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Second Dushanbe Water Supply Project
Dushanbe, Tajikistan

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Summary

Tajikistan is considered one of the fastest growing countries in the Europe and Central Asian (ECA) region despite having survived a long civil war. The country was left with a collapsing water supply and sanitation sector. However, after a severe typhoid epidemic in Dushanbe in 1997, the water supply sector was salvaged by the implementation of the first donor-funded project; Dushanbe water supply project (DWSP). The first project brought significant improvements to the drinking water supply services to the inhabitants of Dushanbe who hitherto, lacked access to potable drinking water. However, the outputs under the first DWSP scope was not fully achieved due to the cancellation of funding by the donor agency; International Development Association (IDA). However, in 2011, Tajikistan successfully negotiated a total of USD 16 million funding support again from the IDA. Thus, the Second Dushanbe water supply project (DWSP2/DWSP2-AF) was designed and implemented. The objectives of the DWSP2/DWSP2-AF were to upgrade water treatment and distribution infrastructure so as to (i) achieve water quality and service improvements noticeable by customers, (ii) expand metering and improved billing and collection systems to quickly enhance revenue generation while improving customer service, and (ii) secure technical assistance and capacity-building to strengthen the project implementation agency; Dushanbe Vodokanal State Unitary Enterprise (DVK) management and operational performance. The DWSP2/DWSP2-AF has been successfully implemented with most of the works, goods, and services contracts awarded and executed. Interim assessment reports of the project noted significant improvement in water supply service delivery, technical aptitude and financial performance of DVK and associated service providers. Significant improvement in the water supply sector of Dushanbe was attributed to the project outcomes.

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Acronyms and abbreviations

AF	Additional Financing
DA	Designated Account
DVK	Dushanbe Vodokanal State Unitary Enterprise
DWSP	First Dushanbe Water Supply Project
DWSP2	Second Dushanbe Water Supply Project
DWSP2-AF	Second Dushanbe Water Supply Project- Additional Funding
ECA	Europe and Central Asia
GDP	Gross Domestic Product
GOT	Government of the Republic of Tajikistan
IDA	International Development Association
WSS	Water and Sanitation Services
KMK	Communal Services Agency
Lcd	Liter per capita per day
AMC	Anti -Monopoly Commission
NAP	Napornaya Water Treatment Plant
NIS	Network Information System
NRW	Non-Revenue Water
PCU	Project Coordinating Unit
ICT	Information Communication Technology
NIS	Network Information System
CSS	Customer Satisfaction Survey
SAM	Samatechnaya Water Treatment Plant
SCADA	Supervisory Control and Data Acquisition
EIRR	Economic Internal Rate of Return
FIRR	Financial Internal Rate of Return
EIA	Environmental Impact Assessment
EMMP	Environmental Management and Monitoring Plan

1 Introduction

Tajikistan is a landlocked country in Central Asia that bordered by Afghanistan in the south, China the east, Kyrgyzstan in the north. After independence in 1991, Tajikistan survived a long civil war that left most of the country's infrastructure in a deplorable state. However, major policy reforms followed by the country projected the country to achieve significant growth over the past decades. Though ranked a lower middle-income country, Tajikistan is considered one of the fastest growing countries in the Europe and Central Asia (ECA) region with a gross domestic product (GDP) per capita of USD 795.84 and annual GDP growth rate of 6.9% in 2016. Tajikistan has an annual population growth of 2.2% in 2016 and a sound economic growth averaging 7% over the last 15 years. Dushanbe has a population of about 764,300 persons (IDA, 2015). Water supply coverage in rural Tajikistan was estimated at 49 percent compared to 93 percent population coverage in urban areas.

Figure 1. Geographic location map of Tajikistan (Source: MAGELLAN GEOGRAPHIX, 1997)

The unavailability and poor quality of water and sanitation services (WSS) is a contributor to non-monetary poverty in many developing countries. By 1997, Tajikistan's water and sanitation infrastructure were in a deplorable state. Most of the facilities were reported to have been built during the Soviet era and have been poorly maintained and or underserviced. The risk of waterborne illness in Tajikistan was also one of the highest among the ECA region due to insufficient water treatment and unreliable water supply to the city. In the year 1997, the capital; Dushanbe suffered a severe typhoid outbreak which recorded about 8,900 cases of typhoid. Due to the old age and dysfunctional state of the city's water supply infrastructure , water utility services were of poor quality, unreliable and inadequate. Communal Services Agency (KMK) has oversight responsibility for most central public functions except for tariff regulation which was entrusted to the Anti-

Monopoly Commission (AMC). However, water supply to Dushanbe is managed by the municipality owned utility; Dushanbe Vodokanal state unitary enterprise (DVK) with control from the KMK. DVK provides water supply and sewerage services to five districts. In Dushanbe, unit water demands have been reported to exceed 1,000 Lcd. The poor quality of supplied water has been attributed to the lack of filtration at the main Samatechnaya (SAM) water treatment plant. As a result, supplied water in Dushanbe was has high turbidity. Even more, only about 40% of the total service area was covered under such conditions (World Bank, 2017). The situation is often more devasting when there are heavy precipitation events. Water supply inefficiency is further worsened by revenue losses and pressure losses due to network leakages and unmetered consumptions. The practice of 'door-to-door' issuance of bills and cash collection by the municipal utility has contributed to the low collection levels. The result of these challenges is the poor service delivery by the municipal utility, DVK.

Substantial capital injection in the water supply sector was necessary to improve the quality of service by DVK to improve service delivery and quality and of the utility company. The first major project funding realized was under the first Dushanbe Water Supply Project (DWSP) which lasted from June 2002 to June 2011. The implementation of the first DWSP was aimed at improving the safety, reliability, efficiency, and financial viability of water supply services in Dushanbe. Following the significant impact made by the first DWSP, a case was made for the Second Dushanbe Water Supply Project (DWSP2) to complement the first DWSP. Further, through the DWSP2, water utility service in Dushanbe would be improved through interventions that would deal with water quality, the financial performance improvement of DVK and demand management, infrastructure rehabilitation.

Figure 2 Potable drinking water scarcity in Dushanbe prior to DWSP (SDC, 2013)

The Second Dushanbe Water Supply project (DWSP2) was designed to attract further capital infusion into the water and sanitation sector, in order to improve the efficiency and reliability of water supply services in Dushanbe. Primarily, the project would enable the completion of previous investments in the sector which were initiated under the first DWSP. Most of the investments initiated under the first DWSP were in dire need of funding to ensure the realization of their full benefit. Many of these

projects were expected to be completed under the DWSP2. The DWSP2 comprised; (i) the completion of the metering program in the southern part of the city and (ii) the installation of network re-chlorination systems, (iii) an additional tranche of filter reconstruction at the Samatechnaya. Regarding the Water Treatment Plant (SAM); (ii) the automation of the coagulation process at SAM WTP; (iii) the replacement and sectorization of network sections; (iv) the development of a tariff and connection fee study; and (v) technical assistance to improve utility management capacities and to develop a non-revenue water (NRW) reduction strategy.

Table 1: Overview of the water supply project (IDA, 2015)

Items		Description
Project Name	:	Second Dushanbe Water Supply Project
Type	:	Water Supply
Donor Name	:	i. International Development Association (IDA) ii. Municipality of Dushanbe, Tajikistan
Project rationale and objectives	:	To improve water utility performance and water supply services in selected areas of Dushanbe
Project Fund	:	Total: USD 19 million (IDA funding: USD16.0 million) (Dushanbe Municipality funding: USD 3.0 million)
Project Duration	:	Originally June 2011- December 2015 Revived to March 2025)

2 Technical and Technological Brief

2.1 Technical description of Second Dushanbe Water Supply Project

Under the DWSP2, and Dushanbe Water Supply project-additional funding (DWSP-AF) herewith referred to as DWSP2/DWSP2-AF, critical interventions would be made to upgrade the water supply situation in Dushanbe, to levels that would ensure improved water supply services of adequate quantity and quality. The project outputs involved the completion of works on the construction and installation of SAM filters. Water filtration process is necessary to limit the amount of colloidal particles in the water and also to reduce the turbidity levels of supplied drinking water to consumers. The project also includes the expansion of the metering program to cover entirely the southern half part of the city. Also, the expansion of the metering program would ensure improved revenue mobilization which is necessary for cost recovery.

Another significant component of the DWSP2/DWSP2-AF is the implementation of the non-revenue water reduction strategy which aimed at demand management and sustainability. The non-revenue water reduction strategy would contribute towards the maximization of sustainable water use among consumers. Sustainable consumer behavior would promote efficient water use and locally increased the availability of treated water to cover the rest of the city which are without water supply. Notably, summer periods are characterized by a significant reduction in water supply. However, the implementation of the non-revenue water reduction strategy would contribute to increased access to water in the summer. The DWSP2/DWSP2-AF project would also introduce block tariffs and

energy efficiency measures to increase the economic and financial viability of DVK's operations. Under the DWSP2 / DWSP2-AF, emphasis on capacity building and institutional strengthening of the sector would be achieved by the provision of training programs for staff geared towards. Part of the project funds will also be allocated to study tariff and connection dynamics as well as provide technical assistance for corporate development, financial management, and customer service management. More importantly, to ensure the achievement of project objectives and project features compliant with IDA standards, part of the project funds would be allocated for soliciting technical expertise, procurement of project management consultants, design and supervision services, project administration unit operating costs and annual project audits.

Table 2: Overview of the water supply project (IDA, 2015)

Components	Descriptions
1. Metering and Demand Management	a) Installation of 10,000 water meters in the completion of the metering program in south Dushanbe b) Implementation of energy efficiency upgrades c) Network sectorization, mains replacement and leak reduction d) Communications strategy and ICT-based reporting system e) Annual customer satisfaction surveys
2. Water Quality Improvement	a) Reconstruction of an additional 50% tranche of filters at SAM WTP and associated inlet and outlet structures b) Automation of coagulation dosage at SAM WTP c) Installation of in-network re-chlorination systems
3. Institutional Strengthening & Capacity Building	a) Tariff and connection fee study b) Technical Assistance for corporate development, financial management, and customer service c) Technical assistance for operational improvements, including NRW reduction strategy d) Training program for operational and administrative capacity building
4. Implementation Support	a) Project management consultancy, design and supervision services b) Project administration unit operating costs c) Annual audits

3 Financial brief

The DWSP2 was much needed to resolve many problems faced by DVK that hindered it from providing good water supply services. It was also necessary to improve the poor financial performance by DVK. The initial project cost was based on the assessment of priority investment areas to scale up the performance DVK. Funding for the DWSP2 was approved by the IDA in 2011. The government of Tajikistan (GOT) managed to secure a total of USD 16 million IDA grant from the International Development Association (IDA) to implement the DWSP2. The Municipality of

Dushanbe however, would counterpart fund with USD 3 million. A first tranche of USD 10.1 million was disbursed by the IDA and later USD 5.9 million was released by the IDA in December 2015.Subsequent negotiations led to the approval of additional funding (DWSP2-AF) support by the IDA as a grant and a credit facility of USD 4.5 million and USD 5.5 million respectively. Under DWSP2-AF, counterpart funding of USD 2 million was to be provided by GOT (IDA, 2015).

Financial management functions are solely the responsibility of the project coordinating unit (PCU). By this, the chief accountant of DVK controls all project financial management system with assistance from a financial management consultant. Under the DWSP2/DWSP2-AF, a financial management consultant was provided by the project management committee (PMC) to establish and maintain an effective project accounting system during project implementation. The role of DVK in the financial management structure, however, is to process payments through approval of invoices and works completion statements. The project components and their cost allocations are shown in Table 3.

Table 3: Overview of the cost allocation to project components (IDA, 2015)

Project component	Cost allocated (USD million)
Metering and demand management	9.80
Water quality improvement	13.07
Institutional strengthening, and capacity building	3.71
Implementation support	3.27
Unallocated contingency	0.16

4 Project Features

4.1 Technical and technological features

The scope of services under the DWSP2/DWSP2-AF are classified under four main components, namely; metering and demand management, water quality improvement, institutional strengthening, and capacity building, implementation support and unallocated contingency. Substantially, water supply metering and demand management are at the core of good financial performance and business viability. The DWSP2/DWSP2-AF has been developed to ensure total metering of all consumer supply and utilization, especially the southern part Dushanbe. By this, the DWSP2/DWSP2-AF were to ensure the procurement and installation of 76,500 residential water meters. Network sectorization, mains replacement, and leak reduction was also to be carried by the procurement and installation of flow meters at four WTP's. In addition, a metering program which would include the updating of customer database and billing and collection systems was to be implemented. Also, the project would establish a network information system (NIS), and a supervisory control and data acquisition (SCADA) software which are all part of modern communications strategy and ICT-based reporting used in modern day utility service management. Further, good communication rapport with consumers is to be pursued by creating channels for

information dissemination, creation of awareness among consumers and customer satisfaction surveys.

Water quality improvement under component 2 would be achieved by cleaning network sections and reservoirs, reconstruction of an additional tranche of 5000 m^3/h rapid sand filters at the SAM WTP and associated inlet and outlet structures. The capacity of the SAM WTP would be extended from 120,000 m^3/d to 170,000 m^3/d. In addition, the coagulation dosage system at SAM WTP would also be automated. Procurement of laboratory equipment, leakage detection equipment and more importantly the procurement and installation of re-chlorination units at 5 reservoirs would be done under component 2 of this project. Effectively, the DWSP2/DWSP2-AF would procure hydraulic excavators, build pumping stations and two minimum reservoirs at the Napornaya Water Treatment Plant. Series of civil works include the demolition of existing transformer rooms and reconstruction of new ones equipped with new 160 kWA transformers and necessary supporting equipment. New administrative building for the personnel and a laboratory of SAM WTP would also be constructed.

Figure 3 Dushanbe Vodokanal water Treatment Plant Pumping Station (DVK, 2012)

Component 3 of the DWSP2/DWSP2-AF would ensure institutional strengthening, capacity building and skill development of DVK and other service providers covered under the project. Tariff and connection fee studies would also be conducted. Under this component, the project would solicit technical assistance for corporate development, financial management, and customer service management. Institutional assessment, re-evaluation of additional funding and inventory, procurement of accounting software and customer management system would be carried out to strengthen and ensure effective and efficient service delivery and management practices by DVK. Service delivery and operations would also to be improved through training and procurement of assistance for corporate development, financial performance, and operational improvements

4.2 Economic and financial features

The Second Dushanbe water supply project would generate significant economic benefits for the consumers in Dushanbe. Due to the failure to complete the first Dushanbe water supply project, the potable water supplied was inadequate to meet the demand of consumers. Unattended consumers would usually rely on boiling of supplied/ collected water to achieve potable water for drinking. The indirect financial and economic savings on the provision of continuous potable water service is the saved cost on energy supply and the cost incurred due to frequent replacement of filter elements of water treatment equipment. Moreover, cost savings on the reduction of waterborne diseases were expected to increase with the achievement of the project development objectives. Quite notably, project appraisal report of the first Dushanbe water supply project indicated an improvement in revenue mobilization by DVK through better metering coverage.

The outcome of the capital investment in the sanitation and water supply sector under the first project was an increase in billing and collection from 22% in 2002 to 95% in 2009. The additional funding (AF) under the Second Dushanbe Water Supply Project (DWSP2-AF) was to increase investment on the metering program with aims to expand metering coverage of uncharged consumers. The new metering program sought to promote sustainable water consumption, the provision of incentives in terms of providing discounted rates to relatively low consumers. With a cue from the previous project, extending billing and collection to cover new and existing consumers is expected to increase revenue for service providers. Under the tariff program, DVKs revision of the existing tariff structure and coverage of consumers was to be commensurate with improved services. Thus, billing and revenue collection was expected to be increased upon the implementation of the second Dushanbe supply project.

The economic assessment of the DWSP2/DWSP2-AF was hinged on the incremental benefits and costs associated with the project implementation. The 'with or without' the project approach to economic analysis helps to clearly put in perspective the economic cost of realizing the project development objectives on all stakeholders. Thus, without the project, the benefits of improving quality, water utility performance, and water supply services in selected areas of Dushanbe would not be realized. By this, consumers in Dushanbe and other service areas would be left with poor water services. An evaluation of the coping cost in terms of the health impact of the project and its associated cost on consumers within the service areas noted that consumers would become vulnerable to waterborne diseases without the project. Likewise, the economic cost based on 'without-project scenario' was calculated based on consumers adopting other self-water purification methods. The incremental benefits based on 'with-project scenario' included the possible reduction in health related costs from waterborne diseases. By this, benefits may be in the area of reduction in health care costs; loss of productivity; and costs due to premature deaths. Project implementation benefits may also be realized from the associated reduced cost of provision of drinking water, reduced costs of treating water for other purposes than drinking and reduced costs of operation and maintenance due to the quality of water supply. In assessing the economic cost of the DWSP2/DWSP2-AF, the project costs were considered as the investment costs. While the economic costs on the investments cost were also assumed to be in close proximity to the financial costs. Survey data from DVKs published customer satisfaction survey (CSS), financial/operational data and World

Bank report 2015 report was used as the basis for economic quantification. Further, the economic assessment made to test the viability of the DWSP2/ DWSP2-AF showed that a favorable economic internal rate of return (EIRR) of 26% would be realized on project investments in Dushanbe.

Likewise, with a financial internal rate of return (FIRR) of 15%, the investment on the DWSP2/DWSP2-AF was projected to be fully affordable for DVK. DVK has since improved its financial performance since the start of the implementation of the DWSP2/ DWSP2-AF. The improved financial performance by DVK was largely attributed to increased revenue mobilization due to the tariff increment by 25% in 2015. More so, DVK's financial management system has been significantly strengthened due to the impact of the project. Improvements made on adjusting tariff levels and increasing metering consumptions contributed largely to the revenue mobilized. Undoubtedly, the implementation of the metering program led to an increase in the number of registered residential consumers from around 400,000 in 2012 to close to 700,000 by 2015. This resulted in a concomitant increase in revenue generated for DVK (IDA, 2015). Notably, reports on the financial assessment of the project indicated that the project would yield significant financial cost savings to DVK. The project FIRR was calculated to be 15% based on the total investment costs of the project (USD 12 million) projected in real terms. With these projections, a positive outlook of the project in terms of economic and financial cost savings was expected. The projections further showed indications of financial and economic viability.

4.3 Social and environmental features

The development and incorporation of adequate key social and environmental impact safeguard policies in the project design were one of the key criteria for loan approval by the IDA. The implementation of DWSP2/DWSP2-AF involved major demolishing and rehabilitation of existing structures on DVK grounds or public lands and lands within residential compounds during civil works. No major adverse social impacts were identified with the project implementation phase. However, the project is expected to contribute towards the reduction of socio-economic impacts of poor water supply services. Resettlement of indigenous and or voluntary resettlements that might arise due to the implementation of the project was reported as non-existent. Social and environmental safeguard reports noted that the resettlement of indigenous people, as well as the impact on physical and cultural resources, were not associated with the project. The cost savings due to productivity losses, health related expenditures were expected to improve the livelihood of consumers within the service area. Moreover, the implementation of a block tariff structure would yield benefits of potable water affordability to consumers particularly in slum areas of Dushanbe. The tariff study under component 3 of DWSP2/DWSP2-AF would provide recommendations on socially inclusive tariffs structures that would benefit all consumers. Further, the block tariff reform implementation would serve as a poverty diagnostic tool which would inform an inclusive policy on the water and sanitation in Tajikistan.

The gender dimensions of the project include the reduction of household tasks of women, particularly those related to water collection and management. The project would improve the customer survey and complaint system to remain relevant and responsive to customer demands especially women and children. Citizenry engagement and inclusion elements of the project would improve social

accountability in the water and sanitation sector. Under the DWSP2/ DWSP2-AF, detailed social analysis and a customer satisfaction study would be carried in consultation with the consumers.

The DWSP2/ DWSP-AF is Environmental Impact Assessment (EIA) category B project because of the limited impact of the project on the environment. Notwithstanding, the potential environmental adverse impacts of the project relates to (i) inappropriate disposal of water treatment sludge (ii) safety hazards from chlorination process (iii) pollution by construction run-offs (iv) disturbance during construction including dust, noise, vibration, access restriction, closure of roads, and increased traffic; (v) improper disposal of demolition debris; (vi) damage to existing utility services during pipe repairs and installation; (vii) safety hazards from construction activities; (viii) spillage of fuel and oil from construction, and (ix) damage to trees and vegetative cover. However, the project promises to improve the state public health through adequate and sustainable potable water supply. However, simple environmental management and monitoring plans (EMMP) were designed in incorporated in the project design to guide the project in mitigating possible environmental impacts associated with project implementation. One of the requirements of awarding construction contracts will be the inclusion of measures in conformity with the those stipulated in the EMMP. This is expected to ensure good construction practices that limit adverse impacts to the environment.

5 Project Benefits

The implementation of the DWSP2/ DWSP2-AF would yield significant benefits to the water and sanitation sector of Dushanbe, particularly to DVK. The project brought about a huge capital investment in the water and sanitation sector of Tajikistan, which at the time, was in dire need of financial investment to salvage the collapsing water supply system. One of the major benefits of the project also is the improvement in access to adequate and available potable water. Thus, the realization of the project objectives would eliminate turbid and unsafe water supply from the water utility company, DVK. Further, access to good quality water would contribute to reducing the incidences of waterborne diseases in Dushanbe. Besides, the project is in line with the government's poverty reduction strategy of Tajikistan. Improving access to reliable potable water for the inhabitants of Dushanbe will invariably increase their productive capacities. The benefits of the implementation of the DWSP2/ DWSP2-AF are also reflected in the socio-economic impacts that can be achieved through urban water security. The new paradigm of reliable and sustained access to potable would positively impact the livelihood strategies of the inhabitants of Dushanbe. Likewise, the project would bring about economic and financial benefits to domestic and non-domestic consumers through cost savings on purchasing of household water filters, water boiling as means of disinfection, water storage systems, purchase of tanker water will. In addition, productivity losses as a result of time lost when water borne diseases are contracted and time spent on dealing with irregular water supply and poor quality water would be greatly reduced.

The benefits of the DWSP2/ DWSP2-AF for the main water supply services provider of Dushanbe , DVK are identifiable in the areas of institutional strengthening, capacity building, skill development and infrastructural development. The project components involved the improvement of the financial management structure in water services delivery and accounting systems used by DVK. DVK benefits substantially from the project due to the integrated training components of the project would build

employers skills and capacity to manage and sustain the improved service delivery standards. The project would also provide technical assistance in customer service management, corporate development, and financial performance. With the implementation of the project, DVK would improve their financial performance as well to be able to remain a viable business. The expansion of the metering and collection program to cover all of the service areas would also naturally enhance revenue mobilization by DVK. Again, reduction in losses and leakages in the water distribution networks coupled with improved billing and collection would improve matching cost and recovery opportunities of DVK.

6 Implementation status of the project

In line with the project development objectives, the parent project, DWSP2 has been completed. However, under the DWSP2-AF, reports by the IDA indicated the completion of all contracts for works, goods, and services. All deliverables under the various components of the DWSP2 and DWSP2-AF has been reported to be completed except the implementation of the largest contract which involves the reconstruction of an additional 50 % tranche of filters at SAM water treatment plant. According to IDA reports, the contract has been signed in October 2017. However, delays have been experienced in the implementation of the contract. Nevertheless, DVK is reported to be in communication with the contractor to help resolve the challenges hampering the execution of the contract.

The terms of reference of the tariff study were also revised due to increase in the electricity tariff in Dushanbe. With this new developments, the financial performance of the DVK is expected to be affected. However, the revision of the original terms of reference of the tariff study was proposed so as to include the part of electricity tariff increment. This is expected to be resolved quickly. Consultancy service on this is expected to be completed by September 2018. The development of geographical information system (GIS) mapping and Network Information System has been implemented to cover more than 60 percent of the city's water supply network. The GIS database, which is yet to be completed would include a complete information on dimensions, material, conditions, and age of the pipelines, which would be used for hydraulic modelling and future asset registry of DVK. Notwithstanding, the project has disbursed a total of USD 16.61 million as of April 2018. The original grant (IDA H6920) has also been fully disbursed, and all contracts for works, goods, and services have been completed. The additional funding disbursement for the Grant (IDA-D0870) and Credit (IDA-57090) stands currently at 19%.

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