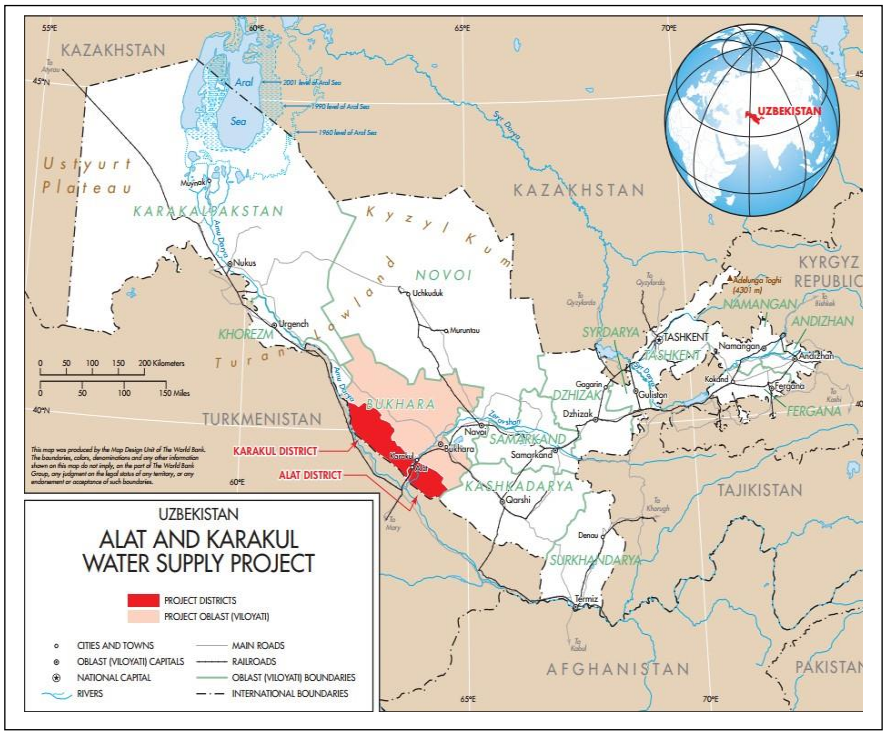
NewTap

Network on Water Technology in Asia and Pacific



Alat and Karakul Water Supply Project, Bukhara, Uzbekistan

JWRC

Japan Water Research Center

ASIAN INSTITUTE OF TECHNOLOGY 1959

Summary

Situated in the south west part of Uzbekistan, inhabitants of Alat and Karakul districts are critically suffering from the scarcity of water. Currently, they are highly dependent on the water supply from Dvoinik water treatment plant (WTP) which is itself in a dilapidated state. Thus, for a continuous supply of water in two districts, Alat and Karakul, the Alat and Karakul Water Supply Project has been established with financial support from International Development Association (IDA) and the Government of Uzbekistan (GOU). The project is expected to expand the existing WTP situated at Amu-Bukhara canal along with rehabilitation of sedimentation system, as well as coagulation, flocculation and filtration units. Also, separate reservoirs, pumping units, disinfection systems and sludge treatment systems are projected to be established. Similarly, the current water transmission pipelines are also in a state of despair. For the purpose to renovate the connections, the rural and urban level networks have been proposed to be set up by polyethylene (PE) pipelines. Thus, with an aim of providing high quality potable water, the project would reconstruct and expand the water distribution centers (WDCs) in different sites of those districts thereby facilitating more than 180,000 inhabitants. The project is estimated to cost USD 113.5 million and is expected to revise the initial closing date of 31 December, 2017 to June 30, 2019.

Prepared by:
Deepak Karna
Research Assistant,
Asian Institute of Technology, 58 Moo 9, Km. 42,
Paholyothin Highway, Klongluang, Pathumthani 12120 Thailand
Email: karnadeepak@ait.asia

Published on: 4 September, 2017

NewTap
Network on Water Technology in Asia and Pacific
http://www.jwrc-net.or.jp/aswin/en/newtap

Acronyms and Abbreviations

GOU	Government of Uzbekistan
IDA	International Development Association
PE	Polyethylene
SES	Sanitary-Epidemiological Station
USD	United States Dollar
WDC	Water Distribution Center
WTP	Water Treatment Plant

1 Introduction

The Alat and Karakul Water Supply Project was developed for Uzbekistan with a major objective to enhance coverage, quality and efficiency of water supply services in Alat and Karakul districts. The project came into effectiveness on 13 February 2014 with prior World Bank approval on 13 December 2012. It is expected to be completed within 3 years with closing date on 31 December 2017 appraised for USD 113.5 million. During these years, the project will focus on better rehabilitation and expansion of production in water and the development of transmission and distribution infrastructure in both rural and urban areas.

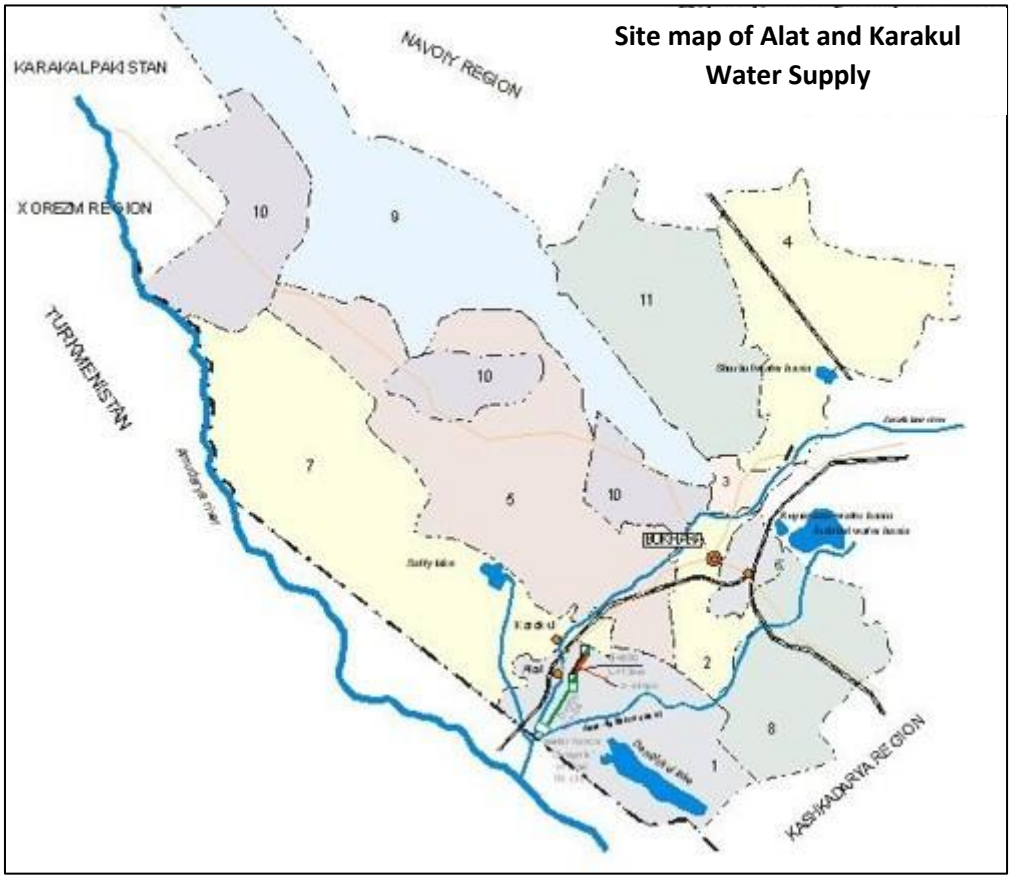


Figure 1: Location map of Alat and Karakul Water Supply Project

Despite the country's substantial investment exemplified by burrowing of USD 344.1 million from 1995 to 2014, there are still a significant number of people unconnected to a piped water supply system. Only 17 percent of urban households receive water continuously for 24 hours. On a holistic approach, it is reported that roughly 16 million people in Uzbekistan are still deprived of continuous water supply through piped connections. The situation is even worse in the rural peripheries. Though an additional 5.4 million people gained access to improved water supplies during 1990-2010, the proportion of people with its access declined to 87 percent as compared to previous 90 percent. Likewise, in rural areas the access to water decreased from 85 to 81 percent during the period. Similarly, in those areas, the proportion for piped connection also declined significantly to 26 percent (World Bank, 2012). To mitigate the problems, people without piped household connections are mainly dependent on tankers and wells for water.

Concerning about the two southern districts of Alat and Karakul region, the inhabitants bear the most insecure water supplies in the country. The current supply system depends upon the trunk line built to mobilize freshwater from Amu-Bukhara canal and provide drinkable water services to the towns, however, there is rapid depletion as well as salinization of local groundwater resources. In addition, the underfunded operations and maintenance of trunk line has imposed severe problems in the supply systems leading to degraded functionality.

Thus the proposed Alat and Karakul Water Supply Project was designed with the highest objective to either rehabilitate or replace the existing water supply infrastructure in those two districts with an optimum goal of reducing hydraulic water losses as well as increase the percentage of regulatory water samples meeting quality criterions.

Table 1: Overview of Alat and Karakul Water Supply and Sanitation Project

Items	Description
Project Name	: Alat and Karakul Water Supply Project
Type	: Water Supply and Water Treatment Upgradation
Donor Name	: World Bank and Government of Uzbekistan
Project Components	: i. Component A: Improvement of Water Supply ii. Component B: Institutional Strengthening and Capacity iii. Component C: Studies for Future iv. Component D: Project
Project Fund	: USD 113.5 million
Project Duration	: From December 2012 to December 2017

2 Technical and Technological Brief

The existing water supply depends on the pumping equipment Dvoinik installed at Amu-Bukhara canal. Before being pumped out, the water undergo decantation in pre-sedimentation unit and then sent to WTP through 25 km connections at Alat town. After the treatment, water is either sent to distribution system or a storage facility located about 13 km from the site. Since the system was designed during Soviet times, they are in a state of devastation and the operation has a very low output due to clogged and leaking transmission lines, loss of coagulation/sedimentation and filtration units as well as openly leaking distribution networks. According to the feasibility study and reports of sanitary-epidemiological station (SES), the quality of water in Amu-Bakhara do not threaten portability of drinking water during any season. The quality of water at the site has been summarized in Table 2.

Table 2. Overview for values of water quality indicators (Loyiha-Maslahat, 2012)

No.	Indicators	Value	Standard Reference
1.	Smell, point	0	2
2.	Taste, point	0	2
3.	pH	7.6	6-9
4.	Oxidability, mg/L	1.58	N/A
5.	Nitrite, mg/L	0.01	3
6.	Nitrate, mg/L	32	45
7.	Alkalinity, mg/L	2.5	N/A
8.	Hardness, mg. equiv. L	6	7/10*
9.	Calcium, mg/L	3.4	N/A
10.	Magnesium, mg/L	2.6	N/A
11.	Chloride, mg/L	220	250/350*
12.	Sulfate, mg/L	270	400/500*
13.	Solid residue, mg/L	920	1000/1500*
14.	Iron, mg/L	0.04	0.3*

*For water pipelines supplying water without special treatment

Thus to achieve an uninterrupted water supply for 24 hours a day in Alat and Karakul districts, the project is set up to operate with centralized water system functionalized at Dvoinik. It ensures to production of quality water, and the transmission and distribution compliant to international standards. Moreover, water meters would be systematically installed for scientific measurement of water production and consumption. In addition, machinery, facilities and pipelines would be rehabilitated with sustainable equipments and materials.

According to Component A of the project, the water production unit in Dvoinik will be expanded to a capacity of 49,000 m^3/d. The rehabilitation of existing water supply system will be carried out in current water intake system. Moreover, construction of new sedimentation tank, new coagulation, flocculation and filtration units would boost up the operating conditions. In addition to this, the project also looks forward to construction of separate reservoirs, pumping units, disinfection systems, sludge treatment systems and rehabilitation of nearby office buildings as well as other facilities. Also, it expects to construct new transmission mains from Dvoinik station to Alat and Karakul with a total of 105 km connection pipelines. Out of that, 71 km would connect new rural water supply service areas with advanced valves, air release and flushing devices installed at appropriate locations.

This component would equally contribute to rehabilitation of 9 WDCs including 1 in Alat town, 1 in Karakul town, 4 in Alat rural settlements and 3 in Karakul rural settlements. This water supply settlement would incorporate 90 km of secondary network, 22 km of household connection lines and 450 new individual connections in Alat town whereas 169 km of secondary network, 49 km of household connections lines and 2,400 individual connections in Karakul town. Similarly, the rural areas of Alat would benefit with 465 km of secondary network, 128 km of connection lines and about 16,000 individual connections while that of Karakul with 630 km of secondary network, 186 km of connection lines and 20,770 individual connections.

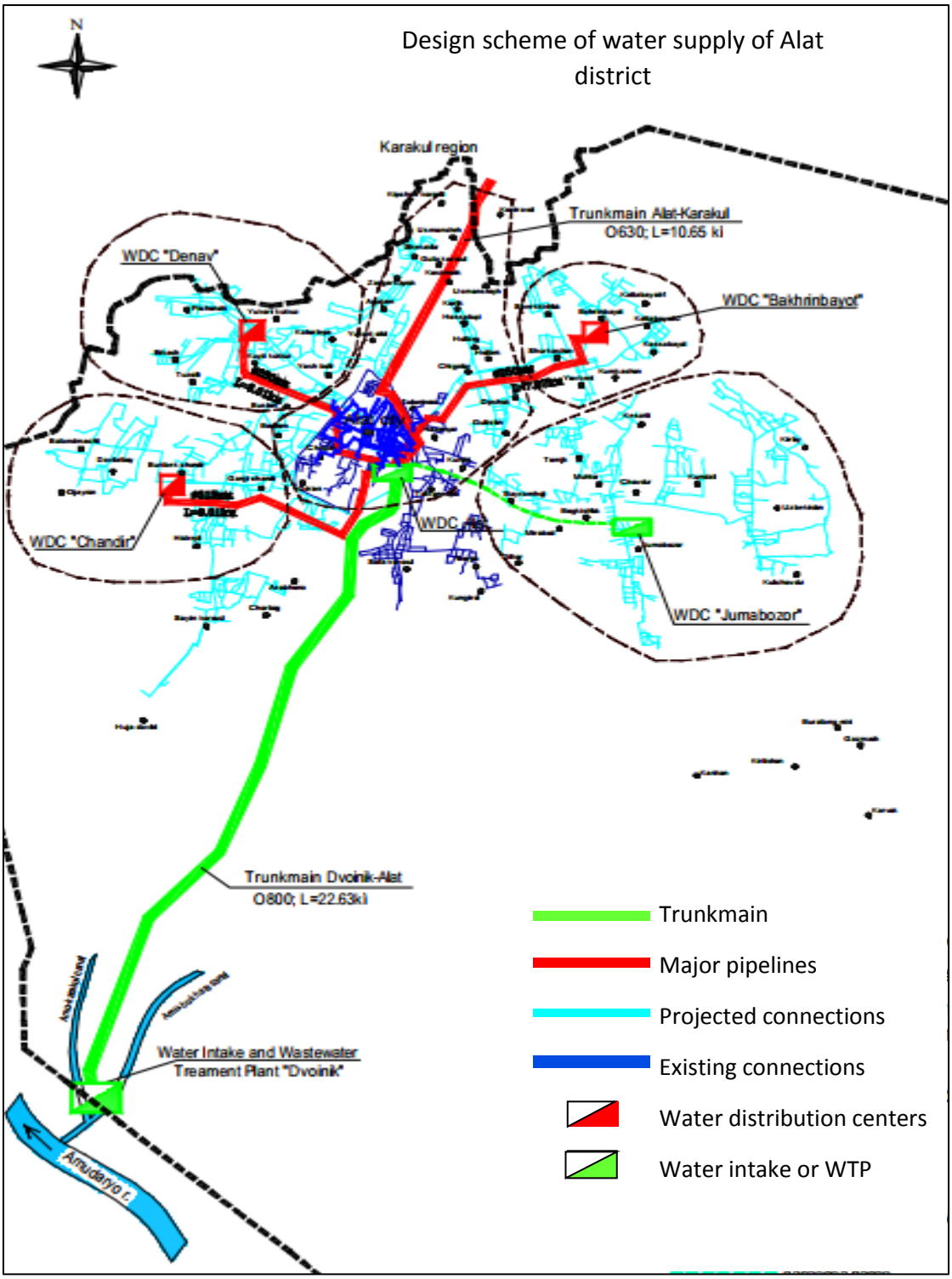


Figure 2: Design scheme of water supply of Alat district (World Bank, 2012)

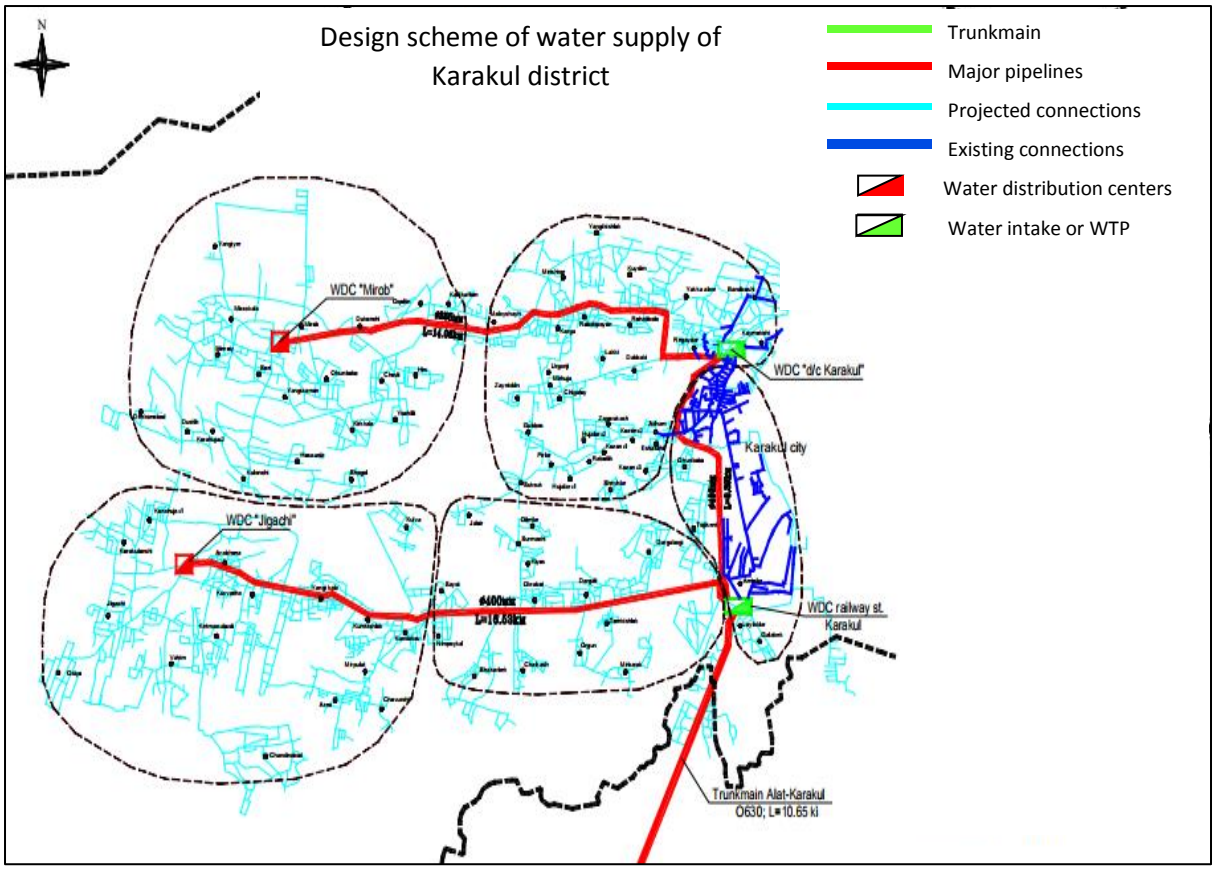


Figure 3: Design scheme of water supply of Karakul district (World Bank, 2012)

3 Financial brief

The Alat and Karakul Project has a total cost of USD 113.5 million of which USD 82 million has been financed by IDA, World Bank. The amount of expenditure has been divided into four parts as per the components. Component A which deals with improvement of water supply infrastructure is expected to cost USD 107.26 million of which 71.6% will be financed by IDA. The sub-component A1 (Engineering-design and operational technical assistance), sub-component A2 (Rehabilitation and expansion of water production and bulk transmission systems) and sub-component A3 (Rehabilitation and expansion of urban and rural water networks) are likely to cost USD 8.57 million, USD 35.95 million and USD 62.74 million respectively. Similarly, Component B which focuses on institutional strengthening is expected to have an expense of USD 3.23 million, Component C which deals with studies for future investments) will have a cost USD 0.38 million while Component D dealing with project management is expected to have a cost of USD 2.36 million.

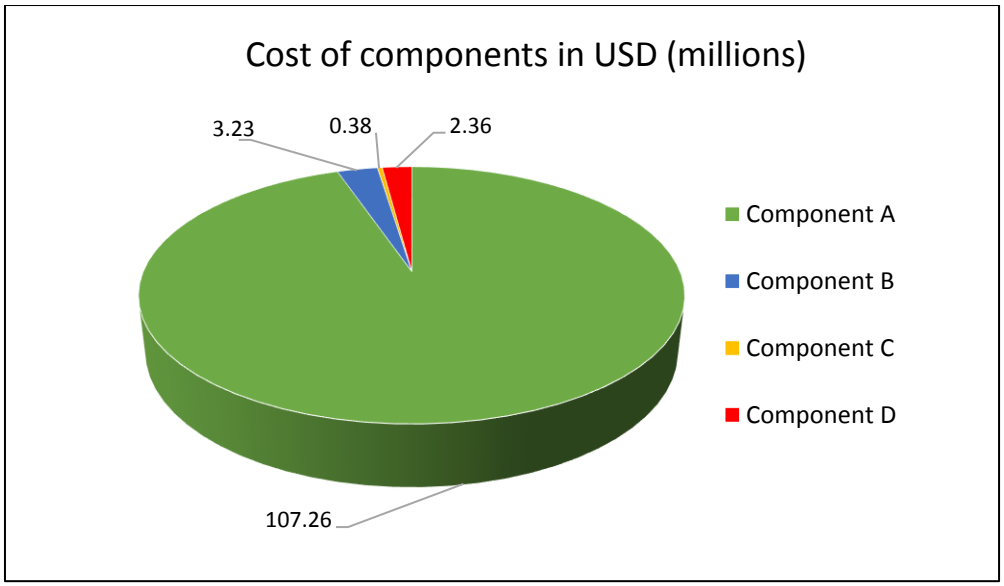


Figure 4: Proposed budget allocation for various components of the project

The loan financed by IDA has an interest rate of 0.75% per annum on the principal amount and the principal amount of the loan shall be paid semiannually over 25 years including a grace period of five years, after the project is closed in 2017.

4 Project Features

4.1 Technical and technological features

According to the project, the centralized water treatment system, 'Dvoinik' will still be located at Amu-Bukhara canal. However, its expansion will take place through construction of new sedimentation tank as well as various coagulation units, flocculation unit, sedimentation unit, and filtration units. Separate reservoirs, pumping units, disinfection systems and sludge treatment systems are novel features of the project. In terms of connecting the water treatment system to Alat and Karakul regions, 105 km connection pipelines are to be rehabilitated. These polyethylene (PE) pipelines would establish a continuous flow rate to the WDCs with the use of international quality advanced valves, air release and flushing devices. The Table 3 shows the number of WDCs established at different sites.

Table 3: Overview of number of WDCs at different sites

S. No.	Number of WDCs	Site	New household connections
1.	1	Alat-town	450
2.	1	Karakul-town	2,400
3.	4	Alat-rural settlement	16,000
4.	3	Karakul-rural settlement	20,770

4.2 Economic and financial features

Among the four components, equal priorities have been provided to each, however, the financial distribution has been proposed as USD 107.26 million for Component A, USD 3.23 million for Component B, USD 0.38 million for Component C and USD 2.36 million for Component D. The initial project support was admitted to be made by World Bank of USD 75 million while

Government of Uzbekistan of USD 38.5 million. However, the World Bank approved to support an amount of USD 82 million after the project commenced. The funding from GOU will be provided as equity for the project which will also take responsibility of servicing the main part of the debt from IDA, World Bank. The financial loan from IDA with an interest of 0.7% per annum has been agreed to be paid within 25 years with 5 years of grace. The cost recovery is expected to be made through water tariffs from the users. For households, the tariffs need to be increased from USD 0.03 to USD 0.08 per cubic meter in 2018 while after all the consumers are connected, it is projected to be stabilized at USD 0.10 per cubic meter.

4.3 Social and environmental features

From the social assessment through household survey and focus groups discussion before the beginning of project, it was found out that the inadequate water supply had been a critical household problem in the area. Moreover, it was evident that most of the households that had connection to piped water only received water for two hours per day in winter and approximately six to seven hours per day in summer. In addition, none of the household received properly treated water resulting in poor quality of life due to waterborne diseases. This project seems to have a very impactful result in the lives of local people regarding quality of life. Due to prior dysfunctional centralized system of water supply, half the population depended on hand-pipe or standpipe on the street. With the piped connections to all houses within the area, it is expected to serve whole population within the area. Based on the focus group discussions, it was reported that in Alat, 83% of households had bad quality water resulting in vulnerability in health of children, senior citizens and women. Thus, with the operation of project, women would have lessened burden of fetching water for non-potable uses from canals. Moreover, the time spent in fetching water could be invested for productive purposes thereby increasing income of family. In contrast, it has some negative impacts, too. The project may involve temporary or permanent acquisition of land in order to rehabilitate existing pipelines or construction of new pipelines. Though high priority is given to state-owned land, there may occur issues in restriction of access to public places such as homes or shop or removal of trees and social structure. However, none of the civil works would have permanent relocation of residents or enterprises.

In other cases, project can cause environmental nuisance such as air pollution and sound pollution around the work areas for a temporary period. The impacts on soil and air quality, construction vibrations, waste generations, accidental discharge of pollutants into groundwater will be actively monitored. Furthermore, any health hazards regarding management of chlorine during disinfection will be prior informed to workers such that health and safety is taken as primary concern.

5 Project Benefits

Before the beginning of project, the water supply services in Alat and Karakul regions had been critically insufficient to meet the growing demands of alarming population and were in desperate verge of collapse. Moreover during 2008, water used to be supplied in Karakul at a rate of 2 to 3 hours per day. Even with the supplements of private tanker trucks, the population in towns were forced to consume unsafe water. Nevertheless, with the proper maintenance of trunk lines and piped connections to individual houses, the project is expected to meet water demands of more than 180,000 inhabitants residing in 2 districts except for 7 rural settlements in Alat (Karikon, Kirlishon, Buralang Eski, Gazmach, Karvok, Khamza 1 and Khamza 2) and 1 rural settlement in Karakul (Sayot). The targeted number of beneficiaries as a result of project has been summarized in Table 4.

Table 4: Target number of beneficiaries

Population Projection	**Alat**		**Karakul**		**Total**	
Population Growth Rate (based on evaluation)	1.15%		1.18%			
Timeline	2011 (baseline)	2017 (targeted)	2011 (baseline)	2017 (targeted)	2011	2017
Total (urban and rural) population	94,269	100,963	122,134	131,000	216,403	232,004
Total (urban and rural) connected population	21,613	100,963	18,843	131,000	40,456	232,004
Percentage	**22.9**	**100**	**15.4**	**100**	**18.7**	**100**

6 Status of implementation progress

Though an end target of 232,000 numbers of direct beneficiaries was expected to be achieved at the end of project, the number has only been restricted to 59,469 as of 17 May, 2017. Till date, all large civil works packages have been contracted and project funds have also been totally committed. This also indicated that the contracts will be under rapid execution during 2017 construction season and as such the reporting of disbursement rate would be significantly increased. However, as the project has not been under its best performance due to various reasons, it is expected that the project closure might be extended by 18 months thereby achieving feat on June 30, 2019 (World Bank, 2017).

Due to intermittent disbursement of financial supplies, the project has not been able to meet expected outcomes as planned before the project. The current indicators demonstrate that 83 percent of households still have water as a priority problem among which 74 percent reside in Alat region while 83 percent inhabit in Karakul region. Similarly, the project has been very slow in regards to fixing the number of breakage in per km of water distribution networks and water transmission mains. Also, it has been lagging far behind the targeted value in setting up connections with operating water meters. In addition to this, no significant achievement has been met with new piped household water connections that had been expected resulting from the project intervention while piped household water connections that was targeted to be benefitted from rehabilitations works undertaken by the project has also been in similar ruined state. However, the project has been able to reach the targeted value in terms of number of water utilities.

7 References

Loyiha-Maslahat. (2012). *Improvement of water supply and Karakul districts of Bukhara region, Uzbekistan.* Tashkent.

World Bank. (2012). *Project Appraisal Document of Alat and Karakul Water Supply Project.* World Bank.

World Bank. (2017). *Implementation Status & Results Report.* World Bank.