

**Table 4.2 Proceeds of the Loan**

Category	Amount (US \$ millions)	Percentage of Expenditures to be Financed
1. Works	19.00	90%
2. Goods	2.40	100% of foreign expenditures, 100% of local expenditures (ex- factory costs), and 75% of local expenditures for other items procured locally
3. Consultants <sup>a/</sup>	4.40	100%
4. Training	0.30	100%
5. Operating Costs	0.40	100%
6. Re-financing of PPF	0.43	Amount due pursuant to Section 2.02 (c) of the Loan Agreement
7. Unallocated	3.37	
<b>Total</b>	<b>30.30</b>	

a/ Includes Foreign Technical Assistance (\$3.52m) and Local Technical Assistance (\$0.88m).

**Table 4.3: Annual and Cumulative Disbursements**  
(US\$ Millions)

Bank Fiscal Year	FY98	FY99	FY00	FY01	FY02	FY03
Annual	2.0	5.0	8.0	8.0	5.0	2.3
Cumulative	2.0	7.0	15.0	23.0	28.0	30.3

4.32 The standard disbursement profile for water supply and sanitation project requires approximately 32 quarters or 8 years to disburse a Loan. However, since the only major contract which will be executed is for four years, the disbursement forecast is based on the ECA disbursements profile. Annex Q shows a detailed disbursement forecast of the Loan. Funds disbursed under the PPF would be repaid from the proposed Loan Funds after effectiveness. A six year period is shown above as it is expected that the Loan will become effective in the first quarter of FY98. The last year of disbursement anticipates final disbursements in mid-FY03. The Project's administrative arrangements are already in place and operating under the PPF. Procurement actions for civil works have been prepared under the PPF and would be ready to initiate upon Loan effectiveness. The disbursement schedule in Table 4.3 allows for some lag time in actual disbursements to account for normal delays in preparation and presentation of documentation.

4.33 **Statements of Expenditure.** Reimbursements would be made on the basis of Statements of Expenditures (SOEs) for expenditures relating to (1) contracts for goods valued at less than US\$ 300,000 equivalent each with the exception of the first three contracts for goods, awarded on the basis of international shopping procedures, and (2) contracts for works individually valued at less than US\$ 50,000 equivalent each with the exception of the first two contracts for small works costing the equivalent of \$20,000 or more. The documentation to support these expenditures would be retained by the PIU, the MOH, and the Dashkhovuz Velayat for the respective project activities for at least one year after receipt by the Bank of the audit report for the year in which the last disbursement is made. This documentation would be made available for review by the external auditors and Bank supervision missions. Disbursements for all other items would be made against full documentation and in accordance with procurement guidelines. Supervision missions would review documentation retained by the borrower in the field. If ineligible expenditures are presented, including those that are not justified by the evidence furnished, or amounts in excess of agreed disbursement percentages as financed from the Special Account (described in paragraph 4.36), the Bank would have the right to withhold further deposits in the Special Account. The Bank may exercise this right until the Borrower has: (1) refunded the amounts involved, or (b) if the Bank agrees, submitted evidence of other eligible expenditures that the Bank can use to offset the ineligible amounts. The minimum application size for payment directly from the Loan Account or for issuance of Special Commitments is 20% of the current Special Account authorized allocation.

4.34 **Certification of Statements of Expenditures.** The etrap accountant would submit SOEs to the CCs for presentation to the Chief Accountant at the Dashkhovuz Velayat Administration. The latter would consolidate the SOEs from the etraps and have them certified by the Hakim of the Etrap Administration before they are forwarded to the Hakim of Dashkhovuz Velayat for transmission to the PIU. The PIU would provide the official certification for the Bank when requesting the replenishment of the Special Account.

4.35 **Special Account.** To facilitate timely project implementation, the borrower has opened under conditions acceptable to the Bank, a Special Account in US dollars in the Central Bank in Ashgabat. During the early stage of the project, the initial allocation of the Special Account would be limited to US\$ 200,000. However, when the aggregate disbursement under the Loan have reached the level of US\$ 3.0 million, the initial allocation may be increased up to the authorized allocation of US\$ 500,000 by submitting the relevant Application for Withdrawal. Replenishment applications should be submitted at least every three months, and must include reconciled bank statements as well as other appropriate supporting documents.

4.36 **Administration of the Special Account.** The Special Account has been established in the name of the Borrower and would be administered by authorized staff of the PIU.

4.37 **Requirements of the Bank for Local Banking Capacity.** The pre-appraisal mission confirmed that the Central Bank is capable of meeting the requirements of the Bank with respect to operating and maintaining the SA. The Central Bank (1) is financially sound as demonstrated by its latest accounts, as audited by an internationally recognized auditing firm; (2) has a significant foreign correspondence network covering all major currencies; (3) has reasonable capacity and experience for issuing letters of credit, for making direct foreign payments and other international transactions with appropriate arrangements for the training and development of its staff; (4) is capable of performing a wide range of local banking services, including cash payments, transfers to other domestic banks, issuance of debit notes, application of conversion rates from foreign currencies, and maintenance of adequate accounts for the SA; (5) is a member of Swift and uses or plans to use this facility to expedite payment transfers; (6) is willing to issue a Comfort Letter to assure the amounts deposited in the SA would not be set off or otherwise seized or attached to satisfy amounts due to the Bank by the Borrower; (7) is willing to maintain adequate accounts as required by the Bank and to provide to the Bank monthly bank statements and any other information considered necessary by the Bank (copies of all transactions would be routinely submitted to the implementing agencies); and (8) is willing to charge reasonable rates for its services and pay reasonable interest on balances held from time to time.

## H. Project Accounts, Budgets and Audits

4.38 **Project Accounts and Budgets.** Financing of project activities would proceed through a Project Account (PA) to be opened by the PIU, through which project funds would be channeled.

4.39 **Accounts and Audits.** The Borrower would be responsible for the appropriate accounting of the funds provided by the Bank under the Loan, for reporting on the use of these funds, and for ensuring that audits of the financial statements or reports are submitted to the Bank. The project accountant in the PIU would maintain consolidated accounts for the Project and would prepare quarterly financial reports. The accounts would be maintained for all project funds, i.e. Loan funds and local contribution.

4.40 All project records and accounts, including those for the SOEs, the SA, and PA would be audited annually in accordance with the "World Bank Guidelines for Financial Reporting and Auditing of Projects Financed by the World Bank," (March 1982). An international auditing firm would be appointed to perform project audits. The Bank would be provided within six months of the end of each fiscal year with an audit report of such scope and detail as the Bank may reasonably request, including a separate opinion by the auditor on disbursements against certified statement of expenditures.

## V. FINANCIAL AND ECONOMIC ANALYSIS

### A. Scope of Analysis

5.1 **Introduction.** This chapter summarizes the results of the financial and economic analysis of the project, which is presented in Annex R. The analysis is divided into four sections: financial analysis; fiscal impact and cost recovery; economic analysis; and affordability. These analyses are limited to the water supply component, which represents about 70% of the basic project cost. For the purposes of this analysis, the water supply project is desegregated into the component for upgrading water supply in the seven etrap cities and that for the nine collective farms selected for the project. The analysis considers these two groups of beneficiaries separately.

5.2 **With and Without Project Scenarios.** The analyses in Annex R are based on a comparison of "with project" and "without project" scenarios for the costs and revenues of the water supply services in the two groups of beneficiaries. The "without project" scenario supposes that existing inefficiencies would continue. The summary of Annex R in this chapter only discusses the "with project" situation.

### B. Financial Analysis

5.3 **System Inefficiency and the Current Cost of Delivered Water.** All aspects of the water systems are in very poor condition. In the existing water systems in the etrap cities and kolkhoses to be included in the project, only about 20% of the water produced is utilized by the customers. The water estimated to be currently delivered to consumers amounts to only 12 liters per capita per day (lpcd). The resulting operational cost per cubic meter (CM) delivered to customers is \$0.59 in the etrap cities and \$1.03 in the kolkhoses.

5.4 **Inefficient Use of Electricity.** The systems use electricity very inefficiently. In the etrap cities, a reported 1.43 KWH are used for every cubic meter of water produced. In efficient systems, electricity use is in the order of 0.4 KWH/CM. This inefficiency does not result in a financial burden to the water utilities because the electricity price is heavily subsidized. However, the real economic cost of these wasted resources is considerable.

5.5 **Financial Analysis of Improvements for the Etrap Cities.** With the completion of the proposed improvements for the etrap cities, delivery of water to customers is expected to rise by a factor of 4.5 to about 2.9 million m<sup>3</sup>/year by the year 2000. By the year 2017, consumption is expected to reach about 6.6 million m<sup>3</sup>/year. However, operating costs are expected to be reduced by 7% between 1997-2000, in spite of the nearly six-fold increase of the volume of water delivered to clients. The average tariff necessary fully to cover the total financial costs of the system, or "full cost tariff" is estimated at US\$ 0.42 per cubic meter. This is a relatively high rate, largely because of the small size of the etrap cities, which makes economies of scale elusive in both production and distribution systems. The cost of water is also affected by the high estimated capital costs expected because of difficulties of attracting contractors to execute projects in Turkmenistan. A tariff sufficient to cover the full cost of operations and maintenance ("O&M Tariff") is US\$ 0.14 per cubic meter. This is much lower than the full cost tariff, once more pointing out the disproportionate weight of capital costs compared to O&M costs, in the full cost tariff.

5.6 **Consideration of Least Cost Alternatives.** The proposed plan represents the least-cost solution for improving water supply in the seven etrap cities. All other possible plans would still require the

improvements to the disinfection, storage, transmission, distribution and delivery components of the project, which represent about 90% of the total capital cost of the improvements. Any other alternative to the proposed supply of water by improving the existing well system would be more costly by a factor ranging from the hundreds to the thousands. The proposed principal means of delivery is by street faucets, which is also less expensive than providing yard taps or direct house connections.

**5.7 Financial Analysis of Improvements for the Collective Farms.** With the completion of the proposed improvements for the nine collective farms, piped water would be delivered to a total of 82,000 people compared to the 20,000 now served. The volume of water expected to be delivered to users would be about 1.6 million m<sup>3</sup>/year in the year 2000. By the year 2017 annual consumption is expected to reach about 4.0 million m<sup>3</sup>/year. The “full cost tariff” for the collective farms is US \$0.74 per cubic meter. The cost of water is higher than that for the etrap cities because of the lower density of the populations. The tariff needed to cover operations and maintenance (“O&M Tariff”) for the kolkhos component of the project is US\$ 0.16 per cubic meter, the same figure reported for the etrap cities. Again, the differences between the two projects’ costs lie in their capital cost requirements, not in unit operating costs. As with the etrap cities, the proposed plan represents the least-cost solution for improving water supply in the nine collective farms.

### C. Fiscal Impact and Cost Recovery

**5.8 Fiscal Impact.** The fiscal impact of the project would depend on the cost recovery mechanisms adopted. If the government applies a full cost tariff the fiscal impact of the project would be zero for the government. (Potential impact on users is discussed in the section on Affordability.) That is, the users would bear the entire burden of the project costs. If an O&M tariff is applied, the net present value of the implicit subsidy (the cost of repaying the loan) for the etrap cities would be US \$6.4 million over the life of the project. For the collective farms, it would be US \$7.26 million.

**5.9 Cost Recovery.** The institutional strengthening component of the project would support the government in analyzing options for cost recovery, and reaching a decision on which option is most suitable for Turkmenistan at this stage. The following cost recovery options could be considered: (a) a flat rate user fee (or tax) for all beneficiaries; (b) user fees differentiated between households with and without yard taps; and (c) a program to introduce metering for households with yard taps. In the initial stage, a metering program is not recommended because of the cost and organizational complexity of this basis for a tariff system.

### D. Economic Analysis

**5.10 Types of Benefits Estimated.** The analysis concentrates on the private benefits to be derived from increased water delivered, improved water quality, and improved reliability of the water supply. No attempt is made to quantify possible externalities such as health benefits and increased output due to a healthier population. The analysis is based on an estimate of the increase in consumer surplus to be derived by households as a result of the reduction in the time they spend carrying water and as a result of the increase in their future consumption of water, due to the improved supply. For each type of consumer, the average welfare gain was calculated per cubic meter of water consumed .

**5.11 Estimate of Benefits.** Separate estimates were made for the gains in welfare from improved water supplies for the users of street faucets, yard taps and direct household connections. In each case, a linear demand curve was estimated, based on the average amount of time spent per household at present

carrying water, and the average volume carried; the estimated average consumption of unrationed households facing a zero marginal price for water with, respectively: a household connection; a yard tap; and a street faucet. The analysis reports an economic internal rate of return of 22.2% for the etrap cities project component and 10.6% for the collective farm project component. The latter is below that of the etrap city project component because of the higher unit costs of production.

**5.12 Sensitivity Analysis.** The results of the financial and economic analysis did not vary significantly throughout the probable range of values of the main independent variables.

### **E. Affordability**

**5.13 Income and Impact of User Fees.** According to the government statistical agency, Goskomstat, the average household monthly disposable income in Dashkhowuz Velayet in 1995 was 13,600 manats, or about \$68 per month. The dollar equivalent, however, was based on the then rate of exchange of 200 manats per dollar, but the current rate (September 1996) is about 4,800 manats per dollar. Incomes certainly have not kept pace with this difference in dollar exchange rates, so the \$68 per month income is not considered realistic in comparisons with late 1996 equivalent dollar income levels. According to the Bank's Social Assessment, average household income was under \$30 per month in November 1995. It is likely that the very rapid depreciation of the exchange rate during 1996 has resulted in a further reduction in the dollar value of household incomes, perhaps to about \$20 per month. A tariff sufficient to cover operations and maintenance costs for a household consuming 9 cubic meters per month (which represents a consumption level of about 50 lpcd) would be \$1.35. This represents 4.5% of an income of \$30/month and 6.8% of an income level of \$20/month. These levels are not far removed from the rule of thumb indicator that spending about 5-6% of household income on water is generally considered affordable.

**5.14 Other Factors Affecting Incomes and Impacts of User Fees.** As a first step, it is proposed that water charges be levied only against those with yard taps or direct connections to houses and buildings. Households with yard taps appear to be more prosperous than families that must depend on street faucets or wells for their water, and logic supports that conclusion. Accordingly, the impact on the yard-tap households of fees in the order of those described above may be considerably less than indicated. In addition, with electricity, health and other typical costs either free or highly subsidized, households should be able to spend a higher portion of their disposable income for water than households that must pay the full burden of the benefits currently being provided by the government of Turkmenistan.

**5.15 Gross Domestic Product (GDP) and Household Income.** The proportion of GDP received as household disposable incomes is very low. The official data for household income imply a per capita annual disposable income which is about 20% of per capita GDP. It appears that most of the GDP is retained by the public sector and is used to finance state-controlled investments and to subsidize the provision of some food items and free public services (including electricity, gas and water). This in turn reflects the slow progress on economic reform and privatization registered since independence. In cases where the state retains some 80% of GDP and households dispose of only 20%, there is likely to be resistance to paying for public services.

**5.16 Share of GDP Relative to Affordability of Water.** In this context, the issue of the affordability of water assumes a much broader significance. Policy dialogue with the authorities would emphasize the potential efficiency gains to be had from linking the incomes of the bodies responsible for producing services to their delivery. The dialogue would also emphasize that the result of privatization would be

to increase the proportion of total income received by private individuals and lower the proportion received by the state. While these issues clearly go well beyond the water sector, in the interim, the institutional strengthening component of the project should also aim to show that even with the collection of a limited user fee sufficient to contribute to pay for operation and maintenance costs, the efficiency of the system's operation can be greatly increased, compared with systems which depend on state budget allowances for all their operating revenues.

## VI. PROJECT BENEFITS AND RISKS

### A. Project Benefits

**6.1 Direct Benefits.** The direct benefits of the project would be to provide a safe, reliable water supply to 108,000 people in the seven etrap cities and to 82,000 in 47 villages in nine collective farms. 62,000 people in these collective farms would be receiving water from a piped system for the first time. Other direct beneficiaries would be the children in 35 schools in the nine collective farms and people who attend the markets in the seven etrap cities that would be provided with new latrines as part of a demonstration project.

**6.2 Indirect Benefits.** The people of Dashkhovuz would benefit from improvements to the Dashkhovuz Center of Health and the health and hygiene education programs to be funded by the project. They would also benefit from improvements to enhance the capabilities of the Dashkhovuz office of the MOH/SES in such areas as water quality monitoring, and sanitation and hygiene surveillance. The country and the velayet would benefit from the demonstration of how to improve water and sanitation services, and be able to apply these lessons to serve the remaining people outside the project area. Both nationally and regionally, the project would strengthen the water and sanitation sector through recommendations for reorganization and internal strengthening of the Dashkhovuz Regional Water and Sanitation Authority. Finally, the country would benefit from the skills acquired in the management of large development projects through the establishment of the project implementation unit.

### B. Risks

**6.3 Categories of Risks.** The various categories of risks include (a) the willingness of the national government to commit itself to sector reform, including adoption of recommendations for institutional reorganization and strengthening, and of a policy of cost recovery for the provision of sector services, (b) completion of the project facilities on time and within budget, (c) the establishment of a water and sanitation sector utility in Dashkhovuz capable of operating and maintaining the facilities for which they are responsible, and (d) the success of changing water users attitudes toward conservation of water and willingness to pay for the improved services being provided.

**6.4 Consequences of Risks.** Failure to overcome one or two of these risks would threaten the success of the project. Should three or four of these risks occur, the project would almost certainly fail. The project has several safeguards to mitigate these risks. Dialogue between the government and the Bank is ongoing to encourage the government's commitment to sector reform, and the loan agreement incorporates specific actions to be accomplished to affirm this commitment. Strong project management, which would include a blend of knowledgeable local expertise with the support of experience foreign consultants, would be in place at the start of the project. Technical assistance would be provided to assist the government in implementing needed reforms and in strengthening the capability of the regional water and sanitation sector organizations in carrying out their responsibilities. This support would be made available to both the utility providing the services and the organization responsible for ensuring that the services provided meet the government's quality standards. Finally, the project would incorporate public education programs to encourage improved water and sanitation practices.

## VII. AGREEMENTS AND RECOMMENDATION

### A. Agreements Reached

#### 7.1 At negotiations, the Government:

- (a) Confirmed that Presidential Decree No. 3006 had been issued (February 4, 1997, Annex A-2). The Decree indicates that once the Water Supply and Sanitation Project's water supply systems become operational, water charges will be imposed on beneficiaries towards full cost recovery of operation and maintenance expenses. The Decree further confirms that the Government will establish a Dashkhovuz Regional Water Supply and Sanitation Authority no later than December, 1998.
- (b) Confirmed that the Director of Project Implementation Unit (PIU) has been appointed and has submitted to the Bank a list of candidates for the economist/planning specialist; accountant/disbursement specialist; and health specialist for Bank review.
- (c) Confirmed that the Project Coordination Committee (PCC) has been established and the Component Coordinators (CCs) have been appointed.
- (d) Confirmed that the import of equipment and materials is exempted from custom duties and taxes.
- (e) Agreed that the project would be implemented with reliance on annual work programs and budgets (WP) with the first WP to cover the period July-December, 1997. The PIU would consolidate the etrap and velayet level annual WP into one WP and would submit the WP to the Bank and the Government by October 31 of each subsequent Project year to coincide with the normal Government budget cycle.
- (f) Agreed that within one month from the end of each quarter each implementing ministry would prepare quarterly reports for submission to the Bank through the PIU
- (g) Agreed that by March 31, 2000, the Borrower would prepare, under terms of reference satisfactory to the Bank, and furnish to the Bank, a mid-term review report integrating the results of the monitoring and evaluation activities performed, the progress achieved in carrying out of the Project during the period preceding the date of the said report and setting out the measures recommended to ensure efficient carrying out of the Project and the achievement of the objectives thereof during the period following such date and that by July 31, 2000 the Borrower shall review with the Bank said report.
- (h) Agreed that the PIU will be maintained throughout the project implementation period with staffing, funds, facilities, and other resources in a manner satisfactory to the Bank.
- (i) Agreed that the PCC, CCs and Regional Component Coordinator will be maintained with resources and under Terms of Reference (TOR) satisfactory to the Bank until completion of the Project.
- (j) Agreed to adopt the Project Implementation Manual (the draft of which is a condition of Loan

Effectiveness) by December 31, 1997.

(k) Agreed to employ by December 31, 1997, consultants with experience and TOR satisfactory to the Bank to prepare the National Sector Reform Study under the project.

(l) Agreed to prepare and discuss with the Bank the National Sector Reform Study by December 31, 1998, and prepare an Action Plan satisfactory to the Bank.

(m) Agreed to prepare and discuss with the Bank by June 30, 1998, the draft legal instrument for the establishment of the Dashkhovuz Regional Water and Sanitation Authority.

(n) Agreed to establish and begin operation of the Dashkhovuz Regional Water and Sanitation Authority no later than December 31, 1998.

(o) Agreed to maintain in manat the Project Account for its counterpart contribution to the financing of the project in a commercial Bank on terms and conditions satisfactory to the Bank and replenish said account by depositing additional amounts equivalent to: (i) \$300,000 on July 1, 1998; (ii) \$600,000 on July 1, 1999; (iii) \$600,000 on July 1, 2000; (iv) \$600,000 on July 1, 2001; and (v) \$312,000 on July 1, 2002.

(p) Agreed that the Dashkhovuz Regional Water and Sanitation Authority will begin to charge tariffs for water supply services provided under the project's new water supply systems in each participating etrap when the new systems become operational.

(q) Agreed to the performance monitoring indicators of the proposed project (Annex O).

(r) Agreed that Disbursements for operating costs shall not exceed \$80,000 equivalent during any calendar year during the period of project implementation.

#### 7.2 Conditions of **Loan Effectiveness** would be:

(a) The Borrower has employed consultants with qualifications, experience and terms of reference satisfactory to the Bank, to assist the PIU in carrying out the activities under the Project.

(b) That the Borrower has submitted a draft Project Implementation Manual satisfactory to the Bank.

(c) That the Borrower has opened a Project Account in a Commercial Bank acceptable to the Bank and has deposited \$200,000 equivalent in the Account.

### **B. Recommendation**

7.3 Subject to these agreements and conditions, the proposed project would be suitable for a Bank Loan of US\$ 30.3 million.

**ANNEX A: PRESIDENTIAL DECREE AND POLICY LETTER**

**ANNEX A-1: POLICY LETTER**

December 5, 1996

Mr. James Wolfensohn  
President  
International Bank for Reconstruction and Development  
1818 H Street, N.W.  
Washington, D.C.

Dear Mr. President:

The Government of Turkmenistan is negotiating with the World Bank a loan in support of a water supply and sanitation project designed to improve the living conditions of the population living in the area of Turkmenistan most severely impacted by the Aral Sea disaster.

Despite its desert climate, Turkmenistan has a long history of agriculture and settlement and thus the provision of water in adequate supply and good quality has been a major concern from the time of our ancestors until the present day. Large irrigation systems of the country most notably the 1400 km Kara Kum Canal are indicative of this objective. The negative environmental impacts which Turkmenistan is now experiencing as a result of the Aral Sea Basin degradation, have challenged our ability to provide adequate and safe drinking water. Therefore, the Government of Turkmenistan has decided to implement a potable water supply and sanitation project in the Aral Sea disaster zone of Turkmenistan, Dashkhovuz Velayet.

The Government finds it necessary to increase water supply coverage and water quality and to ensure sustainability of the systems servicing our people living in small towns and collective farms. We intend to maximize the health benefits associated with improved water supplies by integrating water, sanitation and hygiene education interventions. The Government intends to advance the development of the water and sanitation sector through achieving the following objectives:

Increased access to potable water and improved sanitation facilities in particular those groups living in the most disadvantaged areas

Development of the institutions in charge of production and distribution of potable water and sanitation services and improvement of their technical and financial capacities

Protection of the environment and of public health

Protection of water resources and their optimum utilization

With regard to the proposed project, our principal goals in their regional context can be summarized as follows:

Restructuring of the institutions charged with the delivery of water and sanitation services by creating a regional specialized water and wastewater authority for Dashkhovuz Velayet

Increasing the responsibility and accountability of the management of the water sector

Initiation of cost recovery mechanisms including a tariff setting policy whereby revenues would cover the full cost of operation, variations in working capital requirements and regular preventive maintenance.

In order to achieve these goals, we commit ourselves to the following:

#### Institutional Restructuring Program

The Government is prepared to establish a specialized Dashkhovuz Regional Water and Wastewater Authority by merging the responsibilities of the numerous organizations currently responsible for parts of the sector delivery system. Our ultimate goal is to put into place a system whereby the water utilities would be independent and operate in a transparent system of regulation and control.

#### Tariff Policy

Initiating the Project the Government of Turkmenistan is aware that one of the requirements regarding water supply projects supported by the Bank, is implementation of cost-recovery mechanisms. The Government of Turkmenistan undertakes to allow for the introduction of charges to beneficiaries of the new and rehabilitate water systems. While the water supply systems are being constructed, the institutional mechanisms needed to implement operation and maintenance cost recovery will be established within the newly formed Dashkhovuz Regional Water and Wastewater Authority. When the newly renovated water supply systems are operational, we will take all necessary steps to ensure the collection of fees to cover operation and maintenance costs. We will begin by targeting those beneficiaries who have chosen to receive higher levels of service, i.e yard standpipes. Furthermore, we shall see to it that the agencies involved in the production and distribution of this costly water will take all steps necessary so that costs are minimized. The combination of water pricing and technical improvements to the water supply systems is expected to significantly reduce wastage of water and lead to increased water conservation efforts.

In closing we would like to mention that the aforementioned institutional reforms are being carried out on a regional level in order to gain experience. Depending on progress, reforms can be carried out in other regions of the country with the overriding objective of improving the effectiveness of the sector throughout the country.

Sincerely,

Mr. Ilaman Shikhiev  
Deputy Head of Government  
Cabinet of Ministers  
Turkmenistan

**ANNEX A-2: PRESIDENTIAL DECREE**

**President of Turkmenistan**

**Decree No. 3006 of February 4, 1997**

**Water Supply and Sanitation Improvement in the Dashkhovuz Velayet**

In order to improve living standards of the residents of the Dashkhovuz Velayet which suffered severely from the Aral Sea ecological disaster and in order to improve water supply and sanitation, I hereby decree:

1. The Loan Agreement prepared by the Cabinet of Ministers of Turkmenistan on the loan with 20 year maturity including a 5 year grace period to be provided by the International Bank of Reconstruction and Development for the implementation of the Water Supply and Sanitation Project in the Dashkhovuz Velayet in the amount of 31 million dollars and to be repaid out of the Government budget shall be approved.

2. The Turkmenistan Central Bank shall provide account services for the loan in item 1 of the Decree.

3. The Turkmenistan Government shall assume an unconditional and irrevocable obligation to repay the loan including accrued interest, commitment charges and insurance premiums.

4. In 1997 - 2000, the Ministry of Economy and Finance of Turkmenistan shall allocate budget funds for the implementation of the Water Supply and Sanitation Project in the amount equivalent to 10 percent of the project cost.

5. The Khyakimlik of the Dashkhovuz Velayet:

- shall create in the city of Dashkhovuz no later than December 1998 the Water and Sanitation Administration of the Dashkhovuz Velayet which will unite all water supply and sanitation organizations on the territory of the Velayet; and

- upon the completion of new and reconstructed water systems under the Water Supply and Sanitation Project, shall jointly with the Ministry of Economy and Finance of Turkmenistan determine procedures for paying user charges for the use of water of improved quality and begin collecting these fees in order to achieve full cost recovery for the operation and maintenance of the systems.

Saparmurat Turkmenbashi  
President of Turkmenistan

## ANNEX B. EXECUTIVE SUMMARY: NEEDS ASSESSMENT

1. In 1994, the Government of the Republic of Turkmenistan requested World Bank assistance for improving water supply and sanitation in the velayet of Dashkhovuz, the part of the country most affected by the Aral Sea crisis. In preparing an investment to respond to this need, the project designers recognized the importance of ensuring that its objectives and interventions would address the actual needs of the affected population and would be acceptable to all beneficiaries, especially the poor. As a result, the World Bank collaborated closely during the early project preparation activities with local experts to carry out a needs assessment, as part of a broader social assessment.

### Country Background

2. Turkmenistan is the southernmost Republic situated in the Aral Sea basin. About 90 percent of the country's territory consists of sand deserts characterized by an arid climate with very hot summers and drastic changes in temperature during the winter. The total population as of January, 1995 was 4.4 million people of which 45 percent is urban and 55 percent is rural. The infant mortality rate is the highest among FSU countries (46/1000) and life expectancy is the lowest (66 years). Agriculture is the predominant economic activity accounting for 42 percent of employment.

3. The main source of water for Turkmenistan is the Amu Darya River. Diversion of the Amu Darya River from its inflow to the Aral Sea for expansion of an irrigated cotton monoculture in the Aral Sea Basin over 30 years has resulted in severe hydrological and ecological impacts, including ground water depletion, soil erosion, soil salinization, and ground and surface water pollution. Located at the downstream reaches of the river, Turkmenistan is amongst the hardest hit of the Aral Sea Basin countries by accumulation of contaminants in the river.

4. The largest of the five administrative regions or provinces of the country ("Velayets") is Dashkhovuz, located in the lower reaches of the Amu Darya. Dashkhovuz, which is largely a cotton growing agricultural area, has a population of 907,636 (as of January 1995), of which 70 percent is classified as rural. The velayet is divided into eight districts (etraps), each of which has a district center, a small city of 10,000 to 30,000 inhabitants. The velayet capital is Dashkhovuz City, with a population of 140,000.

5. Dashkhovuz is characterized by high population growth (two-three percent), and high infant mortality (55/1000). Of all the velayets in Turkmenistan, Dashkhovuz is the most directly and severely impacted by the Aral Sea ecological disaster. Environmental degradation, insufficient access to safe drinking water, poor sanitation practices and poorly functioning health care facilities have contributed to a substantial increase of respiratory and infectious diseases in the last 15 years, and a general degradation of public health in the area. Currently, piped water coverage (mostly through public standpipes and yard pipes) is about 73 percent in urban and 15 percent in rural areas (see Table 4.12). Other water sources used by the population are tankers, dug wells and boreholes equipped with hand and electric pumps, and surface water. Water collected from infiltration wells constructed adjacent to the canals is frequently contaminated and is distributed without treatment. Intermittent supply further adds to this contamination. Excessive water losses occur as a result of inadequate maintenance of pipe systems at both the household and community levels. Sanitation coverage is even lower than pipe water coverage, and unhygienic disposal of human waste is a major contributor to the high incidence of mortality and morbidity.

**Needs Assessment: Objectives and Methodology**

6. The importance of considering the needs of populations either directly or indirectly affected by a project is increasingly recognized as a general strategy in social development. The basic premise of this strategy is that interventions should satisfy the needs and priorities as expressed by the project population. Advocates of the needs approach further maintain that project success is determined by: the involvement of those it intends to serve in identifying their interests, needs, and priorities; and the extent to which a project recognizes, accepts, and is responsive to people's expressed needs. Moreover, there is solid evidence demonstrating that no matter who initiates a project, its sustainability is greatly enhanced when local needs are addressed and existing social groups and structures are mobilized for implementation.

7. The overall objectives of the needs assessment for the Turkmenistan Water Supply and Sanitation Project were to (1) provide baseline information on socio-economic conditions, water supply, hygiene and sanitation practices in the area for consultants engaged in other preparatory research work for the project, (2) to help identify suitable locations for planned pilot projects on sanitation methods in schools and for standpipe repair, and (3) to help identify the most critical interventions to be undertaken immediately to improve the water supply and sanitation situation in the project area.

8. The needs assessment was conducted in seven of the eight etrap (districts) of Dashkhovuz velayet (velayet). The eighth etrap, Turkmenbashi, was excluded because it is receiving US\$ three million in assistance for water supply and sanitation from USAID. In each etrap, data was collected in the etrap center and in two collective farms. The needs assessment consisted of the following activities:

- A community profile study focusing on overall socio-economic conditions in and around the selected communities. Data for this part of the survey was supplied by local administrative bodies and management units of collective farms.
- A household survey, including 790 households from the 7 etrap centers and the 14 collective farms. Local specialists collected household data on demography, income, housing, economic activities, problems and needs, water supply, sanitation, and health.
- A study of water supply and sanitation facilities ("Institutional Analysis"), in schools, health facilities, and enterprises. A team of ten local scientists collected data in all schools (128) and health facilities (97) and selected enterprises (74) in the 7 etrap centers and 14 collective farms.

9. The needs assessment was the first stage of a broader social assessment, which in addition to the activities mentioned above, also included focus group discussions and a stakeholder seminar.

**Main Findings of the Needs Assessment**

10. The needs assessment revealed clearly that the major concern of the population in the project area is the lack of basic food products. Concerns about the quality of water rank second, and water supply improvements are considered by many households as a major step towards an improvement of their living conditions. Hygiene and sanitation related needs are generally not reported to be priorities by the households included in the sample. However, from the limited amount of information that could be gathered regarding household hygiene and sanitation practices, coupled with observations from the project identification mission and surveyors, it appears that hygiene and sanitation practices in the project area are rather unsafe. Although this area warrants more study, improvement measures in this sector, such as the construction of safe latrines and hand washing facilities are highly recommended.

*Socio-economic Information*

11. A household's income in Dashkhovuz typically consists of various components: salaries earned by working persons, unemployment benefits, extra earnings from participation in the annual cotton harvest, earnings from the sales of home garden products and privately owned livestock, and income from other informal activities, including trade. While earnings from unemployment benefits and home produce sales contribute only to a very small extent to total annual income, income from the sales of livestock constitutes a substantial share of total annual income for both urban and rural households. Adding earnings from all sources, rural households actually earn 12 percent more per year than urban families, who receive, on average, higher salaries. Overall, the assessment revealed the importance of income from secondary and informal sources to Dashkhovuz households, especially to rural families.

12. In rural communities based on the collective farm system, part of annual income is paid in monthly installments, and the rest is paid as an annual "bonus" at the end of the fiscal year. For many rural families, this income system results in considerable uncertainty and financial vulnerability. In many cases, monthly salaries are several months in arrears, resulting in a loss of real income due to inflation. Also, because of the fluctuating prices for many agricultural goods, especially cotton, it is difficult for households to forecast the amount they can expect to be paid by the farm management at the end of the year, and plan their investments accordingly.

13. Overall, households spent close to 85 percent of their earnings on food, with little difference between urban and rural areas. The high share of income spent on food by households living in the surveyed communities is a clear indicator of high food prices and severe and widespread poverty in the project area.

*Water Supply and Water Use*

14. Around 40-45 percent of all interviewed households have access to piped water. This percentage is much lower for rural households than for urban families (10 percent versus 70 percent). In rural communities, piped water is available mainly through communal stand pipes, while in etrap centers, most households receive piped water through yard pipes. Indoor pipe connections are available to only six percent of urban and one percent of rural families. Wells constitute the second most common source of drinking water, supplying between 27 and 31 percent of households. The third most common source are hand pumps, which are used by 20-21 percent of families. Water vendors and surface water sources play only a minor role as drinking water sources. In rural communities, stand pipes are used by over twice as many households in summer as in winter. This fact is a result of technical break downs of many rural pipe systems during the cold period of the year.

15. In general, households switch from piped water and hand pumps to wells and surface water bodies to draw water for washing and cleaning. To water their home gardens, households use mainly water from surface water sources, such as irrigation canals, rivers, and ponds. On the contrary, water for livestock is in most cases drawn from the same source that supplies households with drinking water. In all etrap centers, piped water is the main source of water for livestock. Although the measurement of the exact amount of water consumed by individual households' livestock was beyond the scope of this study, it can be assumed that livestock water consumption increases the average household's water supply needs substantially.

16. Respondents, in general, consider neither the reliability of their drinking water source nor the quality of their drinking water to be better than barely satisfactory. Hand pumps and wells, the most common sources of drinking water in rural communities, received slightly higher reliability and water

quality ratings than pipe systems and other drinking water sources. While higher reliability ratings for non-pipe sources are mainly based on better water availability in hours/day compared to pipe systems, higher quality ratings for water from wells and pumps are most likely based on perceived lower saltiness of water from these sources, since saltiness is the drinking water feature that most households find the least desirable. Only 1.3 percent of all respondents are more worried about bacteria or other carriers of illnesses that may be present in their drinking water source than about other undesirable water features.

17. Piped water is available for roughly four hours/day to both urban and rural households with pipe water access. In comparison, administrative bodies claim that pipe water is supplied for five-seven hours/day. This shows either the unreliability of official data on water supply issues or the unawareness of water agencies that real water availability is curtailed by substantial water losses in the system. Furthermore, less than half of the respondents reported to have received pipe water every day in the last month. Both figures indicate clearly the unreliability and intermittency of piped water supply in the project area. To increase water availability, all families included in the survey and with access to a pipe water system have water storage facilities, with an average storage capacity of 2m<sup>3</sup>.

18. An indoor pipe connection, combined with a waste water facility, is for the majority of households (75 percent) the most desirable water system, regardless of the type of water source they are currently using. On average, households would be willing to pay a one-time fee of \$17, or 5 percent of total annual income (\$355) for the installation or construction of the water supply system of their choice. In addition, they would be willing to pay a monthly fee of 50 cents, or one-two percent of their monthly income (\$30), for the usage of the new system.

19. A households' willingness to pay for an improved water supply system is directly related to its income. The wealthiest quartile of households included in the sample is willing to pay the highest absolute one-time installation fee (\$20), but in terms of percentage of annual income, the poorest segment of households is willing to pay the most, close to 10 percent of total annual income, compared to 3 percent of total income in the highest income group. Given the widespread poverty among the population in the project area, people's willingness to pay for the water supply system of their choice, which in most cases is an indoor pipe connection, is remarkably high. This indicates again the high level of dissatisfaction with current water sources, as well as very high expectations regarding the improvement of water supply and quality by means of a pipe connection.

### *Hygiene, Sanitation and Health*

20. In both urban and rural communities, the most common place for household members to wash themselves, is a makeshift shower facility in the yard. One fifth of households were found to have indoor washing facilities, while 15 percent of families rely on public bath houses for personal hygiene. While most households have access to washing facilities, the frequency of taking a shower or bathing is alarmingly low for both adults and children, especially in rural areas. Bath houses are only visited one-four times per month, even though an alternative washing facility may not be available. In over 15 percent of families, children are washed less frequently than once a week in winter. In 15 percent of urban and 30 percent of rural households, no soap was found near the washing facility.

21. Most households (93 percent) use unventilated, unlined outside latrines; close to 5 percent of households, all of them living in etrap centers, use public latrines. Only around 2 percent of respondents claim to have a latrine inside their home. Yard (outside) latrines are permanent constructions in only 25 percent of households that use this kind of excreta disposal system. In all other cases, latrines need to be moved when the pit is full, in most cases once a year. In many cases the level of ground water determines the capacity of a latrine pit and thereby the frequency with which the location of a latrine must

be changed. In most cases, latrines are cleaned only once a week or less frequently. These observations stand in stark contrast with the fact that adequate sanitation is considered a major problem by less than one percent of respondents.

22. Based on both observed facts and people's own perception, the state of health of Dashkhovuz residents must give reason for concern. Close to 40 percent of households describe the general state of health of their members as "not very healthy", or "in poor health". In 34 percent of all households with children six years old or younger, a child had been ill during the week preceding the survey. The flu was reported to be the most common illness among children. Cases of diarrhea and intestinal parasites were reported more frequently in rural than in urban areas.

23. While no statistically significant correlation between child diseases and hygiene and sanitation related behavior in families (frequency of washing children, frequency of cleaning latrine, etc.) was found for the survey sample, the type of water source for drinking water used by individual families seems to have an influence on the occurrence of certain diseases among children. Diseases related to intestinal parasites, for example, are more common in households that use water from hand pumps, while the occurrence of hepatitis A among children is higher in families that use water from surface water sources. Subsequent studies during the preparation of the proposed project will be necessary to further explore and explain these correlations.

### **Policy Implications**

24. Although etrap centers and rural communities centered around collective farms show very similar characteristics with regard to infrastructure, architecture and lifestyle, they differ significantly with regard to water supply and water use. Rural households are especially disadvantaged with respect to piped water access and availability. It is therefore recommended that the first stage of the planned project focus on the rehabilitation and expansion of existing piped systems in rural areas.

25. An improvement of piped water systems already in place must be accompanied by the revitalization or construction of chlorination facilities. As established in the report, only a third of existing rural pipe networks are equipped with a chlorination facility, and in both urban and rural areas, only 31 percent of chlorination devices actually function. Adequate water chlorination would not only reduce the risk of the population's exposure to water borne diseases, but also help save energy necessary to boil water, a commonly used disinfection method in households and public institutions.

26. Most households do not know which agency is responsible for the installation, operation and maintenance of piped water systems in their community. Also, people generally have no idea about the costs attached to these activities. Proper repair and maintenance services of public utilities are, however, closely linked to the customers' (end users') possibility to report damage and address complaints to a clearly visible, transparent institution. It is, therefore, important to accompany actual technical improvements of piped systems in individual communities with the provision of better customer service and outreach by the responsible local water agency.

27. As established above, people's willingness to pay for the water supply system of their choice, as expressed in percentage of annual income, is surprisingly high. However, given the irregularity of salary payments, and a family's high reliance on uncertain secondary income sources, it is doubtful that such fees could actually be collected. The project should therefore build on in-kind contributions based on labor for installation and maintenance of system components, rather than cash payments. However, a reasonable annual fee should be collected to promote among the population the concept of resource pricing and to enhance water conservation.

28. The hygiene behavior of the population in the project area, as described by the existence of washing facilities, the frequency of washing children, the presence of a hand washing facility near latrines and other indicators, must give reason for concern in the whole region. Consequently, a campaign on the importance of personal hygiene and sound sanitary facilities should be launched. Such an outreach effort should focus strongly on institutions, where many people share cafeterias and sanitation facilities, and the risk of transmission of diseases through unsafe hygienic behavior is especially high.

29. The most common excreta disposal system used by over 65 percent of households in the communities included in the survey is an unventilated pit latrine in the yard. Only a fourth of these latrines were found to be permanent constructions that can be emptied and used for an unlimited period of time. However, the construction or installation of better sanitation facilities ranks very low on households' list of problems and needs therefore any technical efforts to improve sanitation facilities in the project area must be accompanied by a public awareness campaign on sanitation, hygiene, and health in order to create a demand for improved services. Alternative, low cost latrine designs should be considered.

30. Project preparation includes a demonstration sanitation activity in schools. Most of the visited institutions could benefit from such a demonstration. From the greatest need-based perspective, the pilot project should be implemented in one of the schools in rural Boldumsaz, where the worst sanitary conditions were encountered.

31. An attempt was made throughout the needs assessment to find links between water consumption, sanitation behavior and health. The findings presented in this report, such as the higher occurrence of specific diseases among users of certain drinking water sources, and the more pessimistic self evaluation regarding health by residents of specific etraps, should be further discussed during focus group meetings, and, if possible, scientifically tested. Also, further research will be necessary to collect more information on water treatment and water storage in order to gain a better picture of the risk of water contamination incurred by households in the project area.

## ANNEX C: INSTITUTIONAL ASSESSMENT<sup>6</sup>

### A. Existing Organizational Framework

#### 1. Central Government Institutions With Sector Responsibilities

- a. Introduction This section presents a broad overview of the principal institutions within the Government of Turkmenistan with responsibilities for water, sanitation and health. These organizations are briefly described below, with their areas of interest in the sector noted.
- b. Comments on Names of Organizations The English versions of the names of government organizations often seem strained when literally translated from Russian. Simplified translations have been used in these notes to indicate the essence of the duties of the organizations, with titles more commonly understood in English. Approximations of the literal Russian translation of the various organizations described below appear in parentheses following the simplified name.
- c. Ministry of Water Resources (MWR) This ministry has control over the allocation of the country's water sources. Any "enterprise" (agricultural farms, industries, communities or others) wishing to extract water (from surface or ground sources), or to discharge used or wastewater, must obtain written authorization from this ministry to do so. Other entities also are involved in the application and review process, but ultimate approval lies with the ministry. MWR also has a construction division, which is responsible for constructing the major works for augmenting water supply to Dashkhovuz.
- d. Ministry of Agriculture (MOA) This ministry is the principal user of the country's water resources in the form of irrigation. As such, it has a major impact on potable water supply because much of the municipal water supply in Dashkhovuz is taken from shallow wells which are hydraulically linked to the irrigation canals. As a consequence, while the amounts removed for potable water are inconsequential relative to irrigation usage, the quality of the irrigation water directly impacts that of the potable water.
- e. Ministry of Environment (MOE) (Ministry of Nature and Ecology) This ministry has broad statutory powers to approve applications for use of waters and disposal of wastewaters, but ultimately the MWR appears to have the final say in such matters. The MOE was only established in 1989, and had very little authority until 1992. Like similar ministries in other countries of the FSU, their legal powers appear to be greater than their actual powers. They also have broad responsibilities over a wide range of environmental issues, including use of pesticides, fertilizers and defoliants. They set standards for air quality and wastewater treatment, and are currently following the GOST standards established by the Soviet Union. They maintain a Department of Control and Inspection, with branches in all five regions and the Caspian Sea, which is responsible for enforcing standards and compliance with agreements reached for extraction of water, the quantity and quality of wastewater discharges, and air quality. Unfortunately, this ministry does not have enforcement capabilities to match its legal powers.
- f. Ministry of Health (Sanitary and Epidemiological Services) (MOH/SES). SES is the division of the MOH of most importance to the water, sanitation and health sectors. SES maintains a total of 67 "stations". There is a station in the capital city district of Ashgabat, each of the five velayets, all of the

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<sup>6</sup>The information on which this is assessment was based comes from the project identification mission and background notes, February, 1995. Since Turkmenistan has been moving forward with reforms and reorganizations in several sectors, some of the information under "Existing Organizational Framework" may have changed.

etraps, and additional stations for inspecting ships and planes. In Dashkhovuz, for example, there are stations in the city and Velayet of Dashkhovuz and in each of the etraps, for a total of 10 stations. SES maintains 9 laboratories in Dashkhovuz. One serves both the city and velayet, and there are laboratories in each of the etraps. The principal responsibilities of MOH/SES include: (1) monitor (collect samples periodically and analyze the samples in their labs) the quality of potable water in public water systems to ensure compliance with current standards (they use GOST standards), (2) collect and record information on illnesses and diseases, and (3) investigate factors that could be harmful to the water, air, ground and food environments.

g. Turkmen Geology Committee (TGC) The structure of the Geology function is that of a Committee, headed by a General Director, and is not a ministry. It may be a "State" Committee, in that it reports directly to the Cabinet of Ministers rather than through another ministry. A state committee has most of the autonomy of a ministry, but ranks just below a ministry in importance. There are two major divisions in the TGC. The Water Division is headed by a Chief Hydrogeologist, and the Mineral Division is headed by a Chief Geologist. The Water Division has offices in all five velayets. These branch offices can be either "Expeditions", which perform projects using only budgeted government funds, or "Concerns", which work either with budgeted funds or under contract to other parties. At the national level, the principal responsibility of the Water Division is to conduct research and carry out investigations and planning to locate fresh water sources. Dashkhovuz has a "Concern", the South Aral Hydrogeology Company (SAHC). Responsibilities at the velayet level are to conduct studies, drill wells, monitor groundwater levels, advise "enterprises" of the availability of groundwater resources and approve licenses for the extraction of groundwaters (which the enterprises need to obtain further permits from the MOE and MWR to use those waters), and give advice to enterprises about the proper operation of wells drilled by the TGC.

h. Institute of Design (IOD) (State Scientific Research, Design and Investigation Institute) IOD is subordinate to the Ministry of Water Resources. Although there are other small design institutes conducting minor projects, IOD is the only institute with the capability of undertaking planning and design for major projects. Among its other duties, the IOD serves as a the technical planning entity for studies and designs of water and wastewater projects. IOD is also said to supervise the construction of works that they designed. If so, this is unusual in FSU practice, where construction supervision is rarely practiced. They receive assignments from various governmental organizations at the national and regional (velayet) levels. IOD became involved in the Dashkhovuz water supply schemes (source augmentation) at the invitation of GOSTROI, the former soviet construction institute. IOD is also responsible for the plan to ensure that all potable water is supplied by groundwater rather than from surface supplies. This plan was developed in support of the recent Presidential Decree that established this as official policy.

i. Institute of Chemistry (IOC) (Institute of Chemistry of the Academy of Sciences) Among its other duties, the IOC maintains the only laboratory in Turkmenistan that has the capability of performing water quality testing at the level of internationally acceptable standards. The IOC acts as an advisor to various government organizations in matters of water quality.

j. Housing and Communal Services (HCS) Up to about 1991, the HCS was a ministry. The duties and responsibilities of HCS are now delegated to the velayet level, but a small group of advisors at the Cabinet of Ministers serves to coordinate the HCS activities at the regional level. This national group appears to have no executive powers or responsibilities. HCS is discussed in more detail in the following sections on organizations at the regional level, where it appears to operate as a "trust". As part of the old ministry establishment, there was a national Communal Design Institute (Communproyekt). This institute was responsible for the design of many of the water and wastewater systems in the country. The

institute still exists, and now serves as a quasi-private consulting firm, specializing in water and wastewater projects.

k. Desert Research Institute (DRI) Some 80% of the country is desert. The DRI is said to be one of some ten similar institutes in the world, and is linked to the UN agency ESCAP. DRI has been involved in a project for producing small, portable water filters. They have also proposed a study of the environmental impact of irrigation and drainage as it effects desert lands, but this has not been approved by the Government. DRI publishes bi-monthly scientific journals, which are available in English. The next issue will discuss water and sanitation conditions in Turkmenistan, and is based on the conference on this subject held in Ashgabat in September 1994. Officials report that nomads obtain water for themselves and their livestock from dug wells as deep as 30 meters.

## 2. Dashkhovuz Velayet Organizations with Sector Responsibilities

a. Hakimlik of Dashkhovuz Velayet The five velayets or regions of Turkmenistan have considerable authority, and the powers in the Velayet are vested in the Hakimlik. The term Hakimlik is roughly translated as "the office of the leader". The leader of the Hakimlik is the Hakim, or governor. Each etrap, or sub-region, is also headed by a Hakim. The etrap Hakims are responsible to the Velayet Hakim. Etrap cities and collective farm are headed by an Archin. There are typically about four Vice-Hakims which report to the Hakim. Allocation of duties varies, but broad categories include (1) transport, construction, communications, housing and communal services, and rural water supply, (2) agriculture, (3) commerce, business, legislation and administration, and (4) health, sanitation, culture and women's issues. Petroleum may supplant agriculture in some velayets. Housing and communal services includes public housing, central heating, water supply and piped wastewater collection and disposal (rare), but not latrines, except for pumping out public latrines. Sanitation includes food handling in markets and restaurants, and water quality.

b. City of Dashkhovuz In a manner somewhat comparable to Ashgabat, the City of Dashkhovuz has its own organizations, including a separate department of Housing and Communal Services. This department is responsible for water supply and piped wastewater collection and disposal in the city. This responsibility is vested in the Dashkhovuz Vodocanal (water and sewer utility).

c. City of Kuneurgench Dashkhovuz and Kuneurgench are the only officially designated "cities" of the Velayet. The urban capitals of the other etraps are called "city-type settlements" (or etrap centers). Like Dashkhovuz, Kuneurgench has responsibility for its own water supply, and has its own Vodocanal.

d. Regional Offices of National Organizations Most ministries have local representatives at the velayet level. There appears to be a dual relationship to the parent ministry and the Hakimlik of the Velayet. HCS, no longer a ministry, operates as a "trust" at the Velayet Hakimlik, but, at the etrap level, HCS appears to be subordinated to the Vice-Hakims of the etrap Hakimliks. The significance of operating as a trust is not clear. There does not appear to be a regional branch of the Institutes for Design and Chemistry. The Expeditions or Concerns of the TGC appear to be independent of the Hakimlik.

e. Rural Water Supply Department (RWSD) The responsibilities for the provision of potable water in Dashkhovuz Velayet are widely scattered. As noted, Dashkhovuz and Kuneurgench have their own Vodocanals, which report to HCS at the velayet level. Water supply in the etrap centers is the responsibility of a Vice Hakim who has links to the housing and communal services department at the Velayet level, but is directly responsible to the etrap Hakim. However, some 69% of the velayet population lives in rural areas. Primary responsibility for serving these people with potable water is

assigned to the Rural Water Supply Department of the Hakimlik of Dashkhovuz. This arrangement appears to be peculiar to Dashkhovuz. In other velayets, the MWR has this responsibility. Even in Dashkhovuz, MWR arranges for the construction of the works, which are then turned over to RWSD for operation. The great majority of the rural population live on collective farms. RWSD currently maintains water systems in less than half the 104 collective farms in the velayet. Based on experiences in other countries of the FSU, the Ministry of Agriculture was probably responsible for providing drinking water to the farms, but this appears to be no longer the case. RWSD operates some 48 rural water systems. Most other collectives have either no system or inoperative systems. In those cases, the Archins or managers of the collective farms are said to have responsibility for water supply. In practice, most people meet their own water needs, largely through dug or drilled wells with handpumps.

## 5. Etrap Sector Responsibilities

Hakimliks of the Etraps As noted, there are eight developed etraps in Dashkhovuz Velayet. Of these, one (Turkmenbashi) has no settlement capital, and Dashkhovuz etrap has a settlement that is not a capital (Niyazovsck). The etraps have structures similar to those of Dashkhovuz Velayet, with a Hakim and several (usually four) Vice-Hakims. The MOH/SES and HCS organizations have local staffs in the etraps, under Vice-Hakims, for water, sanitation and health. These responsibilities appear to be limited to the settlement cities for water supply, but the health services may be extended to the rural areas within the etraps. HCS offices appear to have responsibility for pumping out public latrines in the cities and settlements, but not in rural areas. No organization appears to have responsibility for the design, construction, and promulgation of latrines, nor in the education of people as to their use and the importance of such use to their health.

## B. Institutional Assessment

### 1. Organizational Weaknesses

a. Lack of Focus on Sector Responsibilities Housing and Communal Services (HCS), before it was disbanded as a ministry, was responsible for the provision of water supply to the people of Turkmenistan. Since disbandment, that responsibility has not been represented at the ministerial level. The Ministry of Water Resources has the important responsibility of serving as the adjudicator of how the country's scarce water resources are to be allocated and it is presently the ministry most closely associated with the provision of public water supply. However, MWR has no department with responsibility for the public water supply sector. At the velayet level, HCS is responsible for public water supply and for wastewater collection and disposal. However, HCS has many other responsibilities, and water and wastewater is just one of many communal services in its portfolio.

b. Gaps in Responsibilities The most obvious gap in sector responsibilities is that for the provision of safe and convenient means of excreta disposal. Current analyses of health studies indicate that hygienic disposal of human excreta is one of the most critical requirements to assure the health of the people. The Housing and Communal Services department is responsible for the provision of piped sewerage systems for the disposal of wastewater, but there is only one such system in the entire velayet, in Dashkhovuz City. As no other urban settlement has any significant levels of interior plumbing, there is currently no need for other piped sewer systems. HCS also has the responsibility for pumping out public latrines, but this is a very limited effort. There are no safe and economic means presently available for the sanitary removal and disposal of household excreta wastes. The great majority of the people in Dashkhovuz utilize very simple but unhygienic pit latrines, and no organization appears to have responsibility for the design, construction or promulgation of adequate latrines, or programs for the education of the people in the importance and hygienic use of latrines.

c. Overlapping Responsibilities Some 69% of the population of Dashkhovuz live in rural areas, yet less than half of these people are served by the Rural Water Supply department. In other velayets, MWR has responsibility for rural water supply. Even in Dashkhovuz, MWR has the responsibility for the construction of rural water systems, while RWS only has operational responsibilities. The water systems that RWS operates are very similar to those in the urban settlements, yet RWS and HCS, which operates the urban systems, function independently.

e. National Sector Policy Problems One of the problems with national policy is its failure to assign clear responsibility for the water, wastewater and sanitation sector. Another problem is the existing law preventing sector utilities from collecting fees for the services they perform. The lack of long term planning for the sector is one of the consequences of failure to assign overall sector responsibility to a specific government agency. The inadequacies of the existing systems and the large numbers of people without adequate water or sanitation services have several causes, but inadequate funding is one of the principal ones. National pricing policies and lack of focussed responsibility are among the principal causes of the lack of funding.

## 2. Operational Weaknesses

a. Planning and Management There is little evidence of long term planning to overcome existing deficiencies. Even the current crisis of providing water only a few hours per day appears to be accepted with resignation, though there is evidence that water is being wasted under present procedures in volumes which considerably exceed the amounts required to meet the needs of the people 24 hours per day. In many tables of organization, far too many departments report to the head of the organization. There was little evidence of any systems for the accurate collection of financial and technical operating data, and for the distribution of this information to managers. Except for antiquated personal computers (286 units, with 1 MB of RAM and 40 MB hard disk was typical) at the Geology Committee and Institute of Chemistry, no computers were observed at the offices visited. Realistic budgeting and cost estimating are not practiced at the water supply utility level.

b. Operation and Maintenance The current financial difficulties contribute to severe operational problems. Critical parts and supplies are rarely available. Equipment is often cannibalized, and any but the simplest of repairs usually must be made in Dashkhovuz City or, more commonly, back in Ashgabat. Procurement procedures are centralized and complicated, and operators have little control over obtaining the equipment and supplies they require. There was little evidence of preventive maintenance, or the tools with which to accomplish it. On the other hand, there is often no budget for grease, pump packing, tools or other materials and supplies. Operators rarely have copies of the plans and specifications for the works under their responsibility, and no operating manuals or guidelines were noted.

Almost all the piped water systems in Dashkhovuz Velayet utilize water from shallow wells adjacent to irrigation canals. It appears that some of the problems with degraded water quality from these wells results from operation of the wells in a manner that does not comply with recommendations from the authorities of the TGC's hydrogeological companies. Given the importance of these wells, consideration should be given to providing TGC a stronger role in ensuring the proper operation of these wells.

c. Human Resources Salaries of employees in the water, sanitation and health sectors in Dashkhovuz Velayet are extremely low, particularly in relation to the Capital. For instance, employees of the carpet factory in Ashgabat earn twice the pay of a senior engineer in most departments in Dashkhovuz, where typical salaries at the senior levels are in the order of less than US\$ 20 per month. Working conditions are poor, with inadequate vehicles for transport, poor communications and sparsely equipped and furnished offices. Training programs are few and generally inappropriate. Training (most

of it dating back to pre-independence) often seemed to focus on design and advanced technologies rather than meeting actual needs.

### 3. Summary of the Existing Institutional Situation of the Sector

The principal weaknesses of the sector include (1) allocation of responsibility for the sector among too many governmental agencies, (2) the wide range of responsibilities other than water and sanitation assigned to HCS, the principal agency charged with providing water supply, (3) lack of technical and management skills throughout the sector, (4) the absence of a coherent program for the effective operation and maintenance of water and sanitation facilities, (5) inadequate focus on the importance of providing effective means of excreta disposal, (6) inadequacy of funding for both capital construction of new and replacement facilities, and for operation and maintenance of existing facilities, and (7) a national policy which provides water and sanitation services at no cost to the users.

## C. Institutional Strengthening

### 1. Proposed Approach to Sector Reform

There are three components of the proposed approach for building capacity for the effective provision of water and sanitation services in Dashkhovuz: (1) reform of the sector at the national level, (2) reorganization of the sector at the velayet level, and (3) internal strengthening of the velayet sector organizations.

### 2. Sector Reform Needs at the National Level

a. Assignment and Clarification of Responsibilities The various laws and regulations of the country should be reviewed and revised to clarify responsibilities for the water, wastewater and sanitation sector. The following general principles are suggested for adoption:

- (1) Primary Responsibility to the Velayets Assign primary responsibility for providing water, wastewater and sanitation services (the sector) for the people of Turkmenistan to the five velayets, or regions
- (2) Regulatory and Support Role for the National Government Retain the responsibility and improve the capacity for regulation, policy setting and broad sectoral planning; and provide sector support such as training of facility operation and maintenance staff
- (3) Inter-Ministerial Coordination Clarify the relationships and responsibilities among all ministries to ensure that (a) the regulatory functions of MOH, MOE, MOF and MWR (for water quality and health; wastewater and septage disposal and environmental concerns; budgeting, finance and personnel policies; and priority allocation of water resources) are appropriate and clear, and (b) that the planning, design, construction, operation and maintenance of sector facilities are reserved to the velayet sector organizations, and not by any other ministry.

b. Required Actions at the National Level In order to achieve these reforms, the actions to be taken include:

- (1) Obtain national approval of the proposed program for institutional development of the

water, wastewater and sanitation sector (the sector)

- (2) Appoint the Ministry of Water Resources, or such other national ministerial level body as the government may decide, to assume sector responsibilities for broad national planning, adoption of national policies and the provision of support as appropriate
- (3) Draft legislation which will (a) set forth and assign the national sector responsibilities described above, (b) assigns responsibility for the planning, design, construction, operation and maintenance of the sector to new "Regional Water and Sanitation Authorities" at the velayet level, and (c) grants autonomy to the velayets in such important matters as control over personnel, setting tariff levels, controlling finances, and planning and execution of projects. (Note: Until such time as the velayet water and sanitation organizations are financially self-supporting, the central government should provide adequate funds for the construction and replacement of needed facilities, and for the operation and maintenance of existing facilities)

### **3. Reorganization of the Sector in Dashkhovuz Velayet**

a. Identification of Existing Sector Responsibilities and Needs in Dashkhovuz The first step toward reorganization would be to identify existing responsibilities and needs. It appears that responsibility for water supply and wastewater collection in urban centers, and for institutional sanitation in both urban and rural areas is vested in the department of Housing and Communal Services (HCS). Responsibility for water supply in rural areas is vested in the Rural Water Supply department of the velayet, but many rural areas have little or no public water service. No organization has responsibility for excreta disposal or sanitation services for homes or other private interests. While this may represent a general outline of the sector in Dashkhovuz, full understanding will be required before the sector can be reorganized.

b. Suggested Regional Sector Reorganization The proposed name of the new organization is the "Dashkhovuz Regional Water Supply and Sanitation Authority" (Dashkhovuz Velayet Vodocanal). The Authority could report to a new "Division of Water Supply and Sanitation" within the Ministry of Water Resources, or some other arrangement as may be determined. The Authority would be governed by a seven person Board of Directors and headed by a Managing Director.

The Authority would have three basic operating divisions: the Dashkhovuz Vodocanal (for facilities in the velayet capital), the Etrap Centers Vodocanal (for facilities in all the etrap centers and the city of Niayozovsk), and the Kolkhos or Rural Vodocanal (for facilities in the remaining areas of the Velayet). The Authority would also contain five support divisions: Finance and Administration, Personnel, Engineering, Quality Control and Customer Services. In addition, three functions would report directly to the office of the Managing Director: Internal Audit, Legal and Public Relations. A provisional organization chart for the new regional authority is presented as Annex I. The basic duties of each of the support divisions is listed on the chart.

### **4. Strengthening the New Regional Organization**

a. Source of Personnel and Equipment for the New Organization The new organization would draw heavily on the various sector organizations that already are functioning in the velayet. The operating personnel for Dashkhovuz city now exist in the water and wastewater divisions of the Dashkhovuz Vodocanal. The etrap Vice Hakims and their staffs, and the staff of the Rural Water Supply department would become the core personnel for the operating divisions of the Etrap and Rural divisions, respectively. All three groups would contribute personnel to be assigned to the support divisions,

according to their skills. However, the component organizations that would become a part of the new regional organization have inadequate skills and limited resources compared to what would be required to develop an effective water and sanitation utility. Some of these skills include operation and maintenance of facilities, management, collection and dissemination of critical information, finance, administration and personnel. To build capacity in these areas would require training and the provision of equipment and supplies.

## ANNEX D: WATER QUALITY DATA

Selected 1994 analyses of Irrigation Waters and Extracted Groundwaters in Dashkhovuz Velayet

	"Salinity" TDS gram/l	Pesticides Lindane ug/l	Volatile Phenols ug/l	Lead Pb mg/l	Cadmium Cd mg/l	Nitrates NO3 mg/l	Oil Products mg/l
Boldumsaz (Canal)	0.6	0.320	14.0	0.04	0.002	5	0.07
Boldumsaz (Storage)	1.4	TR	5.4	0.05	0.005	8	0.08
Tagta (Canal)	0.6	0.007	57.0	0.04	0.006	4	0.03
Tagta (Storage)	1.4	0.006	5.5	0.28	0.002	7	0.08
Yilanly (Canal)	0.6	0.006	1.5	0.02	0.006	3	0.06
Yilanly (Storage)	1.3	0.007	1.3	0.04	0.002	15	0.07
Ackedepe (Canal)	0.7	0.008	1.4	0.04	0.005	4	0.29
Ackedepe (Storage)	1.6	TR	1.0	0.04	0.002	8	0.06
Gubadagh (Canal)	0.6	1.149	1.7	0.02	ND	4	0.11
Gubadagh (Storage)	1.1	TR	13.7	0.04	0.002	4	0.04
Niyazavosk (Canal)	0.6	0.017	1.0	0.02	0.005	4	1.62
Niyazavosk (Storage)	1.7	0.006	12.7	0.01	TR	14	0.01
Turkmenbashi (Canal)	0.7	0.031	1.4	0.03	0.006	3	0.19
Turkmenbashi (Stor.)	1.2	0.007	1.0	0.04	0.001	5	0.06
Kuneurgench (Canal)	0.6	0.037	1.5	0.02	ND	4	0.59
Kuneurgench (Stor.)	1.2	0.007	22.0	0.04	0.002	6	0.07
Dashkhovuz (Canal)	0.8	0.006	1.5	0.03	0.006	3	0.22
Dashkhovuz (Storage)	1.7	0.006	1.0	0.04	0.001	9	0.17
USEPA Standards	0.5	0.200	2.0	0.015	0.005	45	0.10
EU Standards	NA	NA	0.5	0.05	0.005	50	NA

Notes: NA: Not Available, TR: Trace, TDS: Total Dissolved Solids, Oil Products: Aliphatic Hydrocarbons. Canal samples were taken from the irrigation canal in the city indicated. Storage samples were taken from the ground storage reservoirs of extracted groundwaters beside the canal. All samples taken and analyzed by the Institute of Chemistry, Ashgabat.

## ANNEX E: COST RECOVERY CONSIDERATIONS FOR DASHKHOVUZ VELAYET

### A. World Bank Experience and Policy on Cost Recovery for Water Projects

The World Bank has over twenty years' experience with water supply and sanitation projects worldwide, and has closely examined the results of these investments. In the past, many projects have experienced implementation and operational problems. Analysis of the Bank's water and sanitation portfolio has shown that, underlying these problems, is a vicious cycle of poor water quality and unreliable service delivery that results in consumer's reduced willingness-to-pay, which, in turn, generates inadequate operating funds and a further deterioration in services. Experience has proven that water must be recognized as an economic good, and that most of the financing must come from users in order for investments in water supply projects to be sustainable. These results from the World Bank investment projects in water supply and sanitation have led to the adoption of the Bank's policy that water pricing and cost recovery are essential to project sustainability and must be included in all projects. The World Bank policy states that cost recovery should be sufficient to pay both for operation and maintenance, as well as a fair return on capital investment. User fees not only address the financial sustainability of water supply systems but they also serve to conserve scarce water and thus contribute to the environmental sustainability of World Bank funded projects.

### B. Financial Analysis of the Current Project

1. Tariff Rates Required to Recover all Project Costs The Turkmenistan Water Supply and Sanitation project preparation has included an economic and financial analysis which is summarized in the Bank's Staff Appraisal Report. The analysis calculated the average tariff necessary to fully cover the total financial costs of the project, including (1) the cost to operate and maintain the new and rehabilitated water system (O&M costs), and (2) the cost to repay the loan required to finance the project. The tariffs required to finance the water systems in the etrap cities is about \$0.53 per cubic meter, and the tariff rate required to recover all the costs for the collective farm systems is about \$0.63 per cubic meter. These values may change somewhat as final adjustments are made to the project.

2. Tariff Rates Required to Recover O&M Costs While the Bank policy proposes full cost recovery, this may be unrealistic at this time under the conditions which exist in Turkmenistan. As a consequence, the financial analysis also considered the tariff rates required to recover only the O&M component of the total project costs. The analysis determined that a tariff rate of about \$0.15 per cubic meter would be sufficient to recover this component of project costs for water supply system improvements in both the etrap cities and the collective farms.

3. Rule-of-Thumb for Determining Affordability Experience in developing countries has indicated that people can afford and generally are willing to pay from 4 to 6% of their monthly income for a dependable supply of safe drinking water. Household income data for Dashkhovuz are difficult to determine with accuracy, but average monthly income for households with yard connections (which tend to be more affluent than households served by street faucets) are in the order of \$25 per month. Applying the above "affordability" test, households with yard connections should be able to afford from \$1.00 to \$1.50 per month to pay for a dependable supply of water. At current (mid-January 1997) rates of exchange, this amounts to about 5,500 to 8,000 manats per month. As described in paragraph 5 of Section D, the estimated cost to households with yard connections would be about 7,000 manats, or 5.4% of household income. Such a charge appears to be affordable.

### C. Common Methods of Charging for Water Provided to Customers

1. Introduction Whether water utilities are owned by the government or a private company, almost without exception, these utilities charge their customers for the water which is delivered to them. With some variations, the water is charged to the user in one of the following four ways:
2. Metering The most common means of determining the amount to be charged is to provide a metering device on the pipe that delivers the water to the customer. This system requires that each customer (household) has its own water connection. It also requires the cost of installing and reading the meter, sending out the bills, and collecting the amounts due. It is the most expensive and complex system, but it is also the fairest, since the user pays directly for the amount of water received. It has the added advantage of encouraging users to conserve water and minimize waste.
3. Flat Rate Charging This system is much simpler and much less expensive to administer. All customers are billed a flat or equal charge each month, regardless of usage. The biggest disadvantage is that the system is not fair, since large and small users pay the same. The system encourages waste and discourages conservation.
4. Component of Real Estate (Housing) Tax In communities where municipal taxes are charged to owners of homes or apartment buildings, it is possible to add a surcharge to the real estate or housing tax bill to allow for the cost of delivering water to these buildings. In this way, the home owner pays for his water indirectly, and the apartment renter also pays indirectly for his water as a component of his monthly rent. Some municipal or other governmental agencies object to acting as the "bill collector" for the water utility. In addition, this system does not discourage water waste habits as the charge for water is hidden in the tax bill.
5. Charges Based on Household Size or Plumbing Fixtures Some water utilities base the charge for water use on the number of square meters in the house or apartment (this was common in the former Soviet Union) or the number and type of water-using plumbing fixtures in the house or apartment. These systems are difficult to administer because of problems in measurement of living space, or changes in the number and type of plumbing units. This system also does little to discourage water waste habits as the charge for water is not related to the amounts used.
6. Conditions in Dashkhovuz Which Affect Water Pricing The systems of charging for water described above are based largely on systems under which water is delivered directly to each household. In Dashkhovuz, most people receive their water through public street faucets (sometimes called standpipes), and some by yard connections. Billing for water delivered by street faucets (or yard connections) is more difficult, but has been done in other locations. Strategies for charging for water in Dashkhovuz are discussed in the following section.

### D. Strategies for Charging for Water in Dashkhovuz

1. Background There are several impediments to levying charges for water in Dashkhovuz. One is the current national policy that water is considered to be a benefit to be provided to the people without cost. Another is the relative poverty of the people in the area. Other impediments include the very poor quality of the water service currently being provided, and the sense of being treated unfairly. "Why should I pay if others don't have to?" is a question that deserves a reasonable answer.
2. Strategy No. 1 The first strategy is to make it clear to everyone that no one should be asked to pay for water until there is a demonstrable improvement in the quality of the service being provided.

Only those users who receive water from the new or rehabilitated water supply systems in their communities will be asked to pay for the water they receive from the systems.

3. Strategy No. 2 The next strategy is to start now to inform the people of the intentions of the new water supply improvement scheme; which is to provide safe, disinfected, water under pressure to their neighborhood street faucet or their yard connection for most hours during the day. At the same time, the people will be advised that it will cost money to maintain this new, improved level of service, and that this level cannot be maintained without the financial support of the users. The answer to their question as to why they should have to pay when others don't, is that the others aren't getting this better level of service. A public education program should be prepared and conducted to introduce these concepts, the need for water conservation, and to demonstrate that water is a valuable commodity worth paying for.

4. Strategy No. 3 The third strategy is to provide differential levels of payment for those who have to carry their water from street faucets and those who have it delivered to their yards by a direct piped connection. As the service improves, it is expected that there will be an increased demand by more people for yard connections. The Social Needs Assessment clearly demonstrated that yard connections are greatly preferred over the use of public street faucets. Households will have to pay the cost of making this connection to the system to pipe water to their yards. They will then have to make larger monthly payments to the water utility once the connection is completed, further increasing the revenues to the utility. People with yard connections should be expected to pay two to three times as much for their service as those who have to carry their water, and the tariff structure should provide for this.

5. Strategy No. 4 The initial stage of cost recovery would be based on charging fees for water used by those with yard connections at a level which provides for the full recovery of the estimated operation and maintenance (O&M) cost component of the water used. In the absence of water meters, charges would be based on their estimated water usage. The convenience of direct yard connections will increase the amounts of water used, so it was assumed that water usage by those with connections would amount to 50 liters per capita per day (lpcd). Assuming six persons per household, a typical household would use nine cubic meters per month. The estimated cost of the O&M component of the total cost of water is \$0.15 per cubic meter. For nine cubic meters per month, this represents a cost of \$1.35 per household per month. At current exchange rates, this amounts to about 7,000 manats per household per month, or about 5.4% of estimated monthly household income. The charge to those receiving water from street faucets could be in the order of 2,000 to 3,000 manat per month per household, and could vary (below or above this range) depending on the number of persons per household.

6. Strategy No. 5 In order to collect information about actual water usage, it is recommended that some of the yard connection customers be provided with water meters. A pilot program of installing meters on about 20% of all yard connections is suggested. These customers would be billed on the same estimated rate as other yard connection customers, not on the basis of the metered water use. At some future date, the water utility may wish to install meters on all yard connections and bill for actual water used, but this probably should not be done initially. Water metering is currently being studied in a pilot program in Ashgabat under a UNDP-funded program, and the results of that study may be applied to future programs in Dashkhovuz.

7.. Strategy No. 6 An early decision should be made on the method of charging for water in Dashkhovuz, and a system for collecting the amounts charged. The system of charging and collection should be in place and operational as soon as the improvements to the water system are available to the people. Prior to implementation, this system should be fully explained by means of a public information program. Through gradual tariff increases in unit charges for water and increased use of yard

connections in place of street faucets, the full costs of operation and maintenance to support the new water systems should be recovered by the time the project is implemented.

#### **E. Summary and Future Considerations**

This paper has described some of the various systems used to recover the costs of water supply systems, and has suggested a specific set of strategies to consider to implement cost recovery in Dashkhovuz. Even though the system described in this paper will not result in full cost recovery, it will generate a substantial flow of funds to contribute to the costs of operating and maintaining the new water supply systems. Equally important, it will begin the process of educating people to the economic value of this valuable resource, and the importance of paying for this service. The project will support the Government in identifying, selecting and implementing a system of cost recovery which is best suited for the conditions in Turkmenistan.

## ANNEX F: REVIEW OF THE TUYAMUYUN AND LEBAT REGIONAL WATER SUPPLY SCHEMES

1. **Introduction.** Two regional water supply schemes have been proposed by technical organisations within the Government of Turkmenistan as solutions for the water supply problems of the Velayet of Dashkhovuz. These are the Tuyamuyun surface water scheme, and the Lebat groundwater source. Extensive investigations have been carried out on both these schemes by local organisations, and construction has commenced on the Tuyamuyun supply scheme. As part of the project preparation activities, a review of the two schemes has been carried out, and this annex summarises this work.

### The Tuyamuyun Scheme

2. **Background.** Water supplies for the velayet have historically been obtained from the irrigation canal system, which is fed chiefly from the Shavat Canal. As the quality of this water deteriorated significantly during the 1970s and 1980s, as a result of excessive use of agro-chemicals in the irrigated areas upstream, alternative sources were sought to try to guarantee water of reasonable quality for the velayet. The only source with a large enough yield is the Tuyamuyun reservoir on the Amu Darya, some 190 km upstream of Dashkhovuz, and this was selected for development. At the time the Government of Uzbekistan was planning its own schemes based on the reservoir as a source. The reservoir, although geographically within Turkmenistan, is jointly owned by Uzbekistan and Turkmenistan.

3. **The Tuyamuyun Reservoir.** The reservoir has a retained volume of 2,340 million cubic metres, and although largely used for hydropower and irrigation, is also used as a source of potable water for two regions of Uzbekistan. The withdrawals for potable water (400,000 cubic metres per day for the Uzbek schemes) are negligible in comparison to both the reservoir capacity and the water requirement for irrigation. There are three other reservoirs, Kaparas, Sultan Sandjiran and Kozbulat, which are linked to Tuyamuyun, and are at present used for irrigation storage, although there are plans to reserve the Kaparas reservoir for use as a potable water source.

4. **The Kaparas Scheme.** The Kaparas scheme was planned as a means of optimising the quality of raw water available to the region for potable supplies. Water would be admitted to the reservoir between April and July, when the snow melt from the headwaters of the Amu Darya results in improvements in water quality. This water would then be abstracted for potable use when the water quality in the Tuyamuyun reservoir deteriorated in the autumn and winter. Work was put in hand in 1990 by the Government of Uzbekistan to isolate the reservoir from the Tuyamuyun reservoir, and to construct the intake arrangements and transfer pipelines needed for the Uzbek water supply schemes.

5. Following the independence of Uzbekistan and Turkmenistan, the use of agro-chemicals fell dramatically, and one consequence was that river water quality improved, to the extent that agro-chemical residues and heavy metals are no longer an important water quality issue in the Amu Darya. The most significant quality issue is now water salinity, and despite extensive studies in Uzbekistan there are still conflicting opinions on whether or not the water from a Kaparas scheme will be of significantly better quality than water from the existing Tuyamuyun reservoir. The need for the Kaparas scheme, and justification for the cost needed to complete it, is still unproven. In the meantime construction of the isolating structures, and intake arrangements for the Uzbek schemes, is proceeding slowly. The cost of construction of the additional intake needed for Turkmenistan, together with the transfer pipelines, is estimated as US\$ 82 million: this assumes that the isolating structures are completed by the Uzbeks.

6. **The present scheme.** The intake for the present scheme for Turkmenistan is located on the Pitnyak-Arna canal, immediately downstream of the Tuyamuyun barrage. This will pump the raw water 10 km to a treatment plant, from where the treated water will be pumped a further 175 km to a main distribution center near Dashkhovuz. Five pumping mains, with a total length of 292 km, will carry the water from this distribution center to the etrap centers, including Dashkhovuz. Storage reservoirs would be provided at each of the etrap centers, along with rechlorination facilities. There are no plans to supply the collective farms from this system.

7. The scheme has been planned in two phases: Phase 1, which is partially completed, would supply 109 Mld by 1995, whilst Phase 2 would increase the scheme capacity to 337 Mld and was planned to be completed in 2010. Work on Phase 1 commenced in 1989, but following the independence of Turkmenistan, funding for construction became increasingly scarce, and work is now at a virtual standstill. During the project identification mission the scheme was reviewed and it was considered that it represented a sufficient level of investment by the Government of Turkmenistan to warrant examining in detail the feasibility and costs of completing the first stage of the scheme, and determining whether this could form part of this project.

8. The design and concept of the scheme is in general appropriate although the pipeline sizing is such that high operating costs will be incurred at the design flows. This may be because power at the time of design was cheap, and it was advantageous to reduce the capital costs by installing smaller pipe diameters. The treatment process is sophisticated and it may be possible to simplify this without compromising the effectiveness of the treatment.

9. At the present time, the civil engineering works on the intake and water treatment plant are around 50% complete. The workmanship is not to usual international standards, although it is customary in the region that extensive remedial works are carried out to most structures prior to their being put into service. No mechanical and electrical equipment has been purchased to date. About 8.5 km of the raw water pipeline has been laid, and 167 km of the treated water pipeline to Dashkhovuz. A small length (20 km out of 292 km) of the pipelines from the distribution center near Dashkhovuz have been laid, though work has not started on any of the pumping stations and reservoirs needed within the velayet.

10. **Costs to completion.** The cost of completing Phase 1 of the scheme has been estimated as US\$ 514.5 million, as shown in Table x.1: to provide a supply to Dashkhovuz alone will require an investment of US\$ 215 million. One of the major elements essential for completion of any variant of the original scheme is the laying of the final sections of the raw and treated water pipelines, and lining of the existing mains to prevent corrosion. The total cost of this work is estimated as US\$ 150 million.

**Table 1: Costs to complete Tuyamuyun Scheme**

Item	Cost (US\$ million)
Intake and pumping station	1.5
Raw water main	34.2
Treatment plant civil works	28.7
Treatment works mechanical and electrical equipment	40.0
Main pipeline	115.5
Dashkhovuz distribution center	12.0
Secondary trunk mains and pumping stations	282.6
Total	514.5

11. A revised scheme has been proposed in the consultant's feasibility report that would supply 75 Mld at a cost of US\$ 322 million. The cost savings have been made by limiting the output, thus reducing the size of the pumps and other scheme components that have not yet been built, and omitting some treatment processes which are not considered to be needed following the improvement in quality of the Tuyamuyun water. The scheme will then have the capacity to supply the etrapas of Dashkhovuz, Niyazovsk, Yilanly, Akdepe and Tagta, including the rural areas, although the cost estimate does not include the cost of the pipelines to the rural centers.

12. **Conclusions.** The Tuyamuyun scheme as presently conceived would supply only the etrap centres, including Dashkhovuz. Completion of the scheme, even if it were within the financial limitations of the proposed project, would not meet the objectives of the project in providing improvements to supplies in both urban and rural areas across the velayet; indeed, it is probable that the majority of the water from the new scheme would go to Dashkhovuz, at the expense of the etrap centres. The revised scheme proposed by the consultants is an improvement in this regard, but the fact remains that whilst the local sources remain viable in terms of water quality, the additional capital and operating costs (up to \$ 0.46/cu.m) of the scheme are not justified by the improvement in quality.

13. There are doubts about the long term sustainability of the scheme, because of the reliance on imported chemicals to treat the surface water, the durability, given the poor quality of construction apparent in the works constructed to date, and the current lack of a suitable organisation to operate and maintain the scheme. It is critical for such a large investment that an adequate operation and maintenance organisation is set up well before the scheme is completed, and at the present time there is no clear picture of where such an organisation will be developed from.

14. The cost of completing the scheme, even at the reduced output proposed by the consultant, is far in excess of the maximum loan amount envisaged for this project, or indeed any loan contemplated by the Bank for the country in the near future.

15. For the above reasons, it is concluded that it is not appropriate for the Bank to consider supporting continued construction of the scheme at the present time. The viability of the scheme in the longer term is dependent on the relative water quality in the irrigation canals in the velayet, and the Tuyamuyun reservoir: if the canal water quality remains as at present, then there is no clear case for expenditure on such a scale for a marginal improvement in water quality. However, the quality of both waters needs to be closely monitored in the short term to detect any deterioration as early as possible.

### **The Lebat Groundwater Scheme**

16. This scheme would use the Balqui aquifer in the northern Kara-Kum desert, some 60 km south of the Tuyamuyun canal and 220 km from Dashkhovuz. The aquifer is formed from alluvial sands, possibly deposited by the Amu Darya in the period when it flowed to the Caspian Sea, and the water resources within the aquifer are essentially fossil water: some recharge from rainfall (annual average is 80 to 110 mm) and condensation does occur, but this is thought to be small compared to any likely exploitation.

17. Exploration of the aquifer has been carried out by the South Aral Hydrogeological Expedition (SAHE), who have determined that the aquifer is between 100 and 200 m thick, with the water table between 19 and 38 m below ground level. The water in the aquifer varies in salinity, becoming more saline with depth, and also as the alluvium becomes thinner at the edges of the aquifer. SAHE have determined that the 1.5 g/l iso-salinity line (deemed to be the maximum salinity exploitable for potable supplies) lies between 15 and 45 m below the water table for an area of 240 sq km. Total fresh

groundwater reserves are estimated to be 210 million cu.m.

18. In order to abstract only fresh water, it would be necessary to install doublet wells, with one deep well (average depth 83 m) to draw the saline water away from the shallower (average 38 m deep) freshwater well. The manageable yield with this configuration is estimated to be 8,640 cu.m/day, and it is estimated that 100 doublet wells would be required. At this rate of abstraction the aquifer life would be 66 years. To put the yield into context, the water demand for the seven etrap centers and seven kolkhozes in the present project is 12,000 cu.m/day. The water would be collected into a single transmission main and pumped 60 km to the Tuyamuyun-Dashkhovuz pipeline, where it would be blended with the Tuyamuyun water. As the Tuyamuyun-Dashkhovuz main is limited in capacity, the wellfield would not therefore provide an additional resource, but would partially replace Tuyamuyun water.

19. As a consequence of the method of abstraction, there will be 29,000 cu.m of saline water per day to be disposed of at the peripheries of the aquifer. As well as adding to the cost, the environmental consequences of these discharges would need to be assessed. The less saline water could be used for agriculture, but this would require the establishment of farms in the area, and in such a manner that the freshwater reserves were not compromised.

20. The costs of the scheme have been estimated as US\$ 84.5 million, assuming that the water would be pumped to the Tuyamuyun-Dashkhovuz pipeline, then blended with the Tuyamuyun water. However, if the scheme was constructed as an independent scheme (thus providing an additional resource for the velayet) with a pipeline direct to Dashkhovuz, the cost would be US\$ 240 million.

21. As an independent source, the scheme would provide a small amount of water at a high capital cost: in addition the supply of this water in itself would not meet the aim of the project, that is to direct water supply improvements to as wide a population as possible. For these reasons it is considered that the scheme is not appropriate for inclusion in this project, and also that it is not a viable source for Dashkhovuz velayet.

## ANNEX G: HEALTH DATA

**Table 1: Health Status in Central Asian Countries (1992/1993)**

<i>Indicator</i>	<i>Kazakstan</i>	<i>Uzbekistan</i>	<i>Turkmenistan</i>	<i>Kyrgyz Republic</i>	<i>Tajikistan</i>
Total Fertility Rate	2.7	4.1	4.2	3.7	5.1
Life Expectancy	68.0	69.0	66.0	66.0	69.0
Infant Mortality Rate	31.0	42.0	46.0	37.0	49.0
Maternal Mortality Ratio	63.0	43.0	105 - 114	43.0	39.0

Source: WDR 1996

**Table 2: Health Status in the Aral Sea Disaster Areas (1994)**  
(per 100,000 inhabitants)

<i>Aral Sea Disaster Areas</i>	<i>Infant Mortality Rate</i>	<i>Maternal Mortality Rate</i>
Kzyl-Orda Kazakstan	28.0	25.0
Dashkhovuz Velayet Turkmenistan	52.0	96.0
Karakalpakstan Uzbekistan	35.8	70.2

Source: WDR 1996

**Table 3: Birth Rate**  
(per 1,000 inhabitants)

<i>Birth Rate</i>	<i>1990</i>	<i>1991</i>	<i>1992</i>	<i>1993</i>	<i>1994</i>
Turkmenistan	34.2	33.6	34.0	33.1	32.0
Dashkhovuz Velayet	37.1	37.3	37.3	36.0	-

Source: CIS Statistical Committee 1995, Radzinsky et al 1994, UNICEF 1995, USAID 1995, and Consultant Report

**Table 4: Infant Mortality Rate (per 1,000 inhabitants)**

<i>IMR</i>	1990	1991	1992	1993	1994	1995
Turkmenistan	45.1	47.0	43.6	45.9	46.4	42.2
Dashkhovuz Velayet	55.6	57.7	52.6	52.1	51.8	47.5
Dashkhovuz City		48.7	41.9	38.8	37.5	38.7
Dashkhovuz Etrap		43	40.1	49	60.1	42.7
Akdepe		65.3	53.1	52.7	51.0	49.5
Boldumsaz		61.5	51.1	58.8	49.3	43.6
Gubadagh		54.1	69.5	51.9	55.3	51.2
Kune-Urgench		56.0	54.0	52.9	51.5	47.2
Turkmenbashi		50.2	48.6	50.6	50.0	47.5
Tagta		67.4	59.6	54.5	55.4	50
Yilanly		77.2	62.4	57.3	55.1	47.2

Source: CIS Statistical Committee 1995, Radzinsky et al 1994, UNICEF 1995, USAID 1995, and Consultant Report

**Table 5: Maternal Mortality (per 100,000 births)**

<i>MMR</i>	1990	1991	1992	1993	1994	1995
Turkmenistan	42.3		58.8	44.4		
Dashkhovuz Velayet	125.9			96.3		
Dashkhovuz City						
Dashkhovuz Etrap						
Akdepe		74.5	37.4	118.3		40.3
Boldumsaz		51.1	97.9	28.2	197.1	202.0
Gubadagh			254.1	305.8	101.5	
Kune-Urgench		143.1	123.9	152.9	150.1	82.1
Turkmenbashi		108.8	31.2	51.0	58.0	34.7
Tagta			26.3	64.1	62.8	143.5
Yilanly		126.4	132.8	35.5	28.9	31.9

Source: CIS Statistical Committee 1995, Radzinsky et al 1994, UNICEF 1995, USAID 1995, and Consultant Report

**Table 6: Diarrhea without Known Pathogen - Total Population**  
(per 100,000 inhabitants)

	1989	1990	1991	1992	1993	1994
Turkmenistan	490.4	451.4	463.5	375.1	444.1	
Dashkhovuz Velayet	420.5	401.4	371.9	254.7	285.1	236.6
Dashkhovuz City	367.9	314.9	291.8	234.1	282.2	285.1
Dashkhovuz Etrap	265.9	343.2	247	227.3	245.2	410.8
Akdepe	435.5	444.9	423.5	290.4	415.8	263.2
Boldumsaz	293.9	417.7	326.1	144.1	206.7	40.8
Gubadagh	194.0	275.2	328.1	246.7	99.7	24.9
Kune-Urgench	422.1	601.4	336.7	294.5	408.2	233.7
Turkmenbashi	683.9	456.1	489.8	229.8	239.5	231.4
Tagta	542.1	426.6	448.6	294.4	339.2	196.1
Yilanly	526.4	379.4	490.4	310.3	323.4	307

Source: CIS Statistical Committee 1995, Radzinsky et al 1994, UNICEF 1995, USAID 1995, and Consultant Report

**Table 7: Hepatitis A - Total Population** (per 100,000 inhabitants)

	1989	1990	1991	1992	1993	1994
Turkmenistan	632.6	279.5	508.8	242.9	434.6	
Dashkhovuz Velayet	558.9	224.3	416.4	208.2	282.4	153.3
Dashkhovuz City	686.6	166.1	629.4	179.3	496.9	161.4
Dashkhovuz Etrap	442.0	138.1	181.7	80.4	148.9	113.4
Akdepe	740.3	372.6	349.4	341.3	431.8	271.7
Boldumsaz	710.2	196.1	352.2	206.7	290.0	109.4
Gubadagh	716.4	291.2	424.9	216.3	185.9	137.3
Kune-Urgench	394.8	275.4	287.6	313.3	239.4	137.9
Turkmenbashi	524.6	257.5	208.6	136.3	136.3	65.3
Tagta	598.6	301.6	630.3	242.3	348.9	299.9
Yilanly	319.5	109.2	369.	121.9	223.9	116.2

Source: CIS Statistical Committee 1995, Radzinsky et al 1994, UNICEF 1995, USAID 1995, and Consultant Report

**Table 8: Hepatitis A - Children Below Age of 14**  
(per 100,000 inhabitants)

	1989	1990	1991	1992	1993	1994
Turkmenistan	74.5	56.2	74.6	54.3	69.9	
Dashkhovuz Velayet	70.4	44.8	70.9	58.2	70.9	56.3
Dashkhovuz City	82.0	50.9	83.0	61.0	83.6	50.0
Dashkhovuz Etrap	69.9	50.7	77.5	34.5	65.3	65.9
Akdepe	62.0	46.8	55.4	51.2	61.1	56.5
Boldumsaz	81.0	48.0	77.7	70.5	72.2	65.6
Gubadagh	72.0	35.0	73.6	68.5	65.3	60.3
Kune-Urgench	52.3	36.1	41.8	60.9	51.1	56.4
Turkmenbashi	42.5	43.5	35.2	34.6	59.8	20.6
Tagta	84.4	50.4	76.4	63.5	84.7	72.3
Yilanly	76.2	45.5	71.1	61.5	56.9	30.0

Source: CIS Statistical Committee 1995, Radzinsky et al 1994, UNICEF 1995, USAID 1995, and Consultant Report

**Table 9: Incidence of Tuberculosis**  
(per 100,000 inhabitants)

	1991	1992	1993	1994	1995
Turkmenistan	60.7	53.7	55.4	48.6	43.3
Dashkhovuz Velayet	102.4	87.4	97.1	75.9	63.6

Source: CIS Statistical Committee 1995, Radzinsky et al 1994, UNICEF 1995, USAID 1995, and Consultant Report

## ANNEX H: DEMONSTRATION PROJECTS

### A. Background

1. Three demonstration projects were designed during project identification and included in the nine month project preparation consultancy (March 1996 - December 1996): (1) a school sanitation, hygiene and health education project; (2) a community water supply system demonstration, and (3) an artificial recharge demonstration project. Projects #1 and #2 demonstrated community based approaches to water supply and sanitation. Project #3 was a technical project to demonstrate artificial recharge of a well field to increase the volume of fresh water available.

2. Project #3 was dropped from the project preparation consultancy due to lack of interest on the Government's part - which largely resulted from the recognition that the nine month timeframe was not sufficient to realize useful results. The Bank agreed with this decision.

3. The two remaining demonstration projects were carried out from March, 1996 to December, 1996, under the project preparation consultancy with Electrowatt Engineering. Electrowatt sub-contracted a local NOG, Assistance to Turkmenistan Area (ATTA), for the non-engineering components of the demonstration projects. Local contractors were engaged for construction.

### B. Results

4. The demonstration projects provided an opportunity to introduce new, community-based approaches to water supply and sanitation; to assess unforeseen problems in implementing aspects of the overall Water Supply and Sanitation project (WS&S); to identify of consumer demand, design parameters, operation and maintenance of the water supply and sanitation systems; to develop community participation activities for the WS&S systems; to assess needs in health and hygiene education and develop appropriate education materials; and initiate interaction between water and health sector staff as well as between the community and local officials. The demonstration projects were designed and conducted in close collaboration with the work of other NGOs and donors in the water supply and sanitation sector. In particular, the school sanitation demonstration was developed by UNICEF staff participating in the project identification mission and was coordinated with the UNICEF ASPERA school water supply and sanitation project in Dashkhovuz. Thus the school sanitation project served to bring together those working in WS&S, including ATTA, and to build on one another's efforts.

5. The demonstration projects were dynamic in nature. Results were evaluated by the community and stakeholders throughout the project preparation period and adaptations made in the projects. Results were presented during preparation in several workshops. The workshops served the added purpose of providing a forum for participatory planning. Final results of the school sanitation and community water supply system have guided the design of the sanitation and health component and the water supply and institutional strengthening components of the project, respectively. Additional benefits of the projects include the strengthening of skills and capabilities of a local NGO, ATTA, which was engaged in execution of the projects. NGOs are rare in Turkmenistan, and ATTA's involvement in the project preparation increased its visibility and scope of work.

6. A brief summary of the demonstration projects is given below. Detailed project descriptions, health materials produced, and technical drawings can be found in the Projects Documents File, "Turkmenistan Water Supply and Sanitation Project: Report on Demonstration Projects: Annex to the Main Feasibility Study Report" December, 1996.

### C. School Sanitation Project (SSP)

7. The SSP was implemented in one school in the project area, Boldumsaz School #15. The local community was involved in the school site selection. A project committee was established and included representatives from local government; local water and health offices; school administration; teachers; students; and parents. The project committee along with community representatives and local administrators attended workshops to learn about school sanitation options and to choose the option most appropriate for their school. The group chose to substantially rehabilitate and expand a communal pit latrine. Local competitive bidding was used to select a local contractor for the construction work. The existing facility was converted into a Ventilated Pit Latrine (VIP) with provision for future conversion to pour-flush toilets. Hand washing basins were installed. Construction was carried out during the summer month when school was not in session. The project committee developed an O&M program for the new facilities.

8. The SSP project was designed in a school in order to provide hygiene and health education to the most receptive audience, children. The Social Needs Assessment, focus group discussions and observation had made clear that there is no demand for improved sanitation in the region despite the deplorable (to outsiders) conditions of sanitation facilities. Furthermore, it was clear that both the health professionals and general population were largely unaware of the linkages between sanitation, hygiene and health. Therefore, the SSP project was designed to include improved hygiene and health education activities. Questionnaires were provided to students to assess hygiene and sanitation practices at school and at home. Based on these results and discussions with health professionals, over summer months, lessons on sanitation hygiene and disease transmission were prepared with ATTA staff, teachers, and health professionals. When school began, a five session teacher training program began to train the teachers in the hygiene and health curriculum. The new curriculum has now been introduced and will be part of the 1996-1997 school program. The health education program was closely linked to the new sanitation facilities.

### D. Community Water Supply System:

9. Few, if any, of the public standpipes in the project area have functioning taps, with the result that water runs freely from almost every connection during the service periods. Besides the huge wastage of water, this practice also results in a decrease in pressure and thus a decrease in the service delivery area. In many places the taps have been broken off. The demonstration project was designed to show the benefits of strong, durable taps on standpipes with automatic shut-off valves as well as the convenience of customer access to public standpipes. The technical components were coupled with a public education program on appropriate use and maintenance of the public standpipes and a community based program of site selection, standpipe design, and operation and maintenance. Since success of the technical components of this demonstration rests with the community's safe use and protection of public standpipes, a health education program was incorporated to present the benefits of safe water gathering and storage and clean standpipes.

10. The first step in the demonstration was to assess the water supply system in an etrap center. Gubadag was chosen by local administrators. A community workshop was conducted in March, 1996, and included administrators, local water and health officials, teachers, small enterprises, and community members. The demonstration project concept was presented. It was determined that fourteen new public standpipes would be installed in a concentrated area somewhere in the city to demonstrate the aforementioned benefits. Electrowatt staff worked with the participants to design an appropriate standpipe with a tap and automatic shut-off. The participants chose a three block section of town for the site. The need for a

community survey on current water use practices was raised ; and a survey agreed upon and conducted in May, 1996. The benefits of an increased water supply (due to the increased pressure and water conservation) were quickly identified. Public housing residents said there would be less work carrying water, more time available for other work, and improved personal hygiene. Single story families identified the most important benefit as increased property value, improved personal hygiene and a reduction in illness.

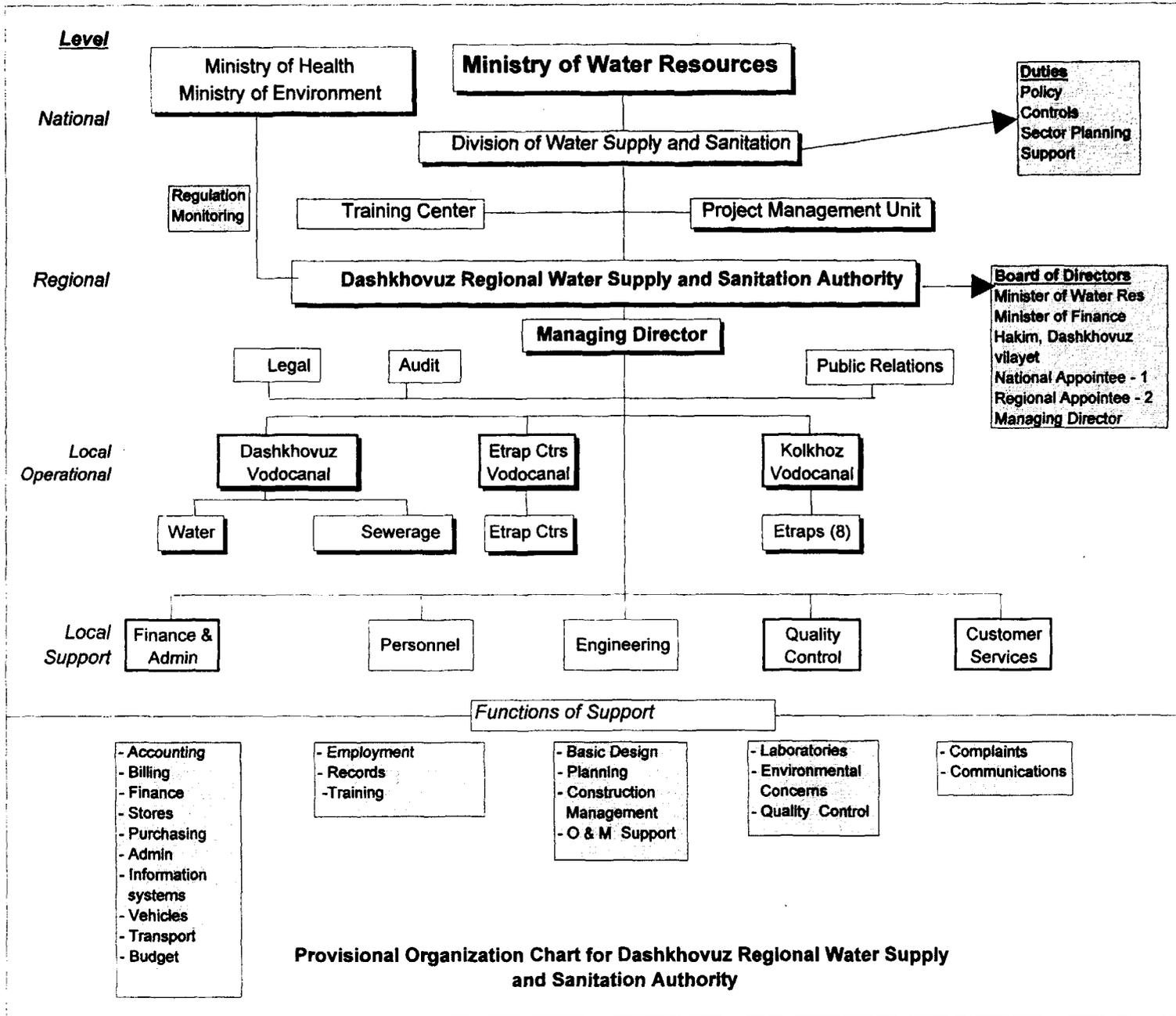
11. Local competitive bidding was used to engage a local contractor to do the work. Design and manufacture of the standpipes was done locally with local materials. Selection of the standpipe sites was done by the residents of the city blocks involved. Construction of the standpipes were completed in July, 1996, and performance evaluation began immediately. Almost immediately residents on the blocks involved saw improvements in service delivery. The use of the shut-off valves increased pressure in the pipes sufficiently to provide water at points not previously functional. The new design, with modifications made based on experience, was user friendly. The users of the standpipes evaluated the performance with forms they had developed.

12. The project developed health education materials (brochures) with community input on disease transmission; use and care of public standpipes; water conservation measures; hygiene practices, e.g. handwashing. These materials were distributed at all community meetings on the project; during the survey. Health materials were given to the local public health services and to teachers. Teacher training was conducted on use and care of standpipes and hygiene education.

13. Results of performance evaluation were used to modify the design of the standpipes. Overall results of the project have been incorporated into the design of the water supply component as well. Health education materials continue to be reproduced and distributed in the community. Results of the health education activities were used to design the health promotion sub-component of the project.

ANNEX I: DASHKHOVUZ REGIONAL WATER SUPPLY AND SANITATION AUTHORITY:

PROPOSED ORGANIZATIONAL STRUCTURE AND TIME SCHEDULE



Provisional Organization Chart for Dashkhovuz Regional Water Supply and Sanitation Authority

## ACTION PLAN FOR ESTABLISHING THE DASKHOVUZ REGIONAL WATER AND SANITATION AUTHORITY (DRWASA)

### I. Components of DRWASA Strengthening

The Institutional Strengthening component of the project will assist in the establishment of the DRWASA and includes the following sub-components.

A. Conduct a National Sector Reform Study The first sub-component is to conduct a study, make recommendations and develop an action plan for making improvements at the national level to strengthen the capacity in Turkmenistan to provide water and wastewater services more effectively to the country's 4.8 million people. This study is intended to provide the support necessary to accomplish the second component, the establishment of a regional sector utility in Dashkhovuz.

B. Assist the GOT in Establishing a New Regional Sector Organization The second sub-component is to evaluate existing sector capabilities within the velayet, to provide specific commendations and necessary legislation for the creation of a new regional water and sanitation authority in Dashkhovuz Velayet, and to assist the government in establishing the new authority.

C. Strengthen the New Regional Sector Organization The third sub-component will provide institutional strengthening of the new authority in order to develop the skills and capabilities within the authority to meet its responsibilities.

### II. Action Category A: Consultant Selection

A consultant will be selected to perform the duties required to achieve the objectives described in the three categories of institutional strengthening described in Section I, above. The specific tasks, estimated time schedule and responsibility for engaging a consultant to perform these duties are described below:

No.	Action	Date	Responsibility
1.	Complete TOR	30 Jan 1997	Bank
2.	Prepare Long List	1 March 1997	PIU
3.	Prepare Short List	1 May 1997	PIU
4.	No Objection from Bank	15 May 1997	Bank
5.	Complete RFP	1 June 1997	PIU
6.	No Objection from Bank	15 June 1997	Bank
7.	Send RFP to Short-Listed Firms	1 July 1997	PIU
8.	Receive Proposals	1 September 1997	Consultants
9.	Evaluate/Select Best Proposal	1 October 1997	PIU
10.	No Objection from Bank	15 October 1997	Bank
11.	Complete Negotiations	15 November 1997	PIU/Consultant
12.	Sign Contract	1 December 1997	PIU/Consultant
13.	No Objection from Bank	15 December 1997	Bank
14.	Consultant Start Date	1 January 1998	Consultant

### III. Action Category B: Decisions and Actions by the Government of Turkmenistan

Decisions and actions required by the GOT with reference to the establishment of a new regional sector authority, referred to below as the Dashkhovuz Regional Water and Sanitation Authority (DRWASA),

are described as follows:

No.	Action	Date	Responsibility
1.	Agree in principle to establishment of the DRWASA and later approval of a legal charter for the organization	February 1997	GOT
2.	Determine whether DRWASA is to report to the Velayet or a Ministry	February 1997	GOT
3.	Approve Dashkhovuz Velayet as the GOT agency to whom the Bank loan is to be made, if the Velayet is the proposed supervising agency	February 1997	GOT
4.	Agree to provide financial support for DRWASA	February 1997	GOT
5.	Approve the charter of duties, powers and responsibilities of DRWASA as recommended by the consultant	June 1998	GOT/Velayet
6.	Approve the recommendations of the consultant relative to national sector reform required to permit the establishment and support of the new regional authority	August 1998	GOT
7.	Provide office space for DRWASA	September 1998	GOT/Velayet
8.	Reassign organizations and personnel to DRWASA as proposed in the consultant's report	October 1998	GOT/Velayet

Action 1 is expected to be incorporated in principle as an agreement to the obligations of the GOT relative to the establishment of the new regional sector authority under the Loan Agreement. This agreement will assume the intent of the GOT to take the necessary steps required to comply with the other actions described above.

#### IV. Action Category C: National Sector Reform Study

The specific tasks required under the national sector reform study component of the institutional strengthening part of the project are described in the terms of reference. The major tasks and estimated time schedules to complete them are described as follows:

Task No.	Task Description	Dates	
		Start	End
A.	Determine, Describe and Evaluate Existing Sector	1/1/98	1/4/98

Conditions organizations, conditions, laws, financial and regulatory activities and other factors which effect the sector at the national level)

- |    |   |               |
|----|---|---------------|
| B. | Recommend Changes for Sector Strengthening<br>(with emphasis on required support for a new regional sector authority in Dashkhovuz) | 1/4/98 1/6/98 |
| C. | Prepare Action Plan for National Sector Reform  | 1/6/98 1/7/98 |

#### **V. Action Category D: Establish Regional Sector Authority**

The specific tasks required under the component of the institutional strengthening part of the project which relates to the establishment of a new regional sector authority are described in the terms of reference. The major tasks and estimated time schedules to complete them are described as follows:

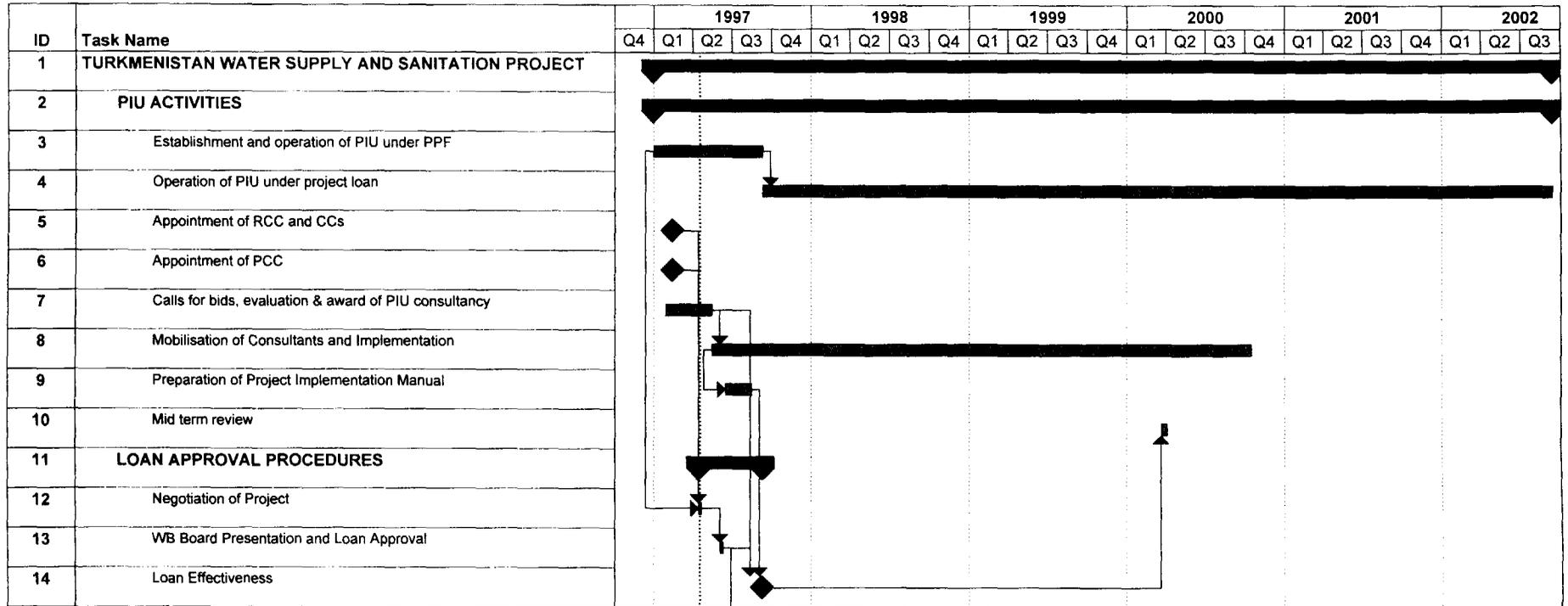
Task No.	Task Description	Dates	
		Start	End
A.	Determine, Describe and Evaluate Existing Sector Conditions (organizations, conditions, laws, financial and regulatory activities and other factors which effect the sector at the Dashkhovuz Velayet level)	1/1/98	1/4/98
B.	Draft Legislation to Create the New Regional Sector Authority	1/2/98	1/4/98
C.	Prepare Action Plan for Implementation (describe specific steps required to transform the existing sector organizations in Dashkhovuz into the proposed new regional sector organization, DRWASA)	1/4/98	1/7/98
D.	Provide Assistance to the GOT/Velayet in Implementation (work with national and local authorities to implement the activities described in the Action Plan)	1/7/98	1/1/99

#### **VI. Action Category E: Strengthen Regional Sector Authority**

The specific tasks required under the component of the institutional strengthening part of the project which relates to the strengthening of the newly established regional sector authority are described in the terms of reference. The major tasks and estimated time schedules to complete them are described as follows:

Task No.	Task Description	Dates	
		Start	End
A.	Strengthen Administration & Management Capabilities	1/1/99	1/1/00
B.	Strengthen Technical & O&M Capabilities	1/4/99	1/9/99
C.	Strengthen Finance and Revenue Generation Capabilities	1/5/99	1/1/00
D.	Strengthen Personnel Management Capabilities	1/6/99	1/1/00
E.	Strengthen Quality Control Capabilities	1/7/99	1/1/00

ANNEX J: PROJECT IMPLEMENTATION PLAN



Task



Milestone



Summary

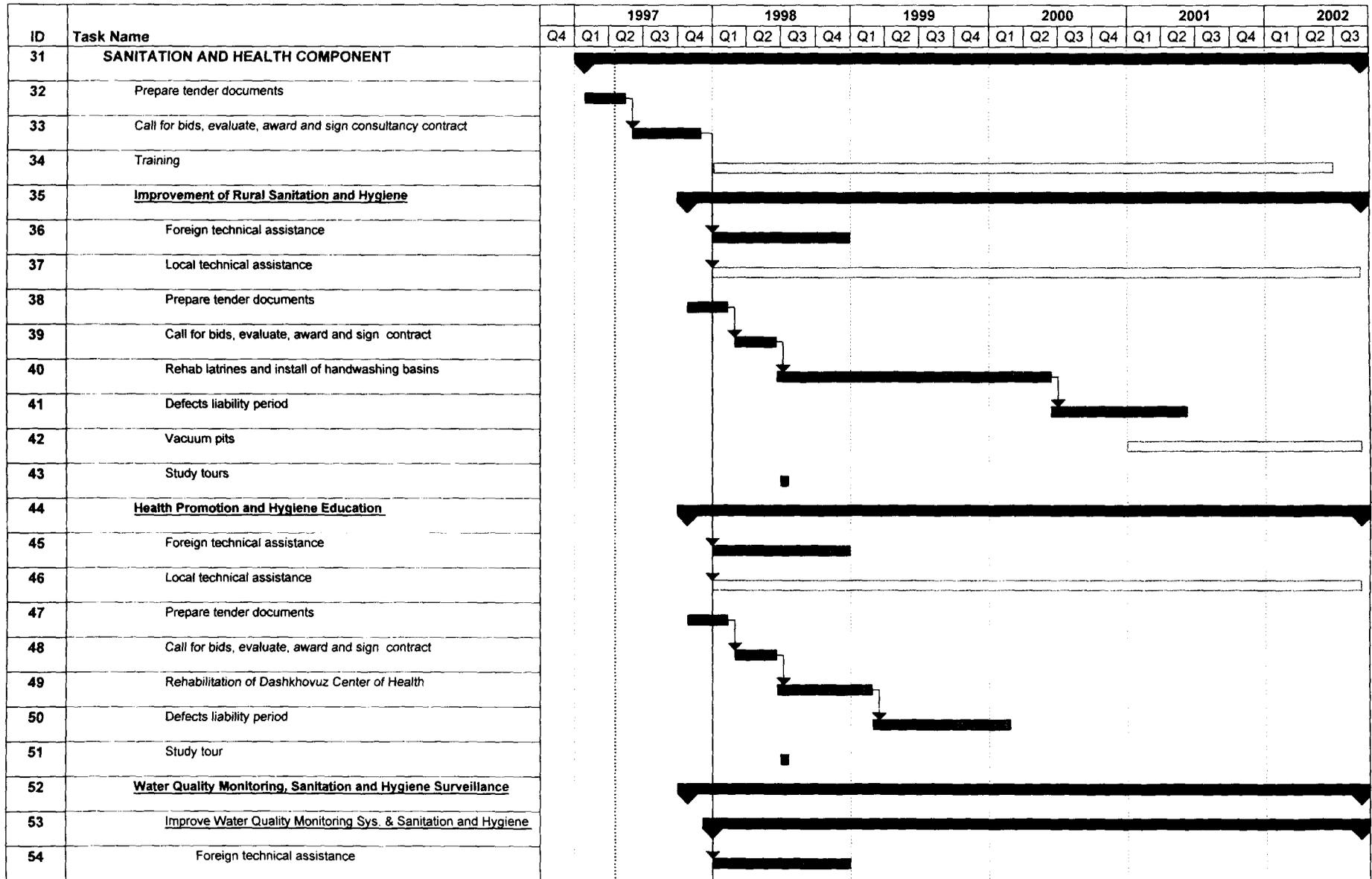


Intermittent task





ANNEX J: PROJECT IMPLEMENTATION PLAN



Task



Milestone



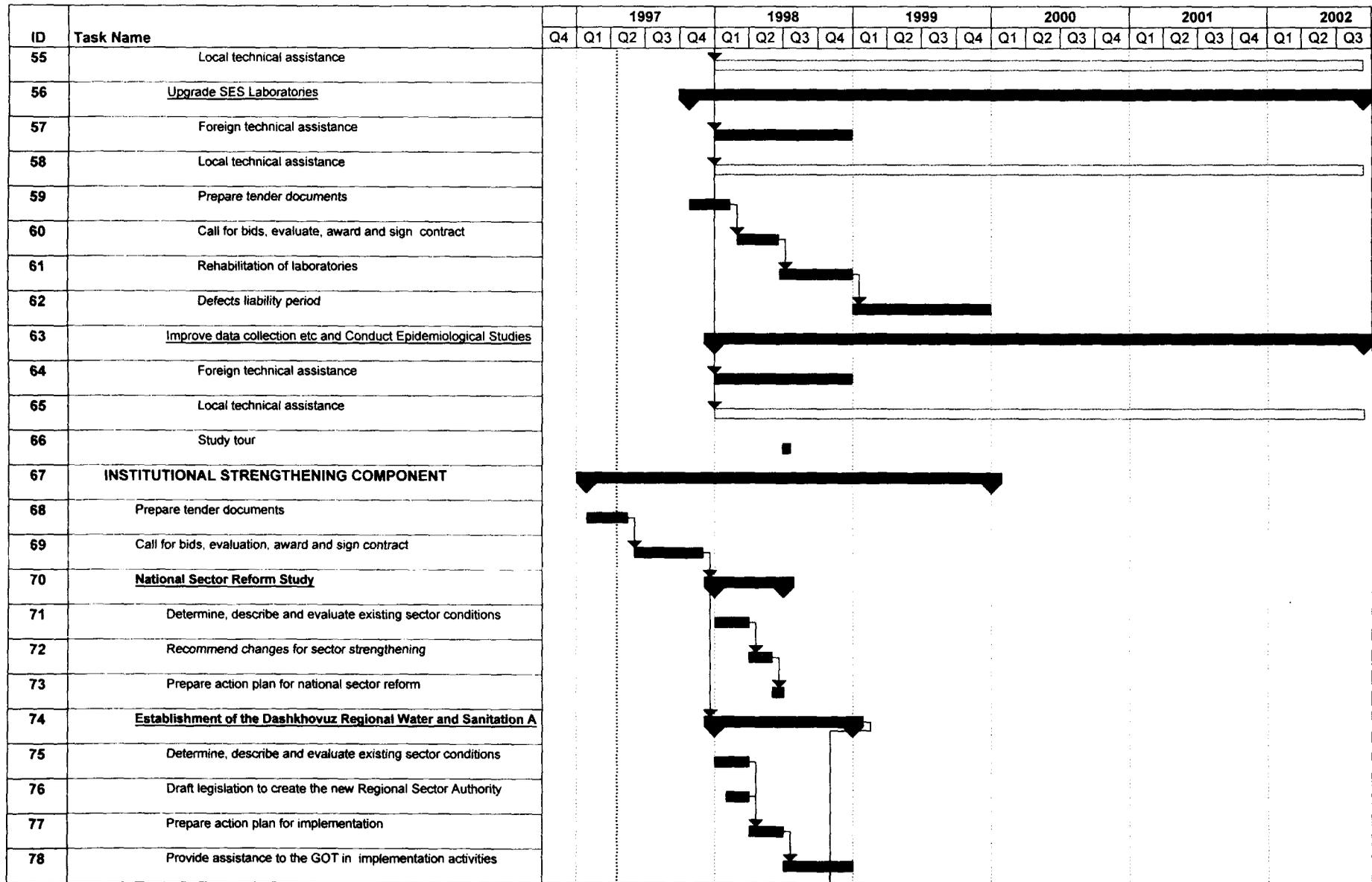
Summary



Intermittent task



ANNEX J: PROJECT IMPLEMENTATION PLAN



**ANNEX J: PROJECT IMPLEMENTATION PLAN**

ID	Task Name	1997				1998				1999				2000				2001				2002			
		Q4	Q1	Q2	Q3																				
79	<u>Institutional Strengthening of the Regional Authority</u>																								
80	Strengthen administration and management capabilities																								
81	Strengthen technical and O&M capabilities																								
82	Strengthen finance and revenue generation capabilities																								
83	Strengthen quality control capabilities																								
84	<u>Public Awareness Program</u>																								

Task



Milestone



Summary



Intermittent task



ANNEX K: DETAILED COST TABLES

Table 1: Expenditure Accounts by Components - Total Costs Including Contingencies (US\$ '000)

	Sanitation and Health												Total		
	Water Supply and Distribution Rehabilitation, upgrading and extension		Assistance to operation of facilities	Health Promotion and Education		Water Qty. Monitoring & Hygiene surveillance			Institutional Development to Improve delivery of Water & Sanitation					Project Management & Implementation	
	Urban centers (7 traps)	Rural Farms (9 Kolkoses)		Improve Rural Sanitation & Hygiene	Rehabilitation of Latrines & install handsinks	Health Promotion in Rural Areas	Improve monitor system for water qty. & hygiene surveillance	Upgrade SES laboratories in Tashauz Veilayet	Improve data collection, analysis & reporting; Epidem. studies	National Sector Reform studies	Establish Regional Water & Sanitation Authority	Institutional Strengthening of Regional Authority			Public Communication Program
<b>I. Investment Costs</b>															
<b>A. Civil Works</b>															
Rehab Water Supply	10,353	12,773	-	-	-	-	-	-	-	-	-	-	-	1,178	24,304
Rehab Sanitation	-	-	-	169	59	-	236	-	-	-	-	-	-	-	464
<b>Subtotal Civil Works</b>	<b>10,353</b>	<b>12,773</b>		<b>169</b>	<b>59</b>		<b>236</b>							<b>1,178</b>	<b>24,768</b>
<b>B. Equipment</b>															
Water supply & Sanitation Equipment	-	-	313	-	58	-	382	-	-	-	-	-	-	-	752
Other Equipment	-	-	-	25	18	28	10	17	12	35	30	4	-	134	312
<b>Subtotal Equipment</b>			<b>313</b>	<b>25</b>	<b>75</b>	<b>28</b>	<b>391</b>	<b>17</b>	<b>12</b>	<b>35</b>	<b>30</b>	<b>4</b>		<b>134</b>	<b>1,064</b>
<b>C. Furniture</b>															
Furniture	-	-	-	-	23	-	129	-	-	-	-	-	-	-	152
<b>D. Vehicles</b>															
Vehicles	-	-	-	18	41	159	-	-	-	41	53	-	-	23	335
<b>E. Educational Material</b>															
Educational Material	-	-	-	7	14	11	-	-	-	-	-	6	-	-	58
<b>F. Technical Assistance</b>															
Foreign Consultants	-	-	-	225	166	143	123	82	184	408	962	83	-	1,276	3,650
Local Consultants	-	-	-	180	192	240	120	72	-	35	35	10	-	884	
Studies	-	-	-	-	-	-	-	161	-	-	-	-	-	161	
<b>Subtotal Technical Assistance</b>				<b>405</b>	<b>358</b>	<b>383</b>	<b>243</b>	<b>315</b>	<b>184</b>	<b>444</b>	<b>997</b>	<b>92</b>		<b>1,276</b>	<b>4,696</b>
<b>G. Training</b>															
Workshops/Seminar	-	-	-	115	101	21	15	12	-	-	-	-	-	33	298
Study Tours/Fellowship	-	-	-	16	34	-	-	34	-	-	-	-	-	56	139
<b>Subtotal Training</b>				<b>130</b>	<b>135</b>	<b>21</b>	<b>15</b>	<b>46</b>						<b>89</b>	<b>437</b>
<b>H. Supplies</b>															
WS&Sanitation chemicals, supplies and tools	-	-	835	57	-	-	-	-	-	-	-	-	-	-	891
Other Supplies	-	-	-	-	20	-	-	-	-	-	-	-	-	-	20
<b>Subtotal Supplies</b>			<b>835</b>	<b>57</b>	<b>20</b>										<b>911</b>
<b>Total Investment Costs</b>	<b>10,353</b>	<b>12,773</b>	<b>1,147</b>	<b>810</b>	<b>724</b>	<b>602</b>	<b>1,014</b>	<b>398</b>	<b>196</b>	<b>520</b>	<b>1,080</b>	<b>102</b>		<b>2,701</b>	<b>32,421</b>
<b>II. Recurrent Costs</b>															
<b>A. Facilities Maintenance</b>															
Facilities Maintenance	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2
<b>B. Personnel</b>															
Higher level staff	-	-	-	-	-	-	-	-	-	-	-	-	-	87	87
Middle level staff	-	-	-	-	-	-	-	-	-	-	-	-	-	168	168
Support level staff	-	-	-	-	-	-	-	-	-	-	-	-	-	27	27
<b>Subtotal Personnel</b>														<b>282</b>	<b>282</b>
<b>C. Office space &amp; operations</b>															
Office space & operations	-	-	-	60	20	55	28	20	11	527	-	3	-	149	874
<b>D. Miscellaneous</b>															
Miscellaneous	-	-	-	-	-	-	-	-	6	55	46	-	-	16	122
<b>Total Recurrent Costs</b>				<b>62</b>	<b>20</b>	<b>55</b>	<b>28</b>	<b>20</b>	<b>17</b>	<b>581</b>	<b>46</b>	<b>3</b>		<b>447</b>	<b>1,280</b>
<b>Total PROJECT COSTS</b>	<b>10,353</b>	<b>12,773</b>	<b>1,147</b>	<b>872</b>	<b>744</b>	<b>658</b>	<b>1,041</b>	<b>418</b>	<b>212</b>	<b>1,101</b>	<b>1,126</b>	<b>105</b>		<b>3,148</b>	<b>33,701</b>
<b>Taxes</b>	<b>1,035</b>	<b>1,277</b>		<b>17</b>	<b>6</b>		<b>24</b>								<b>2,359</b>
<b>Foreign Exchange</b>	<b>7,822</b>	<b>9,691</b>	<b>1,147</b>	<b>511</b>	<b>438</b>	<b>348</b>	<b>800</b>	<b>318</b>	<b>197</b>	<b>485</b>	<b>1,054</b>	<b>93</b>		<b>2,328</b>	<b>25,232</b>

ANNEX K DETAILED COST TABLES

Table 2: Expenditure Accounts by Components - Base Costs (US\$ '000)

	Sanitation and Health													Project Management & Implementation				
	Water Supply and Distribution Rehabilitation, upgrading and extension		Improve Rural Sanitation & Hygiene		Health Promotion and Education		Water Qty. Monitoring & Hygiene surveillance			Institutional Development to improve delivery of Water & Sanitation			Public Communication Program				Establish Project Management Unit	Total
	Urban centers (7 traps)	Rural Farms (9 Kolkoses)	Assistance to operation of facilities	Rehabilitation of Latrines & install handsinks	Health Promotion in Rural Areas	Improve monitor system for water qty. & hygiene surveillance	Upgrade SES laboratories in Tashauz Velayet	Improve data collection, analysis & reporting; Epidem. studies	National Sector Reform studies	Establish Regional Water & Sanitation Authority	Institutional Strengthening of Regional Authority	Establish		%	Amount			
<b>I. Investment Costs</b>																		
<b>A. Civil Works</b>																		
Rehab Water Supply	8,673	10,463	-	-	-	-	-	-	-	-	-	-	-	1,134	20,270	14.2	2,870	
Rehab Sanitation	-	-	-	142	50	-	200	-	-	-	-	-	-	-	-	392	15.0	59
<b>Subtotal Civil Works</b>	<b>8,673</b>	<b>10,463</b>	<b>-</b>	<b>142</b>	<b>50</b>	<b>-</b>	<b>200</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1,134</b>	<b>20,662</b>	<b>14.2</b>	<b>2,929</b>	
<b>B. Equipment</b>																		
Water supply & Sanitation Equipment	-	-	250	-	49	-	325	-	-	-	-	-	-	-	624	15.0	94	
Other Equipment	-	-	-	21	15	24	8	15	10	30	26	4	113	265	15.0	40		
<b>Subtotal Equipment</b>	<b>-</b>	<b>-</b>	<b>250</b>	<b>21</b>	<b>64</b>	<b>24</b>	<b>333</b>	<b>15</b>	<b>10</b>	<b>30</b>	<b>26</b>	<b>4</b>	<b>113</b>	<b>889</b>	<b>15.0</b>	<b>133</b>		
<b>C. Furniture</b>																		
Furniture	-	-	-	-	20	-	110	-	-	-	-	-	-	-	130	15.0	20	
<b>D. Vehicles</b>																		
Vehicles	-	-	-	15	35	135	-	-	-	35	45	-	-	20	285	15.0	43	
<b>E. Educational Material</b>																		
Educational Material	-	-	-	6	12	10	-	-	-	-	-	-	-	-	51	5.0	3	
<b>F. Technical Assistance</b>																		
Foreign Consultants	-	-	-	220	180	140	120	80	180	400	920	80	1,240	3,540	-	-	-	
Local Consultants	-	-	-	180	192	240	120	72	-	35	35	10	-	884	-	-	-	
Studies	-	-	-	-	-	-	-	-	-	-	-	-	-	150	-	-	-	
<b>Subtotal Technical Assistance</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>400</b>	<b>352</b>	<b>380</b>	<b>240</b>	<b>302</b>	<b>180</b>	<b>435</b>	<b>955</b>	<b>90</b>	<b>1,240</b>	<b>4,574</b>	<b>-</b>	<b>-</b>	<b>-</b>	
<b>G. Training</b>																		
Workshops/Seminar	-	-	-	102	90	19	13	11	-	-	-	-	-	30	265	10.0	27	
Study Tours/Fellowship	-	-	-	14	30	-	-	-	-	-	-	-	-	50	124	10.0	12	
<b>Subtotal Training</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>116</b>	<b>120</b>	<b>19</b>	<b>13</b>	<b>11</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>80</b>	<b>389</b>	<b>10.0</b>	<b>39</b>	
<b>H. Supplies</b>																		
WS& Sanitation chemicals, supplies and tools	-	-	750	50	-	-	-	-	-	-	-	-	-	-	800	5.0	40	
Other Supplies	-	-	-	-	18	-	-	-	-	-	-	-	-	-	18	5.0	1	
<b>Subtotal Supplies</b>	<b>-</b>	<b>-</b>	<b>750</b>	<b>50</b>	<b>18</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>818</b>	<b>5.0</b>	<b>41</b>		
<b>Total Investment Costs</b>	<b>8,673</b>	<b>10,463</b>	<b>1,000</b>	<b>751</b>	<b>671</b>	<b>568</b>	<b>896</b>	<b>376</b>	<b>190</b>	<b>500</b>	<b>1,026</b>	<b>99</b>	<b>2,587</b>	<b>27,799</b>	<b>11.5</b>	<b>3,207</b>		
<b>II. Recurrent Costs</b>																		
<b>A. Facilities Maintenance</b>																		
Facilities Maintenance	-	-	-	2	-	-	-	-	-	-	-	-	-	-	2	5.0	0	
<b>B. Personnel</b>																		
Higher level staff	-	-	-	-	-	-	-	-	-	-	-	-	-	87	87	-	-	
Middle level staff	-	-	-	-	-	-	-	-	-	-	-	-	-	168	168	-	-	
Support level staff	-	-	-	-	-	-	-	-	-	-	-	-	-	27	27	-	-	
<b>Subtotal Personnel</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>282</b>	<b>282</b>	<b>-</b>	<b>-</b>	
<b>C. Office space &amp; operations</b>																		
Office space & operations	-	-	-	58	19	53	26	19	11	502	-	3	142	832	5.0	42		
<b>D. Miscellaneous</b>																		
Miscellaneous	-	-	-	-	19	53	26	19	5	52	43	-	15	115	5.4	6		
<b>Total Recurrent Costs</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>58</b>	<b>19</b>	<b>53</b>	<b>26</b>	<b>19</b>	<b>16</b>	<b>554</b>	<b>43</b>	<b>3</b>	<b>142</b>	<b>439</b>	<b>1,231</b>	<b>3.9</b>	<b>48</b>	
<b>Total BASELINE COSTS</b>	<b>8,673</b>	<b>10,463</b>	<b>1,000</b>	<b>810</b>	<b>690</b>	<b>621</b>	<b>923</b>	<b>395</b>	<b>206</b>	<b>1,054</b>	<b>1,069</b>	<b>101</b>	<b>3,026</b>	<b>29,030</b>	<b>11.2</b>	<b>3,255</b>		
Physical Contingencies	1,301	1,569	75	44	40	29	99	8	3	37	13	1	36	3,255	-	-	-	
Price Contingencies	379	741	72	18	14	8	19	16	4	10	44	3	86	1,418	11.2	158	-	
<b>Total PROJECT COSTS</b>	<b>10,352</b>	<b>12,773</b>	<b>1,147</b>	<b>872</b>	<b>744</b>	<b>658</b>	<b>1,041</b>	<b>418</b>	<b>212</b>	<b>1,101</b>	<b>1,126</b>	<b>105</b>	<b>3,148</b>	<b>33,701</b>	<b>10.1</b>	<b>3,413</b>		
<b>Taxes</b>	<b>1,035</b>	<b>1,277</b>	<b>-</b>	<b>17</b>	<b>6</b>	<b>-</b>	<b>24</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>2,359</b>	<b>13.0</b>	<b>308</b>		
<b>Foreign Exchange</b>	<b>7,822</b>	<b>9,691</b>	<b>1,147</b>	<b>511</b>	<b>438</b>	<b>348</b>	<b>800</b>	<b>318</b>	<b>197</b>	<b>485</b>	<b>1,054</b>	<b>93</b>	<b>2,328</b>	<b>25,232</b>	<b>10.3</b>	<b>2,596</b>		

## ANNEX K: DETAILED COST TABLES

Table 3. Project Cost Summary by Components - (US\$ '000s)

	(Manat '000)			(US\$ '000)			%	% Total
	Local	Foreign	Total	Local	Foreign	Total	Foreign Exchange	Base Costs
<b>A. Water Supply and Distribution Dashkhovouz</b>								
<b>1. Rehabilitation, upgrading and extension</b>								
Urban centers (7 etraps)	10,190,433	30,571,300	40,761,734	2,168	6,505	8,673	75	30
Rural Farms (9 Kolkoses)	12,293,978	36,881,934	49,175,912	2,616	7,847	10,463	75	36
<b>Subtotal Rehabilitation, upgrading and extension</b>	22,484,411	67,453,234	89,937,646	4,784	14,352	19,136	75	66
2. Assistance to operation of facilities	-	4,700,000	4,700,000	-	1,000	1,000	100	3
<b>Subtotal Water Supply and Distribution Dashkhovouz</b>	22,484,411	72,153,234	94,637,646	4,784	15,352	20,136	76	69
<b>B. Sanitation and Health</b>								
<b>1. Improve Rural Sanitation &amp; Hygiene</b>								
Rehabilitation of Latrines & install handsinks	1,624,795	2,181,171	3,805,966	346	464	810	57	3
<b>2. Health Promotion and Education</b>								
Health Promotion in Rural Areas	1,391,670	1,852,270	3,243,940	296	394	690	57	2
<b>3. Water Qty. Monitoring &amp; Hygiene surveillance</b>								
Improve monitor system for water qty. & hygiene surveillance	1,438,670	1,479,090	2,917,760	306	315	621	51	2
Upgrade SES laboratories in Tashauz Velayet	1,069,908	3,267,252	4,337,160	228	695	923	75	3
Improve data collection, analysis & reporting; Epidem. studies	464,830	1,390,260	1,855,090	99	296	395	75	1
<b>Subtotal Water Qty. Monitoring &amp; Hygiene surveillance</b>	2,973,408	6,136,602	9,110,010	633	1,306	1,938	67	7
<b>Subtotal Sanitation and Health</b>	5,989,873	10,170,043	16,159,916	1,274	2,164	3,438	63	12
<b>C. Institutional Development to Improve delivery of Water &amp; Sanitation</b>								
1. National Sector Reform studies	68,432	897,700	966,132	15	191	206	93	1
2. Establish Regional Water & Sanitation Authority	2,767,360	2,185,500	4,952,860	589	465	1,054	44	4
3. Institutional Strengthening of Regional Authority	327,120	4,695,770	5,022,890	70	999	1,069	93	4
4. Public Communication Program	58,656	417,830	476,486	12	89	101	88	-
<b>Subtotal Institutional Development to Improve delivery of Water &amp; Sanitation</b>	3,221,568	8,196,800	11,418,368	685	1,744	2,429	72	8
<b>D. Project Management &amp; Implementation</b>								
1. Establish Project Management Unit	3,805,120	10,417,832	14,222,952	810	2,217	3,026	73	10
<b>Subtotal Project Management &amp; Implementation</b>	3,805,120	10,417,832	14,222,952	810	2,217	3,026	73	10
<b>Total BASELINE COSTS</b>	35,500,972	100,937,910	136,438,882	7,553	21,476	29,030	74	100
Physical Contingencies	3,770,087	11,528,885	15,298,972	802	2,453	3,255	75	11
Price Contingencies	532,565	6,123,216	6,655,780	113	1,303	1,416	92	5
<b>Total PROJECT COSTS</b>	39,803,624	118,590,011	158,393,634	8,469	25,232	33,701	75	116

## ANNEX L: ENVIRONMENTAL ANALYSIS

### A. Project Impact and Environmental Rating

1. The Turkmenistan Water Supply and Sanitation Project is designed to improve the health and quality of life of the target population by providing safe and adequate supplies of drinking water and improve sanitation. Approximately 108,000 people living in the seven Etrap centers and 82,000 in nine collective farms (including 62,000 new consumers) would benefit from improved water supplies. The project is expected to have a positive impact on public health while maintaining or improving quality and quantity of regional water resources. Rehabilitation of disinfection systems; leak repair; improved sanitation facilities; and increased water delivery periods would reduce levels of bacteriological contamination in the drinking water supplies. Technical improvements to the distribution system including leak repair and the provision of automatic shut-off valves on public standpipes combined with public awareness and education efforts would promote water conservation. Improvements to the water quality laboratories and training would improve the region's water quality monitoring capabilities.

2. The project has been assigned a Category 'B' rating. Project activities involve primarily rehabilitation and small expansions of the existing well fields, pipelines, and treatment facilities. No resettlement or property rights issues would be raised since the project focuses on rehabilitation of existing facilities. All works would be executed either within the premises of existing facilities, existing public streets or publicly owned property. The project will not affect any archeological or historical sites. Under the terms of the bidding documents, the contractors would be responsible for keeping worksites pollution free, returning sites to their original condition, and minimizing dust, noise or other work-related nuisances. Contractors would be responsible for notification to authorities of the discovery of any previously unknown archeological or historic sites, and the suspension of work until decisions are taken concerning necessary steps to protect such sites. The project will have no impact on the flow regime or quality of water in the Amu Darya River, and therefore does not require notification for the purposes of OD.7.50.

### B. Project Background and Environmental Issues

3. **Surface Water Resources.** The study area is arid and is located in the lower plain of one of the Amu Darya river, a flat plain gently sloping westwards towards the Sarykamish lake. The essentially agricultural plain is marked by a dense network of irrigation and drainage canals. There are five large-scale irrigation systems all taking origin from the Amu Darya. The main canals are: Shavat, Gazavat, Klychbay, Dzumabaysana and Soviet Yab (now Kazak Yab). The latter excepted, the remaining four canals cross Khorezm, an agricultural area in Uzbekistan, and receive the region's agricultural, industrial and municipal effluents. The drainage of the irrigation water is conveyed into four large collector canals: Chagat, Atabent, Ozemy, Daryalyk and the main Kunya Urgench. The collector main follows the trace of a fossil river bed of the Amu Darya river and conveys the drained water into the Sarakamysh basin, a 40 meter deep depression. The system has been in operation for thirty years and has created the present Sarakamysh lake which has a total a surface of 3,000 km<sup>2</sup>.

4. **Groundwater Resources.** Geologically, the Dashkhovuz area is a sedimentary basin formerly occupied by a Neogene sea, constituted by a Triassic basement overlain by mesozoic-cenozoic deposits. Neogene deposits with interspersed recent quaternary alluvia constitute a widespread shallower formation. In general terms, shallow bearing deposits exist in the upper 20 to 30 m thick series of Neogene-Quaternary sediments. These are underlain by a 90 to 120 m thick sequence of paleogene clays, acting as a regional impermeable substratum to the shallower water bearing sediments. The shallow groundwater in the Dashkhovuz Plain is generally highly mineralized, with total salinity between 15 and 30 g/l and generally

increasing towards the depth.

5. **Piped Water Supply Systems.** Recharge of the shallow aquifer occurs essentially through seepage from the irrigation canals. Shallow aquifer lenses along the canals benefit by recharge of relatively fresh water (salinity < 1.5 g/l) from the canals. In comparison with the quality of the regional ground water system, and the surface water, this system provides a relatively fresh water supply for the region. The infiltrated canal water forms lenses of fresh water reaching a maximum thickness of 20-30 m beneath the canal and becoming thinner progressively at perpendicular distances from the canal. The piped water supply systems for both the etrap centers and the collective farms in the study use shallow wells adjacent to, and as described above hydraulically linked, with an irrigation canal as the water source. These wells are typically 10-25 m deep, and between 4 and 12 are provided for each system. Operation of the well fields often does not follow well field rules recommended by hydrogeologist (due to malfunctioning equipment). This may lead to a disruption in the design flow regime and increases the chances of drawing water of relatively poor quality.

6. **Sanitation.** Pit latrines are the only form of sanitation practiced in the project area. Although household sanitation coverage is almost universal, the facilities are often in very poor condition and hygiene is poor.

### C. Project Activities and Impacts

7. **Piped Water Supply Systems.** The project will rehabilitate and expand piped water system to seven etrap centers and nine collective farms and provide a supply of spare parts and repair materials. The project would repair existing street standpipes and provide new taps as required to provide space of about 70 m between taps. The existing well fields will be rehabilitated and new borehole pumps and control installed. Chlorination systems would be installed. The major environmental concern related to this component is the impact on groundwater resources. Improvement to the wellfields would reduce water wastage and improve water quality. In the seven Etrap centers the increase of the per capita water service would be achieved through improvement of the distribution system and consequent reduction of the water losses. The need of groundwater production will only slightly increase from the present 6,331 m<sup>3</sup>/day to 6,482 m<sup>3</sup>/day and would have no consequence in the groundwater balance of the wellfields. In the ten collective farms, the production of groundwater will increase from the present 155 m<sup>3</sup>/day serving 15,793 rural population to 2,461 m<sup>3</sup>/day for the needs of the rural population. The groundwater production potentials of the near-canal groundwater bearing lenses identified on the basis of hydrogeological investigations and from inventory of existing and programmed wells (as documented in the project feasibility report) appear in all cases large enough to satisfy the required present and projected quantities of groundwater to be produced (Table 1). Thus the induced recharge to the aquifer lenses from the canals is large enough to sustain increased groundwater withdrawal projected at the horizon 2001 and there will be no impact on the hydrodynamic equilibrium of the aquifers.

**Table 1: Groundwater Resources: Production and Potential**

Etrap Centers			
Name	Production m <sup>3</sup> /d		Groundwater Potential (m <sup>3</sup> /d)
	1996	2001	
Akdepe	968	1,022	7,500
Boldumsaz	1,340	1,077	3,000
Gubadagh	518	588	1,600
Kunya-Urgench	864	1,361	34,500
Niyazovsk	691	610	7,400
Tagta	622	720	1,600
Yilanly	1,328	1,104	3,100
Collective Farms			
Ersarieva/AKD	26	525	3,200
On Yl Abadanlik/BLD	29	166	2,500
Bereket/GBD	26	402	3,100
Maslahat/KNU	20	332	
Shodlik/NYZ	25	376	1,550
Magtymguly/TGT	-	196	2,800
Andalip/YLN	29	464	12,960
Kirk-Giz/KNU	32	151	1,944
Darjalik/KNU	-	131	1,032

8. **Wastewater.** Upon implementation of the water supply component of this project in the year 2001, 74% of the present population of the seven Etrap centers and 85% of the inhabitants of the ten collective farms would have access to water supply delivered by standpipes at very accessible distance for each household. Each Etrap center and rural inhabitant will have access to 48 and 26 l/day respectively. This means 274 and 148 l/household per day in the urban and rural areas respectively. A large percentage of this will become wastewater. The wastewater would result mostly from washing and other various household activities. Currently, sullage is disposed of by putting it in a pit in the yard or reuse for gardens. Since the project is not providing yard or household connections, and standpipe wastage would be reduced by use of automatic valves, the project keeps any negative impact of wastewater at a minimum. Considering the large spaces available and the arid climate, the current methods of wastewater disposal should continue to be effective. Obviously, in the longer term, as households move towards house connections and flush toilets, the wastewater disposal issue would need to be addressed.

9. **Sanitation.** The project would involve rehabilitation of pit latrines and installation of hand washing

facilities at schools and markets. The schools selected would be in villages receiving improved water supply systems and the markets in the etrap centers, all of which are receiving improved water supply systems. This component addresses the most urgent needs of unsanitary facilities and poor hygiene in communal facilities and is not likely to have any adverse environmental impacts. As part of this component, water quality monitoring and testing equipment, and training, would be provided to laboratories in each of the etrap centers thus enhancing the regional water quality surveillance program. Health education activities would complement the sanitation component and are an integral element of the overall strategy for improving public health. No adverse impacts are likely to occur from these activities.

#### **D. Overall Environmental Impact**

10. The overall impact of the project would be to provide an additional 108,000 urban and 82,000 rural consumers with improved water supplies. The entire population of the velayet, 950,000, is expected to benefit from the health and hygiene education program to the extent that this program has an impact on changing hygiene practices and on health, especially among children. Both urban and rural populations would benefit from improved sanitation at schools and markets. While providing better water supply and sanitation facilities, the project would also strengthen management of the water sector by establishing a regional water and wastewater authority in Dashkhovuz and strengthening management capabilities of the new authority.

11. Overall the project is envisaged to contribute substantially to the improvement of public health and quality of life in the project area with no adverse environmental impacts.

**ANNEX M: PROJECT IMPLEMENTATION UNIT****A. Project Implementation Unit**

1. A Project Implementation Unit (PIU) is being established in the MWR for the duration of the project. The PIU would have overall project responsibility for coordination of project activities. In addition, it would have responsibility for common implementation functions such as project accounting, procurement, disbursements, consolidation of annual work programs and budgets, and quarterly and annual progress reports. The PIU would also provide training and technical assistance coordination, project supervision, and assistance to the Regional Component Coordinator (RC) and other Component Coordinators (CCs). The PIU would serve as the primary contact with Government agencies, the Bank, other donors, NGOs and others. Construction management including supervisors and construction specialists will be located within the PIU. The detailed responsibilities and activity plans for the PIU are outlined below.

**General Functions of the PIU**

2. The general functions of the PIU would be:
- (a) Administration
  - (b) Project Planning
  - (c) Operating Procedure Development
  - (d) Implementation Oversight and Coordination
  - (e) Procurement and Disbursement Functions; and
  - (f) Training and Technical Assistance Coordination

**Specific PIU Responsibilities**

3. The following specific activities would be performed by the PIU:
- (a) Comply with directives of the Project Coordination Committee (PCC) and coordination of all activities needed for project execution. The PIU would serve as the Secretariat for the PCC.
  - (b) Prepare a Project Implementation Manual (PIM) summarizing procedures for monitoring project implementation; processing of withdrawal applications; use of Statement of Expenditures (SOEs), and overall project funds; replenishment of the special and project accounts; and methods of procurement to be followed under the project as per the Loan Agreement. The PIM would include sample forms of contracts and withdrawal applications.
  - (c) Assist in coordination between the Ministry of Water Resources, Ministry of Health, Ministry of Education, Dashkhovuz Velayat and participating etraps' administrations to ensure a consistent approach in project implementation.

- (d) Provide the technical, administrative and logistical assistance necessary to the implementing agencies.
- (e) Prepare Terms of Reference, recruit, train PIU local staff in overall project management and administration and procurement and disbursement procedures.
- (f) Prepare Terms of Reference, hire under terms and conditions satisfactory to the Bank, and supervise the external technical assistance who would assist the PIU in carrying out its responsibilities in supervising and assisting the implementation of project components.
- (g) Assist and supervise project activities of the Ministry of Water Resources and Ministry of Health and local administrations responsible for implementation with the preparation of bidding documents, procurement specifications, evaluation of bid proposals, negotiation of terms, and drafting of contracts between the suppliers and the project component units.
- (h) Review and approve the final project-related contracts for final approval by the Bank prior to contract signature.
- (i) Ensure that works, equipment, training and studies under execution are consistent with the requirements of the Implementation Plans for each component.
- (j) Develop and implement a simple but effective financial administration system for the project which would include procedures and controls to accurately account for loan disbursement and counterpart funds to enable adequate monitoring and control of project activities.
- (k) Maintain accounts and records in a manner that can be reviewed by Bank supervision staff and external auditors.
- (l) Manage Special Account, including compiling supporting documentation necessary to replenish the special account, and ensure timeliness of disbursements to contractors/suppliers.
- (m) Prepare consolidated quarterly and annual progress reports and annual work programs and budgets.

#### **Specific Construction Supervision Responsibilities**

4. During construction, the Construction Engineers will be responsible for field supervision of the construction work by the contractors. He/she will be expected to utilize staff from existing organizations within the project area that in the past have had responsibility for construction supervision, but should allow for training of such staff in the methods, procedures, and standards expected from site supervision by the Bank prior to commencement of work on site. Short term foreign construction specialists will provide additional assistance. The two construction supervisors tasks will include but necessarily be limited to:

- (a) Preparation of a detailed construction management plan including an environmental management plan, schedules for construction, bidding, financing including disbursement of the proceeds of the loan and budget appropriation by the GoT, final testing, commissioning and start-up of all project facilities;
- (b) Monitor the delivery and secure storage of materials and equipment;

- (c) Review shop drawings prepared by the contractors and equipment manufacturers and suppliers;
- (d) Monitor the contractors' topographic surveys and setting out of the works to ensure correct alignments and elevations of the facilities;
- (e) Inspect materials and equipment delivered to site and witness tests of materials and equipment to be incorporated into the works, if necessary at the manufacturers' premises;
- (f) Supervise, inspect, measure and control the quality of the construction of the works and the installation of equipment to ensure compliance with the drawings and specifications;
- (g) Review the contractors safety and environmental protection plans and supervise the implementation of all safety and environmental protection measures;
- (h) Maintain records of progress of the works and the results of inspections and test of materials and equipment, and all construction related activities;
- (i) Issue instructions to the contractors and equipment suppliers in connection with the construction of the works and in accordance with the contract documents;
- (j) Make recommendations and issue instructions, with the approval of the PIU to contractors on the extent of special inspections and testing required and to be carried out in connection with the construction of the works;
- (k) Compare actual progress with scheduled progress and advise the PIU of any developments that could delay completion. Recommend any actions necessary by the contractor or the GoT to facilitate timely completion of construction;
- (l) Record any change or previously unknown conditions that may require modifications to the design and/or specifications of the works, advise the PIU of the change, and recommend appropriate action; prepare any necessary work orders with the approval of the PIU;
- (m) Convene and attend monthly meetings with the contractor to review progress; prepare minutes of such meetings for general circulation;
- (n) Check, agree with the contractors and authorize interim payments for all contracts in accordance with the contract: evaluate claims by the contractor for additional payments and extensions of time and make appropriate recommendations to the GoT;
- (o) Provide independent advice to the PIU in the resolution of disputes between the GoT on one hand and contractors and/or suppliers on the other;
- (p) Provide advice and suggestions to the PIU on the overall construction works, and attend meetings concerning project implementation as and when required by GoT;
- (q) Prepare monthly progress reports for the PIU summarizing construction progress and the status of expenditure on the works;
- (r) Supervise final pressure tests of the major pipelines, and of all equipment start-up and commissioning. Inspect and approve all completed works and check contractors completed or as-built

schedules of quantities. Make recommendations to the PIU on the issuance of the certificate of completion; and

(s) Ensure that on completion of the works that the contractors provide such records and manufacturer's manuals that are necessary for the operation and maintenance of the works. Check the contractor's as-built drawings and compile a scheme specific operating manual for each project, including design philosophy and criteria, materials specifications, scheme layout and as-built drawings and individual plant operating manuals.

### B. PIU Organization and Staffing

5. The PIU would be headed by a Director with demonstrated management ability and vested with a sufficient level of authority to enable him/her to carry out the responsibilities of the PIU at the ministerial level and act as project spokesperson in relations between the Ministries, the Bank and other donors.

6. The Director would be assisted by a number of professional foreign and local staff and administrative/support staff assigned to the PIU (para 6). The PIU would perform the following functions.

(a) **Director.** The Director would be responsible for the technical and administrative management and leadership of the project. He/she would report to the Deputy Minister of Water Resources, responsible for Construction and Operations.

(b) **Project Planning and Control Function.** Within the PIU there would be a functional activity to prepare and maintain the Project Implementation Plan (PIP). In addition, the Project Planning and Control Function would provide ongoing support to the PIU Director in evaluating progress in the implementation of each component against activity and financial plans, and preparing revised plans that reflect project progress and revised strategies for effective use of project resources..

(c) **Procurement Function.** Within the PIU there would be a functional activity to coordinate all the procurement under the project. Specifically, it would provide assistance, advice, and supervision to the implementing agencies with regard to the procurement of civil works, equipment and related services, and recruitment of consultants.

(c) **Finance and Accounting Function.** Within the PIU there would be a functional activity to establish a financial management system, prepare and maintain project detailed and summary accounting and financial records and reports, including disbursement-related records.

7. **Staffing.** The PIU would be staffed by local staff and external advisors, and construction supervision foreign staff, as follows:

- PIU Director - Engineer (local)
- Economist/Planner (local)
- Health Specialist (local)
- Accountant/Disbursement (local)
- Procurement Specialist (local)
- Project Management Specialist - Long-term (foreign)
- Procurement Specialist - Long-term (foreign)
- Computer Specialist - Short Term (foreign)
- Financial Management Specialist - Short-term (foreign)

- Interpreter/translator (local)
- Bilingual Secretary (local)
- Construction Engineer (Supervisors - 2 positions: foreign)
- Construction Specialists - Short-term (foreign)

8. Critical activities of the PIU are included in the Project Implementation Plan (Annex J). Achievements objectives for the PIU are included in Performance Monitoring Indicators (Annex O).

### C. Budget

9. Initial PIU organization and start-up funding would be provided through a Project Preparation Facility (PPF). The initial funding would be US\$ 430,000 and would cover the cost of technical assistance (Project Management Specialist (10 months), Procurement Specialist (9 months) and Financial Management Specialist (3 months) -- all foreign); the PIU Director, the Regional Coordinator, and other local staff (Economist, Accountant, Interpreter/Translator, and a Secretary - 12 months each); equipment training of staff; and incremental recurrent costs.

10. For Project Management and Implementation, the loan would provide an additional US\$ 1.9 million over the years to finance consulting services in project management, procurement, and financial management, local staff, training, equipment, and incremental recurrent costs. Construction Supervision would receive an additional US \$1.2 million for foreign staff, training, and equipment.

### D. Record Keeping, Reporting and Evaluation

11. **PIU Record Keeping.** The PIU would maintain records and accounts of all financial transactions made with contractors, suppliers, and consulting firms. In addition, it would maintain records of all project related reports prepared during the life of the project.

12. **Project Reporting.** The PIU would prepare quarterly and annual progress reports on each component and the overall project. These reports would be prepared with inputs from the specific implementing agency. The PIU would only consolidate the reports and prepare a summary of main findings and recommendations (para 3.10). Reports would be submitted to the Bank.

13. **Project Component Monitoring and Reporting.** Monitoring would be carried out in five main areas: (a) the procurement and physical delivery of goods and construction contracts; (b) the physical implementation of project activities; (c) the impact on service delivery; (d) the financial management and control of project funds; and (e) the capacity building under the project. A systematic assessment would be carried out in the context of the Project Implementation Plan (Annex ...), Performance Monitoring Indicators, and, more specifically, the annual work programs. The indicators would be specifically indicated in the work programs and then be reported in the quarterly and annual reports along with the basic financial information.

### E. Financial Management and Accounting Control

14. **Chart of Accounts.** The project financial accounting transactions and reports would use a Chart of Accounts which would be maintained through regular posting of transaction detail and monthly development of trial balances for all accounts.

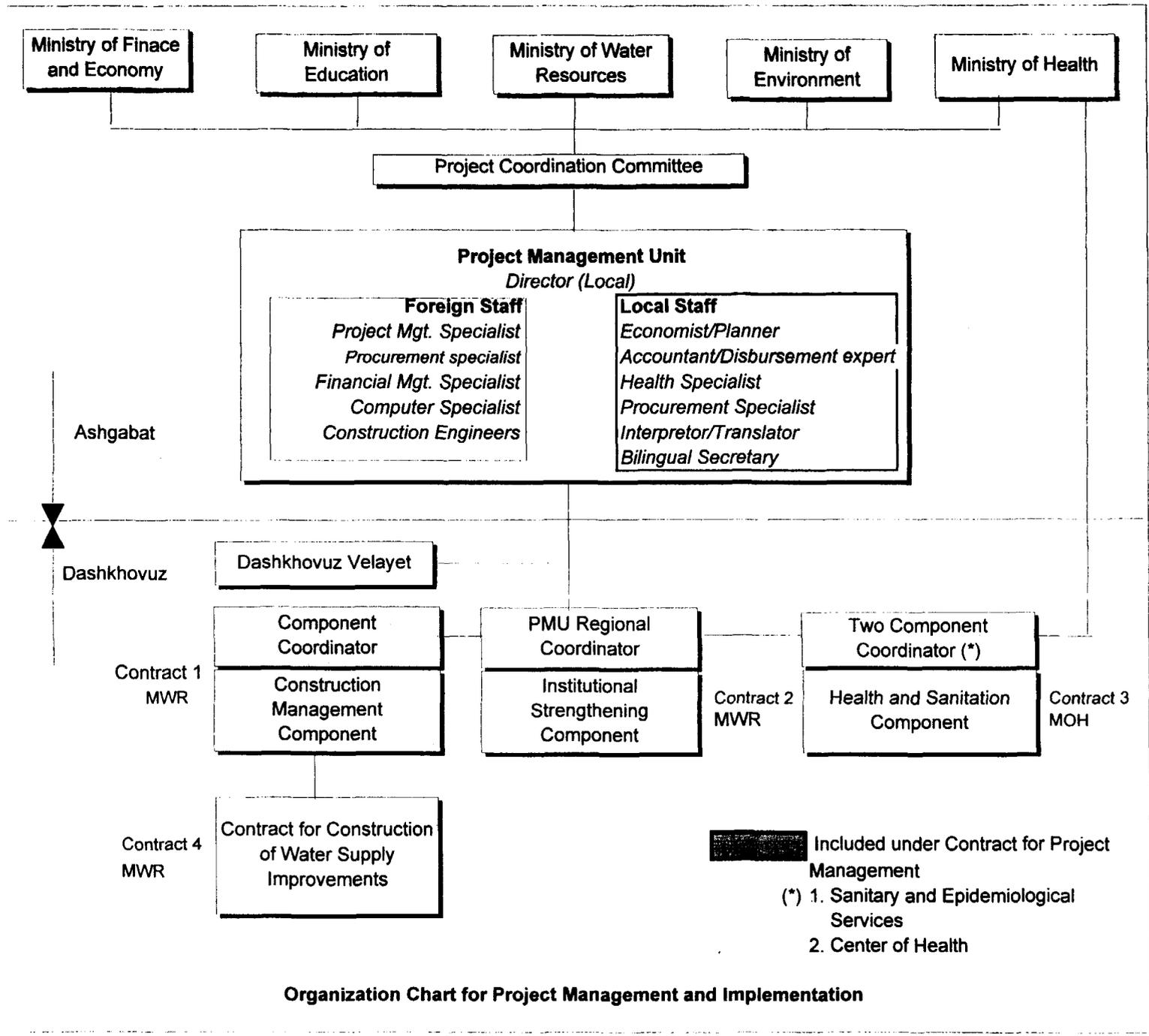
15. **Financial Status Reports.** The PIU Accounting Function would prepare a Project Financial Status Summary each month by the 20th of the subsequent month to keep the PIU Director informed of the

status of accounts and progress against spending plans of the project. These financial reports would then be consolidated and presented as part of the quarterly progress reports.

16. **Auditing and Control of Project Accounts.** Annually, the project accounting and financial records must be subjected to an independent audit by a certified professional auditing firm. To maintain control of project assets such as capital equipment, the project would establish and maintain a system of equipment and property control which provides for allocation of formal responsibility for all project-related items through signed personal responsibility vouchers.

ANNEX M: ORGANIZATIONAL CHART FOR PROJECT MANAGEMENT AND IMPLEMENTATION

IMPLEMENTATION



Organization Chart for Project Management and Implementation

## ANNEX N: SUPERVISION PLAN

Mission Dates	Character of Mission	Mission Staffing	Staff Weeks
07/97	Project Launching	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist Procurement/Disbursement Specialist	3 3 3 3 3
10/97	First Supervision Mission (after Effectiveness)	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist Procurement/Disbursement Specialist	3 2 2 2 2
02/98	Second Supervision Mission	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist Procurement/Disbursement Specialist	3 2 2 2 2
<b>FY98</b>			<b>37</b>
07/98	Third Supervision Mission	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
01/99	Fourth Supervision Mission	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
<b>FY99</b>			<b>18</b>
07/00	Fifth Supervision Mission (mid-term review)	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
01/01	Sixth Supervision Mission (to review action plan following mid-term review)	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
<b>FY00</b>			<b>18</b>

07/01	Seventh Supervision Mission	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
01/02	Eighth Supervision Mission	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
<b>FY01</b>			<b>18</b>
07/02	Ninth Supervision Mission	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
01/03	Last Supervision Mission prior to PCR	Task Manager Financial Analyst/Institutional Development Specialist Water Supply and Sanitation Engineer Public Health Specialist	3 2 2 2
<b>FY02</b>			<b>18</b>
<b>TOTAL</b>			<b>109</b>

## ANNEX O: PERFORMANCE MONITORING INDICATORS

Objective	Indicators	Means of Verification
<b>Project Development Objectives:</b>		
1. improve water supply and sanitation in seven etrap centers and nine collective farms in Dashkhovuz Velayet	<ul style="list-style-type: none"> <li>• % of population served by water supply system</li> <li>• number of borehole pumps operational/replaced/repared per month</li> <li>• number of hours increased in the duration of water supplied</li> <li>• % of water quality samples meeting bacteriological water quality standards</li> <li>• decrease in the incidence of water borne diseases particularly diarrheal diseases, subdivided by sex and age.</li> </ul> <p><b>Socio-economic impact indicators</b></p> <ul style="list-style-type: none"> <li>• timespent collecting water (hours)</li> <li>• % of households within 50m of public standpipes</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly Reports</li> <li>• Bank Supervision Reports</li> <li>• Water quality data provided to SES</li> <li>• SES morbidity and mortality quarterly statistics.</li> </ul>
2. initiate institutional changes in the water and sanitation sectors to ensure that the project is financially and technically sustainable	<ul style="list-style-type: none"> <li>• establishment of Dashkhovuz Regional Water and Sanitation Authority by December, 1998</li> <li>• Completion and discussion of the National Water and Wastewater study by December, 1998</li> <li>• Initiation of water charges for cost recovery for Operation and Maintenance (as systems come on line)</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly Reports</li> <li>• Bank Supervision Reports</li> <li>• Regional Water Authority Records</li> <li>• Presidential Decrees, National Sector Study Report</li> <li>• Water tariffs</li> </ul>
<b>Project Components:</b>		
The proposed project comprises four main components:		
1. Water Supply Improvements	<ul style="list-style-type: none"> <li>• kms of transmission mains rehabilitated</li> <li>• number of wells rehabilitated</li> <li>• number of pumping stations rehabilitated</li> <li>• kms of distribution pipework rehabilitated</li> <li>• number of new standpipes installed</li> <li>• number of standpipes rehabilitated</li> <li>• number of storage reservoirs rehabilitated</li> <li>• number of chlorination systems installed</li> </ul>	<ul style="list-style-type: none"> <li>• Contractors' records</li> <li>• Quarterly Reports</li> <li>• Bank Supervision Reports</li> <li>• Regional Water Authority Records</li> </ul>
2. Sanitation and Health	<ul style="list-style-type: none"> <li>• <u>number of staff trained</u> <ul style="list-style-type: none"> <li>• water quality surveillance</li> <li>• sanitation and hygiene surveillance</li> <li>• water quality monitoring and test procedures</li> <li>• epidemiological methods</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Statistics compiled by SES</li> <li>• Epidemiological studies</li> <li>• Quarterly Reports</li> <li>• Bank Supervision Reports</li> <li>• SES records</li> </ul>

	<ul style="list-style-type: none"> <li>• <u>number of workshops</u> <ul style="list-style-type: none"> <li>• water quality surveillance</li> <li>• sanitation and hygiene surveillance</li> <li>• water quality laboratory training</li> <li>• epidemiological methods</li> </ul> </li> </ul>	
A. Improvement of Rural Sanitation and Hygiene	<ul style="list-style-type: none"> <li>• number of latrines rehabilitated in schools/markets</li> <li>• number of handwashing basins installed</li> </ul>	<ul style="list-style-type: none"> <li>• Contractors' records</li> <li>• Quarterly Reports</li> <li>• Bank Supervision Reports</li> <li>• SES and Center of Health records</li> </ul>
B. Health and Hygiene Education	<ul style="list-style-type: none"> <li>• % of population receiving health education</li> <li>• number of Dashkhovuz Center of Health staff trained</li> <li>• number of workshops organized</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly Reports</li> <li>• Center of Health records</li> <li>• Bank Supervision Reports</li> </ul>
C. Water Quality Monitoring and Sanitation and Hygiene Surveillance	<ul style="list-style-type: none"> <li>• number of labs refurbished</li> <li>• number of epidemiological studies conducted</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly Reports</li> <li>• SES reports</li> <li>• Bank Supervision Reports</li> </ul>
3. Institutional Strengthening	<ul style="list-style-type: none"> <li>• Action plan for National sector Strength completed</li> <li>• Following Establishment of DRWASA policies and procedures adopted</li> <li>• Computer technical support center established</li> <li>• Number of staff trained <ul style="list-style-type: none"> <li>• computer technical support side skills</li> <li>• operation and maintenance skills</li> <li>• technical and management skills</li> </ul> </li> <li>• MIS established</li> <li>• Internal Audit Office established</li> <li>• Public Relations office established</li> <li>• Customer Service office opened</li> <li>• % population covered by campaign messages: leaflets, press, radio, television, etc.</li> <li>• % population reporting positive attitudes and practices before and after campaign regarding <ul style="list-style-type: none"> <li>• water conservation</li> <li>• cost-recovery</li> <li>• safe use of water</li> <li>• participation of the population in system operation and maintenance</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Regional Water Authority Records</li> <li>• Quarterly Reports</li> <li>• Bank Supervision Reports</li>   <li>• Quarterly Reports</li>   <li>• KAP Surveys</li> </ul>
4. Project Management and Construction Supervision	<ul style="list-style-type: none"> <li>• MIS</li> <li>• Annual Audit</li> <li>• Office Staff Hired</li> <li>• Office Established</li> </ul>	<ul style="list-style-type: none"> <li>• Quarterly Reports</li> <li>• Bank Supervision Reports</li> </ul>

## ANNEX P: PROCUREMENT ARRANGEMENTS

Table 1: Detailed Procurement Arrangements (in US\$ million)

	Procurement Method			Not Bank Financed	Total Cost
	International Competitive Bidding	National Competitive Bidding	Other		
1. Works					
1.1 Rehabilitation	22.60 (20.30)		0.50 <sup>a/</sup> (0.40)		23.10 (20.70)
2. Goods					
2.1 Equipment			1.10 <sup>b/</sup> (1.10)		1.10 (1.10)
2.2 Vehicles			0.30 <sup>c/</sup> (0.30)		0.30 (0.30)
2.3 Supplies	0.80 (0.80)		0.20 <sup>d/</sup> (0.20)		1.00 (1.00)
3. Consultant Services					
3.1 Technical Assistance			5.20 <sup>e/</sup> (5.20)		5.20 (5.20)
3.2 Construction Supervision			1.20 <sup>f/</sup> (1.20)		1.20 (1.20)
3.3 Training			0.40 <sup>g/</sup> (0.40)		0.40 (0.40)
4. Recurrent Costs			1.30 <sup>h/</sup> (0.50)		1.30 (0.50)
5. PPF			0.43 <sup>i/</sup> (0.43)		0.43 (0.43)
Total	23.40 (21.10)		10.33 (9.23)		33.73 (30.33)

**Figures may not total due to rounding.**

Figures in parentheses are the respective amounts financed by the Bank.

a/ Sanitation Civil Works \$0.5 million to be procured by National Shopping

b/ Includes Water Supply and Sanitation equipment \$0.8 million and office equipment \$0.3 million to be procured by International Shopping

c/ Vehicles to be procured by International Shopping

d/ Includes furniture of \$23,000 and other supplies of \$20,000 to be procured by National Shopping and Laboratory Furniture \$128,000 and water supply and sanitation supplies \$56,000 to be procured by International Shopping.

e/ Includes Local TA of \$0.9 million and Foreign TA of \$4.3 million to be procured per Guidelines for the use of Consultants, August, 1981.

f/ Includes Consulting Services for Construction Supervision \$1.2 million to be procured per Guidelines for the use of Consultants, August, 1981.

g/ Includes workshops/seminars \$297,000 and study tours \$139,000 to be procured per Guidelines for the use of Consultants, August, 1981.

h/ Includes office rent to be financed by the government \$787,752; PIU personnel salaries after effectiveness \$282,000 procured per Guidelines; and office operation, maintenance and communication costs \$76,000 and miscellaneous expenses \$122,000 to be procured by national shopping.

i/ Includes phase I of PIU consulting contract \$350,000; local consultants \$35,000; office equipment (NS) \$30,000; training \$10,000; and recurrent costs \$5,000

Table 2: Procurement Schedule

Category	Package	Estimated Cost (US\$000)	Procurement Method	Major Activities Schedule (Dates)			
				Issue Docs.	Bids/Pro.Recd.	Contract.Signed	Start/Delivery
<b>Civil Works</b>							
Water Supply Rehabilitation	1	23, 148	ICB with Prequalification*	July, 1997	September, 1997	December, 1997	January, 1998
Construction Supervision	1	1,178	Consultant Guidelines Shortlist	February, 1997	April, 1997	May, 1997	June, 1997
Sanitation Rehab.	16	169	NS	March, 1998	April, 1998	May, 1998	June, 1998
Health Center	1	59	NS	March, 1998	April, 1998	May, 1998	June, 1998
Laboratory Rehab.	9	236	NS	March, 1998	April, 1998	May, 1998	June, 1998
<b>Subtotal Civil Works</b>		<b>24,790</b>					
<b>Goods</b>							
Water Supply and Sanitation Equipment	3	752	IS	July, 1997	September, 1997	December, 1997	January, 1998
Other Equipment	4	281	IS	September, 1997	November, 1997	December, 1997	January, 1998
Furniture - Health Rehab	1	23	NS	July, 1998	September, 1998	October, 1998	February, 1999
- Upgrade SES Labs	1	129	IS	May, 1998	July, 1998	September, 1998	December, 1998
Water Supply and Sanitation Supplies	1	835	ICB	July, 1997	September, 1997	December, 1997	January, 1998
	1	57	IS	June, 1998	August, 1998	September, 1998	November, 1998
Other Supplies	1	20	NS	March, 1998	April, 1998	May, 1998	July, 1998
Educational Materials	5	58	NS	June, 1998	July, 1998	July, 1998	August, 1998
Vehicles - Sanitation and Health Component (Jeeps)	1	218	IS	August, 1997	October, 1997	November, 1997	January, 1998
- Institutional Strengthening and PMU	1	117	IS	August, 1997	October, 1997	November, 1997	January, 1998
<b>Subtotal Goods</b>		<b>2,490</b>					
<b>Consultants</b>							
Sanitation and Health	1	1,704	Consultant Guidelines Shortlist	July, 1997	September, 1997	December, 1997	January, 1998

Category	Package	Estimated Cost (US\$000)	Procurement Method	Major Activities Schedule (Dates)			
				Issue Docs.	Bids/Pro.Recd.	Contract.Signed	Start/Delivery
Institutional Strengthening	1	1,717	Consultant Guidelines Shortlist	July, 1997	September, 1997	December, 1997	January, 1998
Project Management (Phase II)	1	926	Consultant Guidelines Shortlist	January, 1997	March, 1997	May, 1997	June, 1997
<b>Subtotal Consultant</b>		<b>4,347</b>					
<b>Training</b>							
Wrkshps/Seminars		288	Consultant Guidelines	Note: Local training for first two years to be done under Foreign Consultants contract, remainder to be done by local trainers.			
Study tours		138	Consultant Guidelines	Note: Study tours to be done in the first year of project implementation under the Foreign Consultants Contract.			
<b>Subtotal Training</b>		<b>426</b>					
<b>Recurrent Costs</b>							
Facilities Maintenance	2	2	NS	Note: Latrines to be emptied twice during life of project, once each in 2001 and 2002			
PIU Personnel (salaries after effectiveness)	12	247	Consultant Guidelines	April, 1997	June, 1997	July, 1997	July, 1997
Office Space & Operations		788		Note: Office Rent to be financed by the Government.			
Miscellaneous	6	203	NS	April, 1997	June, 1997	July, 1997	July, 1997
<b>Subtotal Recurrent Costs</b>		<b>1,240</b>					
<b>Project Preparation Facility (PPF)</b>							
Consultant Services (Phase I)	1	350	Consultant Guidelines Shortlist	January, 1997	March, 1997	May, 1997	June, 1997
Local Staff (PIU staff salaries until effectiveness)	12	35	Consultant Guidelines	"	"	"	"
Equipment	1	30	NS	"	"	"	"
Training		10	Consultant Guidelines	"	"	"	"
Recurrent Costs		5	NS	"	"	"	"
<b>Subtotal PPF</b>		<b>430</b>					
<b>TOTAL COSTS</b>		<b>33,723</b>					

a/ Prequalification docs issued April, 1997

## ANNEX Q: DISBURSEMENT SCHEDULE

Table 1: Disbursement Schedule  
(US\$ million)

Bank Fiscal Year	Disbursements by Semester	Cumulative Disbursements by Fiscal Year
<b>FY98</b>		
July, 1997 - December, 1997	0.4	0.4
January, 1998 - June, 1998	1.6	2.0
<b>FY99</b>		
July, 1998 - December, 1997	2.0	4.0
January, 1998 - June, 1999	3.0	7.0
<b>FY00</b>		
July, 1999 - December, 1999	4.0	11.0
January, 1999 - June, 2000	4.0	15.0
<b>FY01</b>		
July, 2000 - December, 2000	4.0	19.0
January, 2001 - June, 2001	4.0	23.0
<b>FY02</b>		
July, 2001 - December, 2001	3.0	26.0
January, 2001 - June, 2002	2.0	28.0
<b>FY03</b>		
July, 2002 - December, 2002	1.3	29.3
January, 2003 - June, 2003	1.0	30.3

## ANNEX R: FINANCIAL AND ECONOMIC ANALYSIS

1. **Data.** All monetary figures are reported in 1996 US \$, unless otherwise specified. The exchange rate used is M.3,550 = \$1.00, the average market rate in the second quarter of 1996. The official and market exchange rates were unified in March 1996 when an auction system was introduced. However, at September 1996 a 15% gap had arisen between the market rate and the auction rate.

2. Data for costs of operation of the existing water supply operations are based on real (as opposed to planned or budgeted) expenditures in nominal Manats for the first half of 1996, converted to dollars at the exchange rate of 3,550.

3. *GDP data and inflation.* There is considerable confusion about national accounts, due both to the transformation from Soviet accounting standards and to the effects of very high inflation and currency depreciation in 1993-1995. The following estimates for GDP, per capita GDP and inflation are taken from IMF documents, but are not official figures.

	1992	1993	1994	1995
GDP (mln Manat)	653	9,397	97,000	1,107,000
GDP per capita (US\$, Atlas methodology)	1,490	1,290	1,070	920
Retail price index (% change during period)	644	9,743	1,469	
Consumer price index (% change during period)			1,328	1,262

4. Nominal GDP in 1995 is estimated by the IMF at M.1,107,000 million. However, in September 1996, Goskomstat estimated 1995 nominal GDP at M.464,457. The IMF reports a real reduction of GDP of 39% between 1993 and 1995, due principally to declining gas production. However, gas still accounted for 51% of GDP (1995). Neither the Government nor the IMF has published official estimates of dollar GDP for recent years. However, estimates made using the Atlas methodology show a sharp reduction, of 38% between 1992 and 1995, in which year per capita dollar GDP stood at \$920. Inflation (Consumer Price Index, point to point) in 1994 was 1,328% and in 1995, 1,262%. However, following the implementation of a stabilization program based on fiscal and monetary control, in the first 8 months of 1996, the accumulated rise in the price index was down to 263%.

5. **Scope of this analysis.** This annex presents a financial and economic analysis of the project, following the guidelines established in the World Bank Handbook on the Economic Analysis of Investment Operations (1996) and in the memorandum Guidelines for Economic Analysis of Projects, issued by the Chief Economist of ECA dated February 29 1996. The main body of the analysis is divided into four sections: financial analysis; analysis of the project's cost recovery mechanisms and fiscal impact; economic analysis; and analysis of poverty considerations and affordability.

6. The project has four components: water supply improvements, sanitation and health, institutional strengthening, and project management and construction supervision. The quantitative economic analysis presented here is limited to the water supply improvements component, for which the benefit stream is well defined and quantifiable (the private benefits and externalities to be derived from increasing the

supply of potable water).<sup>1</sup> The water supply component represents 70% of the total value of the proposed loan. For the purposes of this analysis, the water supply project is disaggregated into the component for upgrading water supply in seven Etrap Cities and that for nine Kolkhozes. This procedure has been adopted because each component has clearly identifiable cost and benefit streams.

7. **Country context.** The country context of Turkmenistan, detailed in Chapter I, Section A of the SAR, is problematic for a water and sanitation project. The Bank Group's program has developed slowly but steadily in this environment reflecting the limited but growing Bank-Government dialogue on development issues and approaches. A first Bank Group Country Assistance Strategy (CAS) has been prepared, at the request of the Government, for discussion by the Board on May 27, 1997, together with the Urban Transport project and this operation. The most important problem from a sectoral point of view is that the Government is committed to a policy of public services, including water supply for human consumption, free at the point of demand. This runs directly against the grain of the Bank's policies for sustainability in water supply, via cost recovery from the users. No corporate framework exists within the sector; water services are organized as government departments (variously local and national) and are financed on an annual budget basis. There is considerable duplication of functions. The organizations responsible for urban water supply in small towns are multi-purpose departments, also responsible for housing and communal services. The project will address these problems through an institutional strengthening component which will promote cost recovery and the creation of a specialized water and wastewater authority in Dashkhovuz, subject to a new regulatory framework (see Annexes C, I and S-2).

### Financial analysis

8. **Operational inefficiencies in the existing systems.** The financial analysis is based on a comparison of "with project" and "without project" scenarios for the costs and revenues of the water supply services in the two groups of beneficiaries. Data for operating costs and water production in the first half of 1996 are summarized in Table 1. In each case, the water utilities' performance reflects the inadequacy of the existing regulatory framework. In the first place, since capital resources are free to the utilities, there is little attention to economy in their use. On average, pumps, which should last for between four and five years, are replaced annually. The budget for replacing equipment is 58% of total expenditure in the Etraps and 59% in the Kolkhozes; an efficient proportion would be below 20%.

9. The distribution system is severely decayed, and the low pressure in the system has led to a vicious circle, with the deliberate removal of faucets from street standpipes, in an effort to facilitate access to the small amount of water which arrives, and resulting in astronomical physical losses (estimated at 80% by the Consultants who prepared the investment plan).

10. As a result, in the seven Etrap Centers to be included in the project, water production is an estimated 2.3 million M3 per year, but only 462,000 M3 are delivered to clients. In the nine Kolkhozes to be covered by the project, production is estimated at 370,967 M3 per year, but only 74,193 M3 are delivered to clients.

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<sup>1</sup>For the other two components, the benefit stream is indirect. The institutional strengthening component seeks to improve sector performance in the medium to long run through the creation of a unitary water and waste water authority in Dashkhovuz. The health and sanitation component seeks to improve institutional capacity through technical assistance to the regulatory authorities and to increase future demand for improved public health conditions through demonstration projects in sanitation. The Social Needs Assessment revealed that at present there is little demand for improved sanitation; however, unsatisfactory sanitary conditions are believed to be the principal cause of the high level of infant mortality from diarrhea. In the future, it should become feasible to finance investment projects to improve sanitation, justified by the increased willingness to pay which the demonstration projects will create.

In each case, this amounts to around 12 liters per person per day for the corresponding population. The resulting operational cost per M3 delivered to clients is \$0.59 in the Etrap Centers and \$1.03 in the Kolkhozes.<sup>2</sup>

**Table 1: Operating costs and productivity indicators, existing water supply systems**

	Etrap Centers	Kolkhozes
Annual operating costs, \$	\$271,127	\$76,403
Of which: Materials and equipment, \$	\$157,746	\$45,127
Materials and equipment, % of operating cost	58%	59%
Production, M3 / year	2,310,815	370,967
Delivery, M3 / year	462,163	74,193
Cost per M3 produced	\$0.12	\$0.21
Cost per M3 delivered	\$0.59	\$1.03
Physical losses, %	80%	80%
Population covered	108,000	16,730
Water delivered per person, liters per day	11.7	12.2

11. Due to the enormous losses and the deteriorated condition of the wells and pumping facilities, the system is unable to achieve the designed pressures and supply volumes. In most places, there is supply in the standpipes only four to six hours per day. In addition, overpumping of the wells in an effort to compensate for losses in the system leads to high salinity in the water supplied, as well as further contributing to the accelerated depreciation of the pumps. Virtually all the chlorination facilities are in disuse.

12. Although in the Etrap Centers, an estimated 45% of households have yard taps and 5% have household connections, these normally are not functional. As a result, the inhabitants must resort to coping strategies to meet their water needs. Water is taken from wells, handpumps or (in the limited hours when it arrives) the piped supply from the stand pipes. None of these supplies is treated with chlorine, and Dashkhovuz reports the highest rate of infant mortality in Turkmenistan, a significant part of which is likely to be attributable to water-related infections.

13. The systems also use electricity very inefficiently. This is a predictable result of receiving a supply at the average price of \$0.01 per KWH (marginal supply price is actually one tenth of this, as the fixed charge for installed capacity accounts for most of the total). Pump sizes are normally inefficient and pumps normally are run outside their optimal operating ranges. This results in very large consumption of electricity per cubic meter of water delivered to clients. In the Etrap Centers, a reported 1.43 KWH are used for every

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<sup>2</sup> Operating costs do not include any element for the financial costs of capital investments, since these resources are granted from the state budget. Although there is a depreciation provision in the HCS accounts for operating costs of the Etrap Centers water supply, recent inflation has severely eroded the real value of the historic costs at which assets are depreciated, so there is effectively no accounting for capital consumption.

M3 of water produced. An efficient level would be around 0.4 KWH/M3. Although this inefficiency does not result in a financial burden to the water utilities, because the electricity price is heavily subsidized, the real economic cost of these wasted resources is considerable.

14. ***Project strategy to improve performance.*** The project will address these problems by rehabilitating the existing production system, repairing and replacing pumps and boreholes, and installing automatic controls to prevent overpumping and avoid pressure surges in the system. It will restore the chlorination systems and replace as necessary the deteriorated pipes of the distribution network. Street stand pipes with improved design, including automatically closing faucets and anti freezing devices, will be installed.

15. As a result of these improvements, physical losses are expected to be reduced to 20% and the system will offer a reliable supply, between 12 and 20 hours per day, of drinkable water. The correct operation of the wells will optimize the quality of the water and should gradually reduce salinity. Improved pressure in the system will allow the water to reach the existing installed yard taps and household connections. This is likely to lead to a steady rise in the proportion of households with yard taps and household connections, since the Social Needs Assessment revealed a high preference for these, over the use of stand pipes. The rehabilitated distribution systems in the Etrap Centers will have sufficient capacity to allow a doubling of water supplied, with only relatively minor additional investments in production capacity (additional boreholes and pumping equipment), up to 2011. At that point further expansion of the distribution network will be necessary. In the Kolkhozes the distribution networks established with the initial investment will be sufficient to absorb anticipated demand through 2017.

16. The following financial analysis, presents projections for 20 years of the impacts of the Etrap Center and Kolkhoz investment programs. First, the assumptions made in each case are explained in detail. Then the results of the projections are presented. A sensitivity analysis of the impact of changes in key variables is presented at the end of the financial and economic evaluation.

17. ***“Without project” scenarios.*** It is assumed in each case that the physical and financial performance registered in the first half of 1996 would continue unchanged over the proposed 20 year life of the project. Data for a the first half of 1996 were used as the basis for the projection, due to the difficulty of standardizing intertemporal series in the climate of high inflation / rapid devaluation experienced by Turkmenistan in the last three years. For Etrap Centers, ***Table A1*** presents projected operating expenditure and ***Table A2*** presents projected net financial flows without the project. For Kolkhozes, the corresponding tables are ***A6*** and ***A7***. In each case, capital expenditure is set at zero because we are analyzing the people covered by the existing system (expansions of the system would be alternative projects). Water produced and delivered remain constant. Income is set at zero, on the assumption that without the project, the Government would continue with its policy of 100% subsidies for water.

18. ***Cost recovery and its impact on demand.*** The Government is expected to introduce a system for direct cost recovery from the users of the improved system (see paragraphs 51-60 below). However, it is expected in the medium term that whatever mechanism is adopted for charging, it will be a flat rate system (in which the marginal cost of water to the user is zero). For this reason, it was not necessary to estimate demand elasticities in order to complete the financial analysis of the project (since the volume of demand will not be affected by a flat rate tariff).

19. ***Demand projection - Etrap Centers (Table A3).*** In the “with project” scenario, production (called “system demand” in the table) will be 3.7 million M3 in 2000 when the works are complete, compared with 2.3 million M3 produced in the “without project” scenario. The rehabilitation of the distribution network allows the loss ratio to fall to 20%, so that delivery of water rises spectacularly, to 2.9 million M3 in 2000,

compared with 462,000 M3 per year without the project. Thereafter, production and delivery are assumed to grow steadily over the next 20 years, permitting (and responding to) a steady growth in demand, attributable to a projected population growth rate of 2.2% within the area covered by the distribution network, coupled with the gradual conversion of stand pipe users to yard tap or household connexion users, which is likely to be stimulated by the increased reliability of the system. Yard taps and household connections generate much higher per capita consumption than stand pipes, because the water does not have to be carried. According to this projection, total annual consumption will more than doubled, from 2.7 million M3 in 1998, to 6.6 million by the year 2017.

20. **Operating costs - Etrap Centers (Table A4).** The profile of operating expenditure will be radically altered, due to the imposition of efficiently designed and operated pumps. This would a) reduce the budget for replacement of equipment from 57% of the total down to under 20% and b) reduce the consumption of electricity from 1.43 KWH per M3 produced, to 0.33. The projection assumes that real salaries for system staff will double, to allow the recruitment and retention of adequate professionals, but the total salary bill will increase by under 10% in real terms, due to more efficient staffing policies. Finally, a provision has been made for the cost of chemicals needed to operate the chlorination system; at present, there is little chlorination. As a result of all these factors, total operating costs will be reduced by 7% between 1997-2000, in spite of the fivefold increase of the volume of water delivered to clients. Thereafter, operating costs will rise gradually, as increasing output pushes up the electricity and chemicals bills. It is assumed that the other components of operating expenditure will not rise in line with output.

21. **Cost and tariff calculations - Etrap Centers (Table A5).** The average tariff necessary fully to cover the total financial costs of the system, including the operating costs and the debt service of the loan which finances the investment, has been calculated. The estimate assumes that the Bank loan will be for 20 years with a 5 year grace period, and annual interest rate of 7.5%. The resulting "**full cost tariff**" of **US \$0.42 per cubic meter** gives a good measure of the average total cost of the water to be supplied by the revamped system.

22. The cost is relatively high, due to the small size of the Etrap Centers, which makes both scale economies in production and network economies in distribution elusive. It is also affected by the high estimated capital costs, due to the difficulties of attracting contractors to execute projects in Turkmenistan. The Consultant Engineers who prepared the project consider that 100% of the resources used in the construction will be imported to the country - including the manual labor. This is consistent with the pattern observed in other civil works contracts underway in the country, where Turkish and Pakistani manual labor is being used.

23. Nevertheless, the proposed plan represents the **least-cost solution** for improving water supply in the 7 Etrap cities. The alternative of completing the unfinished aqueduct from Tuyamuyun to Dashkhovuz was evaluated by the consultant and found to be far more costly; requiring \$502 million to complete the works. The engineers also considered the option of utilizing surface water (canal water) coupled with the introduction of sand pressure filters, as an alternative to the existing borehole supply source. This option did not report lower unit costs than the proposed project and was considered technically more complex, and therefore rejected because it would increase project risks. However, the option of complementing the revamped system with surface water and filtration should be kept open, in the event that salinity does not fall in the well water following improved management of the pumping regime, since the surface water at present registers lower salinity than groundwater and salinity is an important consideration in demand for water.

24. The reported tariff is calculated on a *cash-flow basis*, using a discount rate of 12%.<sup>3</sup> To simplify the calculation, the *depreciation rate* on the investment is set equal to the amortization rate on the loan. This is justifiable, as a twenty year life is a reasonable average for the types of investment being made. The tariff calculated is an *average total cost tariff*, based on the whole output and costs of the system if the investment goes ahead - it is not based on average incremental cost.

25. Since at present the water utilities in Dashkhovuz velayet have no charging policy, it is unlikely that they will move directly to a full cost tariff. For this reason, we have also calculated a tariff sufficient to cover the full cost of Operations and Maintenance ("*O&M Tariff*"). This tariff, also reported in Table A5, is *US\$ 0.14 per cubic meter*. This is much lower than the full cost tariff, underlining the high weight of capital costs in the full cost tariff, and also illustrating the expected efficiency of the operation of the improved system. This tariff would be sufficient to cover the full cost of staff, repairs and maintenance, electricity and chemicals at the existing unit costs of these inputs and at the efficiency (productivity) levels projected by the project engineers.

26. *Financial internal rate of return - Etrap Centers (Table A5)*. The expected financial internal rate of return of the project (at market prices) is *10.7%*, if a full cost tariff is applied. This rate of return is calculated on the basis of incremental real incomes and expenditures which will arise in each period if the project is implemented, compared with the situation if it is not implemented. The cost of investments is registered in full in the year they are made and the debt service flow is excluded from the calculation.

27. *Demand projection - Kolkhozes (Table A8)*. In the "with project" scenario, production ("system demand" in the table) will be 1.98 million M3 in 2000 when the works are complete, compared with 0.51 million M3 in the "without project" scenario. In addition, the rehabilitation of the distribution network allows the loss ratio to fall to 20%, so that delivery of water rises to 1.59 million M3 in 2000, compared with 102,000 M3 per year without the project. Thereafter, production and delivery are assumed to grow steadily over the next 20 years, permitting (and responding to) a steady growth in demand, attributable to a projected growth rate from 2002 onwards of 2.2% of the population within the area covered by the expanded network, and to the gradual conversion of stand pipe users to yard tap or household connexion users, which is likely to be stimulated by the increased reliability of the system. By the year 2017, total annual consumption would have tripled, from 1.3 million M3 in 1998, to 3.97 million.

28. *Operating costs - Kolkhozes (Table A9)*. The profile of operating expenditure will be radically altered, due to the imposition of efficiently designed and operated pumps. This would a) reduce the budget for replacement of equipment from 63% of the total down to under 20% and b) reduce the consumption of electricity from 1.43 KWH per M3 produced, to 0.33. The projection assumes that real salaries for system staff will double, to allow the recruitment and retention of adequate professionals, and staffing levels will also be increased significantly from their present levels, which are too low for efficient operation. As a result, the total salary bill will increase from just over \$10,000 without the project, to a projected \$66,600 with the project. Finally, a provision has been made for the cost of chemicals needed to operate the chlorination system; at present, there is little chlorination. As a result of all these factors, total operating costs will be doubled, from their present level of \$105,000 per year to \$216,000 a year in 2000, when the works are complete. But this will be compensated by a fifteen-fold increase of the volume of water delivered to clients (from 102,000 M3 a year now to 1.58 million M3 in 2000). Thereafter, operating costs

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<sup>3</sup> Since this discount rate is higher than the 7.5% interest rate on the loan, the project benefits from the high gearing (100% loan financed) and the resulting tariff is lower than would be a tariff calculated on the flow of real expenditures. The net present value of the flow of real transactions is negative at \$2.8 million when the full cost tariff is levied (Table A5).

will rise gradually, as increasing output pushes up the electricity and chemicals bills. It is assumed that the other components of operating expenditure will not rise in line with output.

29. *Cost and tariff calculations - kolkhozes (Table A10)*. The “*full cost tariff*” (see definitions above, in discussion of Etrap Centers) is US *\$0.74 per cubic meter*. The cost is higher than for the Etrap Centers, due to the even lower density of the populations, which makes scale economies in production and network economies in distribution elusive. As with the Etrap Centers, it is also affected by the high estimated capital costs, due to the difficulties of attracting contractors to execute projects in Turkmenistan. Nevertheless, the proposed plan represents the least-cost solution for improving water supply in the 9 Kolkhozes. The engineers also considered the option of utilizing surface water (canal water) coupled with the introduction of sand pressure filters, as an alternative to the existing borehole supply source. The observations made with respect to the Etrap Center project on this point also apply here.

30. The tariff needed to cover operations and maintenance (“*O&M Tariff*”) for the Kolkhoz project is *US\$ 0.16* per cubic meter (Table A10). This is only slightly higher than the \$0.14 reported for the Etrap Centers; the differences between the two projects’ costs lie mainly in their capital-output ratios, not in unit operating costs.

31. *Financial internal rate of return - Kolkhozes (Table A10)*. The expected financial internal rate of return of the project (at market prices) is *10.7%*, if a full cost tariff is applied. As for the Etrap Centers, this rate of return is calculated on the incremental real incomes and expenditures which will arise in each period if the project is implemented, compared with the situation if it is not implemented. The cost of investments is registered in full in the year they are made and the debt service flow is excluded from the calculation.

### **Fiscal impact and cost recovery**

32. The fiscal impact of the project will depend on the cost recovery mechanisms adopted. If the government applies a full cost tariff the fiscal impact of the project will be zero. If an O&M tariff is applied, the net present value of the implicit subsidy (the cost of the loan finance) for the Etrap Centers will be US \$6.4 million over the life of the project (calculated as the present value of the difference between the projected income from a full cost tariff and projected O&M costs - see Table A5). For the Kolkhozes, it will be US \$7.26 million (Table A10). The Institutional Strengthening component of the project will support the Government to analyze options for charging for the improved water service and to reach a decision on which option is most suitable for Turkmenistan at this stage. The following options are under discussion:

- a) A flat rate user fee (earmarked tax) for all beneficiaries, to be collected directly by the HCS (Etrap Centers) and either by the Rural Operations Department or (possibly) by the Kolkhoz authorities (Kolkhozes).
- b) A user fee differentiated between households with and without yard taps. Within this framework, a possible option is a zero fee for users without yard taps. This would allow the project to comply with the President’s free water policy, since everyone can use the stand pipes. There might also be a connexion fee for establishing yard taps, including a component for the direct cost of the connexion and a component for increasing production capacity in the system.
- c) A program to introduce metering for households with yard taps. This would be dependent on the overall development of a commercial function and on the establishment of tariff levels sufficiently high to allow the benefits from metering to offset the costs of the same.

33. In the initial stage, it is not recommendable to begin a metering program, due to the organizational complexity of this sort of tariff system and the fact that there will be excess supply capacity in the system for 10 years, according to the demand projections. The rationale for metering will grow stronger, in the degree that total demand approaches the distribution system's capacity. In this context, it is important to remember that the main economic benefit from metering arises from the double incentive:

- a) To the user, to reduce his consumption at the margin, because this reduces his water bill; this allows the water company to supply more water to other clients who derive a higher marginal utility from the water.
- b) To the water company, to increase the number of cubic meters supplied to clients (since this increases the company's income); this gives the company a direct interest in increasing the efficiency of production.

### **Economic analysis**

34. *Methodology.* The economic evaluation of the two projects was undertaken by adapting the financial analysis through the substitution of economic opportunity costs for financial costs, and the substitution of the estimated economic benefits for the financial revenues. This section describes in general terms the problems faced and the methodological decisions made in the course of the analysis and then presents the results of the economic analysis for the Etrap Center and Kolkhoz projects.

### **Cost conversions**

35. *Numeraire.* The analysis was undertaken in dollars at border prices. This was the most convenient numeraire because the virtually the whole of the capital costs will be incurred in dollars.

36. *Shadow exchange rate.* The economy of Turkmenistan is still largely state controlled. Nevertheless, considerable headway has been made on exchange and trade liberalization. At the time of the Pre Appraisal Mission, there was a unified exchange rate, whose value was not significantly below the black market rate. Import demand is highly elastic, but imports are virtually tax and duty free (there is a 2% excise tax on which VAT of 20% is added, for a total of 2.4%). Although the regulation of the exchange auction can be presumed to involve a significant degree of administrative channeling of foreign exchange towards state corporations, in accordance with their planned resource needs, it was not considered practicable in the time available for the present analysis to try to quantify the implicit tariff to which such procedures might give rise. Turkmenistan's exports (gas, cotton, oil) are highly price inelastic. The country's strong natural resource base has given it comfortable foreign exchange reserves and the expectation in the medium term of a relatively strong currency (subject to the adoption of satisfactory fiscal and monetary discipline). In mid 1996 the exchange rate had stabilized and the monthly inflation rate had been reduced to single digits. For these reasons, it was decided that it was inappropriate to presume the existence of a shadow exchange rate above the market rate; the economic analysis was conducted using the average market rate of exchange applicable in the first half of 1996 (M.3550 = US\$ 1.00).

37. *Conversion factors for domestic costs.* As was mentioned above, the capital costs of the project (including labor) are expected to be incurred almost entirely in foreign exchange; no conversion is therefore necessary. The required revenue costs for imported materials such as chemicals have also been estimated directly in dollars at border prices. Since Turkmenistan does not have a labor surplus economy, and in the "with project" scenario it is presumed that there should be a 100% real wage increase, in order to attract and retain adequate staff in the reformed water utility, it would clearly be inconsistent to apply a shadow price for labor, lower than that amount.

38. *Electricity.* The only component of operating costs which is clearly priced well below its economic opportunity cost is electricity. Turkmenistan trades electricity internationally over the Uzbek border, at prices ranging from \$0.04 to \$0.05 per KWH, both importing and exporting. During the last year, electricity was imported to Dashkhovuz from Uzbekistan at the price of \$0.05 per KWH. However, the average price at which electricity is supplied to the water utilities is only \$0.01. For this reason, a conversion factor of 5 was applied to the average price of electricity (raising it from US\$ 0.01/KWH to US\$ 0.05).<sup>4</sup> This has an important positive impact on the result of the economic analysis in the Etrap Centers, where the project will reduce total electricity consumption.

39. *Taxes.* The capital costs include a tax component of 15% of the total investment cost. This cost has been removed for the purposes of the economic evaluation.

40. *Benefit estimate.* The project will deliver an improved water supply to the populations which benefit from the investment. Given the economic cost of the improvement in water supply (discussed in the previous section), its economic rate of return depends on the value assigned to that water by the users (their "willingness to pay", WTP) plus the value of any additional benefits to society which are not reflected in WTP (externalities), such as improved health status, resulting in lower medical costs to the public sector and in increased output whose economic value is greater than the private incomes to which it gives rise. However, following standard practice in the evaluation of drinking water projects, this analysis concentrates on the private benefits to be derived from increased water delivered, improved water quality, and improved reliability of the water supply. No attempt is made to quantify possible externalities such as health benefits and increased output due to a healthier population.

41. Normally, the willingness to pay for the improved service would be analyzed through a detailed study of the revealed preference of water users who have access to different types of supply option at present, on the basis of which, a demand curve would be estimated. Failing this, a willingness to pay survey would be used to establish a contingent valuation for the improved service. However, in this case, no data of either sort were available, because there is no relevant survey information, and the existing formal water supply is not charged for. The following paragraphs describe the procedure used to estimate the value of the benefit stream.

42. The economic analysis is based on an estimate of the increase in consumer surplus to be derived by households as a result of the reduction in the time they spend carrying water and as a result of the increase in their future consumption of water, due to the improved supply. According to the findings of focus groups conducted during the Pre-Evaluation Mission, on average a household in Tagta spends 1.5 hours per day or 45 hours per month carrying an average total of 3.6 cubic meters of water to their house.<sup>5</sup> This amounts to

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4 It would be possible to justify an even higher conversion factor. Turkmenistan generates electricity using natural gas. It charges the electricity company M.500 per thousand cubic meters. The border price of gas is M.213,000 (\$40); this amount is expected to rise during the life of the project, since Turkmenistan is planning pipelines to Pakistan and Turkey, where the selling price would be between \$60 and \$80. At the present price, gas costs represent just 3.6% of electricity generation costs in Turkmenistan. However, if the border price were applied, the price of gas would rise by a factor of 426 and the total cost of electricity would in consequence rise by a factor of 16.3 (1630%). Nevertheless, since gas reserves are so great that there is no effective short term trade-off between domestic consumption and exports, the analysis uses a more cautious basis for the shadow price estimation.

5 Unfortunately, the Household Survey conducted during the Social Needs Assessment did not gather data on time used fetching water. It did attempt to produce willingness to pay data for an improved system, but used an open-ended question which invited strategic responses, and did not in general comply with the standard requirements for producing valid responses in contingent valuation surveys. The survey did not use the Referendum method; did not limit the consultation to one price per household; and did not specify to the household what sort of service was being offered. Rather, it allowed the household to say what service it would like

12.5 hours per cubic meter. This water is for all uses. In the present analysis, the time spent at present carrying water is accounted for at the value it would have in the labor market at present. At the average money wage of M.40,000 per month (1996, September) or \$11.2, the average hourly wage (assuming a 20 day working month) is \$0.07. Therefore the value of the labor time used to carry each meter of water is \$0.88.<sup>6</sup>

43. This is reasonable, because there is not a significant amount of unemployment in the Turkmenistan economy. If anything, it may result in an underestimation of the likely economic value of the time savings during the life of the project, because dollar wages are at present highly devalued, due to depreciation outstripping domestic price and cost inflation during 1995-96, and can be expected to grow significantly once the macroeconomic stabilization program is completed. Also, the economy can be expected to grow in real terms during the life of the project, increasing the economic opportunity cost of the time which would be spent carrying water if the project does not go ahead. However, for the purposes of this analysis we have left the value constant in real dollar terms throughout the analysis; the benefit estimate reported here is therefore a conservative one. In the following sections we describe the application of this methodology to the Etrap Center and Kolkhoz projects and present the results.

44. *Economic evaluation - Etrap Centers.* Separate estimates are made for the gains in welfare from improved water supplies for the users of: stand pipes; yard taps; and household connections (*Table A13* and *Chart I*). In each case, a linear demand curve is estimated, with the form  $P = \alpha + \beta Q$ , where  $P$  = price per cubic meter,  $Q$  is cubic meters consumed per month and  $\alpha$  and  $\beta$  are constants which reflect the elasticity of demand. The three estimated demand curves are based on:

a) The average amount of time spent per household at present carrying water, and the average volume carried (this is the same for each category, because at present most yard taps and household connections are inoperative due to the system's collapse, and everyone must use wells or standpipes). This gives a point on the demand curve with a price per meter of US\$ 0.88 and consumption per household/month of 3.6 M3.

b) The estimated average consumption of unrationed households of 6 people facing a zero marginal price for water with, respectively: a household connexion (23.4 M3 / month, based on 130 l.p.d. and average household size of 6); yard tap (10.8 M3.) and stand pipe (6.3 M3). For yard taps and household connections, the marginal price for the unrationed supply is zero (because the tariff is expected to be a fixed charge). In the case of stand pipe users, it is assumed that the fetching time per meter is reduced by 80% due to system improvements (better reliability and closer spacing of standpipes). This gives an implicit price of \$ 0.18 / M3 corresponding to the projected consumption level of 6.3 M3 / month.

45. In each case, the welfare gain has two components: the cost saving from not having to carry water at present (area A in the graph), and the welfare gain from the increased consumption (area B). For each type of consumer, the average welfare gain per cubic meter consumed is calculated (Table A13). The gain is

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to have and then invite the respondent to say what they would like to pay for this service. For all these reasons, the resulting data have not been used in the present analysis.

<sup>6</sup> Another indicator of the alternative cost of coping strategies are the large private investments made by many households to install wells, with both handpumps and electric pumps, to substitute for the inoperative piped water system. According to focus group respondents, between 45% and 5% of residents in different etrap centers and kolkhozes have invested amounts equal in value to 1.5 months wages to establish such systems. However, these systems do not supply chlorinated water.

estimated at \$0.51 per M3 for household connections; \$0.59 for yard taps and \$0.55 for stand pipes. On the basis of these amounts, the total consumer surplus is estimated for each year, from the structure of consumption in the demand projection (Table A14). As mentioned in the section on the financial analysis, since the price of water will for the time being be zero at the margin, there was no need to adjust the demand projection for the impact of possible tariffs. The results of the cost-benefit analysis are presented in *Table A14*. The project has an estimated economic internal rate of return of 22.2%. A sensitivity analysis is presented below.

46. *Economic evaluation - Kolkhozes.* The demand curves estimated for the Kolkhozes are presented in *Table A17 and Chart 2*. They differ in two ways from those estimated for the Etrap Centers. In the first place, due to the larger average lot size in the Kolkhozes, estimate demand per capita with the improved water system is higher, for yard taps and for stand pipes. In addition, average household size in the rural area of Dashkhovuz is 7, compared with 6 for urban households, making for a further factor of adjustment. As a result, monthly average household consumption is expected to be 27.3 M3 for a household connection, 14.7 M3 for a yard tap and 8.4 M3 for a stand pipe user. It should be noted that these volumes do not include irrigation of private plots - the Kolkhozes have separate irrigation systems which use canal water for this purpose.

47. The second important difference between the demand curves estimated for the Etrap Centers and the Kolkhozes, is that the estimate of time presently used to fetch water is higher for the Kolkhozes. This is reasonable, because they have a far inferior water service at present, with large areas outside the range of the network, and the population density is far lower, so that traveling time to the available sources is likely to be high. For these reasons, we have estimated an average time per M3 one third above that which is prevalent in the Etrap Centers, giving an implicit price per M3 of \$1.17.<sup>7</sup> The resulting demand curves are plotted in Chart 2. They imply a total welfare gain per M3 consumed from the improved system of between \$0.66 and \$0.73, depending on the type of connection. Together with the demand projection for Kolkhozes (Table A3), these values are used to calculate the projected economic benefit reported in *Table A18*. The Kolkhoz project has an estimated economic internal rate of return of 10.6%, somewhat below that of the Etrap Center project, due to the higher unit costs of production. A sensitivity analysis is presented below.

### Sensitivity analysis

48. Table A19 presents the results of a sensitivity analysis for the financial analysis and economic evaluation of each project. For the financial analysis, we explored the impact on the estimated unit cost of production of varying the assumptions made on physical loss levels, population growth, the electricity price and the discount rate used in the analysis. In both projects, the only factor which had any significant impact on the tariff is the population growth rate, which affects the growth of total consumption. However, a large change in the assumed growth rate in the Etrap Centers, from 2% to 3%, would only change the estimated cost per M3 from \$0.42 to \$0.40; the change is similar for the case of the Kolkhozes. We can conclude that the results of the financial analysis are robust in the face of all likely values of the most important independent variables.

49. The sensitivity analysis for the economic evaluation investigates the way in which the economic internal rate of return varies with key independent variables. Once again, it studies the impact of physical losses and population growth, and finds their impact to be minor over likely ranges. The impact of changes

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<sup>7</sup> The hourly value of labor is estimated at the same rate in the Etrap Centers and Kolkhozes; according to household survey data, per capita earnings are very similar in the two groups.

in the shadow price assigned to electricity is also relatively small in the case of the Etrap Centers, and is insignificant for the Kolkhozes.

50. However, the impact of the value assigned to the labor used to carry each M3 of water in the “without project” scenario has a very important impact on the results of the analysis. This is because the estimated demand curves and the associated estimates of consumer surplus flow from this cost (which is taken as the implicit price of each M3 of water supplied in the “without project” scenario). For this reason, in each case, we have calculated the value of this variable which would return an economic internal rate of return of zero for the project. In the case of the Etrap Centers, the rate of return falls to zero when the imputed cost of water at present falls to \$0.21 / M3 (compared with the value of \$0.88 used in the baseline case). For the Kolkhozes, a zero rate of return is reached when the imputed price falls to \$0.55 (compared with the baseline assumption of \$1.17. We can conclude that the economic opportunity cost of labor used for carrying water, in each scenario, would need to be radically below that which we have assumed, before either of the projects ceases to report a positive economic rate of return.

### **Poverty analysis and affordability**

51. This section discusses the prospects for cost recovery in the social and economic setting of Dashkhovuz. It briefly describes the economic situation of the country, then presents evidence on household incomes and real and nominal wages from the Turkmen authorities and from the Household Survey (see Annex B and the Needs Assessment report, November 1995 from the Project files for more details), and discusses the political economy of public service provision in Turkmenistan in that context.

52. *The economic situation in Turkmenistan.* The Bank Group’s program has developed slowly but steadily in this environment reflecting the limited but growing Bank-Government dialogue on development issues and approaches. A first Bank Group Country Assistance Strategy (CAS) has been prepared, at the request of the Government, for discussion by the Board on May 20, 1997, together with the Urban Transport project and this operation. The economy is highly dependent on the production of natural gas, which in 1995 accounted for 51% of GDP (data from the IMF). Turkmenistan is the world’s fourth largest producer of natural gas and has proven reserves sufficient for some 200 years’ production at the present rate of extraction. Following independence, Turkmenistan has had difficulty in exporting gas to the FSU states, especially Ukraine, due to their inability to pay in hard currency. The accounting value of gas exports is \$42 per 1,000 cubic meters, but 57% of this is paid for in barter, where goods are substantially overvalued, and there are large arrears in cash payments. In an effort to press for higher real revenues, Turkmenistan has halved gas exports to the FSU. As a result, production has fallen from 80 billion cubic meters a year at independence, to around 40 billion at present. As a result, GDP has declined sharply in real terms. According to the IMF, real GDP declined by 10% in 1993, 19% in 1994 and 14% in 1995 - a cumulative reduction of 39%. Per capita dollar GDP has also declined sharply. Estimates made using the Atlas methodology show a reduction of 38% between 1992 and 1995, in which year per capita dollar GDP stood at \$920.

53. Future prospects for GDP growth will depend on the development of gas, oil and agricultural production. To increase value added in gas production, Turkmenistan will need to open new export markets through the construction of pipelines to Turkey and possibly to Pakistan. However, the political problems faced by this land-locked country in establishing such pipelines (through, respectively, Iran and Afghanistan) are severe. Both the construction of gas pipelines and increased oil production will require foreign investment, which will in turn depend on the extension of adequate guarantees to investors. In agriculture, liberalization is needed in order to allow the country to maximize the income produced on the limited irrigated territories in its possession.

54. **Household incomes in Dashkhovuz.** GDP accounts are available only on a production basis; they are not available on either an income or an expenditure basis. However, it is clear that the proportion of GDP received as household disposable income is very small. According to the government statistical agency, Goskomstat, in 1995 the average household monthly disposable income in Dashkhovuz velayet - where the project is based - was M.13,587, or \$68 at the average exchange rate for the year (Table 2).

55. However, according to the Social Needs Assessment conducted during 1995, monthly household disposable income is even lower than the official figures suggest. Annual household income in Dashkhovuz is reported as \$355 (urban \$336, rural \$375); monthly income is therefore under \$30 on average. The same exchange rate was used for each of these figures, so the differences arise in the estimated value of income in Manats. It is likely that the very rapid depreciation of the exchange rate during 1996 has resulted in a further sharp reduction in the dollar value of household incomes. At the time of writing, the average wage is M.40,000, which would correspond to a household income of around M.100,000 a month (assuming 2.5 incomes per household) or \$20. This is much lower than the figures estimated for 1995, and reflects the severe erosion of the dollar equivalent values of Manat incomes during 1996. However, this is likely to be corrected in some degree once the stabilization program is complete.

**Table 2: Indicators of household income and expenditure, Dashkhovuz velayet, 1995**

1995 US\$ (Exchange rate M.200 = \$1)	Goskomstat data			Social Needs Assessment data		
	Urban	Rural	Total	Urban	Rural	Total
Monthly income, US\$	\$62	\$66	\$64	\$28	\$31	\$30
Proportion of spending on food (%)	70%	51%	58%	84%	85%	85%

56. The proportion of income used to buy food is relatively high. According to official data, food expenditure is on average 58% of total expenditure. For rural households, the proportion spent on food is lower (51%) and for urban households, it is higher (70%). The Social Needs Assessment estimated a far higher proportion (85%). These data should be interpreted with care; the high weight of food spending reflects in part the fact that a wide range of basic services are supplied either free of charge or at nominal rates which are effectively free, including housing, electricity, gas, water, phones, health care and education. Therefore, the high share of food in total expenditure is not an indicator of abject poverty, so much as an indicator of the unreformed nature of the economic system.

57. The proportion of GDP received as household disposable incomes is very low indeed. The official data for household income imply a per capita annual disposable income of \$117, which is around 13% of per capita GDP. It appears that most of GDP is retained by the public sector and goes to finance state-controlled investments and to subsidize the provision of food and free public services (including housing, electricity, gas and water). This in turn reflects the slow progress on economic reform and privatization registered since independence. The economy of Turkmenistan is still in the initial phases of the transition from a Soviet-style planned economy to a market economy. Perhaps the most important part of that transition is the shift from state control of consumption decisions, to private control. For that to happen, the proportion of national income which is received as private disposable household incomes will have to rise radically from its present low level. While the state retains some 87% of GDP and households dispose of only 13%, there is always likely to be resistance to paying for public services: many people will feel (not unreasonably) that they have a right to expect free or subsidized services out of the part of national income which is retained in the public sector.

58. Turkmenistan is clearly at a level of development where the country is able to pay for piped water with household connections for the great majority of its population. However, if this is done through a centrally subsidized arrangement, with cash household incomes remaining low, then the resulting service is likely to be inefficient. The state of the existing services in Dashkhovuz velayet is testimony to this. If, on the other hand, public services were to be supplied at their full cost, on a pay-as-you-use basis, with the installation of water meters, the system would be likely to be far more efficient. However, the distribution implications of requiring the population to pay in full for their basic services, while their disposable incomes remain at the low levels registered at present, are clearly unacceptable.

59. In this context, the issue of the affordability of water tariffs assumes a much broader significance. Policy dialogue with the authorities should emphasize the potential efficiency gains to be had from tying the incomes of the bodies responsible for producing services, to their delivery. It should also emphasize that the result of privatization will be to increase the proportion of total income received by private individuals and lower the proportion received by the state. While these issues clearly go far beyond the water sector, in the interim, the institutional strengthening component of the water and sanitation project should also aim to show that even with the collection of a limited user fee sufficient to cover operation and maintenance, the efficiency of the system's operation can be greatly increased, compared with systems which depend on state budget assignments for all their operating revenues.

60. The water tariff necessary to cover operations and maintenance in the present project, is estimated at \$0.14 and \$0.16 per cubic meter in the Etrap Center and Kolkhoz projects, respectively. Households with yard taps are likely to consume around 15 M3 a month - which would imply a tariff of \$2.25 per month. This would represent 7.5% of average monthly household incomes, on the income estimate made by the Social Needs Assessment, or 3.5%, on the estimate of Goskomstat. At present (September 1996) incomes, it might represent just over 10%. The establishment of a tariff in the range suggested is clearly not impossible; in this context, it is also important to bear in mind that the provision of subsidized housing, power, transport, health and education all help to reduce the pressure on the household budget.

**Table A19**  
**Sensitivity analysis**

<b>A: ETRAP CENTERS</b>					
<b>FINANCIAL ANALYSIS</b>			<b>ECONOMIC ANALYSIS</b>		
<b>Indicator: Cost/M3</b>			<b>Indicator: Economic IRR</b>		
		\$/M3			%
Physical losses	20%	\$ 0.42	Physical losses	20%	22.2%
	25%	\$ 0.43		25%	22.1%
	30%	\$ 0.45		30%	21.3%
Population growth	2%	\$ 0.42	Population growth	2%	22.2%
	1%	\$ 0.45		1%	20.6%
	3%	\$ 0.40		3%	23.5%
Electricity price/KWH	\$ 0.01	\$ 0.42	Shadow elect.price/KWH	\$ 0.050	22.2%
	\$ 0.02	\$ 0.43		\$ 0.025	21.3%
	\$ 0.03	\$ 0.44		\$ 0.075	23.1%
Discount rate	\$ 0.12	\$ 0.42	Economic Cost/M3 of water hauled manually in "without project" scenario	\$ 0.88	22.2%
	\$ 0.11	\$ 0.43		\$ 0.66	16.2%
	\$ 0.10	\$ 0.43		\$ 1.10	28.1%
				\$ 0.21	0.0%

<b>B: KOLKHOZES</b>					
<b>FINANCIAL ANALYSIS</b>			<b>ECONOMIC ANALYSIS</b>		
<b>Indicator: Cost/M3</b>			<b>Indicator: Economic IRR</b>		
		\$/M3			%
Physical losses	20%	\$ 0.74	Physical losses	20%	10.6%
	25%	\$ 0.75		25%	10.5%
	30%	\$ 0.76		30%	10.3%
Population growth	2%	\$ 0.74	Population growth	2%	10.6%
	1%	\$ 0.79		1%	9.5%
	3%	\$ 0.70		3%	11.8%
Electricity price/KWH	\$ 0.01	\$ 0.74	Shadow elect.price/KWH	\$ 0.050	10.60%
	\$ 0.02	\$ 0.74		\$ 0.025	10.64%
	\$ 0.03	\$ 0.75		\$ 0.075	10.57%
Discount rate	\$ 0.12	\$ 0.74	Economic Cost/M3 of water hauled manually in "without project" scenario	\$ 1.17	10.6%
	\$ 0.11	\$ 0.74		\$ 0.88	6.3%
	\$ 0.10	\$ 0.75		\$ 1.47	14.4%
				\$ 0.55	0.0%

**Table A1**  
**SEVEN ETRAPS**  
**Financial operating expenditure without the project**

Ex. Rate 3550

Year	Mats & equip.	Fuel	Electricity	Deprecn.	Salaries	Other	Total
<i>1996 Dollars, per year</i>							
1996	157,746	3,944	35,493	4,437	39,930	29,577	271,127
1997	157,746	3,944	35,493	4,437	39,930	29,577	271,127
1998	157,746	3,944	35,493	4,437	39,930	29,577	271,127
1999	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2000	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2001	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2002	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2003	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2004	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2005	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2006	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2007	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2008	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2009	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2010	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2011	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2012	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2013	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2014	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2015	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2016	157,746	3,944	35,493	4,437	39,930	29,577	271,127
2017	157,746	3,944	35,493	4,437	39,930	29,577	271,127
		KWH/day	9,033				
		Price/KWH	\$0.01				

**Table A2**  
**SEVEN ETRAPS**  
**Income and expenditure without the project**

NPV -2,025,166  
 Disc Rate 12%

Year	Production			Income, US\$ 1996			Expenditure, US\$ 1996			\$/M3 cons \$
	m3 produced	Loss ratio	m3 delivered	Tariff	Billings	Income	Capital	Operating	Total	
1996	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
1997	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
1998	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
1999	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2000	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2001	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2002	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2003	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2004	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2005	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2006	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2007	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2008	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2009	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2010	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2011	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2012	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2013	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2014	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2015	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2016	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
2017	2,310,815	80%	462,163	0	0	0	0	271,127	271,127	0.59
Prodn./day	6,331				Collection rate	90%				

**Table A3**  
**SEVEN ETRAPS**  
**Demand projection**

Cons lpd Year	Type of cover				Total population	otal annual consumption M3	Losses	System demand M3	Daily productio M3	Percapita daily av. prodn, L.	System capacity		Required nvestment \$
	H/hold con 130	Yard taps 75	Stand pipe 40	No cover 0							Total Utilization	Total M3	
	Proportion of popln. with each type of cover												
1998	10%	20%	50%	20%	154,053	2,699,009	20%	3,373,761	9,243	75	12,000	77%	500,000
1999	11%	21%	49%	20%	158,366	2,820,824	20%	3,526,030	9,660	76	12,000	81%	0
2000	11%	22%	47%	20%	162,801	2,949,722	20%	3,687,152	10,102	78	12,000	84%	0
2001	12%	23%	45%	20%	167,359	3,086,192	20%	3,857,740	10,569	79	12,000	88%	0
2002	12%	24%	45%	19%	171,045	3,236,946	20%	4,046,182	11,085	80	12,000	92%	0
2003	13%	26%	44%	18%	174,811	3,395,797	20%	4,244,746	11,629	81	12,000	97%	0
2004	13%	27%	43%	17%	178,661	3,563,246	20%	4,454,057	12,000	81	12,000	100%	250,000
2005	14%	28%	42%	16%	182,596	3,739,825	20%	4,674,781	12,808	84	14,500	88%	0
2006	15%	30%	41%	15%	186,617	3,926,105	20%	4,907,631	13,446	85	14,500	93%	0
2007	16%	31%	39%	14%	190,726	4,122,693	20%	5,153,367	14,119	86	14,500	97%	0
2008	16%	33%	38%	13%	194,926	4,330,241	20%	5,412,802	14,500	86	14,500	100%	250,000
2009	17%	34%	37%	12%	199,219	4,549,443	20%	5,686,804	15,580	89	17,000	92%	0
2010	18%	36%	35%	11%	203,606	4,781,042	20%	5,976,302	16,373	90	17,000	96%	0
2011	19%	38%	33%	10%	208,090	5,025,831	20%	6,282,288	17,000	91	17,000	100%	#####
2012	20%	40%	31%	10%	212,673	5,253,608	20%	6,567,011	17,992	94	22,000	82%	0
2013	21%	42%	28%	10%	217,356	5,494,965	20%	6,868,706	18,818	96	22,000	86%	0
2014	22%	44%	25%	10%	222,143	5,750,825	20%	7,188,531	19,695	99	22,000	90%	0
2015	23%	46%	21%	10%	227,035	6,022,181	20%	7,527,726	20,624	101	22,000	94%	0
2016	24%	48%	18%	10%	232,034	6,310,094	20%	7,887,617	21,610	103	22,000	98%	0
2017	25%	51%	14%	10%	237,144	6,615,703	20%	8,269,628	22,000	103	22,000	100%	0
	Annual growth				Pop growth 1996-2001								
	5%				2.8%								
					Pop growth 2002-17								
					2.2%								

**Table A4**  
**SEVEN ETRAPS**  
**Operating expenditure with the project**

Year	Ex.Rate 3550 Mats & equip.	Elect.	Chems.	Salaries	Other	Total	% inc
<i>1996 Dollars</i>							
1996	157,746	35,493	0	39,930	37,958	271,127	
1997	157,746	35,493	0	39,930	37,958	271,127	0.00
1998	123,023	27,989	28,317	44,200	37,520	261,049	-0.04
1999	98,716	22,881	49,450	47,189	37,214	255,450	-0.02
2000	42,000	10,479	94,391	54,163	36,500	237,533	-0.07
2001	42,000	10,964	98,758	54,163	36,500	242,385	0.02
2002	42,000	11,499	103,582	54,163	36,500	247,745	0.02
2003	42,000	12,063	108,666	54,163	36,500	253,392	0.02
2004	42,000	12,658	114,024	54,163	36,500	259,345	0.02
2005	42,000	13,286	119,674	54,163	36,500	265,623	0.02
2006	42,000	13,947	125,635	54,163	36,500	272,246	0.02
2007	42,000	14,646	131,926	54,163	36,500	279,235	0.03
2008	42,000	15,383	138,568	54,163	36,500	286,614	0.03
2009	42,000	16,162	145,582	54,163	36,500	294,407	0.03
2010	42,000	16,985	152,993	54,163	36,500	302,641	0.03
2011	42,000	17,854	160,827	54,163	36,500	311,344	0.03
2012	42,000	18,663	168,115	54,163	36,500	319,442	0.03
2013	42,000	19,521	175,839	54,163	36,500	328,023	0.03
2014	42,000	20,430	184,026	54,163	36,500	337,119	0.03
2015	42,000	21,394	192,710	54,163	36,500	346,767	0.03
2016	42,000	22,416	201,923	54,163	36,500	357,003	0.03
2017	42,000	23,502	211,702	54,163	36,500	367,868	0.03
	Spares/Mats \$6,000 (per Etrap/yr)	Price/KWH \$0.01 KWH/M3 0.33	Price/M3 \$0.03 Price/Kg \$2.00 Kg/M3 0.016	Av. salary/month \$43.40 Real inc 100% Staff/etrap: 12 Cen.Admin: 20	Av./day \$100		

Table A5

## SEVEN ETRAPS

## Financial rate of return and tariff calculation

Loan terms		Net present values				
Loan	10,936,000	Discount Rate	Income - O&M	Total cash flow	Net real trans.	Net financial impact
Grace per.	5	12.0%	6,402,553	0	-2,838,646	-813,479
Payments	15	Full cost tariff /1		\$ 0.42	O&M tariff /1	\$ 0.14
Interest	7.5%	IRR - full tariff /2		10.7%		

Year	Income			Expenditure					Total cash flow /3	Net real transactions /4	Net financial impact of project /5
	m3 delivered	Billings	Receipts	Initial investment	Debt Service	Incremental investment	Operating	Total			
1998	1,208,431	510,825	459,742	5,468,000	0	500,000	261,049	761,049	-301,307	-5,769,307	-5,498,180
1999	1,771,759	748,953	674,058	5,468,000	0	0	255,450	255,450	418,608	-5,049,392	-4,778,265
2000	2,949,722	1,246,899	1,122,209	0	0	0	237,533	237,533	884,676	884,676	1,155,802
2001	3,086,192	1,304,587	1,174,128	0	0	0	242,385	242,385	931,743	931,743	1,202,870
2002	3,236,946	1,368,313	1,231,482	0	0	0	247,745	247,745	983,737	983,737	1,254,864
2003	3,395,797	1,435,462	1,291,916	0	1,656,689	0	253,392	1,910,082	-618,165	1,038,524	1,309,651
2004	3,563,246	1,506,246	1,355,621	0	1,656,689	250,000	259,345	2,166,035	-810,413	846,276	1,117,403
2005	3,739,825	1,580,889	1,422,800	0	1,656,689	0	265,623	1,922,313	-499,512	1,157,177	1,428,304
2006	3,926,105	1,659,633	1,493,669	0	1,656,689	0	272,246	1,928,935	-435,266	1,221,424	1,492,550
2007	4,122,693	1,742,734	1,568,461	0	1,656,689	0	279,235	1,935,925	-367,464	1,289,226	1,560,352
2008	4,330,241	1,830,468	1,647,422	0	1,656,689	250,000	286,614	2,193,303	-545,882	1,110,807	1,381,934
2009	4,549,443	1,923,129	1,730,816	0	1,656,689	0	294,407	1,951,097	-220,281	1,436,409	1,707,536
2010	4,781,042	2,021,030	1,818,927	0	1,656,689	0	302,641	1,959,330	-140,404	1,516,286	1,787,412
2011	5,025,831	2,124,506	1,912,055	0	1,656,689	3,000,000	311,344	4,968,033	-3,055,978	-1,399,288	-1,128,162
2012	5,253,608	2,220,792	1,998,712	0	1,656,689	0	319,442	1,976,131	22,581	1,679,270	1,950,397
2013	5,494,965	2,322,817	2,090,535	0	1,656,689	0	328,023	1,984,712	105,823	1,762,513	2,033,639
2014	5,750,825	2,430,974	2,187,876	0	1,656,689	0	337,119	1,993,809	194,068	1,850,757	2,121,884
2015	6,022,181	2,545,681	2,291,112	0	1,656,689	0	346,767	2,003,456	287,656	1,944,346	2,215,473
2016	6,310,094	2,667,386	2,400,648	0	1,656,689	0	357,003	2,013,692	386,956	2,043,645	2,314,772
2017	6,615,703	2,796,573	2,516,915	0	1,656,689	0	367,868	2,024,557	492,358	2,149,048	2,420,174

Notes: Collection rate: 90%

- Tariff calculations are on a cashflow basis (see note 3.); depreciation is set equal to the amortization of the loan.
- The financial IRR is calculated for the full tariff, on the basis of the net financial impact of the project (as defined in note 5 below).
- Total cash flow is defined as total cash receipts less total cash expenditure (inc. debt service) in each period. Debt-financed capital expenditures are netted out of the flow.
- Net real transactions is cash income less investment and O&M expenditures. This includes the value of investments in the year they are made; it excludes debt service.
- Equal to the net real transactions of the "with project" scenario less the net income stream of the "without project" scenario.

**Table A11**  
**SEVEN ETRAPS**  
**Economic operating expenditure without the project**

Ex. Rate 3550

Year	Mats & equip.	Fuel	Electricity	Deprecn.	Salaries	Other	Total
<i>1996 Dollars, per year</i>							
1996	157,746	3,944	164,852	4,437	39,930	29,577	400,486
1997	157,746	3,944	164,852	4,437	39,930	29,577	400,486
1998	157,746	3,944	164,852	4,437	39,930	29,577	400,486
1999	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2000	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2001	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2002	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2003	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2004	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2005	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2006	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2007	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2008	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2009	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2010	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2011	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2012	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2013	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2014	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2015	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2016	157,746	3,944	164,852	4,437	39,930	29,577	400,486
2017	157,746	3,944	164,852	4,437	39,930	29,577	400,486
		KWH/day	9,033				
		Price/KWH	\$0.05				

**Table A12**  
**SEVEN ETRAPS**  
**Economic operating expenditure with the project**

Year	Ex.Rate 3550 Mats & equip.	Elect.	Chems.	Salaries	Other	Total	% inc
			<i>1996 Dollars</i>				
1996	157,746	35,493	0	39,930	37,958	271,127	
1997	157,746	35,493	0	39,930	37,958	271,127	0.00
1998	123,023	39,446	28,317	44,200	37,520	272,506	0.01
1999	98,716	42,889	49,450	47,189	37,214	275,457	0.01
2000	42,000	48,670	94,391	54,163	36,500	275,725	0.00
2001	42,000	50,922	98,758	54,163	36,500	282,343	0.02
2002	42,000	53,410	103,582	54,163	36,500	289,655	0.03
2003	42,000	56,031	108,666	54,163	36,500	297,359	0.03
2004	42,000	58,794	114,024	54,163	36,500	305,481	0.03
2005	42,000	61,707	119,674	54,163	36,500	314,045	0.03
2006	42,000	64,781	125,635	54,163	36,500	323,079	0.03
2007	42,000	68,024	131,926	54,163	36,500	332,614	0.03
2008	42,000	71,449	138,568	54,163	36,500	342,680	0.03
2009	42,000	75,066	145,582	54,163	36,500	353,311	0.03
2010	42,000	78,887	152,993	54,163	36,500	364,544	0.03
2011	42,000	82,926	160,827	54,163	36,500	376,416	0.03
2012	42,000	86,685	168,115	54,163	36,500	387,463	0.03
2013	42,000	90,667	175,839	54,163	36,500	399,169	0.03
2014	42,000	94,889	184,026	54,163	36,500	411,578	0.03
2015	42,000	99,366	192,710	54,163	36,500	424,739	0.03
2016	42,000	104,117	201,923	54,163	36,500	438,703	0.03
2017	42,000	109,159	211,702	54,163	36,500	453,525	0.03
	Spares/Mats \$6,000 (per Etrap/yr)	Price/KWH \$0.05 KWH/M3 0.33	Price/M3 \$0.03 Price/Kg \$2.00 Kg/M3 0.016	Av. salary/month \$43.40 Real inc 100% Staff/etrap: 12 Gen.Admin: 20	Av./day \$100		

Table A14

## SEVEN ETRAPS

Baseline estimate of economic rate of return

Net present value	5,736,235
Discount rate	12%
Economic internal rate of return	22.2%

Year	Water delivered				Economic benefits	Investment costs	Economic costs	Total	Net benefit (Economic benefit - economic cost)
	Total, m3	Household connection	Yard Tap	Stand pipe	Increase in consumer surplus		Operating (with project-without project)		
1998	1,208,431	359,958	415,337	433,135	666,211	5,127,148	-129,359	4,997,788	-4,331,577
1999	1,771,759	527,759	608,952	635,048	976,776	4,697,595	-129,359	4,568,235	-3,591,459
2000	2,949,722	851,670	982,696	1,115,356	1,626,373	0	-127,980	-127,980	1,754,353
2001	3,086,192	919,292	1,060,722	1,106,178	1,701,426	0	-125,029	-125,029	1,826,455
2002	3,236,946	986,514	1,138,285	1,112,147	1,784,386	0	-124,761	-124,761	1,909,148
2003	3,395,797	1,058,650	1,221,520	1,115,627	1,871,794	0	-118,143	-118,143	1,989,936
2004	3,563,246	1,136,062	1,310,841	1,116,343	1,963,922	214,777	-110,831	103,946	1,859,976
2005	3,739,825	1,219,134	1,406,693	1,113,997	2,061,064	0	-103,127	-103,127	2,164,191
2006	3,926,105	1,308,281	1,509,555	1,108,269	2,163,533	0	-95,005	-95,005	2,258,538
2007	4,122,693	1,403,946	1,619,938	1,098,809	2,271,662	0	-86,441	-86,441	2,358,103
2008	4,330,241	1,506,607	1,738,393	1,085,242	2,385,807	214,777	-77,407	137,370	2,248,437
2009	4,549,443	1,616,775	1,865,509	1,067,160	2,506,350	0	-67,872	-67,872	2,574,222
2010	4,781,042	1,734,998	2,001,921	1,044,123	2,633,697	0	-57,806	-57,806	2,691,503
2011	5,025,831	1,861,866	2,148,307	1,015,658	2,768,285	2,577,320	-47,175	2,530,145	238,140
2012	5,253,608	1,998,011	2,305,397	950,200	2,893,397	0	-35,942	-35,942	2,929,339
2013	5,494,965	2,144,112	2,473,975	876,378	3,025,955	0	-24,070	-24,070	3,050,025
2014	5,750,825	2,300,895	2,654,879	795,050	3,166,466	0	-13,023	-13,023	3,179,489
2015	6,022,181	2,469,144	2,849,012	704,025	3,315,473	0	-1,317	-1,317	3,316,790
2016	6,310,094	2,649,695	3,057,340	603,059	3,473,558	0	11,092	11,092	3,462,466
2017	6,615,703	2,843,448	3,280,902	491,353	3,641,346	0	24,253	24,253	3,617,093
					Loan	\$ 10,936,000			
					Tax rate	16%			
					Adjustment for tax	0.86			

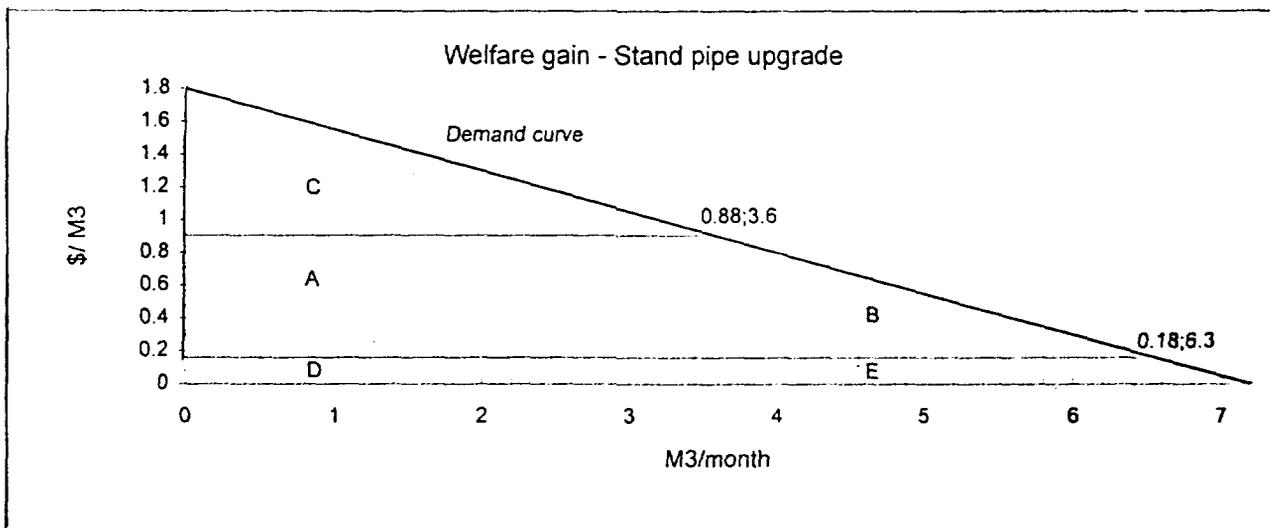
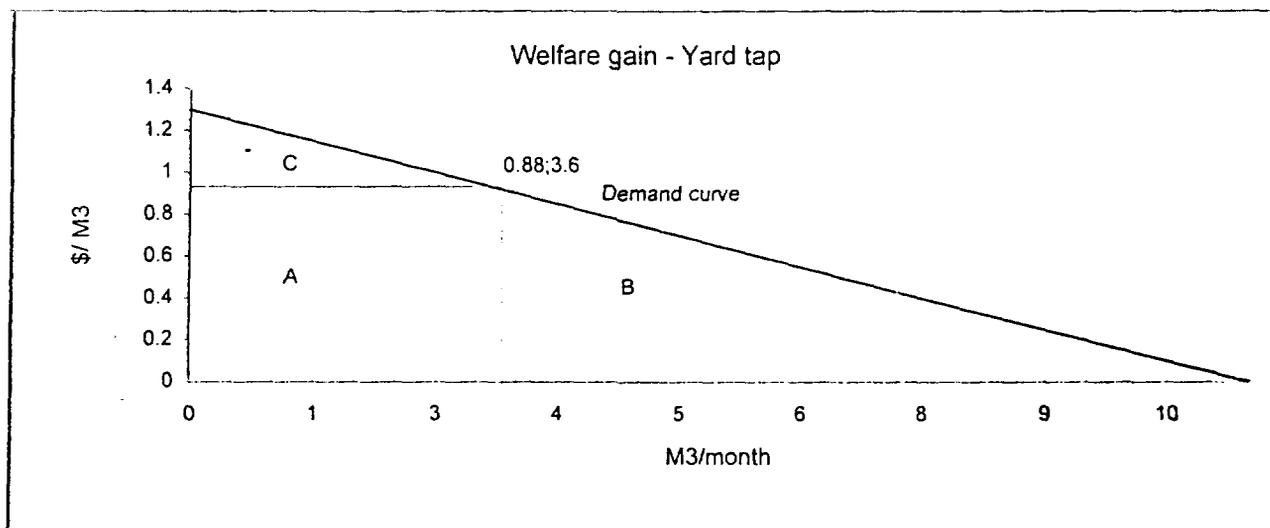
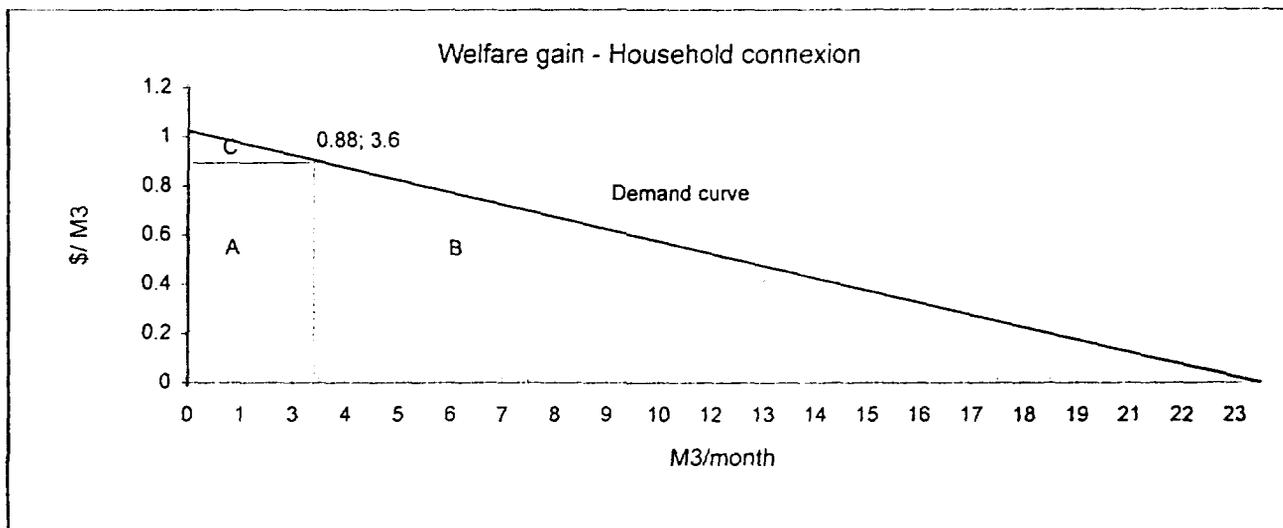
**Table A 13**  
**Estimated welfare gains from improved water supply - Etrap Centers**

	H.Conn	Yard tap	Stand pipe	Notes
<b>Demand curves</b>				1
Time spent fetching water (per household/day)	1.5	1.5	1.5	
Average monthly wage, M	40,000	40,000	40,000	
Average hourly wage, \$	0.07	0.07	0.07	
Average monthly exp. on water, \$	3.17	3.17	3.17	
p1 \$/M3	0.88	0.88	0.88	2
q1 M3/month	3.6	3.6	3.6	3
p2 \$ M/3	0	0	0.18	4
q2 M3/month	23.4	10.8	6.3	
ALPHA	1.04	1.32	1.82	
BETA	-0.04	-0.12	-0.26	
Demand elasticity (p1)	-5.5	-2	-0.94	
<b>Consumer surplus increase (\$/household/month)</b>				
A: Reduced cost of water	3.17	3.17	2.54	
B: Increased consumption	8.71	3.17	0.95	
Total, \$	11.88	6.34	3.49	
<b>Av. gain per M3 total consumption</b>				
Total, \$	0.51	0.59	0.55	

**Notes**

1. The estimated curve is:  $P = \text{ALPHA} + \text{BETA} Q$
2. Imputed value of fetching time per M3.
3. Consumption at present is estimated at 20 litres/person/day; 6 persons per household
4. Expected value of fetching time per meter for the improved standpipe system

Chart 1 Monthly household welfare gains from different types of service - Etrap Centers



**ETRAPS  
OPERATING EXPENDITURE WITHOUT PROJECT**

Ex. Rate 3550

<b>Year</b>	<b>Mats &amp; equip.</b>	<b>Fuel</b>	<b>Electricity</b>	<b>Deprec.</b>	<b>Salaries</b>	<b>Other</b>	<b>Total</b>	<b>US \$</b>
<i>Millions of 1996 Manats</i>								
1996	640	16	144	18	162	120	1,100	309,859
1997	640	16	144	18	162	120	1,100	309,859
1998	640	16	144	18	162	120	1,100	309,859
1999	640	16	144	18	162	120	1,100	309,859
2000	640	16	144	18	162	120	1,100	309,859
2001	640	16	144	18	162	120	1,100	309,859
2002	640	16	144	18	162	120	1,100	309,859
2003	640	16	144	18	162	120	1,100	309,859
2004	640	16	144	18	162	120	1,100	309,859
2005	640	16	144	18	162	120	1,100	309,859
2006	640	16	144	18	162	120	1,100	309,859
2007	640	16	144	18	162	120	1,100	309,859
2008	640	16	144	18	162	120	1,100	309,859
2009	640	16	144	18	162	120	1,100	309,859
2010	640	16	144	18	162	120	1,100	309,859
2011	640	16	144	18	162	120	1,100	309,859
2012	640	16	144	18	162	120	1,100	309,859
2013	640	16	144	18	162	120	1,100	309,859
2014	640	16	144	18	162	120	1,100	309,859
2015	640	16	144	18	162	120	1,100	309,859
2016	640	16	144	18	162	120	1,100	309,859
2017	640	16	144	18	162	120	1,100	309,859

Prod growth

-1

**Table A6**  
**KOLKHOZES**  
**Financial operating expenditure without the project**

Ex. Rate	3550	<table border="1" style="margin-left: auto; margin-right: auto;"> <tr> <td>Total present coverage, RWD (persons)</td> <td>Present coverage, 9 Kolkhozes</td> <td>% of present cost attributable to 9 Kolkhozes</td> </tr> <tr> <td>148,000</td> <td>16,730</td> <td>11.30%</td> </tr> </table>				Total present coverage, RWD (persons)	Present coverage, 9 Kolkhozes	% of present cost attributable to 9 Kolkhozes	148,000	16,730	11.30%	Total
		Total present coverage, RWD (persons)	Present coverage, 9 Kolkhozes	% of present cost attributable to 9 Kolkhozes								
148,000	16,730	11.30%										
Year	Mats & equip.	Fuel	Electricity	Salaries	Other							
<i>1996 Dollars, per year</i>												
1996	45,127	10,403	5,268	7,314	8,292	76,403						
1997	45,127	10,403	5,268	7,314	8,292	76,403						
1998	45,127	10,403	5,268	7,314	8,292	76,403						
1999	45,127	10,403	5,268	7,314	8,292	76,403						
2000	45,127	10,403	5,268	7,314	8,292	76,403						
2001	45,127	10,403	5,268	7,314	8,292	76,403						
2002	45,127	10,403	5,268	7,314	8,292	76,403						
2003	45,127	10,403	5,268	7,314	8,292	76,403						
2004	45,127	10,403	5,268	7,314	8,292	76,403						
2005	45,127	10,403	5,268	7,314	8,292	76,403						
2006	45,127	10,403	5,268	7,314	8,292	76,403						
2007	45,127	10,403	5,268	7,314	8,292	76,403						
2008	45,127	10,403	5,268	7,314	8,292	76,403						
2009	45,127	10,403	5,268	7,314	8,292	76,403						
2010	45,127	10,403	5,268	7,314	8,292	76,403						
2011	45,127	10,403	5,268	7,314	8,292	76,403						
2012	45,127	10,403	5,268	7,314	8,292	76,403						
2013	45,127	10,403	5,268	7,314	8,292	76,403						
2014	45,127	10,403	5,268	7,314	8,292	76,403						
2015	45,127	10,403	5,268	7,314	8,292	76,403						
2016	45,127	10,403	5,268	7,314	8,292	76,403						
2017	45,127	10,403	5,268	7,314	8,292	76,403						
Structure:	59%	14%	7%	10%	11%	100%						
		Price/KWH	\$0.01									
		KWH/M3 prod.	1.42									
		m3 prod/day	1016									
		KWH/day	1,443									

**Table A7**  
**KOLKHOZES**  
**Income and expenditure without the project**

NPV -570,688  
 Disc Rate 12%

Year	Production			Income, US\$ 1996			Expenditure, US\$ 1996			\$/M3 cons \$
	m3 produced	Loss ratio	m3 delivered	Tariff	Billings	Income	Capital	Operating	Total	
1996	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
1997	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
1998	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
1999	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2000	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2001	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2002	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2003	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2004	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2005	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2006	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2007	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2008	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2009	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2010	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2011	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2012	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2013	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2014	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2015	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2016	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
2017	370,967	80%	74,193	0	0	0	0	76,403	76,403	1.03
odn. M3/day	1,016	Cons l/p/d	12.15		Collection rate	90%				

**Table A8**  
**KOLKHOZES**  
**Demand projection**

Year	Type of cover				Total population	Total annual consumption M3	Loss rate	System demand M3	Daily production M3	Percapita daily av. prodn, L.	System capacity Total M3	Utilization	Required Investment \$	
	H/hold con 130	Yard taps 75	Stand pipe 40	No cover 0										
Cons lpd	Proportion of popln. with each type of cover													
1998	5%	15%	60%	20%	95,500	1,455,301	20%	1,819,126	4,984	65	6,500	77%	0	
1999	5%	16%	59%	20%	97,983	1,519,291	20%	1,899,113	5,203	66	6,500	80%	0	
2000	6%	17%	57%	20%	100,531	1,587,637	20%	1,984,546	5,437	68	6,500	84%	0	
2001	6%	19%	55%	20%	103,144	1,660,730	20%	2,075,912	5,687	69	6,500	87%	0	
2002	7%	20%	54%	19%	105,416	1,747,646	20%	2,184,558	5,985	70	6,500	92%	0	
2003	7%	22%	53%	18%	107,737	1,840,265	20%	2,300,331	6,302	71	6,500	97%	0	
2004	8%	23%	52%	17%	110,110	1,939,058	20%	2,423,823	6,500	71	6,500	100%	500,000	
2005	8%	25%	51%	16%	112,535	2,044,545	20%	2,555,681	7,002	74	9,750	72%	0	
2006	9%	27%	49%	15%	115,013	2,157,290	20%	2,696,613	7,388	76	9,750	76%	0	
2007	10%	29%	48%	14%	117,546	2,277,914	20%	2,847,392	7,801	77	9,750	80%	0	
2008	10%	31%	46%	13%	120,134	2,407,093	20%	3,008,866	8,243	79	9,750	85%	0	
2009	11%	33%	44%	12%	122,780	2,545,569	20%	3,181,961	8,718	81	9,750	89%	0	
2010	12%	36%	41%	11%	125,484	2,694,153	20%	3,367,692	9,227	83	9,750	95%	0	
2011	13%	38%	39%	10%	128,247	2,853,736	20%	3,567,170	9,750	84	9,750	100%	500,000	
2012	14%	41%	35%	10%	131,071	3,006,153	20%	3,757,692	10,295	87	13,000	79%	0	
2013	15%	44%	31%	10%	133,958	3,170,766	20%	3,963,457	10,859	90	13,000	84%	0	
2014	16%	48%	26%	10%	136,908	3,348,714	20%	4,185,892	11,468	93	13,000	88%	0	
2015	17%	51%	22%	10%	139,923	3,541,249	20%	4,426,561	12,128	96	13,000	93%	0	
2016	18%	55%	16%	10%	143,004	3,749,746	20%	4,687,183	12,842	100	13,000	99%	0	
2017	20%	59%	11%	10%	146,153	3,975,713	20%	4,969,641	13,000	100	13,000	100%	0	
	Annual growth				Pop growth 1996-2001		Loss rate							
	8%	8%			2.6%		20%							
					Pop growth 2002-17									
					2.2%									

**Table A9**  
**KOLKHOZES**  
**Financial operating expenditure with the project**

Ex.Rate Year	3550 Mats & equip.	Elect.	Chems.	Salaries	Other	Total		\$/M3 cons	
			<i>1996 Dollars</i>					<i>% inc</i>	
1996	45,127	5,268	0	7,314	18,694	76,403			
1997	45,127	5,268	0	7,314	18,694	76,403	0.00		
1998	44,549	5,652	19,052	25,118	24,036	118,407	0.55	0.05	
1999	44,144	6,012	33,265	37,582	27,775	148,778	0.26	0.05	
2000	43,200	6,549	63,505	66,662	36,500	216,417	0.45	0.07	
2001	43,200	6,851	66,429	66,662	36,500	219,642	0.01	0.09	
2002	43,200	7,209	69,906	66,662	36,500	223,477	0.02	0.12	
2003	43,200	7,591	73,611	66,662	36,500	227,564	0.02	0.12	
2004	43,200	7,999	77,562	66,662	36,500	231,923	0.02	0.12	
2005	43,200	8,434	81,782	66,662	36,500	236,578	0.02	0.11	
2006	43,200	8,899	86,292	66,662	36,500	241,553	0.02	0.11	
2007	43,200	9,396	91,117	66,662	36,500	246,875	0.02	0.10	
2008	43,200	9,929	96,284	66,662	36,500	252,575	0.02	0.10	
2009	43,200	10,500	101,823	66,662	36,500	258,686	0.02	0.10	
2010	43,200	11,113	107,766	66,662	36,500	265,242	0.03	0.09	
2011	43,200	11,772	114,149	66,662	36,500	272,283	0.03	0.09	
2012	43,200	12,400	120,246	66,662	36,500	279,009	0.02	0.09	
2013	43,200	13,079	126,831	66,662	36,500	286,272	0.03	0.09	
2014	43,200	13,813	133,949	66,662	36,500	294,124	0.03	0.08	
2015	43,200	14,608	141,650	66,662	36,500	302,620	0.03	0.08	
2016	43,200	15,468	149,990	66,662	36,500	311,820	0.03	0.08	
2017	43,200	16,400	159,029	66,662	36,500	321,791	0.03	0.08	
	Spares/Mats \$4,800 (per Kolkhoz/yr)	Price/KWH \$0.01 KWH/M3 0.33	Price/M3 \$0.03 Price/Kg \$2.00 Kg/M3 0.016	Av. salary/month \$43.40 Real inc 100% Staff/kolkhoz: 12 Cen.Admin: 20	Av./day \$100				

Table A10

## KOLKHOZES

## Financial rate of return and tariff calculation

Loan terms		Net present values				
Loan	12,396,000	Discount Rate	Income - O&M	Total cash flow	Net real trans.	Net financial impact
Grace per.	5	12.0%	7,257,320	0	-3,217,616	-2,479,117
Payments	15		<b>Full cost tariff /1</b>	\$ 0.74	<b>O&amp;M tariff /1</b>	\$ 0.16
Interest	7.5%		<b>IRR - full tariff /2</b>	8.4%		

Year	Income			Expenditure					Total cash flow /3	Net real transactions /4	Net financial impact of project /5
	m3 delivered	Billings	Receipts	Initial investment	Debt Service	Incremental investment	Operating	Total			
1998	528,226	389,324	350,391	6,198,000	0	0	118,407	118,407	231,984	-5,966,016	-5,867,147
1999	867,977	639,733	575,760	6,198,000	0	0	148,778	148,778	426,982	-5,771,018	-5,672,148
2000	1,587,637	1,170,150	1,053,135	0	0	0	216,417	216,417	836,719	836,719	935,588
2001	1,660,730	1,224,023	1,101,620	0	0	0	219,642	219,642	881,978	881,978	980,848
2002	1,747,646	1,288,083	1,159,275	0	0	0	223,477	223,477	935,798	935,798	1,034,667
2003	1,840,265	1,356,347	1,220,712	0	1,877,864	0	227,564	2,105,428	-884,716	993,148	1,092,017
2004	1,939,058	1,429,162	1,286,246	0	1,877,864	500,000	231,923	2,609,787	-1,323,542	554,322	653,192
2005	2,044,545	1,506,910	1,356,219	0	1,877,864	0	236,578	2,114,442	-758,223	1,119,641	1,218,510
2006	2,157,290	1,590,007	1,431,007	0	1,877,864	0	241,553	2,119,417	-688,410	1,189,454	1,288,323
2007	2,277,914	1,678,912	1,511,020	0	1,877,864	0	246,875	2,124,739	-613,719	1,264,145	1,363,014
2008	2,407,093	1,774,121	1,596,709	0	1,877,864	0	252,575	2,130,439	-533,730	1,344,134	1,443,003
2009	2,545,569	1,876,184	1,688,565	0	1,877,864	0	258,686	2,136,550	-447,984	1,429,880	1,528,749
2010	2,694,153	1,985,696	1,787,127	0	1,877,864	0	265,242	2,143,106	-355,979	1,521,885	1,620,754
2011	2,853,736	2,103,315	1,892,983	0	1,877,864	500,000	272,283	2,650,148	-757,164	1,120,700	1,219,569
2012	3,006,153	2,215,652	1,994,087	0	1,877,864	0	279,009	2,156,873	-162,786	1,715,078	1,813,948
2013	3,170,766	2,336,978	2,103,280	0	1,877,864	0	286,272	2,164,137	-60,856	1,817,008	1,915,877
2014	3,348,714	2,468,133	2,221,320	0	1,877,864	0	294,124	2,171,988	49,331	1,927,195	2,026,064
2015	3,541,249	2,610,039	2,349,035	0	1,877,864	0	302,620	2,180,484	168,551	2,046,415	2,145,284
2016	3,749,746	2,763,709	2,487,338	0	1,877,864	0	311,820	2,189,684	297,654	2,175,519	2,274,388
2017	3,975,713	2,930,256	2,637,230	0	1,877,864	0	321,791	2,199,655	437,575	2,315,439	2,414,309

Notes: Collection rate: 90%

1. Tariff calculations are on a cashflow basis (see note 3.); depreciation is set equal to the amortization of the loan.
2. The financial IRR is calculated for the full tariff, on the basis of the net financial impact of the project (as defined in note 5 below).
3. Total cash flow is defined as total cash receipts less total cash expenditure (inc. debt service) in each period. Debt-financed capital expenditures are netted out of the flow.
4. Net real transactions is cash income less investment and O&M expenditures. This includes the value of investments in the year they are made; it excludes debt service.
5. Equal to the net real transactions of the "with project" scenario less the net income stream of the "without project" scenario.

**Table A15**  
**KOLKHOZES**  
**Economic operating expenditure without the project**

Ex. Rate	3550	Fuel	Total present coverage, RWD (persons)			Total	\$/M3 cons
			Present coverage, 9 Kolkhozes	% of present cost attributable to 9 Kolkhozes			
	<b>Mats &amp; equip.</b>		148,000	16,730	11%		
Year			Electricity	Salaries	Other		
<i>1996 Dollars, per year</i>							
1996	45,127	10,403	26,339	7,314	8,292	97,474	1.31
1997	45,127	10,403	26,339	7,314	8,292	97,474	1.31
1998	45,127	10,403	26,339	7,314	8,292	97,474	1.31
1999	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2000	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2001	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2002	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2003	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2004	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2005	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2006	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2007	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2008	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2009	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2010	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2011	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2012	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2013	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2014	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2015	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2016	45,127	10,403	26,339	7,314	8,292	97,474	1.31
2017	45,127	10,403	26,339	7,314	8,292	97,474	1.31
Structure:	46%	11%	27%	8%	9%	100%	
		Price/KWH	\$0.05				
		KWH/M3 prod.	1.42				
		m3 prod/day	1016				
		KWH/day	1,443				

**Table A16**  
**KOLKHOZES**  
**Economic operating expenditure with the project**

Ex. Rate	3550							
Year	Mats & equip.	Elect.	Chems.	Salaries	Other	Total		\$/M3 cons
				<i>1996 Dollars</i>				
							<i>% inc</i>	
1996	45,127	26,339	0	7,314	18,694	97,474		
1997	45,127	26,339	0	7,314	18,694	97,474	0.00	
1998	44,549	28,261	19,052	25,118	24,036	141,016	0.45	0.07
1999	44,144	30,058	33,265	37,582	27,775	172,824	0.23	0.06
2000	43,200	32,745	63,505	66,662	36,500	242,613	0.40	0.09
2001	43,200	34,253	66,429	66,662	36,500	247,044	0.02	0.10
2002	43,200	36,045	69,906	66,662	36,500	252,313	0.02	0.14
2003	43,200	37,955	73,611	66,662	36,500	257,928	0.02	0.13
2004	43,200	39,993	77,562	66,662	36,500	263,918	0.02	0.13
2005	43,200	42,169	81,782	66,662	36,500	270,313	0.02	0.13
2006	43,200	44,494	86,292	66,662	36,500	277,148	0.03	0.12
2007	43,200	46,982	91,117	66,662	36,500	284,461	0.03	0.12
2008	43,200	49,646	96,284	66,662	36,500	292,292	0.03	0.12
2009	43,200	52,502	101,823	66,662	36,500	300,688	0.03	0.11
2010	43,200	55,567	107,766	66,662	36,500	309,695	0.03	0.11
2011	43,200	58,858	114,149	66,662	36,500	319,370	0.03	0.11
2012	43,200	62,002	120,246	66,662	36,500	328,610	0.03	0.10
2013	43,200	65,397	126,831	66,662	36,500	338,590	0.03	0.10
2014	43,200	69,067	133,949	66,662	36,500	349,378	0.03	0.10
2015	43,200	73,038	141,650	66,662	36,500	361,051	0.03	0.10
2016	43,200	77,339	149,990	66,662	36,500	373,691	0.04	0.09
2017	43,200	81,999	159,029	66,662	36,500	387,390	0.04	0.09
	Spares/Mats	Price/KWH	Price/M3	Av. salary/month	Av./day			
	\$4,800	\$0.05	\$0.03	\$43.40	\$100			
	(per Kolkhoz/yr)	KWH/M3	Price/Kg	Real inc				
		0.33	\$2.00	100%				
			Kg/M3	Staff/kolkhoz: 12				
			0.016	Gen.Admin: 20				

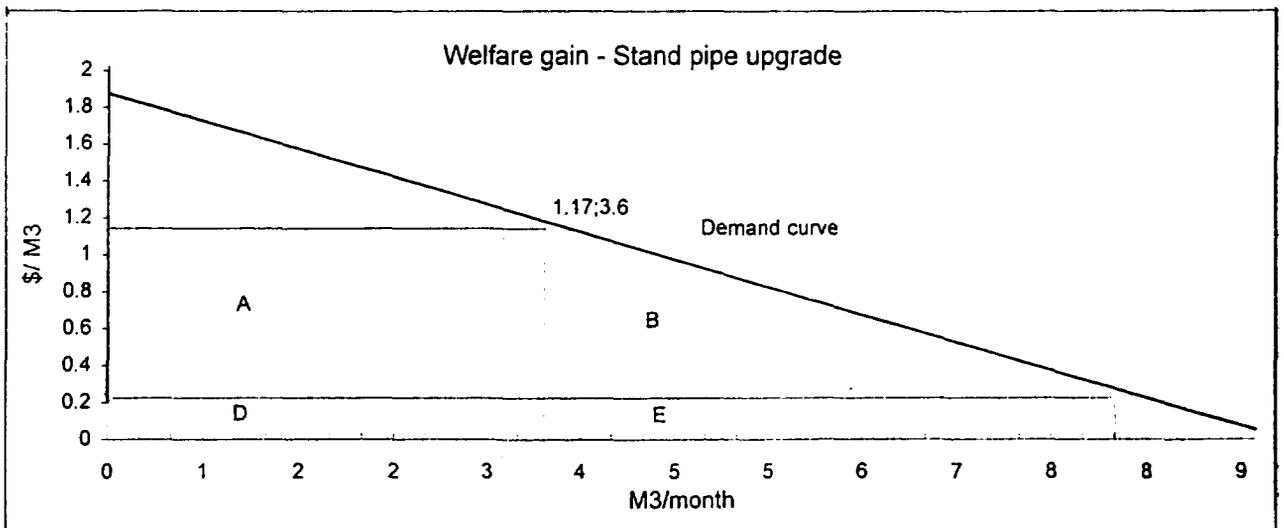
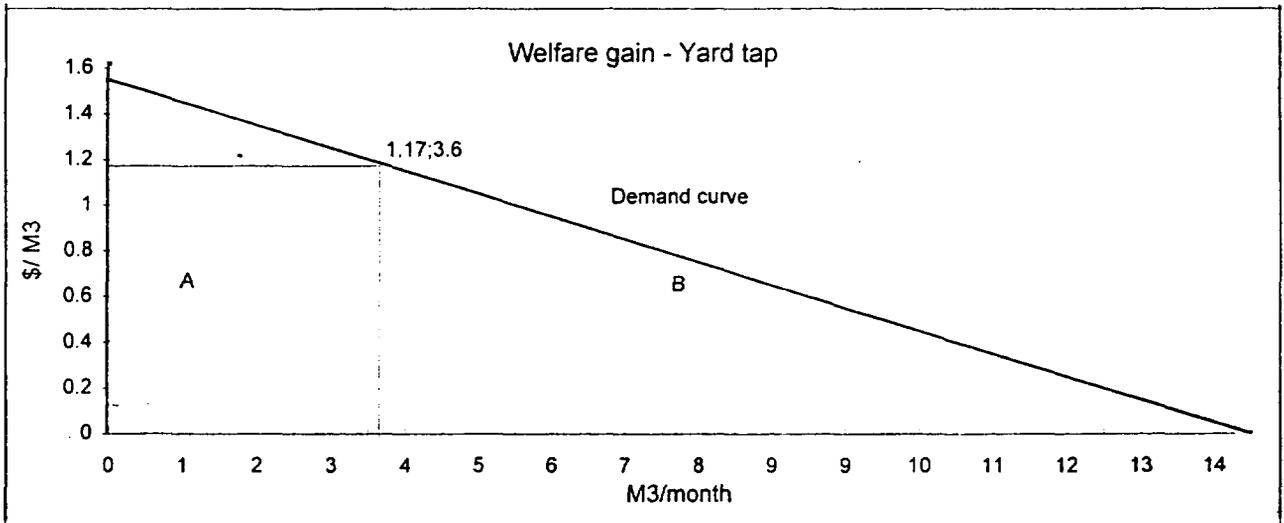
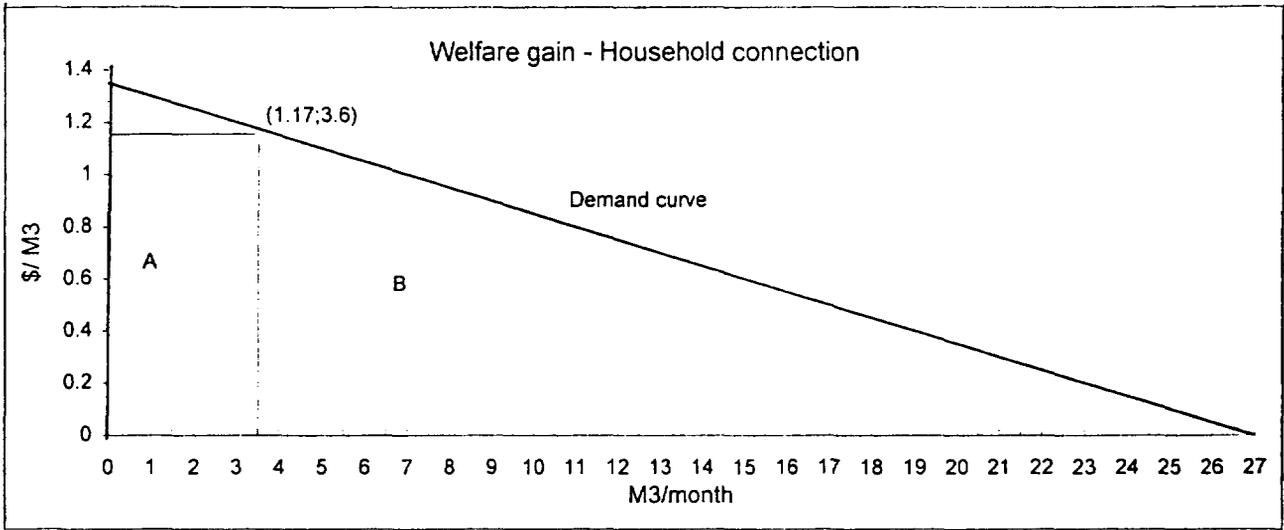
**Table A 17**  
**Estimated welfare gains from improved water supply - Kolkhozes**

	H.Conn	Yard tap	Stand pipe	Notes
<b>Demand curves</b>				1
Time spent fetching water (per household/day)	2.0	2.0	2.0	
Average monthly wage, M	40,000	40,000	40,000	
Average hourly wage, \$	0.07	0.07	0.07	
Average monthly exp. on water, \$	4.23	4.23	4.23	
p1 \$/M3	1.17	1.17	1.17	2
q1 M3/month	3.6	3.6	3.6	3
p2 \$ M/3	0	0	0.23	4
q2 M3/month	27.3	14.7	8.4	
ALPHA	1.35	1.55	1.88	
BETA	-0.05	-0.11	-0.20	
Demand elasticity (p1)	-6.6	-3.1	-1.67	
<b>Consumer surplus increase (\$/household/month)</b>				
A: Reduced cost of water	4.23	4.23	3.38	
B: Increased consumption	13.91	6.51	2.25	
Total, \$	18.13	10.74	5.63	
<b>Av. gain per M3 total consumption</b>				
Total, \$	0.66	0.73	0.67	

**Notes**

1. The estimated curve is:  $P = \text{ALPHA} + \text{BETA} Q$
2. Imputed value of fetching time per M3.
3. Consumption at present is estimated at 17 litres/person/day; 7 persons per household
4. Expected value of fetching time per meter for the improved standpipe system

MONTHLY HOUSEHOLD WELFARE GAINS FOR DIFFERENT TYPES OF SERVICE - KOLKHOZES



**Table A18  
KOLKHOZES**

**Baseline estimate of economic rate of return**

Net present value	-850,896
Discount rate	12%
Economic internal rate of return	10.6%

Year	Production		Water delivered			Economic benefits	Economic costs		Net benefit		
	m3 produced	Loss ratio	Total, m3	Household connexion	Yard Tap	Stand pipe	Increase in consumer surplus	Economic investment costs /1	Operating (with project-without project)	Total	(Economic benefit - economic cost)
1996	370,967	80%	74,193					0	0	0	0
1997	370,967	80%	74,193	12,881	22,293	39,019		0	0	0	0
1998	855,041	62%	528,226	91,704	158,719	277,803	363,190	5,413,100	43,542	5,456,642	-5,093,452
1999	1,221,302	49%	1,057,932	183,666	317,883	556,383	727,396	5,413,100	75,350	5,488,451	-4,761,054
2000	1,984,546	20%	1,587,637	275,627	477,046	834,964	1,091,603	0	145,139	145,139	946,464
2001	2,075,912	20%	1,660,730	304,002	526,158	830,569	1,143,384	0	149,570	149,570	993,813
2002	2,184,558	20%	1,747,646	333,999	578,076	835,571	1,204,593	0	154,840	154,840	1,049,754
2003	2,300,331	20%	1,840,265	366,956	635,117	838,192	1,269,915	0	160,454	160,454	1,109,460
2004	2,423,823	20%	1,939,058	403,165	697,786	838,107	1,339,694	436,681	166,444	603,125	736,569
2005	2,555,681	20%	2,044,545	442,947	766,639	834,959	1,414,310	0	172,839	172,839	1,241,471
2006	2,696,613	20%	2,157,290	486,654	842,286	828,351	1,494,175	0	179,674	179,674	1,314,501
2007	2,847,392	20%	2,277,914	534,674	925,397	817,843	1,579,743	0	186,987	186,987	1,392,757
2008	3,008,866	20%	2,407,093	587,432	1,016,709	802,952	1,671,510	0	194,818	194,818	1,476,692
2009	3,181,961	20%	2,545,569	645,396	1,117,031	783,141	1,770,019	0	203,214	203,214	1,566,805
2010	3,367,692	20%	2,694,153	709,079	1,227,253	757,821	1,875,863	0	212,222	212,222	1,663,641
2011	3,567,170	20%	2,853,736	779,047	1,348,350	726,339	1,989,694	436,681	221,896	658,577	1,331,116
2012	3,757,692	20%	3,006,153	855,918	1,481,397	668,839	2,099,390	0	231,137	231,137	1,868,254
2013	3,963,457	20%	3,170,766	940,374	1,627,571	602,820	2,218,003	0	241,116	241,116	1,976,887
2014	4,185,892	20%	3,348,714	1,033,164	1,788,169	527,380	2,346,370	0	251,904	251,904	2,094,466
2015	4,426,561	20%	3,541,249	1,135,110	1,964,614	441,525	2,485,410	0	263,577	263,577	2,221,834
2016	4,687,183	20%	3,749,746	1,247,116	2,158,470	344,161	2,636,134	0	276,217	276,217	2,359,917
2017	4,969,641	20%	3,975,713	1,370,173	2,371,453	234,086	2,799,648	0	289,916	289,916	2,509,732
							Loan	\$ 12,396,000			
							Tax rate	15%			
							Adjustment for tax	0.87			

**KOLKHOZES  
OPERATING EXPENDITURE WITHOUT PROJECT**

Ex. Rate 3,550

Year	Mats & equip.	Fuel	Electricity	Salaries	Other	Total	US \$
<i>Thousands of 1996 Manats</i>							
1996	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
1997	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
1998	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
1999	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
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2008	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
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2012	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
2013	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
2014	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
2015	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
2016	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203
2017	1,417,200	326,688	24,540	229,692	260,400	2,258,520	636,203

Prod growth

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## ANNEX S: TERMS OF REFERENCE

### ANNEX S-1: TERMS OF REFERENCE FOR PROJECT IMPLEMENTATION AND MANAGEMENT ADVISORY SERVICES

#### A. Background

1. The Central Asian Republics of Turkmenistan, Uzbekistan, Kazakstan, the Kyrgyz Republic, and Tajikistan are involved in the Aral Sea Program, which was designed in cooperation with the United Nations Development Program (UNDP), the United Nations Environmental Program (UNEP), and the Bank to improve environmental, social, and economic conditions in the regions affected by the Aral Sea crisis. The Bank has taken a leading role in the development and implementation of the Program, including donor coordination, technical assistance to all projects, and capacity building assistance to regional institutions.

2. The Velayet of Dashkhovuz is the area of Turkmenistan most affected by the crisis, being to the north of the country and closest to the Aral Sea, and receiving its potable and irrigation water supplies from the irrigation canals fed by the Amu Darya River. The water from these canals has in the past been heavily polluted with residues from upstream industries, particularly agriculture, which has had severe effects on the health of the population and agricultural production. The Velayet has a population of 951,000, of whom 300,000 live in Dashkhovuz and eight etrap centers and 651,000 on collective farms (kolhozes), of whom only half have access to some sort of piped supply.

#### Existing Water Supplies.

3. The principal potable water sources for the project area are the irrigation canals fed from the Amu Darya River, augmented by small quantities of groundwater in areas distant from irrigation canals. The potable water supplied in the velayet is obtained from boreholes, which abstract from the shallow aquifers adjacent and hydraulically linked to the irrigation canals. The quality of the borehole water is highly dependant on the quality of water in the irrigation canals, as the effect of the shallow aquifer is limited to filtering out suspended solids. The boreholes are typically 10 to 25 m deep, and between 4 and 12 are provided for each system, depending on the size of the settlement and the well performance. The water is pumped to a nearby ground reservoir where chlorine is added. The distribution pump station then draws water from the reservoir and pumps directly into the distribution system.

4. Maintenance of the water supply systems falls far below acceptable standards, as a result of lack of spares and chemicals, and inadequate funding. Very few of the systems have operating chlorination systems, with the result that water is usually delivered to supply with no disinfection. Pumps and pumping station pipe work is usually a mixture of different sizes and types of equipment, much of it broken down, which leads to frequent supply failures. In most towns, water is provided for between 4 and 6 hours per day, and often this limited supply does not reach consumers at the extremities of the distribution systems. The systems themselves suffer from high leakage and frequent bursts.

5. The majority of the population are supplied through street standpipes, although some households have yard taps, and in Dashkhovuz city there are a limited number of house connections. Because system operation is often limited to 6 hours per day, the street standpipes are either broken or missing, so that a large proportion of the water supplied by the system runs to waste. Similarly, yard taps are often left on, and water collected in containers, or left to run into gardens.

## B. Project Objectives

6. The objectives of the proposed project are to: (i) improve water supply and sanitation in seven etrap centers and nine collective farms in Dashkhovuz velayat; and (ii) initiate institutional changes in the water and sanitation sector to ensure that the project is financially and technically sustainable. The proposed project will comprise four main components: (a) water supply improvements; (b) sanitation and health; (c) institutional strengthening; and (d) project management and construction supervision.

## C. Overall Project Management

7. Implementation of the specific components would be the responsibility of the respective implementation agency (Ministry of Health (MOH) for the Sanitation and Health Component, the Ministry of Water Resources (MWR) for the Institutional Strengthening Component, and the local authorities in Dashhawuz Velayat and the participating etrap centers for the Water Supply and Distribution Improvements Component). To support project management and coordination responsibility, a Project Implementation Unit (PIU) has been established to support and coordinate overall project activities including, administration, project planning, organizational development, operating procedure development, implementation oversight, training, and technical assistance coordination. The PIU is responsible for ensuring that the requirements of Bank Guidelines on procurement of services and goods are understood and met, as well as disbursement responsibilities. In addition to overall coordination, the PIU would be responsible for common implementation functions such as project accounting, procurement, disbursements, consolidation of quarterly and annual progress reports, and annual work programs and budgets. The PIU would also provide training and technical assistance coordination, project supervision, and assistance to the Component Coordinators (CCs).

8. The PIU reports to the Deputy Minister of Water Resources, responsible for Construction and Operations. It is being staffed with a Director (local), an Economist (local), a Health Specialist (local), an Accountant/Disbursement Expert (local), an interpreter/translator (local), a Secretary (local), a Project Management Specialist (foreign), and a Procurement Specialist (foreign). In addition, the project will finance a limited number of short-term consultants such as a Financial Management Specialist, and a Computer Specialist (to help design a Project Management and Information System). The PIU will be provided with suitable office space, and local communications, and office equipment, although the consultants should be prepared to arrange for their own logistical support in transportation, international communications and lodging.

9. The project is expected to be approved by the World Bank Board by end of May 1997. The loan is expected to be effective by end of August 1997. The PIU has begun operations with financing from an advance approved by the Bank in November 1996 (PPF). The consultant services for project management, administration and construction supervision (this contract) will be divided into two phases: (i) establishment of the PIU and preparation and execution of initial procurement actions for the major technical assistance contracts to the MWR and the participating velayat; (ii) continued procurement of necessary consultants, initiation of purchasing of material and equipment, and setting up arrangements for rehabilitation of selected facilities; supervising on-going work and providing general support for policy and operational aspects of the project's execution to the project's conclusion. In addition, the consultant will be expected to train PIU staff and Component Coordinators (CCs) in the implementing agencies/departments in how to meet Bank Guidelines, operating procedures and reporting requirements, and design and implement a Management Information System for project activities. Consultants selected for phase one will be expected, if performance warrants and Loan funding becomes available, also to provide services in the second phase.

## D. PIU Functions

10. The PIU is the focal point for the project and is responsible for its overall coordination. The PIU headed

by its director will act as a service agency and agent to the implementing agencies/departments for those consulting services, equipment and rehabilitation activities to be provided to them under the project. Acting in cooperation and in consultation with the implementing agencies, it has delegated authority for preparing and recommending payments through the preparation and administrative approval of Bank Withdrawal Applications, and manages the procurement and signing (along with another designated official) of any contracts and payments.

11. The general functions and responsibilities of the PIU are as follows:

- (i) Administration
  - PIU organization procurement and purchasing
  - Supply and Logistics - ensure goods, equipment and facilities are available.
  - Human Resources - ensure recruitment of qualified staff.
- (ii) Project Planning
  - Policy development
  - Operating procedures development
  - Budget Development
  - Implementation Planning
- (iii) Organization Development
  - PIU Organization
  - PIU Staff Selection
  - Development of Organization Policy
  - Staff Orientation and Training
  - Project Organization and Definition
- (iv) Operating Procedure Development
  - PIU Administrative Procedures
  - Project Administrative Procedures and Guidelines
  - Procurement Procedures
  - Financial Management
  - Planning and Evaluation
  - Reporting
- (v) Implementation Oversight and Coordination
  - PIU Establishment
  - Project Start-up and Operations Coordination
  - Component-Specific Coordination
  - Government Agencies Coordination
  - Technical Assistance Coordination
  - External Training Coordination
- (vi) Training and Technical Assistance Coordination
  - Training of staff and TA Needs Assessment

- TA Coordination
- Training Evaluation
- TA Evaluation

### **E. PIU Organization and Staffing**

12. The PIU is being headed by a Director with demonstrated management and engineering abilities, and knowledge of local budgetary processes, and vested with authority to carry out the responsibilities of the PIU at the ministerial level and act as project spokesperson in relations between the implementing agencies and the Bank. For the Water Supply Improvement and the Institutional Strengthening Components, the PIU will act as the coordinator of necessary inputs to the velayat and etraps, and facilitate the execution of the technical services offered to the etraps

### **F. Scope of the Consulting Services** **General**

13. The services will be provided by a consulting firm (consultants) over a 40 month period starting from four weeks after contract signature. The (consultants) firm will be responsible for assisting the PIU and the implementing agencies in setting up systems and managing and executing their procurement actions. In addition, the consultants will provide selected technical inputs to the activities financed under the Water Supply Component, which while executed and directly connected to relevant agencies of the implementing velayat and etrap administrations, will depend administratively upon the PIU for contract administration and support. Accordingly, the first six months (phase one) will be dedicated to intense assistance to the PIU and the implementing agencies in pre-contract award activities including design of a Project Financial and Management Information System covering procurement, status of project components, and Project Work Programs and Budgets. Short term specialized consultant services are expected during this phase to help design the Project Management Information System. In addition, during this Phase One, and assuming Loan effectiveness and the availability of Loan funding, a review of consultant performance will be carried out and, if positive, authorization will be given for the consultant to proceed with Phase Two Activities.

14. **Phase Two** will involve managing the day-to-day operations of the PIU in procurement, financial and accounting systems, information systems, and monitoring and coordination activities as well as initiation of the procurement of equipment and material and the design and execution of rehabilitation activities.

### **G. Implementation of Components**

15. The respective agencies would be responsible for implementation of their components. As noted before, the Project Implementation Unit would be responsible for overall project coordination. At the level of Dashhawus Velayat, a PIU Regional Coordinator (RC) has been appointed to coordinate/oversee all project activities for the velayat. In addition to the RC, Component Coordinators (CCs) would be appointed for each of the three components. The Regional Coordinator also serves as Component Coordinator for the Institutional Strengthening Component. Two CCs would be appointed for the Sanitation and Health Component (Sanitary Epidemiological Services and Center of Health), and one for the Construction Management Component. The CCs would be the focal points for all project activities related to their components. The CCs, through the RC would be the first point of contact between MOH, the PIU, the Bank, and the PC. These arrangements would remove the need to create separate structures within each implementing agency. A seminar was held during Project Appraisal, with the participation of staff of the PIU and key officials of implementing agencies for better understanding of the project, and proposed implementation arrangements. In addition, a project launch workshop will be organized immediately after Board Presentation.

16. With support from technical assistance, all CCs would be responsible for coordinating the planning and implementation of project activities in their respective components. Specifically, the CCs would be responsible for the preparation of the annual work programs and budgets. The CCs would also help ensure that project accounts and records are maintained, and that supporting documentation is kept in an organized manner for the preparation of funding requests from the Special Account. In addition, they would be responsible for the preparation of quarterly and annual progress reports. At the velayat level, the CCs would be responsible for coordinating the planning and implementation of project activities at the etrap level, consolidating the annual work programs and budgets and ensuring that the project financing requirements are incorporated in the velayat budgets before they are sent to the PIU and subsequently to the MO during the annual budget preparation process. They would also review and consolidate the annual programs and annual reports before they are sent to the PIU.

#### H. Terms of Reference

17. TOR have been prepared as a guide for project planning and consulting firms. The Terms of Reference are organized as follows:

- (a) Project Implementation Unit (PIU)
  - (i) Project Management Specialist
  - (ii) Procurement Specialist
  - (iii) Short-term (Financial Specialist)
  - (iv) Short-term (Computer Specialist)
- (b) Construction Supervision
  - (v) Construction Engineers (supervisors 2 positions)
  - (vi) Short-term Construction Specialists

18. The work will initially involve assisting the PIU to review the tender documents for each contract package, managing the tendering process, assisting the PIU to carry out tender evaluation and subsequent award of contract. The Project Management Consultant, Procurement Specialist, and short-term Financial and Computer Specialists will provide direct assistance to the PIU, both at the level of Ashgabat and Dashkhovuz. The Consultant will continue to assist the PIU in Ashgabat in carrying out its duties as outlined above throughout the duration of the project. During construction the Consultant, through the field team, will act as Engineer under the FIDIC Conditions of Contract, and will be responsible for construction supervision and management, using local staff recruited, among others, from the organizations responsible for construction supervision at the present time in the project area. The Consultant will be required to carry out training for these staff to ensure that they are aware and capable of maintaining the standards of supervision required. Terms of Reference for the specific positions are as follows: **Recruitment of consultants will be undertaken in two phases: (a) under PPF financing already approved by the World Bank, the Project Management, Procurement, and Financial Management Specialists will start work as soon as contractual arrangements are finalized; (b) once the loan becomes effective, the consultant's contract will be extended for specific periods as described in the individual TOR and conditional to satisfactory performance.**

#### **POSITION (i): PROJECT MANAGEMENT SPECIALIST**

##### **A. Job Description**

19. The Project Management Specialist would report to the PIU Director. His/her main responsibility would

be to advise the PIU Director in all aspects of the coordination and follow-up of project implementation and, most specifically, on the coordination of technical assistance and on financial management matters. As such, he/she would:

(a) help organize the launching of project activities by working closely with the Component Coordinators (CCs) to organize workshops or seminars in Ashgabat and in Dashkhovuz before the start of project implementation. The purpose of these workshops would be to familiarize key project implementation staff with the project objectives, contractual implications, implementation arrangements, and financial mechanisms to be put in place.

(b) assist in coordination among implementing agencies ensuring that technical work is completed in close collaboration with counterparts;

(c) prepare TOR for local staff and provide in-the job training and formal training through seminars/workshops on overall project management and organization;

(d) set up a system for the coordination and follow up of project activities to ensure an effective flow of information and feedback between Ashgabat, Dashkhovuz and the participating etraps. This would entail preparing and reaching agreement on: (i) the standards and timetable for the preparation of annual work programs and budgets; (ii) the review and clearing of the work programs; (iii) the format and schedule of the reporting of project activities; (iv) practical steps for the flow of funds; and (v) the setting-up of an effective communications system between Ashgabat and Dashkhovuz and the etraps;

(e) preparation of Project Implementation Manual (PIM) that would summarize: (i) procedures for monitoring project implementation; (ii) processing of withdrawal applications under the loan; (iii) methods of procurement to be followed according to the Procurement Schedule in the Loan Agreement; (iv) guidelines for the use of Statement of Expenditures (SOEs) and overall project funds; and (v) procedures for replenishment of special and project accounts;

(f) design and maintain a system of record keeping for all formal activities and transactions of project activities at the velayet and etrap levels and in Ashgabat. The project files thus defined would include but not be limited to the following documents: (i) status of project accounts; (ii) all procurement information; (iii) status of project components; and (iv) project plan, including organization and staffing, milestones, issues, achievements and critical events (workshops/study tours);

(g) help the CCs identify training needs and propose adequate programs to meet those needs whether on the job, within the country or outside the country. He/she would also help design evaluation modalities for the selection of staff to be trained; and

(h) help consolidate quarterly and annual progress reports, annual work programs and budgets, training programs, and accounts prepared/maintained by the participating agencies into single "project documents" to be sent to the Bank.

## **B. Assignment**

20. Twenty seven months (12 months PY1, 10 months PY2, three months PY3, and 2 months PY4. His/her contract would start with PP financing.

## **C. Background Experience and Qualifications**

21. Candidates for the job of Project Management Specialist should have a university degree (master's degree or higher) in economics, business management or public administration. In addition, they should have acquired extensive and meaningful operational experience in economic development projects, with some relevant experience in economies in transition for a minimum of 10 years in well defined and structured situations. They should be able to demonstrate proven ability to work in the context of a multi-disciplinary and multi-cultural team. Russian language knowledge would be an advantage/

## **POSITION (ii): PROCUREMENT SPECIALIST**

### **A. Job Description:**

22 The **Procurement Specialist** reports to the PIU Director. He/She would:

(a) develop the procurement manual (as part of the Project Implementation Manual) with guidelines corresponding to the procurement arrangements proposed under the project and described both in the SAR and the Loan agreement and in accordance with the "Procurement Guidelines under IBRD Loans and IDA credits" dated January 1995, as revised in January and August 1996). Key topics to be included in the manual include a presentation of the methods of procurement to be followed under the project; the distribution of direct responsibilities for the velayet; the PIU for each method; a description of the procedures for the review of procurement decisions by the Bank; and a description of the provision for preferences for domestic manufacturers and contractors;

(b) organize procurement arrangements for the procurement by ICB, LIB, IS, and DS according to the Procurement Schedule in the Loan Agreement;

(c) consolidate the lists of goods to be procured under the project into appropriate bidding packages for the most economic and effective method of procurement and distribution of goods;

(d) prepare all bidding documents necessary related to goods and services, and technical assistance to be procured under the project;

(e) organize, at the start of project implementation, workshops or seminars for CCs to explain the procurement arrangements under the project using the manual produced. Special emphasis would be placed during those seminars on the respective roles of the CCs and the PIU in procurement, coordination of procurement matters and the links between the annual work programs and budgets and procurement under the project;

(f) establish and maintain a list of prospective bidders who have indicated interest in bidding for the goods and services;

(g) based on information provided by implementing agencies, incorporate into the appropriate bidding packages the requirements for staff training in the use and maintenance of the equipment procured;

(h) ensure that the services and/or goods contracted for are provided or delivered as stipulated in the contracts; and

(i) assist the local implementing agencies to carry out the procurement of services (works) at the local level when applicable using procedures acceptable to the Bank.

### **B. Assignment**

23. Twenty four months (12 months PY1, 10 months PY2, 2 months PY3). The initial contract would be financed under a PPF.

### **C. Background, Experience and Qualifications**

24. Candidates for the post of procurement specialist should have a master's degree in economics, finance, business management or engineering and a minimum of 10 to 15 years of experience in project implementation and management, procurement management, or in a senior position, responsible for logistics and materials and equipment acquisition with a major company or institution operating internationally.

### **POSITION (iii): FINANCIAL MANAGEMENT SPECIALIST**

#### **A. Job Description:**

25. The **Financial Management Specialist** will:

(a) work closely with the PIU Director, Project Management Specialist, and the Procurement Specialist to set up simple but effective financial and accounting management systems to record project activities, produce project accounts and quarterly as well as annual financial information reports, and generally to monitor financial project activities;

(b) make a diagnostic of the existing budgetary planning, execution, control and reporting procedures, the accounting methods by assessing the existing accounting system (reliability, accuracy, control mechanisms, reporting procedures, operational relevance and actual utilization), the level of qualifications and effectiveness of the personnel, identification of the strong points and the weak points;

(c) explain to the personnel of the velayet and etrap financial departments, the accounting and financial reporting requirements under the project. (The PIM would facilitate this work);

(d) identify improvements or modifications that would be needed to the existing systems to satisfy the project requirements;

(e) maintain records of all expenditures made out of the Special Account and Project Account and prepare withdrawal applications for payment or replenishment of special account; and

(f) design a simple accounting system to document and record all transactions and expenditures related to project activities. This would include a simple chart of accounts that is related to the local system. Procedures to maintain the accounts through regular posting of project transactions and monthly production of reports (including trial balances) should be defined. The proposed system would include specific features to manage and trace the status of the following: (i) the Bank; (ii) Loan Account; (iii) Special Account; (iv) Project account; and (v) the Statement of Expenditures (SOEs); and

(g) train the local PIU accountant in international accepted accounting practices to enable to take over full responsibilities once the technical assistance is completed.

#### **Assignment**

26. Eight months PY1. His/her assignment could start with PPF financing.

#### **Background, Experience and Qualifications**

27. The Financial Management Specialist should have a master's degree in economics, finance, or business management and a minimum of 10 years experience in financial management or accountancy with a water utility or major organization.

#### **POSITION (iv): COMPUTER SPECIALIST**

##### **A. Job Description**

28. The Computer Specialist will be responsible for designing and installing a computerized management information system (MIS) at the PIU to facilitate the implementation of the project. He/she will:

(a) identify the requirements of the project at all levels for a good MIS, working closely with the PIU Director, Project Management, Procurement, and Financial Specialists, and the accountant;

(b) design a computer system that meets the needs identified, and as appropriate, prepare the specifications necessary for the PIU to initiate procurement actions. This would include the design or adaptation of a software package that is appropriate;

(c) identify training needs for the personnel expected to run the systems, and

(d) design, organize, and conduct the training of project personnel as appropriate.

##### **B. Assignment**

29. Two months PY1 with possibility of an extension of a further two months if deemed necessary.

##### **C. Background, Experience and Qualifications**

30. Candidates for the post of computer specialist would have a university degree in computer science or management information. In addition, they should have practical, hands-on experience of at least 10 years in designing, installing and managing information systems in either a major industrial company, government, development project, or accounting firms.

#### **POSITION (v): CONSTRUCTION ENGINEERS (supervisors 2 positions)**

##### **A. Job Description**

31. During construction, the Construction Engineers, will be responsible for field supervision of the construction work by the contractors. He/she will be expected to utilize staff from existing organizations within the project area that in the past have had responsibility for construction supervision, but should allow for training of such staff in the methods, procedures and standards expected from site supervision by the Bank prior to commencement of work on site. Their tasks will include, but not necessarily be limited to:

(i) Preparation of a detailed construction management plan including an environmental management plan, schedules for construction, bidding, financing including disbursement of the proceeds of the loan and budget appropriation by the GoT, final testing, commissioning and start-up of all project facilities;

(ii) Monitor the delivery and secure storage of materials and equipment;

- (iii) Review shop drawings prepared by the contractors and equipment manufacturers and suppliers;
- (iv) Monitor the contractors' topographic surveys and setting out of the works to ensure correct alignments and elevations of the facilities;
- (v) Inspect materials and equipment delivered to site and witness tests of materials and equipment to be incorporated into the works, if necessary at the manufacturers' premises;
- (vi) Supervise, inspect, measure and control the quality of the construction of the works and the installation of equipment to ensure compliance with the drawings and specifications;
- (vii) Review the contractors safety and environmental protection plans and supervise the implementation of all safety and environmental protection measures;
- (viii) Maintain records of progress of the works and the results of inspections and test of materials and equipment, and all construction related activities;
- (ix) Issue instructions to the contractors and equipment suppliers in connection with the construction of the works and in accordance with the contract documents;
- (x) Make recommendations and issue instructions, with the approval of the PIU to contractors on the extent of special inspections and testing required and to be carried out in connection with the construction of the works;
- (xi) Compare actual progress with scheduled progress and advise the PIU of any developments that could delay completion. Recommend any actions necessary by the contractor or the GoT to facilitate timely completion of construction;
- (xii) Record any change or previously unknown conditions that may require modifications to the design and/or specifications of the works, advise the PIU of the change, and recommend appropriate action; prepare any necessary work orders with the approval of the PIU;
- (xiii) Convene and attend monthly meetings with the contractor to review progress; prepare minutes of such meetings for general circulation;
- (xiv) Check, agree with the contractors and authorize interim payments for all contracts in accordance with the contract: evaluate claims by the contractor for additional payments and extensions of time and make appropriate recommendations to the GoT;
- (xv) Provide independent advice to the PIU in the resolution of disputes between the GoT on one hand and contractors and/or suppliers on the other;
- (xvi) Provide advice and suggestions to the PIU on the overall construction works, and attend meetings concerning project implementation as and when required by GoT;
- (xvii) Prepare monthly progress reports for the PIU summarizing construction progress and the status of expenditure on the works;
- (xviii) Supervise final pressure tests of the major pipelines, and of all equipment start-up and commissioning. Inspect and approve all completed works and check contractors completed or as-

built schedules of quantities. Make recommendations to the PIU on the issuance of the certificate of completion; and

- (xix) Ensure that on completion of the works that the contractors provide such records and manufacturer's manuals that are necessary for the operation and maintenance of the works. Check the contractor's as-built drawings and compile a scheme specific operating manual for each project, including design philosophy and criteria, materials specifications, scheme layout and as-built drawings and individual plant operating manuals.

#### **B. Assignment**

32. Twelve months in PY1, and 8 months in PY2 for Chief Construction Supervisor, and 12 months in PY1, and 6 months in PY2 for second Construction Supervisor.

#### **C. Background, Experience and Qualification**

33. The construction engineers should have a recognized degree in civil engineering and a minimum of 15 years post graduate experience, of which at least six years should have been supervising construction of public health schemes in developing countries. At least one of the Chief Construction Supervisor's recent supervisory positions should have been as Resident Engineer or equivalent.

#### **POSITION (v): Short-Term Construction specialists (Mechanical, electrical and other)**

##### **A. Job Description for Mechanical Engineer**

34. The mechanical engineer will form part of the construction supervision team, and will report to the construction engineer. His/her duties will include:

- (a) Advise and assist the construction supervision team in matters relating to mechanical plant;
- (b) Review shop drawings prepared by the contractors and equipment manufacturers and suppliers;
- (c) Inspect mechanical equipment delivered to the sites and witness tests at manufacturer's premises if necessary;
- (d) Advise on, and directly supervise as appropriate, installation of mechanical plant;
- (e) Supervise final tests of pumps and other mechanical equipment, and the initial setting to work of the systems; and
- (f) Assist with compilation of the scheme specific operating manuals for the scheme.

##### **B. Assignment**

35. Four months in short visits at times as dictated by the progress of the works in PY1 and PY2.

##### **C. Background, Experience and Qualifications**

36. The mechanical engineer should have a degree in mechanical engineering and at least 10 years post-graduate experience, at least 6 years should have been on public health schemes. He/she should have experience in the supervision of installation of electro-submersible pumps, and centrifugal pumping installation.

#### **A. Job Description for Electrical Engineer**

37. The electrical engineer will form part of the construction supervision team, and will report to the construction engineer. His/her duties will include:

- (a) Advise and assist the construction supervision team in matters relating to electrical plant and equipment (switchgear, control systems, transformers, pump motors and the like);
- (b) Review shop drawings prepared by the contractors and equipment manufacturers and suppliers;
- (c) Inspect electrical equipment delivered to the sites and witness tests at manufacturer's premises if necessary;
- (d) Advise on, and directly supervise as appropriate, installation of electrical plant;
- (e) Supervise final tests of electrical equipment and the initial setting to work of the systems;; and
- (f) Assist with compilation of the scheme specific operating manuals for the scheme.

#### **B. Assignment**

38. Four months in short visits at times as dictated by the progress of the works in PY1 and PY2.

#### **C. Background, Experience and Qualifications**

39. The electrical engineer should have a degree in electrical engineering and at least 10 years post-graduate experience, at least 6 years should have been on public health schemes. He/she should have experience in the supervision of installation of control equipment, transformers, and pump sets.

#### **Other Specialists**

40. It is expected that other specialists such as process engineer, contracts specialists and training advisors will be required at times and for durations that may only be determined during the course of the consultancy. An allowance of 6-person months has been allowed for these inputs in the project budget in PY1 and PY2.

#### **Reporting**

41. The consultant will be required to prepare the following specific reports and documents, in both English and Russian. Please note that this may be in addition to reports referred to in the attached annex and other sections of the scope of work, and are seen as the key Project Monitoring and evaluation reports:

- (a) **Draft Project Implementation Manual (PIM).** This will be prepared in order to facilitate the management and implementation of the project. The PIM will summarize procedures for monitoring project implementation, processing of withdrawal applications under the loan, various methods of procurement to be

followed according to the Procurement Schedule in the Loan Agreement, use of Statement of Expenditures and overall project funds, procedures for replenishment of special and project accounts. The PIM will be prepared by the foreign project management and procurement specialists in the PIU, and will be translated into Russian. The PIU's foreign specialists will be required to organize training for the PIU's local staff, and the Component Coordinators, in order to ensure an understanding of the procedures specified in the PIM. Submission of a satisfactory draft of the PIM to the Bank will be a condition of Loan Effectiveness;

(b) **Project Implementation Manual.** Following approval by the PIU and the Bank of the draft, prepare and issue 25 copies in Russian and 10 copies in English;

(c) **Quarterly Progress Reports.** These will summarize progress on all components of the project. The first report will be issued three months after Loan Effectiveness. The reports will include: (i) a summary of project activities by component; (ii) a description of the main achievements against agreed implementation targets and disbursement schedules, and the problems encountered; (iii) recommendations on how to solve problems and comments on progress in implementing previous recommendations; (iv) a description of component activities; (v) a presentation of the financial situation of the project in terms of actual versus budget for the major expenditure categories and the financing of these categories; (vi) a presentation of the final situation of each component.

(d) **Annual Progress Reports.** At the end of each calendar year, the PIU will prepare with the help of the consultants, annual progress reports. The annual reports will follow the same formats as the quarterly reports and will highlight major activities undertaken during the year.

(e) **Final Report.** On completion of the assignment a detailed report will be submitted, which will compare the performance of the project against performance indicators. It will report on actual progress compared to anticipated progress at the start of the project, and will comment on lessons learned from this project which should be incorporated into other projects, by way of improved project design or implementation arrangements and procedures. A total of 25 copies of the report will be submitted in both English and Russian.

## **Program**

42. Preparation of detailed engineering designs and bid documents is already underway. The project has already been appraised and is expected to be negotiated in early April 1997. Board approval by the Bank is expected by June 1997, and loan effectiveness by September 1997. This consultancy is expected to be negotiated by April/May 1997 in time to assist the PIU with the bidding process for the construction contracts once the loan becomes effective. Construction activities are expected to begin in January 1998 and be completed by July 1999. The consultancy assignment will run through to August 1999, to allow the Consultant to manage the commissioning of all schemes.

43. The program for the assignment will be driven by the anticipated progress on the construction project. However, the following milestones should be included by the Consultant in his overall program:

- Design of project accounting and financial management system - by the end of Month 2 of the assignment;
- Procurement of initial batch of computers and office equipment - by the end of Month 2;
- Issue of draft Project Implementation Manual - by the end of Month 3;
- installation of the project management and information system - by the end of

Month 4;

- Issue of final PIM - within one month of receipt of comments on the draft.

### **Logistics**

44. The Consultant will be provided with office space in both Ashgabat and Dashowuz, including office supplies. The consultant will be responsible for accommodation and transport for the foreign staff, and for non site-based local staff as required. Certain equipment might be purchased by the Consultant for use by the Consultant and the PIU on the project and will be handed over to the PIU on completion of the assignment. This may include:

- 12 desktop computers, with keyboard, monitor, and Windows based software (MS office, MS Project, etc.);
- 4 Laserjet printers;
- 2 photocopiers; and
- 2 phone/fax machines;
- 12 UPS systems

45. Staff based on site, responsible for the construction supervision will be provided with office space, furniture, equipment and transport through the construction contracts. Housing for these staff will be the responsibility of the Consultant.

**ANNEX S-2: TERMS OF REFERENCE FOR INSTITUTIONAL STRENGTHENING COMPONENT****GENERAL INFORMATION****Background**

Turkmenistan achieved political independence from the Soviet Union in 1991. At that time the country inherited the organizational structure of the former Soviet Union for the provision of water, sanitation and wastewater services (the sector). Essentially that system assigned responsibility for the sector to the Ministry of Housing and Communal Services (MHCS), and the operating utilities at the municipal level had little control over the planning, design, funding or construction of the facilities they were charged to operate. Turkmenistan continued that system in the early years of its independence, but then abolished the MHCS as a ministry and converted the regional or velayet offices of the MHCS to "trusts" with substantially the same responsibilities they had before when they reported to a central ministry instead of to a velayet. However, there is a lack of clarity about the roles of the many national and regional (velayet) organizations with responsibilities that effect the sector, and this confusion adversely impacts on the abilities of the local sector utilities to meet their obligations.

**Purpose**

The goals of the Turkmenistan Water Supply and Sanitation project are to (1) improve water supply and sanitation in seven etrap capital cities and nine collective farms in Dashkhovuz Velayet and (2) initiate institutional changes in the water and sanitation sector to ensure that the project is financially and technically sustainable. The project has four components: (1) water supply systems (2) sanitation and health (3) institutional strengthening and (4) project management and construction supervision. This consultancy addresses the institutional strengthening component and the consultancy's purpose is to develop and improve the institutional capacity to operate and maintain the water supply and sanitation improvements. The scope of work tasks are divided into three parts, described as follows:

1. National Sector Reform Study The first part is to conduct a study, make recommendations and develop an action plan for making improvements at the national level to strengthen the capacity in Turkmenistan to provide water and wastewater services more effectively to the country's 4.5 million people. This study is intended to recommend changes that will provide the support necessary to accomplish the second part, the establishment of a regional sector utility authority in Dashkhovuz.
2. Establish a New Regional Sector Organization The second part is to evaluate existing sector capabilities within Dashkhovuz Velayet, to provide specific commendations and draft necessary legislation for the creation of a new regional water and sanitation authority in the Velayet, and to assist the government in establishing this new authority.
3. Strengthen the New Regional Sector Organization The third part will provide institutional strengthening of the new authority in order to develop the skills and capabilities within the authority to meet its responsibilities.

**PART I - NATIONAL SECTOR REFORM  
TASKS TO BE PERFORMED**

**Task A**            **Describe and Evaluate Existing Conditions**

Task A.1          Existing Conditions: Organizations in the Sector

List and describe those organizations which now have responsibilities for the sector, at the national, regional or local level; describe their reporting relationships and how they inter-relate with one another; and indicate whether their responsibilities relate to funding, policy setting, operations, or regulation.

Task A.2      Existing Conditions: Setting and Implementing Sector Policies

Describe, consider and discuss alternatives with relevant sector officials for the following policy issues: (1) the extent to which responsibility for sector utility planning, funding, design, construction, and operation and maintenance is to be transferred from the national to the regional or municipal levels, for both water and wastewater, and for urban and rural systems, (2) whether the establishment of combined water and wastewater utilities should be encouraged, (3) the potential role for private sector involvement in the provision of sector services, (4) who should have the responsibility for planning, design, construction, and operation of the sector facilities, (5) who should set standards for drinking water, wastewater effluent and receiving waters; and also standards for type or level of service to be provided, such as separate vs combined sewers, piped sewerage vs sanitation, piped water or public faucets in rural areas, pressures or hours of service per day for piped water supplies, (6) the extent to which the cost of services is to be borne by users, and whether charges are to be flat rate, metered or some other method, (7) whether water and wastewater services should be combined, (8) whether policies are or should be different for urban and rural areas, (9) the role for the national government in setting broad policies such as these and establishing sector priorities, and which national body should have this responsibility, (10) the extent to which the national government should provide technical and /or financial support to those regional or municipal sector utilities with sector operational responsibilities and which national body should have this responsibility, and (11) such other policy matters as may be appropriate. Policies affecting regulation of the sector are discussed under Task A.10.

Task A.3      Existing Conditions: Current Laws and Regulations

Determine and summarize key laws and regulations which are now in effect that relate to policies for guiding and controlling the sector, and the planning, funding, design, construction and operation of sector facilities.

Task A.4      Existing Conditions: Sector Planning

Describe who has responsibility for, and findings relative to the adequacy of, broad sector planning and the preparation of specific feasibility studies for sector programs prior to their implementation. Is broad sector planning now being done? Are technical and economic feasibility studies being conducted prior to approval of programs for design and construction? What role do the sector operating utilities have in deciding (1) who conducts these feasibility studies, (2) the terms of reference for the studies, and (3) the review and approval of such studies?

Task A.5      Existing Conditions: Detailed Designs

Describe who has responsibility for, and findings relative to the adequacy of, the preparation of detailed plans and specifications for sector programs prior to their implementation. What role do the sector operating utilities have in deciding (1) who conducts these designs, (2) what facilities are to be designed, (3) the adoption of design criteria, and (4) specifications relative to the type and quality of materials to be used in constructing the works?

Task A.6      Existing Conditions: Construction

Describe who has responsibility for, and findings relative to the adequacy of, (1) setting the procedures or criteria for selection of a contracting company, (2) actual selection of the construction company, and (3) supervision of

the activities of the contractor to ensure that the facilities are constructed in accordance with the engineer's plans and specifications. What role do the sector operating utilities have in this process?

**Task A.7**      Existing Conditions: O&M Manuals and Facility Start-Up

Describe who has responsibility for, and findings relative to the adequacy of, (1) preparation of and delivery to the sector operating utility of manuals of instruction for the proper operation and maintenance of all newly constructed or rehabilitated facilities, and (2) training of staff of the sector operating utility in starting up and proper operation of these facilities. What role do the sector operating utilities have in this process?

**Task A.8**      Existing Conditions: Operation and Maintenance

In general terms, describe who has responsibility for, and findings relative to the adequacy of, (1) the provision of water and wastewater services to residential and industrial customers in urban areas, and (2) the provision of water and sanitation services to people living in rural communities. The intent is not to provide details, but to present information that provides a clear picture of the general conditions and magnitude of problems that exist nationwide relative to the operation and maintenance of sector services. Information is to be presented separately for (1) water and wastewater facilities in urban municipalities, and (2) for water supply and sanitation facilities in the rural communities.

**Task A.9**      Existing Conditions: Financial Aspects of the Sector

Determine and describe the current situation relative to (1) national government policies related to the establishment of user charges for water and wastewater services, (2) responsibilities for and adequacy of sector budgets, (3) process used to estimate and provide funding for the construction of capital projects, (4) national laws on requirements for budgeting and accounting systems to be used by sector utilities, and (5) any other finance-related matters which impact on sector operating utilities.

**Task A.10**     Existing Conditions: Regulation of Sector Operations

Describe, consider and discuss with relevant sector officials the laws, policies and other matters affecting sector regulation that now exist. These include responsibilities for monitoring (1) the quality of water being provided by utilities, (2) the adequacy of the sector service being provided, (3) the quality of the wastewater being discharged to receiving waters, (4) the quality of the receiving waters; and (5) the capacity of the regulating bodies to enforce utility compliance with standards for water quality and adequacy, and for wastewater effluent and receiving water quality. Determine whether (1) organizations other than the Ministry of Health (water quality) and the Ministry of Environment (wastewater disposal) have sector regulatory responsibilities; (2) describe the structure of all sector regulatory bodies at the national, regional and local levels; and (3) determine the capacity of these regulatory bodies to meet their responsibilities.

**Task B**            **Recommend Changes for Sector Reform**

**Task B.1**        Factors to be Taken Into Account in Making Recommendations

The recommended changes or other actions should take into consideration the need for effective sectoral interactions, introduction of cost recovery for services while safeguarding the interests of low-income groups, improving environmental standards, and adopting realistic standards for drinking water quality and wastewater effluent quality.

Task B.2 Recommendations for National Sector Policies

Based on the results of Tasks A.2 and A.10, make recommendations for setting and implementing national policies including but not limited to those described under Tasks A.2 and A.10.

Task B.4 Recommendations for Laws and Regulations

Based on the results of Task A.3, make recommendations for changes to existing laws and regulations or the adoption of new laws and regulations considered appropriate for strengthening the sector, and which take into account recommended new sector policies.

Task B.5 Recommendations for the Conduct of Sector Planning

Based upon the results of Task A.4, make recommendations for the assignment of responsibility for and the types of planning to be implemented.

Task B.6 Recommendations for Adequacy and Responsibility for Detailed Designs

Based on the results of Task A.5, make recommendations for the assignment of responsibility for directing the preparation of detailed plans and specifications for sector facilities to be constructed. Make recommendations for improving the quality of such designs and specifications.

Task B.7 Recommendations for Responsibilities for and Quality of Construction

Based on the results of Task A.6, make recommendations for the assignment of responsibility for the selection of construction companies and the supervision of the work of these companies. Make recommendations for improving the quality of sector construction.

Task B.8 Recommendations for O&M Manuals and Facility Start-Up

Based on the results of Task A.7, make recommendations for (1) the preparation of and delivery to the sector operating utilities, of manuals of instruction for the proper operation and maintenance (O&M) of all newly constructed or rehabilitated facilities, and (2) the training of staff of the sector operating utility in starting up and proper operation of these facilities.

Task B.9 Recommendations for Improved Operation and Maintenance Procedures

Based on the results of Task A.8, make recommendations for the improvement of operation and maintenance of sector services to ensure the sustainability of the facilities. Recommendations should be presented separately for (1) water and wastewater facilities in urban municipalities, and (2) for water supply and sanitation in the rural communities.

Task B.10 Recommendations for Improvements to Financial Aspects of the Sector

Based on the results of Task A.9, make recommendations for improvements to the financial aspects considered appropriate for strengthening the sector, including but not limited to those described under Task A.9. In particular, recommendations should be made relative to (1) the importance of requiring users to pay for the sector services they receive, and (2) a suggested phased approach to introducing user charges.

**Task B.11**     Recommendations for Improvements to Regulation of the Sector

Based on the results of Task A.10, make recommendations for improvements to the regulation of the sector considered appropriate for strengthening the sector, including but not limited to those described under Task A.10.

**Task B.12**     Summarize Recommended Strengthening Program

Summarize the recommended program for strengthening the sector and present suggested tables of organization which show how the various sector organizations at both the national and Dashkhovuz Velayet level relate to one another based on recommendations for organizational changes and assignment of responsibilities. Prepare a report of these summary recommendations in English and Russian.

**Task C**        **Prepare Plans for Changes in the National Sector****Task C.1**     Prepare Action Plan for National Sector Changes

Prepare a developmental strategy and an Action Plan to implement the recommendations presented in Task B. The plan should include specific activities to be undertaken, estimated resources required, specific individuals and/or organizations proposed to be assigned to implement the plan, estimated time schedules, estimated cost of implementation, reporting requirements, assignment of responsibilities, description of expected results, or any other actions required to achieve the recommended results. The Action Plan should be prepared in English and Russian.

**Task C.2**     Recommend Immediate Changes to Support the New Dashkhovuz Authority

Identify components of the Action Plan described in Task C.1 which should be implemented before 31 December 1998 in order to permit the establishment of and provide support to the new regional water and sanitation authority described in Part II of the terms of reference. Prepare a separate plan recommending these immediate changes in English and in Russian.

**PART II - ESTABLISH A NEW REGIONAL SECTOR AUTHORITY  
TASKS TO BE PERFORMED**

**Task A**        **Describe and Evaluate Existing Conditions****Task A.1**     Existing Conditions: Dashkhovuz Velayet Organizations in the Sector

List and describe those organizations in Dashkhovuz Velayet which now have responsibilities for some part of the sector, at the velayet and etrap levels, both for urban and rural areas. Describe their reporting relationships, how they inter-relate with one another, and state whether their responsibilities relate to funding, policy setting, operations, or regulation. Assess the relative capabilities of the existing sector organizations in terms of human resource skills; and physical resources such as office space, vehicles, equipment, laboratories or other non-operational physical resources. Prepare a table of organization that indicates how the existing Velayet sector organizations relate to one another and to Velayet and national supervisory and regulatory organizations.

**Task A.2**     Existing Conditions: Setting and Implementing Sector Policies

Describe, consider and discuss with relevant sector officials the policy issues described under Task A.2 of Part

I. In the absence of any changes in existing national policies as proposed in Task C.2 of Part I, consider what flexibility is available to Velayet officials in adopting appropriate policies for the sector in Dashkhovuz Velayet.

Task A.3 Existing Conditions: Current Velayet Laws and Regulations

Determine and summarize key laws and regulations which are now in effect in the Velayet that relate to matters affecting any aspects of the operation of sector facilities.

Task A.4 Existing Conditions: Sector Planning

Describe who has responsibility for, and findings relative to the adequacy of, sector planning at the Velayet level and the preparation of specific feasibility studies for sector programs prior to their implementation. Is Velayet sector planning now being done? Are technical and economic feasibility studies being conducted prior to approval of programs for design and construction? What role do the sector operating utilities have in deciding (1) who conducts these feasibility studies, (2) the terms of reference for the studies, and (3) the review and approval of such studies?

Task A.5 Existing Conditions: Detailed Designs

Describe who has responsibility for, and findings relative to the adequacy of, the preparation of detailed plans and specifications for sector programs prior to their implementation. What role do the Velayet sector operating utilities have in deciding (1) who conducts these designs, (2) what facilities are to be designed, (3) the adoption of design criteria, and (4) specifications relative to the type and quality of materials to be used in constructing the works?

Task A.6 Existing Conditions: Construction

Describe who has responsibility for, and findings relative to the adequacy of, (1) setting the procedures or criteria for selection of a contracting company, (2) actual selection of the construction company, and (3) supervision of the activities of the contractor to ensure that the facilities are constructed in accordance with the engineer's plans and specifications. What role do the Velayet sector operating utilities have in this process?

Task A.7 Existing Conditions: O&M Manuals and Facility Start-Up

Describe who has responsibility for, and findings relative to the adequacy of, (1) preparation of and delivery to the Velayet sector operating utility of manuals of instruction for the proper operation and maintenance of all newly constructed or rehabilitated facilities, and (2) training of staff of the sector operating utility in starting up and proper operation of these facilities. What role do the Velayet sector operating utilities have in this process?

Task A.8 Existing Conditions: Operation and Maintenance

In general terms, describe who has responsibility for, and findings relative to the adequacy of the operation and maintenance of water and/or wastewater operating utilities in urban and rural communities. The intent is not to provide details, but to present information that provides a clear picture of the general conditions and magnitude of problems that exist throughout the Velayet relative to the operation and maintenance of sector services. Information is to be presented separately for (1) water and sanitation or wastewater facilities in urban municipalities, and (2) for water supply and sanitation facilities in the rural communities.

Task A.9 Existing Conditions: Financial Aspects of the Sector

Determine and describe the current situation relative to responsibilities and capabilities in the Velayet sector organizations for (1) preparation of sector budgets for capital and operating needs, (2) adoption and use of accounting systems, (3) existence of auditing systems, either internal for the Velayet or external by the national government, (4) banking or other arrangements for the control and use of funds received from the national government, and (5) any other finance-related matters which impact on sector operating utilities in the Velayet.

**Task B      Recommend Attributes and Organizational Structure for the New Dashkhovuz Regional Water and Sanitation Authority**

**Task B.1      General Recommendations for Sector Reorganization in Dashkhovuz Velayet**

Make recommendations for the establishment of a new, comprehensive, velayet-wide, regional water supply and sanitation authority (the Authority) which would have responsibility for all aspects of water supply, wastewater and sanitation in Dashkhovuz Velayet. Recommendations should include (1) proposed reporting relationships between the Authority and Dashkhovuz Velayet, and with the national government; (2) the legal form of the Authority, (3) how the personnel, equipment and responsibilities of the existing sector organizations are to be transferred to the Authority, and (4) tables of organization for the Authority and its principal components. Prepare a report on the recommendations for this Authority in English and Russian. All of the remaining recommendations to be prepared under this Task B should be based on the expectation of the establishment of the Authority as a legal operating entity on or before 31 December 1998.

**Task B.2      Recommendations for Velayet Sector Policies**

Based on the results of Task A.2, make recommendations for setting and implementing Velayet policies. These policies should be appropriate for and support the reorganization of sector responsibilities under the new Authority proposed under Task B.1.

**Task B.3      Recommendations for Velayet Laws and Regulations**

Based on the results of Task A.3, make recommendations for changes to existing laws and regulations or the adoption of new laws and regulations considered appropriate for strengthening the sector, and which take into account recommended new sector policies and the proposed reorganization. In particular, draft a new law, charter or presidential decree to establish the Authority. Such legislation should provide the Authority with the powers necessary to permit the Authority to become an autonomous, self-sustaining sector utility. The draft legislation should be prepared in English and Russian.

**Task B.4      Recommendations for the Conduct of Sector Planning**

Based upon the results of Task A.4, make recommendations for (1) the assignment of responsibility for planning, (2) the types of planning to be implemented, and (3) the development of the capacity for planning within the Authority.

**Task B.5      Recommendations for Adequacy and Responsibility for Detailed Designs**

Based on the results of Task A.5, make recommendations for the assignment of responsibility for directing the preparation of detailed plans and specifications for sector facilities to be constructed. Make recommendations for improving the quality of such designs and specifications, taking into consideration the use of private sector companies for this work.

**Task B.6      Recommendations for Responsibilities for and Quality of Construction**

Based on the results of Task A.6, make recommendations for the assignment of responsibility for the selection of construction companies and the supervision of the work of these companies. Make recommendations for improving the quality of sector construction. Make recommendations for the development within the Authority of the capability to supervise construction work performed by contractors.

**Task B.7      Recommendations for O&M Manuals and Facility Start-Up**

Based on the results of Task A.7, make recommendations for (1) the preparation of and delivery to the sector operating utilities, of manuals of instruction for the proper operation and maintenance of all newly constructed or rehabilitated facilities, and (2) the training of staff of the sector operating utility in starting up and proper operation of these facilities. Consider the role for the private sector in the provision of these services.

**Task B.8      Recommendations for Improved Operation and Maintenance Procedures**

Based on the results of Task A.8, make recommendations for the improvement of operation and maintenance of sector services to ensure the sustainability of the facilities. Make recommendations for the development within the Authority of the capability to operate and maintain all sector facilities.

**Task B.9      Recommendations for Improvements to Financial Aspects of the Sector**

Based on the results of Task A.9, make recommendations for improvements to the financial aspects considered appropriate for strengthening the sector in the Velayet, including but not limited to those described under Task A.9. Such improvements should also anticipate the ability to be able to charge users for sector services but should not be limited to those described under Task A.10. Make recommendations for the development within the Authority of the capability to provide all financial services required of an effective sector utility.

**Task B.10     Recommendations for Establishing Water and Sanitation User Charges**

The Government is expected to revise its regulations to permit recovery of operation and maintenance costs on a gradual basis, with the proviso that a basic amount of water is to be provided to users at no cost in order to meet health and subsistence needs of low income customers of the Authority. Taking into account the financial estimates of the cost of water made by the World Bank and Bank policy papers on this subject prepared during project preparation, prepare a suggested program for water use charges based on the type of service received, or other factors as relevant. The program should also suggest charges for other services to be provided by the Authority, including the installation of water or wastewater connections to the Authority's pipes. Charges for wastewater collection and disposal of latrine wastes should also be considered.

**Task C        Prepare and Implement Action Plan for Establishment of a New Dashkhovuz Velayet Regional Water and Sanitation Authority (Authority)**

**C.1        Prepare Action Plan to Establish the New Authority**

Prepare a developmental strategy and an Action Plan to implement the recommendations presented in Task B. The plan should include specific activities to be undertaken, estimated resources required, specific individuals and/or organizations proposed to be assigned to implement the plan, estimated time schedules, estimated cost of implementation, reporting requirements, assignment of responsibilities, description of expected results, or any other actions required to establish the new Authority and to strengthen its capability to achieve the recommended results.

The Action Plan should be prepared in English and in Russian.

C.2 General Assistance in Implementation of the Action Plan

Provide advice, guidance and general assistance to those officials appointed by the Government to implement the Action Plan, with the goal of establishing the new Authority as a legal, operational organization by the target date of 31 December 1998.

C.3 Assistance in Passage of Legislation

Using the draft legislation prepared under Task B.3 of Part II, and in accordance with the Action Plan, assist the Velayet and national authorities in the introduction and passage of this legislation.

**PART III - STRENGTHENING THE NEW REGIONAL SECTOR AUTHORITY  
TASKS TO BE PERFORMED**

The basic intent of Part III is that the consultant will assist the Authority in improving its institutional capacity through the implementation of the consultant's recommendations arising from the completion of the tasks described in Part II. The tasks described below assume that the Authority will be established not later than 12 months from the start of work under the consultant's scope of work, and that an additional 12 months will be available to implement these tasks. It is unlikely that the consultant will be able to assist the new Authority to obtain full capability in all the subjects described in this section. The tasks have been framed as actions required to achieve goals, but with the understanding that attainment of these goals will be dependent to a large extent upon factors not under the control of the consultant. Such factors include the timing and extent to which the Authority actually exists, in terms of its charter; the capacity and suitability of assigned personnel and office quarters; and such physical resources as office furnishings and equipment, vehicles, and spare parts and materials for operation and maintenance of facilities.

**Task A Strengthen Authority's Administration and Management Capabilities**

Background Administration and management are broad terms which embrace the policies, procedures, systems and skills necessary for conducting all the operations that permit the Authority to fulfill its obligations as the organization responsible for water supply, sanitation and wastewater services throughout the Velayet. There are many alternatives for dividing these responsibilities between the Managing Director of the Authority and a separate department of administration. The consultant will perform the following tasks:

Task A.1 Develop Key Policies and Procedures

Compile and review significant policies and procedures now in effect, or under consideration, that relate to the Authority's responsibilities. Revise the key existing or draft policies and procedures and develop new policies and procedures as appropriate. Review all such policies and procedures with the Authority. Based on that review, prepare and translate new policies and procedures for the Authority.

Task A.2 Establish Program for Computer Technical Support

Develop a computer technical support center and train staff to implement the responsibilities of this center. The consultant will determine the duties and responsibilities of this center, but they should include the capability of training staff in other divisions of the Authority to provide essential employees with needed skills in word processing, spread sheets, accounting programs, desk top publishing or other computer skills required for the

performance of the duties of their divisions. The center should also serve as a source of technical support and troubleshooting, and in the development of new programs to enhance the capabilities of the various divisions of the Authority.

Task A.3 Establish Basic Management Information System

Review the current level and type of information being generated, and the procedures for distribution of such information. Based on the results of this study, develop and implement a program for the determination of what type of information is required for senior and middle level managers, the level of detail to be provided, its frequency, and assignment of responsibilities for the preparation and dissemination of the desired information. These activities will be used to develop a comprehensive management information system for the Authority. The purpose of this effort is the prompt provision of accurate information to key managers sufficient to support decision-making or other actions leading to the achievement of the Authority's goals.

Task A.4 Define and Develop a Legal Office

Prepare a description of duties and responsibilities for an internal legal office within the Authority. Duties are expected to include review and recommendations for approval of all contracts which the Authority is planning to execute, advice to the Managing Director on any potential legal problems arising from the Authority's activities, interpretation of GOT laws that may constrain the Authority's ability to function autonomously, or any other legal matter which may arise. This probably should be a single lawyer with a small administrative staff, with occasional support from staff on loan from other departments during peak workloads.

Task A.5 Define and Develop an Internal Audit Capability

Prepare a description of duties and responsibilities for an internal audit office within the Authority. The internal audit office should be independent of the financial division, and should have such responsibilities as reviewing all of the Authority's financial dealings, suggesting changes in policies and procedures to ensure strict accountability of all revenues and expenses, and advising the Managing Director of any inadequacies or potential problems relative to the Authority's financial practices. This office should also monitor compliance of the financial department with GOT laws and regulations that affect utility financial activities. Staffing of an internal audit office will be dependent upon the extent to which financial activities of the Authority are to be reviewed.

Task A.6 Define and Develop a Public Relations Capability

Prepare a description of duties and responsibilities for a public relations office within the Authority, and an outline plan of action for this office. Public support will be critical to the success of the Authority as an effective sector utility organization meeting the needs of the Velayet. Possible activities include the development and implementation of a program to routinely inform customers of the Authority's activities of benefit to customers and the various communities of the Velayet, to respond to adverse media publicity, to educate customers about the need for adequate user fees, to develop means of communicating information to employees and fostering improved staff morale, and to conduct activities in any other areas in which the Authority could obtain benefits in improving its public image so as to further its goals of autonomy and sustainability. Initially this office probably should consist of a single professional person and a small administrative staff, with occasional support from staff on loan from other departments as the workload requires.

Task A.7 Define and Develop a Customer Services Capability

Prepare a description of duties and responsibilities for a customer services office within the Authority. The

purpose of this office is to serve the interests of the customers. Possible activities include the opening and publication of a customer complaint telephone line, development and implementation of a program to train and assign people to answer the phones, transmit the complaints to the appropriate department, and follow up to ensure that legitimate complaints are addressed. This office should be sympathetic to, and, to the extent possible, encourage the development of, consumer action groups in Dashkhovuz Velayet. This office would serve the function of "ombudsman", or in-house representative of the interests and concerns of the Authority's customers. Such a function will, in the long run, enhance the Authority's public image as a caring organization. This office probably should consist of the customer's representative, and a small staff to answer phones and assist the representative in ensuring that complaints are addressed promptly.

**Task A.8**      Define and Develop an Improved System of Stores and Parts Management

Based on the evaluation of existing conditions and assessment of future needs, recommend a new system of stores and parts management, including record keeping and the development of physical facilities. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task A.9**      Define and Develop a Capability for Vehicle and Transport Management

Based on the evaluation of existing conditions and assessment of future needs, recommend a new system of vehicle, heavy equipment and transport management, including allocation of such facilities based on priority needs. The system should include record keeping, repairs and physical facilities such as garages and maintenance and repair equipment. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task B**      **Strengthen the Authority's Technical and O&M Capabilities**

Background There are several categories of technical expertise which require strengthening to better serve the Authority's needs. These include (1) long-term planning, (2) operation, maintenance and repair of the physical works of the system and also of the Authority's buildings and equipment, (3) mapping and record keeping, (4) construction management, (5) basic design of standards for commonly needed facilities (building connections, latrines and procedures or facilities for emergency repairs), (6) management of wastewater, septage and latrine waste disposal, and (7) capability to procure and monitor the services of private sector engineers for conducting feasibility studies and the design of major new works.

**Task B.1**      Reorganize the Technical Department

Suggest an appropriate organization of the technical department which ensures the establishment of sections, and appoints section leaders, with responsibilities for the proposed divisions and sub-divisions of the department, including those described in the following tasks.

**Task B.2**      Define and Develop Planning Capabilities

Define the Authority's planning needs, in terms of the purpose and the information needed upon which to base such plans. The basic purposes of planning should include an identification of the description, size, type, location and cost of facilities needed to meet future demands, either from growth in new areas or increased water needs, wastewater flows or latrine wastes from existing customers, as estimated for various periods in the future. Similarly, the planning should identify the need to replace aging components of the system as they reach the end of their useful life. Develop the capability within the Authority to identify planning needs, conduct the planning, ensure that these plans are subject to review and approval, and that the approved plans become the basis of the

estimated costs for capital development and replacement needs incorporated in long-term financial planning. In some organizations, the long-term planning function is part of the office of the Managing Director of the Authority.

**Task B.3**      Define and Develop O&M Capabilities

Based on the evaluation of existing O&M capabilities, assess the Authority's O&M needs, in terms of both the Authority's facilities for providing sector services such as wells, pipelines and pump stations, and also for its own buildings, laboratories and equipment. Develop a system for guiding operators in the proper operation of all facilities, and for both periodic, preventive maintenance, and routine and emergency repairs. Assist the Authority in developing a basic capacity for these purposes which is appropriate for the initial needs of the Authority.

**Task B.4**      Define and Develop Mapping and Record Keeping Capabilities

Based on the evaluation of existing conditions and assessment of future needs, recommend a new system of mapping and record keeping. The mapping and record keeping should make use of the identification of the description, size, type, location and condition of facilities as described in Task B.2. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task B.5**      Define and Develop Construction Management Capability

Based on the evaluation of existing conditions and assessment of future needs, recommend a program for developing a capability within the Authority for managing and supervising the construction of facilities which are being constructed by others for the Authority. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority, making full use of the water supply improvement program which is part of this project. This task should be closely coordinated with the services being provided by the project management contractor.

**Task B.6**      Define and Develop Basic Design Capabilities

Based on the evaluation of existing conditions and assessment of future needs, recommend a program for developing a capability within the Authority for preparing basic designs. Basic designs are considered to be those required for making standard drawings for repetitive works such as customer service connections to the Authority's pipelines, improvements to street faucets, designs required on short notice for emergency repairs, and similar purposes. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task B.7**      Define and Develop Capabilities for Utilization of Private Sector Engineers

In previous years, engineering plans and specifications were the responsibility of national design institutes. As a condition to receiving Bank funding, designs and specifications for the current water supply improvement project were conducted by a foreign private sector consultant. Most efficient utilities make use of private sector consultants for the design of the major new works, rather than maintain their own in-house design teams. Develop procedures for the fair and efficient procurement of private sector consultants, and for monitoring their performance. Develop the capabilities of the Authority technical staff in the use of such procedures.

**Task C**      **Strengthen the Authority's Capabilities in Finance and Revenues**

Background Current capabilities in the Velayet in the areas of finance and revenue are very limited. Financially

self-sustaining sector organizations require the capability of developing and using such systems as payroll/personnel, general ledger and inventory control systems, and systems for revenue billing, collection and cash flow monitoring.

**Task C.1 Define and Develop a Capacity for Budgeting**

Based on the evaluation of existing conditions and assessment of future needs, recommend a new system of budgeting for both capital and O&M costs. The system should be suitable for a modern water and sanitation utility, but also must be adaptable to the requirements of the Government's approved system of budgeting. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task C.2 Develop and Assist in Installing a System for Purchasing**

Based on the evaluation of existing conditions and assessment of future needs, recommend a new system of purchasing for the various types of equipment, commodities and services required by the Authority. The system should be suitable for a modern water and sanitation utility. Depending upon the flexibility provided in the Authority's charter, the system may have to meet the requirements of the Government's approved system of purchasing. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task C.3 Develop and Assist in Installing an Improved Accounting System**

Based on the evaluation of existing conditions and assessment of future needs, recommend a new system of accounting suitable for a modern water and sanitation utility. The system should include general ledger, payroll and inventory control systems. Depending upon the flexibility provided in the Authority's charter, the system may have to meet the requirements of the Government's approved system of accounting. In any event, the proposed new accounting system must be adaptable to the requirements of the Government's approved system of accounting. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task C.4 Develop Systems for Billing and Collection of Revenues**

At the present time there are no user charges for water, sanitation and wastewater services, so the only systems for billing and collection relate to the small charges which are made for making connections to the system. Based on the evaluation of existing systems and an assessment of future needs, as noted under Task B.10 of Part II, recommend a new system of billing and collection of revenues suitable for a modern water and sanitation utility. Assist the Authority in developing a basic capacity for this purpose which is appropriate for the initial needs of the Authority.

**Task D Strengthen the Authority's Capabilities in Personnel Management**

**Background** Current levels of skills and payment schedules are inadequate to the Authority's needs. Control over personnel, the capacity to train staff to meet the greater demands of an efficient sector organization, and the ability to properly compensate trained staff will be dependent upon the ability of the Authority to become financially self-sustaining. As long as the Authority is dependent upon the national government for funding it will be difficult to achieve its objectives.

**Task D.1 Develop and Institutionalize a New Personnel System**

Based on the evaluation of existing conditions and assessment of future needs, recommend a new personnel system suitable for a modern water and sanitation utility. The system should include personnel policies, criteria for hiring and firing, promoting and motivation, personnel performance reviews and record keeping, and training. Depending upon the flexibility provided in the Authority's charter, the system may have to meet the requirements of the Government's laws relative to personnel. Assist the Authority in developing a basic capacity for human resource development and management which is appropriate for the initial needs of the Authority.

**Task D.2**      Identify Areas of Basic Skill Deficiencies and Suggest Programs for Overcoming Such Deficiencies

Based on the findings of existing conditions in the various departments following the completion of the sub-tasks listed under Task A of Part II, identify the deficiencies in personnel capabilities which must be overcome in strengthening the Authority as proposed under Part III. Recommend a program for overcoming deficiencies in basic skills.

**Task D.3**      Identify Areas of Critical Skill Deficiencies and Develop Options for Obtaining Such Skills from the Private Sector

Based on the results of Task D.2 above, determine which of these deficiencies occur among the "critical " skills required by the Authority. Critical skills may be considered skills in the development, management and training of others in the use of computers and software programs; development, management and monitoring of O&M programs; or other technical or management skills in short supply in Turkmenistan. Recommend a program for overcoming deficiencies in critical skills, including consideration of contracting with the private sector for such services until such time as these skills can be developed within the Authority.

**Task E**            **Strengthen the Authority's Capabilities in Quality Control**

**Task E.1**        Laboratories

Based on a review of pre-project evaluations of existing laboratories in the Velayet, and verification of the adequacy of existing laboratories by means of selected field investigations, make recommendations for consolidation and upgrading water quality laboratories in the Velayet. This evaluation is not meant to include those laboratories operated by MOH/SES or other parties, but only those required to ensure that the Authority's operations meets the legal requirements for providing potable water and for the adequacy of treatment of collected wastewaters prior to disposal.

**Task E.2**        Define and Develop an Environmental Department

Prepare a description of duties and responsibilities for an environmental office within the quality control division of the Authority. The environmental office should be independent of the engineering division, and should have such responsibilities as conducting studies of the environmental consequences of current Authority activities, reviewing plans for future activities for their environmental consequences, and advising the Managing Director of any potentially adverse consequences of existing or planned activities, suggesting mitigation measures. Initially this office probably should consist of a single professional person and a small administrative staff, with occasional support from staff on loan from other departments as the workload requires.

**Task E.3**        Quality Control

Based on water quality standards for potable water and wastewater effluent quality standards, and on the

performance indicators to be developed under Task F, recommend procedures for ensuring control of quality in important aspects of the Authority's activities, including the delivery of potable water, satisfaction of wastewater effluent standards, ensuring the reliability of water service, and meeting such other performance factors as may be adopted by the Authority.

## **Task F      Develop Performance Indicators and Initiate Performance Monitoring**

### **Task F.1      Develop Key Performance Indicators for the Authority**

Prepare a list of suggested key performance indicators for the Authority, similar to those suggested below, and suggest target goals over time, as appropriate, in the following areas:

- a.      Water Supply For each community water system: Number of hours per day that water is supplied under pressure; Percent of water quality samples that meet bacteriological standards; Percent of community population served; Total water produced; Number of leaks/breaks repaired per month; Percentage of households with direct connections; Percentage of people within 50 meters of a functioning street faucet; Number of street faucets and percentage of functioning street faucets; Hours per month that service is unavailable to street faucets because of freezing; Average number of persons served per street faucet; and similar indicators. Suggest a program to develop base-line data for the number of hours spent by households in collecting water, and the amounts carried, for those dependent upon street faucets for their water supply.
- b.      Wastewater and Sanitation Performance indicators to be developed by the consultant, based on conditions appropriate to the various communities.
- c.      Finance and Administration For each community water system, and for those two communities with wastewater systems: Total operation and maintenance costs; O&M costs per cubic meter of water produced or wastewater collected; Revenues collected per month by type of customer (residential street faucets, residential yard taps, commercial/industrial or other); Number of Authority employees per customer served (all communities); Accounts receivable (revenues billed but not collected); Average age of accounts receivable (how many months has it been, on average, since the accounts receivable were billed); Information on the date of establishment, existence and effectiveness of such programs as training, management information systems, financial systems, or other Authority functions; and other performance indicators as appropriate.

### **Task F.2      Measurement of Performance**

Suggest programs for the utilization of these performance indicators by management as a means of measuring overall performance of the Authority, and for the publication and dissemination of reports on performance to the Authority's Board of Directors, other supervisory organizations or groups which represent the interests of the consumers.

## **Task G      Develop and Implement a Public Awareness Campaign**

Background In addition to the institutional strengthening of the Authority as described in the previous tasks, the consultant will develop and assist officials of the Velayet in the implementation of a public awareness campaign (1) to inform the population in the project areas about improvements of services in water supply, sanitation and health; (2) to introduce the principle of cost-recovery from those who benefit from the improved service; and (3) to educate the general population about the value and importance of water conservation; safe practices for water

collection and storage; linkages between water, sanitation and good hygienic practices and health; and community and household involvement in operation and maintenance of the water supply system. The public awareness campaign is linked with the community development activities for community participation in water supply and sanitation systems (which are being developed under the sanitation and health component of the project). Feedback from numerous community focus groups and stakeholder workshops has found that beneficiaries want more public education regarding the new systems so that they can identify specific and appropriate mechanisms for their participation. The public awareness program will be implemented coincident with the establishment of the Authority, and will be coordinated with the sanitation and health component of the project, and with the UNDP national public awareness program on water conservation and usage.

Time Period and Responsibility for the Program The consultant will be responsible for this program for a period of 18 months until the conclusion of the consultant's contract. At the completion of the consultant's contract, it is intended that one or more of the local personnel trained by the consultant will be employed by the Authority for assignment to the Customer Services Department described under Task A.7. The Authority will be encouraged to continue the program at least until the end of construction, and preferably beyond that on a continuing but reduced basis. The tasks to be performed are described as follows:

Task G.1 Develop a Draft Public Awareness Program

Develop a draft public awareness program which includes (1) conducting initial surveys of public knowledge and understanding of the issues mentioned in the campaign objectives (cost-recovery, water conservation, proper water usage, and community participation in the system operation and maintenance), (2) establishes measurable objectives, (3) evaluates communication strategies, (4) determines target audiences, (5) recommends the media mix to be utilized, (6) drafts the themes and contents of the messages to be imparted (including proper use of street faucets and possibly neighborhood policing of such use), (7) determines the resources required, (8) prepares a budget for the program to be implemented by the consultant, and (9) suggests annual budgets for a reduced program to be implemented by the Authority at the end of the consultant's contract. The draft program should be prepared in English and Russian.

Task G.2 Engage Local Staff

Determine the job requirements for and engage a local specialist in communications for 18 months and a media specialist for a total of 6 months, to assist in the development and implementation of the program.

Task G.3 Identify Stakeholders, or Parties Interested in Such a Program

Identify regional and local organizations which are presumed to have an interest in the conduct of a public awareness program on the issues of water supply, sanitation and health; including water and sanitation utilities (the new Authority), public health organizations (SES or other departments of the Ministry of health), governmental organizations (Velayet and Etrap Hakimliks, Archyns of etrap centers and kolkhoses), international donor groups or others. This campaign will be coordinated with the sanitation and health component (community participation, and health promotion and health education activities), and the UNDP national public awareness program on water conservation and usage.

Task G.4 Identify the Presumed Representatives of the Beneficiaries

The direct beneficiaries are considered to be the general population of Dashkhovuz Velayet. Identify the presumed representatives of these beneficiaries, which might include the Domkom (the street or neighborhood leaders), the Gengeshi (municipal councilors), women's groups, school organizations, local or international NGOs, or any other

organization which either represents or has the potential to represent, the interests of the people in matters of water supply, sanitation or health.

**Task G.5      Identify parties With Potential to Deliver the Messages of the Program**

Identify those parties which could contribute to the content of the messages (water and sanitation specialists, health specialists), and those parties which could prepare and deliver the messages. The latter could include representatives of the media in television, radio, newspapers, magazines or other press; as well as media production firms, including video filming and printing shops.

**Task G.6      Discuss and Agree on Final Public Awareness Program**

Review the draft public awareness program with selected representatives from the groups identified in Tasks G.3 through G.5. Prepare a report on the final public awareness program which reflects the views of these representatives to the maximum extent, recognizing that not all parties will be in agreement. The report on the final public awareness program should be prepared in English and Russian.

**Task G.7      Implement the Public Awareness Program**

Implement the public awareness program, making full use of local staff so that they may be able to continue similar programs in the future. The program should provide for at least 12 months of continuity in delivering messages by a variety of media.

**Task G.8      Conduct Survey of Program Results**

In coordination with the health promotion and education subcomponent of the sanitation and health component, conduct a survey of the target audiences before and after the campaign to evaluate changes in knowledge, attitudes and practices related to water supply usage and conservation, sanitation and personal and household hygiene. Prepare a report on the results of the survey in English and Russian, and disseminate the Russian-language report results to appropriate parties throughout the velayet.

### ANNEX S-3: TERMS OF REFERENCE FOR SANITATION AND HEALTH COMPONENT

#### Introduction

1. The Government of Turkmenistan has received a loan from the International Bank for Reconstruction and Development (World Bank) in support of a program of investments to improve and expand water supply, sanitation and health in the regions affected by the Aral Sea disaster. The objectives of the proposed project would be to: (i) improve water supply and sanitation in etrap centers and selected collective farms in Dashkhovuz velayet; and (ii) initiate institutional changes in the water and sanitation sectors to ensure that the project is financially and technically sustainable. Within the scope of this project, the Government has decided to contract the services of consultants (the Consultant) to carry out the Sanitation and Health Component.

#### Background

2. **Health status.** Health status in Turkmenistan is poor, compared with other countries of the former Soviet Union, and health status is poorer in Dashkhovuz velayet than in the rest of the country. The poor and declining health is attributed to degradation of the environment; qualitative and quantitative deterioration of the drinking water supply; poor sanitation and hygiene practices; protein and vitamin deficiency; and inadequate and declining health care services.

3. Responsibilities for water provision and quality, sanitation and hygiene. In urban areas of Dashkhovuz Velayet, the Department of Housing and Communal Services (DHCS) have responsibility for operating and maintaining the Dashkhovuz City piped wastewater system, through the Dashkhovuz Vodocanal. They also are said to have responsibility for the provision and maintenance of latrines in public areas such as government buildings, markets and clinics or hospitals. Installation of latrines in schools appears to be under the control of individual school authorities. No official government organization has responsibility for any aspect of latrines or other means of excreta disposal for private households or businesses. While the Sanitary and Epidemiological Services of the Ministry of Health (MOHMI/SES) is primarily a regulatory agency to monitor the performance and quality of the water and wastewater services being provided, they also appear to be involved in the "treatment" (addition of lime) and disposal of latrine sludges from some institutional latrines, such as those in schools. Whether or not DHCS, MOHMI/SES or any other governmental organization has responsibility for them, most institutional latrines are in deplorable condition.

4. The MOHMI/SES has the clear responsibility for monitoring the quality of the water supplied to the people of Turkmenistan through municipal water supply systems. No agency concerns itself with the quality of water used by people from their private sources of water. SES samples water quality from public systems at the point of supply, the distribution system, and selected users, including schools and homes. The frequency and number of tests depends upon the size of the system being monitored. Sampling is said to take place about once or twice a month, on average. As noted hereinafter, water quality frequently fails to meet drinking water standards. SES has the authority to levy fines against communities which fail to chlorinate, and to shut down systems which fail bacteriological tests. Officials whose systems frequently fail to meet the standards are subject to criminal prosecution. It appears that these sanctions are rarely imposed. As a result of severe budget limitations, SES suffers from a shortage of operable vehicles, buildings of limited size and poor quality, and laboratories with failing equipment and inadequate supplies of chemicals. These problems constrain SES in fulfilling its responsibilities.

5. **The project.** On the Aral Sea Basin regional level, the project originates from the Aral Sea Program 5 "Clean Water and Health" and constitutes Project 5.2 Turkmenistan Water Supply and Sanitation. The project was specifically intended to address the demand for improved water supplies for the population most affected by the Aral Sea disaster. It is also based on optimizing the health benefits realized by improvements in water supply systems by improving sanitation and hygiene. The project would be the first infrastructure investment operation in Turkmenistan, therefore the project was designed to be focused and simple to implement both technically and administratively. During project preparation it was determined that a long-term investment in excess of US\$ 140 million would be required to rehabilitate and expand the water supply infrastructure to the entire velayet. Therefore it was decided that the project would focus on the immediate needs (which are in the secondary cities and farms rather than the capital city) in an equitable fashion by improving services in one secondary city and one farm in each etrap. Noting significant sector institutional weaknesses on the national and regional level, the project was designed to include institutional restructuring and financial reforms on the regional level. The project would serve as a demonstration for institutional reforms.

6. The Ministry of Land Reclamation and Water Resource Management has undertaken project preparation with technical assistance from Electrowatt Engineering. The feasibility work included two demonstration projects: the installation of effective taps on street standpipes in Gubadagh; and the construction of improved latrines and handwashing facilities at a school in Boldumsaz. Results of the street standpipe demonstration have been taken into account in the water supply rehabilitation component and form the basis for the development of community involvement in operation and maintenance. The results of the sanitation project form the basis of the school-based sanitation, hygiene and health education component of the project. The results of these two demonstration projects were used in the project formulation. During preparation, participatory methods, such as focus group discussions, were used routinely to guide the two demonstration projects and to provide additional background information. A local NGO has been actively engaged in project preparation and is assisting in the implementation of the community involvement components of the two demonstration projects. During appraisal, the role of the community in the project was discussed in a stakeholder workshop conducted in Dashkhovuz, and in subsequent discussions with local community residents; water, health and education authorities; non-governmental organizations (NGOs); donors; and government officials. Based on these discussions, the principle of increased community participation to strengthen the involvement of beneficiaries in system design, usage and operation and maintenance has been agreed upon and emphasized in the project.

### **Objectives and approach**

7. The Consultant will provide technical assistance to the Government of Turkmenistan and local authorities in Dashkhovuz to implement the Sanitation and Health Component of the Water Supply and Sanitation Project. The component aims at improving sanitation, health and hygiene through the installation of improved public toilets, especially in schools and markets, as well as through health promotion and hygiene education. The component combines activities aiming at changing the population and authorities knowledge, attitudes and practices in relation to health, water supply, sanitation and hygiene; with improvements in the water supply and sanitation facilities, namely by improving access to safe water, and to handwashing and sanitation facilities in target sites such as schools and markets. The objectives and subcomponents of the Sanitation and Health component are the following:

8. **Sanitation and Health.** The objective of this component is to optimize the project's health benefits through improved sanitation, health promotion, hygiene education, the improvement of water quality monitoring and sanitation, and better hygiene surveillance. Almost all households in urban and

rural areas have a sanitation facility (pit latrine), but coverage is less complete in schools, markets, and other communal facilities. Most sanitation facilities are in very poor condition and few have handwashing facilities. This project component will target the under-served and receptive beneficiaries by improving sanitation and hygiene schools and markets. It will rehabilitate and construct latrines and install handwashing basins in target schools and markets in the areas covered by the project. The three subcomponents include:

9. **Improvement of Sanitation, Hygiene and Water Supply Facilities Utilizing Community-Based Approaches.** The objective of this subcomponent is to demonstrate the benefits of safe water usage and conservation, and of improved sanitation and hygiene through community-based activities. Results of the school sanitation and health education demonstration project conducted as part of project preparation have been used to design this sub-component. The subcomponent will provide local and foreign technical assistance in community participation to develop community-based activities to improve water supply and sanitation. The Consultant will assist the Department of Housing and Communal Services (DHCS) to implement this subcomponent in Dashkhovuz velayet. This subcomponent will finance the rehabilitation of latrines and installation of hand-washing basins in about 45 schools in the nine collective farms for which water supply improvements are being provided, and in one market in each of the seven etrap centers included in the water supply component. The latrines will be emptied at least once during project implementation, for demonstration purposes. One foreign project manager (sanitation engineer) will train, and assist district project managers (sanitation engineers) in managing the component and in the implementation of this subcomponent. The subcomponent will organize training of district managers, collective farm directors and other staff in management, low-cost sanitation, and community participation. The subcomponent will cover office space in each district, as well as office equipment and supplies, including computers, telephones and modems to establish an Internet link. The component would finance the purchase of one vehicle and equipment, workshops and a study tour to Uzbekistan to visit the pilot projects developed as part of the Water, Sanitation and Health Project.

10. **Health Promotion and Hygiene Education in Rural Areas.** This subcomponent aims at changing knowledge, attitudes and practices related to water, sanitation and health. Health promotion and hygiene education will be carried out in the schools and markets covered by subcomponent (a) above, and also in other rural areas. The Consultant will assist the Center of Health (Ministry of Health) in Dashkhovuz in implementing this component. Foreign specialists in health promotion, and media communication will train an equal number of specialists in each etrap and in the capital city. The subcomponent will cover training of trainers, as well as of health workers, teachers and others involved in health education in each district. In the first year, trainers of trainers will participate in a study tour to the Estonia Health Promotion Fund and health education services. The Center in Dashkhovuz will be rehabilitated, to install a training room for about 30 trainees. The Center will be provided with equipment for training and for health education activities, office furniture and equipment, including computers, telephones, and modems to establish an Internet link, as well as with one vehicle (van). The Center of Health will also manage funds to cover for publication and communication costs (e.g., leaflets, newsletters, newspaper space, and radio and TV time). Assisted by local and foreign experts, the Center will carry out studies of knowledge, attitudes and practices that contribute to monitor progress and impact of the project.

11. **Water Quality Monitoring and Sanitation and Hygiene Surveillance.** This subcomponent aims at improving water quality monitoring, and sanitation and hygiene surveillance. It will improve the performance of the Sanitary and Epidemiological Services (SES) division of the Ministry of Health in the velayet. This subcomponent will:

(i) Improve water quality monitoring system and sanitation and hygiene surveillance systems. Responsibility for this activity will rest with the Dashkhovuz velayet SES, with assistance from local and foreign specialists. By the end of the first year, SES stations in Dashkhovuz and in each district will have adopted a program to monitor water quality, and to supervise sanitation and hygiene, designed according to modern standards of practice. This first activity will provide one vehicle to each district SES, office equipment, local and foreign technical assistance (one water quality specialist, and one sanitation and hygiene specialist), training of trainers, and training of water quality monitoring and sanitation and hygiene surveillance district staff, and will cover publication and dissemination of the new monitoring and surveillance schemes to be put in place.

(ii) Upgrade SES laboratories in Dashkhovuz velayet. The existing SES laboratories will be refurbished and equipment for bacteriological and chemical analysis purchased. By the end of the first year, the bacteriological/chemical laboratories in Dashkhovuz, and the 8 district bacteriological laboratories will be rehabilitated and provided with modern equipment. This activity will provide local and foreign technical assistance (one public health laboratory specialist, and one civil works engineer) and training of trainers, and of laboratory staff.

(iii) Improve data collection, analysis and reporting; and conduct epidemiological studies. Training will be provided to SES staff in data collection and analysis methods. Reporting procedures will be revised. Equipment will be furnished to improve data analysis. Technical assistance and training in environmental epidemiology will be provided. Epidemiological studies will be conducted as a training vehicle as well as to investigate linkages between water and sanitation and health, and to document impacts of the project's interventions. This activity will provide equipment, mainly computers and software, as well as Internet connections; local and foreign technical assistance of epidemiologists and statisticians; and training in data collection, analysis and reporting.

### Scope of Work

12. **Improvement of Sanitation, Hygiene and Water Supply Facilities Utilizing Community-Based Approaches.** The consultant's scope of work will include, but not will not be limited to the following activities:

(i) Assess the capability of the DHCS to undertake the maintenance of the latrines, and if necessary develop training programs and strengthening mechanisms to allow them to function effectively in their future capacity;

(ii) Assist the DHCS to purchase vehicles and other equipment for the project, in accordance with Bank guidelines;

(iii) Develop and implement a training program for the district project managers (sanitation engineers). Prepare and organize a minimum of 2 workshops per year in each district (etrap), for about 20 participants each, for the district project managers; and prepare and organize a minimum of 6 workshops per year in each etrap, for about 25 participants each, for collective farm committee members and other staff on low-cost water supply and sanitation, management and community participation. The workshops, and material provided for the workshops, will be in Russian and/or Turkmen.

(iv) Conduct field research to establish the most appropriate locations and designs of the proposed latrines. The consultant will discuss and agree the general approach with DHCS and other organizations involved, as well as with communities. The handwashing facilities should be connected to the piped water supply, where this is practicable;

(v) Prepare designs and tender documents for the proposed latrines and handwashing facilities to allow local organizations to bid for the construction work. As far as possible the designs should utilize materials that are available locally;

(vi) Assist the DHCS to tender the work, carry out bid evaluation and award the contract. The consultant will also assist DHCS to comply with Bank requirements in respect of the tender process;

(vii) Develop a program for construction of the latrines and handwashing facilities, and assist DHCS to monitor progress against the program;

(viii) Assist the local district project managers to supervise and manage the construction, providing advice on construction, quality control and organizational issues;

(ix) Develop a program for emptying latrines, and a method of disposal of the contents in a safe and appropriate location and manner. Implement the start of this program, for demonstration purposes, so that each latrine is emptied at least once during the project implementation;

(x) Prepare quarterly reports indicating the progress of the subcomponent, and cumulative on the component to date. Suggest and implement, after agreement with the local organizations, any measures needed to keep the program on target, either in terms of time or cost. Reports will also include expenditure to date on the project, and any items likely to increase the cost of the project.

13. **Health Promotion and Hygiene Education in Rural Areas.** The consultant scope of work will include, but will not be limited to the following activities:

(i) Identify in Dashkhovuz and in each district staff and organizations that could be involved in health promotion, community participation and communication activities;

(ii) Develop and implement a training plan. Prepare and organize four training of trainers workshops per year, for about 25 participants each, to train specialists in health promotion, community participation and media specialists;

(iii) Develop and implement with these specialists, and in collaboration with the district managers, health promotion and health education plans, first for areas where the sanitation subcomponent will be implemented, and in a second phase for all other areas. The plans will include training of health workers, teachers and others involved in health education in each district (about 9 workshops per year in each etrap, for about 25 participants each), as well as publications and communication (leaflets, posters, newsletters, newspaper space, radio and TV time, etc.);

(iv) Subcontract civil works enterprises to rehabilitate the Center of Health in Dashkhovuz;

(v) Assist the Center of Health to purchase equipment and supplies, including education equipment (e.g., overhead projectors, screens, televisions, videocameras, videorecorders), computers, software and modems, and office furniture and supplies, and one vehicle; assist the Center to establish an Internet connection;

(vi) Organize a study tour of trainers of trainers to Estonia, to visit the Health Promotion Fund and health promotion and health education services;

(vii) Assess and report on changes in knowledge, attitudes and practices related with water, sanitation and hygiene, and relate these with project progress;

(viii) Prepare quarterly reports indicating the progress of this sub-component, and cumulative on the program to date. Suggest and implement, after agreement with the local staff and organizations, any measures needed to keep the program on target, either in terms of time or cost. Reports will also include expenditure to date on the project, and any items likely to increase the cost of the project.

14. **Water quality monitoring and sanitation and hygiene surveillance.** The consultant's scope of work will include, but will not be limited to the following activities:

Adoption of updated programs to monitor water quality and supervise sanitation and hygiene

- (i) In Dashkhovuz, and in each district SES, identify local water quality specialists, and sanitation and hygiene specialists to prepare, implement and supervise the adoption of updated programs to monitor water quality and supervise sanitation and hygiene;
- (ii) With these specialists, develop training plans for trainers (2 workshops/year/10 participants), and for district staff involved in water quality monitoring and sanitation and hygiene surveillance (4 workshops/year/etrap/10 participants);
- (iii) In the first year of the project, assist SES experts to develop programs to monitor water quality, and to supervise sanitation and hygiene, designed according to the World Health organization guidelines and modern standards of practice;
- (iv) Assist the MOHMI in purchasing one vehicle for Dashkhovuz and each district SES, to be assigned to the water quality monitoring, and sanitation and hygiene surveillance programs;
- (v) Assist the MOHMI to provide each SES station with office equipment, namely one computer, printer, modem and telephone;
- (vi) Assist SES to publish and disseminate throughout the services the new monitoring and surveillance schemes to be put in place.

#### **Upgrade SES laboratories in Dashkhovuz and in each district.**

- (i) Assess the civil works needed to rehabilitate the SES bacteriological /chemical laboratories in Dashkhovuz and the district bacteriological laboratories, and prepare tender documents, including designs and specifications, to allow local organizations to bid for the work;
- (ii) Assist the SES throughout the procurement process in contractor evaluation and selection procedures in accordance with Bank guidelines and procedures;
- (iii) Assist the SES to monitor and supervise the progress and quality of the work, and provide advice as required on construction and management issues;
- (iv) In conjunction with the MOHMI, prepare schedules of modern laboratory equipment and furniture for the laboratories in Dashkhovuz, and the districts, and assist with the procurement through the appropriate Bank procedures (ICB/IS/NCB);
- (v) Develop and implement a training plan for trainers of laboratory staff (six workshops for about 20 participants), and for laboratory staff (six workshops per etrap, for about 20 participants each).

#### **Improve data collection, analysis, and reporting.**

- (i) Identify in Dashkhovuz SES three epidemiologists and three statisticians that will work on improving SES data collection, analysis and reporting;
- (ii) Develop with these specialists a training of trainers program to be implemented in the first months of the project with the assistance of the foreign epidemiologist and statistician;
- (iii) Develop and implement a training plan of SES staff involved in data collection, analysis and reporting (one training of trainers workshop per year for about 20 participants each, and one workshop per year in each etrap for about 20 participants each);
- (iv) Assist the MOHMI to provide the SES with equipment, mainly computers (3) and software, as well as Internet connections, to be assigned to data collection, analyses and reporting;
- (v) Organize a study tour to the Kyrgyz Republic to visit health services organizing the information network CARINFONET;
- (vi) Assist SES in carrying out studies related to water quality, sanitation and hygiene and their impact on health. The studies will contribute to monitoring progress and impact of the project in Dashkhovuz; and

(vii) Prepare quarterly reports indicating the progress of this subcomponent, and cumulative on the program to date. Suggest and implement, after agreement with the local staff and organizations, any measures needed to keep the program on target, either in terms of time or cost. Reports will also include expenditure to date on the project, and any items likely to increase the cost of the project.

### Program

15. This consultancy is expected to commence around January 1998, and have a duration of 24 months.

16. The consultancy will run concurrently with other components of the project, and for the purposes of coordination, the consultant will report to two Component Coordinators (CCs - one for the sanitation component representing DHCS and one for the remainder of the consultancy, representing MOHMI). The component coordinators will in turn report to a Regional Component Coordinator, based in Dashkhovuz, who will be responsible to the Project Implementation Unit of the Ministry of Land Reclamation and Water Resources Management in Ashgabad. The Consultancy should coordinate with UNICEF's Water Supply and Sanitation Program in Dashkhovuz and ensure that activities are consistent with the UNICEF approach.

17. The consultancy includes a substantial amount of construction work, both for the Sanitation subcomponent and for rehabilitation of laboratories and offices. The consultant will be expected to draw up a detailed program for this work as part of the assignment, but the anticipated cumulative progress for these works is shown in Table 1.

### Staffing

18. **Improvement of Sanitation, Hygiene and Water Supply Facilities Utilizing Community-Based Approaches.** The consultant's staff will comprise a project manager (possibly sanitation engineer, foreign, 6 person-months), who will be responsible for management and coordination of the work for the full 24 month duration of the assignment, although it is expected that this will be achieved through part time inputs; and a community participation specialist (foreign - 5 person-months). The project manager will be based in Dashkhovuz, and should preferably have a knowledge of Russian and/or Turkmen. In addition, there will be 7 local project managers (30 person months each), one in each district, who will manage the work in their area, and a community participation specialist (30 person-months each) in each district. The local staff will be recruited in consultation with the CC from the DHCS. It is envisaged that the consultant will employ support staff as necessary, (total 60 local person months) e.g. interpreter, a driver and secretarial staff. In addition to managing the sanitation subcomponent, the foreign project manager will monitor the two other subcomponents throughout the assignment.

19. **Health Promotion and Hygiene Education.** The consultant's staffing for this subcomponent is expected to comprise short term foreign specialists supported by local staff. The foreign staff inputs will comprise a health promoter/educator (5 person-months), and a media specialist (3 person-months) providing expertise during the first 12 months of the assignment. The local staff will consist of a health promoter, and a media specialist in each district (30 person-months each). The local staff will be recruited from the Center of Health and other local organizations involved in health promotion, health education, community participation and media activities. The consultant will employ support staffing as necessary, including an interpreter and a secretary.

20. **Water quality monitoring and sanitation and hygiene surveillance.** The consultant's staffing for this subcomponent is expected to comprise short term foreign specialists that will provide expertise in Dashkhovuz, and will be supported by local staff, paid by the project on a part time basis. The foreign staff inputs will comprise: (i) for the first activity, a water quality specialist (3 person months) and a sanitation and hygiene surveillance specialist (4 person months) in the first year of the project. These specialists will be assisted by one specialist in Dashkhovuz and one in each district (30 person-months each); (ii) for the second activity, a public health laboratory specialist providing 4 months of expertise in the first year of the project; and one civil engineer providing two months of expertise for the rehabilitation of the public health laboratories, in the first months of the project implementation. The first specialist will be assisted by one local public health specialist in Dashkhovuz and one in each district (30 person-months each); (iii) for the third activity, a foreign epidemiologist (2 months) and a foreign statistician (2 months), will provide expertise during the duration of this assignment. Each of these specialists will be assisted by 3 local experts (30 person-months each).

21. **Deliverables.** The Consultant will provide the following reports in English and in Russian:

(i) **Quarterly reports.** These reports will indicate progress of sub-components, and cumulative on the program to date. The reports will include recommendations for any measures needed to keep the program on target, either in terms of time or cost. Reports will also include expenditure to date on the project, and any items likely to increase the cost of the project.

(ii) **Annual reports.** These reports will indicate the progress of this component, including performance indicators (inputs, outputs and outcomes to date); include expenditure to date on the component, and items likely to increase the cost of the project; and recommend any measures needed to keep the program on target, either in terms of time or cost.

(iii) **Final Report.** This report will contain details of the project implementation, including problems encountered and resolved, the performance of the project against the performance indicators, and will also comment on the sustainability of the component activities after the end of the project. It will also make recommendations on any measures needed to improve sustainability.

22. **Logistics.** The Consultant will be provided with furnished and equipped offices in Dashkhovuz for foreign and local staff for each subcomponent: offices will also be provided in the districts for local staff based in the districts under each subcomponent. Computers and other equipment for the offices will be purchased by the PIU. For the Sanitation subcomponent the consultant will use a vehicle provided under the project (purchased by the PIU) for project activities. For the Health Promotion and Water Quality Monitoring subcomponents the consultants will be provided with transport as necessary for project activities, generally through vehicles purchased for the project by the PIU.

24. **Equipment.** The Consultant will assist the Government in procuring the equipment according to The World Bank guidelines. At least 75 percent of the equipment should be purchased in the first year of the project, and the remaining in the second year. The equipment to be purchased is the following:

- (i) Office furniture for the Center of Health in Dashkhovuz;
- (ii) Education equipment, such as screens, overhead projectors, videos, televisions, videocameras, etc., for the Center of Health in Dashkhovuz;
- (iii) Laboratory equipment, such as stills, sterilizers, media, bottles, membrane filters, incubators, etc., for 1 bacteriological/chemical laboratory in Dashkhovuz, and for 1 bacteriological laboratory in each district (8); and

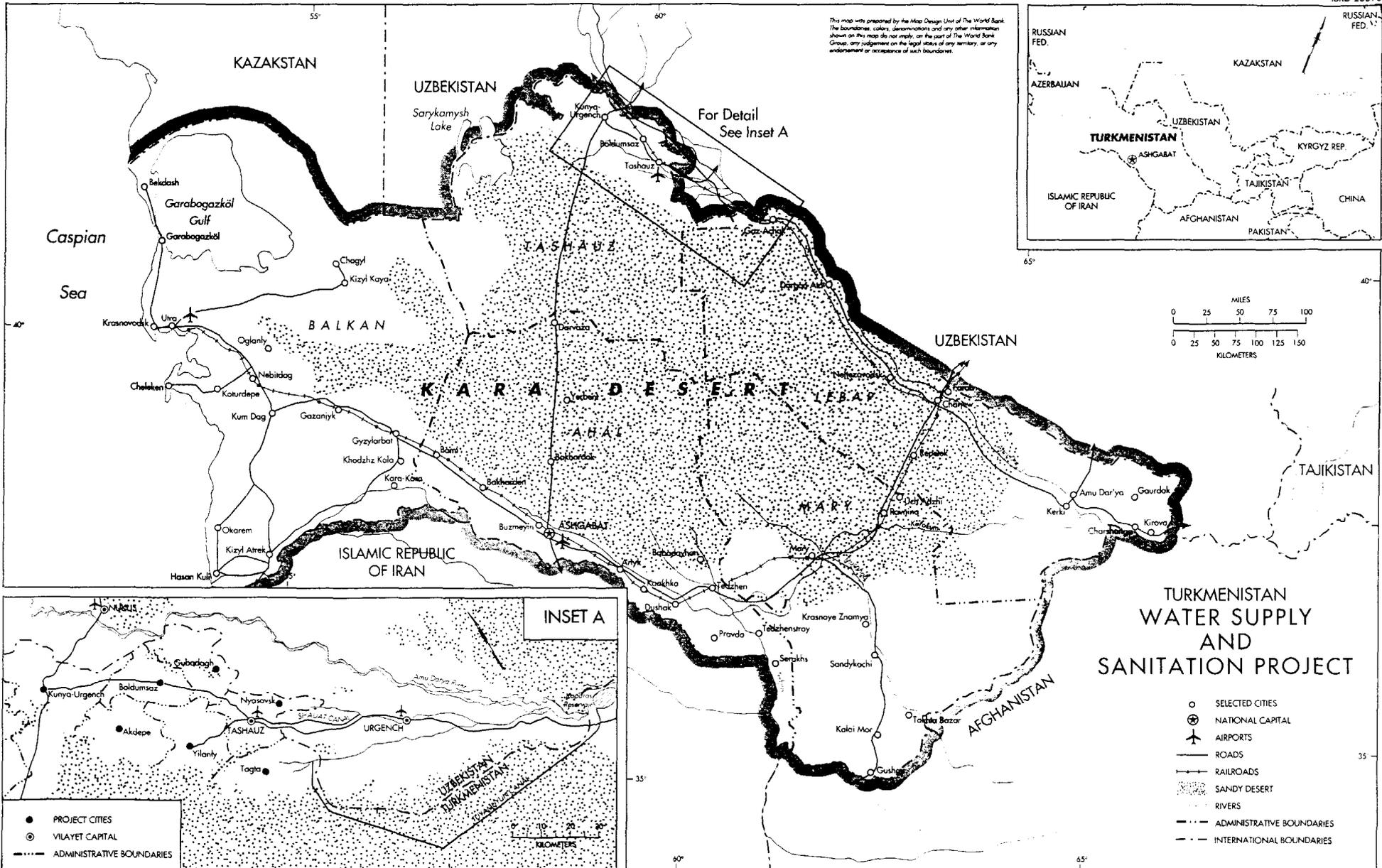
- (iv) Laboratory furniture, for 1 bacteriological/chemical laboratory in Dashkhovuz, and for 1 bacteriological laboratory in each district (8).

Table 1 Sanitation and Health Component Program

	Year 1	Year 2	Year 3	Year 4	Year 5
Project Management Offices	90%	100%			
Latrines and handwashing basins	25%	60%	100%		
Public latrines emptied			25%	60%	100%
Other Civil Works	60%	100%			
Equipment & Furniture	75%	100%			
Vehicles	75%	100%			
Trainees	25%	50%	75%	100%	
Study Tours	1	2	3		
Internet Connections	25%	50%	75%	100%	
Water Quality Monitoring Programs	90%	100%			
Sanitation & Hygiene Surveillance Program	90%	100%			
Studies	1 KAP study; 1 water quality monitoring study; 1 sanitation & hygiene study.		2 KAP studies; 2 water quality monitoring studies; 2 sanitation & hygiene studies		3 KAP studies; 2 water quality monitoring studies; 2 sanitation & hygiene studies
Monthly Health Data Reports Published	12	24	36	48	60
Consultant Reports	Quarterly Annual	Quarterly Annual	Quarterly Annual	Quarterly Annual	Quarterly Annual Final

**ANNEX T: PROJECT DOCUMENTS IN FILES**

1. Identification Mission Background Notes - February, 1995
2. Needs Assessment - November, 1995
3. Electrowatt Engineering: Monthly Reports - March, 1996 - December, 1996
4. Electrowatt Engineering: Inception Report - April, 1996
5. Electrowatt Engineering: Draft Feasibility Report - September, 1996
6. Electrowatt Engineering: Report on Public Health - September, 1996
7. Electrowatt Engineering: Final Feasibility Report - December, 1996
8. Electrowatt Engineering and ATTA: Report on Demonstration Projects (Annex to the Main Feasibility Report) - December, 1996
9. Electrowatt Engineering: Report on Remaining 97 Collective Farms - December, 1996



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For Detail See Inset A

### TURKMENISTAN WATER SUPPLY AND SANITATION PROJECT

- SELECTED CITIES
- ⊙ NATIONAL CAPITAL
- ✈ AIRPORTS
- ROADS
- RAILROADS
- ▨ SANDY DESERT
- RIVERS
- - - ADMINISTRATIVE BOUNDARIES
- - - INTERNATIONAL BOUNDARIES

- PROJECT CITIES
- ⊙ VILAYET CAPITAL
- - - ADMINISTRATIVE BOUNDARIES





## IMAGING

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