



# Completion Report

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Project Number: 44236-013  
Loan Number: 2668  
Grant Number: 0217  
July 2017

## Kyrgyz Republic: Emergency Assistance for Recovery and Reconstruction

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Asian Development Bank

## CURRENCY EQUIVALENTS

Currency Unit – som (Som)

		<b>At Appraisal</b> (30 August 2010)	<b>At Project Completion</b> (22 September 2015)
Som1.00	=	\$0.02174	\$0.01419
\$1.00	=	Som46.00006	Som70.49380

## ABBREVIATIONS

ADB	–	Asian Development Bank
ACTED	–	Agency for Technical Cooperation and Development
DMF	–	design and monitoring framework
DRC	–	Danish Refugee Council
DSC	–	design and supervision consultant
EARR	–	Emergency Assistance for Recovery and Reconstruction
EBRD	–	European Bank for Reconstruction and Development
EIRR	–	economic internal rate of return
FIRR	–	financial internal rate of return
O&M	–	operation and maintenance
PMC	–	project management consultant
SAACCS	–	State Agency for Architecture, Construction and Communal Services
SDR	–	special drawing right
SDRD	–	State Directorate for Reconstruction and Development of Osh and Jalal-Abad
STC	–	Save the Children
WACC	–	weighted average cost of capital
WSS	–	water supply and sanitation

## WEIGHTS AND MEASURES

km	–	kilometer
l/sec	–	liter per second
m	–	meter
m <sup>2</sup>	–	square meter
m <sup>3</sup>	–	cubic meter
m <sup>3</sup> /day	–	cubic meter per day

## NOTE

- (i) In this report, "\$" refers to US dollars.

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## BASIC DATA

### A. Loan and Grant Identification

1.	Country	Kyrgyz Republic
2.	Loan Number	2668 (Concessional OCR Loan)
	Grant Number	0217
3.	Project Title	Emergency Assistance for Recovery and Reconstruction
4.	Beneficiary	Kyrgyz Republic
5.	Executing Agency	Ministry of Finance
6.	Amount of Loan	SDR32,057,000
	Amount of Grant	\$51,500,000
7.	Project Completion Report Number	1635

### B. Loan and Grant Data

1.	Appraisal	
	– Date Started	8 July 2010
	– Date Completed	15 July 2010
2.	Loan Negotiations	
	– Date Started	10 September 2010
	– Date Completed	11 September 2010
3.	Date of Board Approval	23 September 2010
4.	Date of Financing Agreement	27 September 2010
5.	Date of Loan and Grant Effectiveness	
	– In Loan Agreement	26 November 2010
	– Actual	14 February 2011
	– Number of Extensions	0
6.	Closing Date	
	– In Financing Agreement	31 March 2014
	– Actual (Loan)	23 November 2016
	– Actual (Grant)	26 September 2016
	– Number of Extensions	3
7.	Terms of Loan	
	– Interest Rate	1% per annum
	– Maturity (number of years)	40
	– Grace Period (number of years)	10
8.	Terms of Relending (if any)	
	– Interest Rate	1% per annum
	– Maturity (number of years)	40
	– Grace Period (number of years)	10

#### 9. Disbursements

a. Dates

	Initial Disbursement	Final Disbursement	Time Interval
Loan 2668	15 March 2011	17 October 2016	67 months
Grant 0217	15 March 2011	22 March 2016	60 months
	Effective Date	Original Closing Date	Time Interval
Loan 2668	14 February 2011	31 March 2014	37 months
Grant 0217	14 February 2011	31 March 2014	37 months

## b. Amount (SDR) for Loan 2668 (Concessional OCR Loan)

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
Fiscal Support	10,906,000	10,906,000	0	0	10,906,000	0
Civil Works – Water Supply and Sanitation Systems	17,820,000	16,346,900	319,481	0	16,027,419	319,481
Goods – Equipment and Machinery	660,000	323,511	0	0	323,511	0
Consulting Services	2,671,000	4,467,489	246,238	0	4,221,251	246,238
Compensation to Affected People	0	13,100	288	0	12,812	288
<b>Total</b>	<b>32,057,000</b>	<b>32,057,000</b>	<b>566,007</b>	<b>0</b>	<b>31,490,993</b>	<b>566,007</b>

## Amount (\$) for Grant 0217

Category or Subloan	Original Allocation	Last Revised Allocation	Amount Canceled	Net Amount Available	Amount Disbursed	Undisbursed Balance
Fiscal Support	23,500,000	23,500,000	0	0	23,500,000	0
Civil Works – Housing Reconstruction	28,000,000	26,918,673	0	0	26,918,673	0
Civil Works – Water Supply and Sanitation Systems	0	0	0	0	0	0
Goods - Water Supply and Sanitation	0	1,081,327	0	0	1,081,327	0
<b>Total</b>	<b>51,500,000</b>	<b>51,500,000</b>	<b>0</b>	<b>0</b>	<b>51,500,000</b>	<b>0</b>

## 10. Local Costs (Financed)

- Amount (\$)	0
- Percent of Local Costs	0
- Percent of Total Cost	0

## C. Project Data

## 1. Project Cost (\$) for Loan 2668 (Concessional OCR Loan) and Grant 0217

Cost	Appraisal Estimate	Actual
Foreign Exchange Cost	100,000,000	98,249,824
Local Currency Cost	10,000,000	0
<b>Total</b>	<b>110,000,000</b>	<b>98,249,824</b>

## 2. Financing Plan (\$)

Cost	Appraisal Estimate	Actual
Implementation Costs		
Borrower Financed	10,000,000	0
ADB Financed		
Loan	48,500,000	46,749,824
Grant	51,500,000	51,500,000
Other External Financing	0	0
<b>Total</b>	<b>110,000,000</b>	<b>98,249,824</b>
IDC Costs		
Borrower Financed	0	0
ADB Financed	1,000,000	0



Other External Financing	0	0
<b>Total</b>	<b>1,000,000</b>	<b>0</b>

ADB = Asian Development Bank, IDC = interest during construction.

### 3. Cost Breakdown by Project Component (SDR) for Loan 2668 (Concessional OCR Loan)

<b>Component</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Fiscal Support (Component 1)	10,906,000	10,906,000
Civil Works – Water Supply and Sanitation Systems (Component 3A)	17,820,000	16,346,900
Goods – Equipment and Machinery (Component 3A)	660,000	323,511
Consulting Services (Component 4)	2,671,000	4,467,489
Compensation to Affected People	0	13,100
<b>Total</b>	<b>32,057,000</b>	<b>32,057,000</b>

### Cost Breakdown by Project Component (\$) for Loan 2668 (Concessional OCR Loan)

<b>Component</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Fiscal Support (Component 1)	16,478,966	17,129,618
Civil Works – Water Supply and Sanitation Systems (Component 3A)	26,926,020	22,890,874
Goods – Equipment and Machinery (Component 3A)	997,260	499,471
Consulting Services (Component 4)	4,035,881	6,210,138
Compensation to Affected People	0	19,723
<b>Total</b>	<b>48,438,127</b>	<b>46,749,824</b>

### Cost Breakdown by Project Component (\$) for Grant 0217

<b>Component</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Fiscal Support (Component 1)	23,500,000	23,500,000
Civil Works – Housing Reconstruction (Component 2)	28,000,000	26,918,673
Civil Works – Water Supply and Sanitation Systems (Component 3A)	0	1,081,327
Goods - Water Supply and Sanitation (Component 3A)	0	1,081,327
<b>Total</b>	<b>51,500,000</b>	<b>51,500,000</b>

### 4. Project Schedule

<b>Item</b>	<b>Appraisal Estimate</b>	<b>Actual</b>
Date of Contract with Consultants		
Project Management Consultant	Q4 2010	Q1 2011
Design and Supervision Consultant	Q2 2011	Q2 2012
Completion of Engineering Designs	Q4 2011	Q4 2013
Civil Works Contracts		
Component 2: House Reconstruction		
Date of Award	Q4 2010	Q2 2011
Completion of Work	Q2 2011	Q3 2012
Component 3: Construction and Rehabilitation of Water Supply and Sanitation Systems in Bazar-Korgon, Jalal-Abad, and Osh		
Date of Award (Bazar-Korgon)	Q2 2011	Q3 2014
Completion of Work (Bazar-Korgon)	Q3 2013	Q3 2015
Date of Award (Jalal-Abad)	Q2 2011	Q3 2014
Completion of Work (Jalal-Abad)	Q3 2013	Q3 2015
Date of Award (Osh)	Q2 2011	Q2 2014
Completion of Work (Osh)	Q3 2013	Q3 2015
Equipment and Supplies		
Dates		

First Procurement	Q1 2011	Q1 2012
Last Procurement	Q1 2011	Q4 2012
Completion of Equipment Installation	Q3 2011	Q2 2013
Start of Operations		
Completion of Tests and Commissioning	Q4 2013	Q1 2016
Beginning of Start-Up	Q1 2014	Q2 2016

#### 5. Project Performance Report Ratings

Implementation Period	Ratings	
	Development Objectives	Implementation Progress
From Q2 2011 to Q3 2011	Potential problem	Did not meet baseline projection on contract awards
From Q4 2011 to Q2 2013	On track	
From Q3 2013 to Q4 2013	Potential problem	Did not meet baseline projection on contract awards
From Q1 2014 to Q3 2016	On track	

#### D. Data on Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person-Days	Specialization of Members
Loan inception	18–24 January 2011	3	21	d, i, j
Review 1	6–10 April 2011	2	10	d, g
Review 2	20–25 June 2011	1	6	d
Review 3	20 January–3 February 2012	3	21	d, i, j
Midterm review	16–21 May 2012	4	24	a, d, i, j
Review 4	24–27 September 2012	1	4	G
Review 5	1–22 March 2013	4	50	g, h, f, l <sup>a</sup>
Review 6	23 September–13 December 2013	2	36	f, c, g <sup>b</sup>
Review 7	14 February–24 April 2014	5	73	b, g, b f, k, l <sup>a</sup>
Review 8	23 September–31 October 2014	4	34	g, b h, k, l
Review 9	13 April–18 May 2015	2	46	g, b j
Review 10	11–23 June 2015	6	33	c, g, j, k
Review 11	21 September–6 October 2015	6	37	c, g, e, j, k
Special loan administration	9–15 March 2016	5	35	c, g, f, j, k
Project completion review	9–21 November 2016	6	85	f, g, j, l <sup>d</sup>

a = senior advisor, b = director, c = principal urban development specialist, d = senior urban development specialist, e = senior environment specialist, f = senior portfolio management specialist, g = urban development specialist, h = social development specialist (safeguards), i = senior project officer, j = project officer, k = project analyst, l = staff consultant.

<sup>a</sup> Land acquisition and resettlement.

<sup>b</sup> Urban development specialist/ and team leader on extended mission.

<sup>c</sup> Integrity team from Portfolio, Results, Safeguards and Social Sector Unit, CWRD); 5 person-days.

<sup>d</sup> Staff consultants consist of a water supply and sanitation engineer (22 person-days) and an economic/financial specialist (12 person-days).

## **I. PROJECT DESCRIPTION**

### **A. Objectives**

1. In April 2010, the Kyrgyz Republic experienced political disturbances resulting in many deaths and injuries, substantial property damage, and a change in government. Community violence erupted in June 2010 with even greater casualties, internal displacement of many people, and physical losses.

2. The urgent need for shelter for the affected people before the onset of winter combined with food security and livelihood restoration needs increased the government's burden. Energy infrastructure remained vulnerable to breakdown due to disrepair. While water supply and sanitation (WSS) infrastructure was not damaged, the shortfall in fiscal transfers to maintain dilapidated systems in the country's urban centers, especially in Osh and Jalal-Abad cities, was expected to result in significant deterioration of public health conditions.

3. The objectives of the Emergency Assistance for Recovery and Reconstruction (EARR) were to (i) restore the country's immediate fiscal capacity to meet the sharp rise in incremental costs arising from the April and June 2010 conflicts; and (ii) rebuild damaged houses and improve essential public infrastructure, as reflected in the report and recommendation of the President.<sup>1</sup>

### **B. Components**

4. To address the objectives, the following four components were envisaged under the EARR:
- (i) Component 1: Provide fiscal resources to ensure uninterrupted provision of education, health, social assistance, transport, and urban services.
  - (ii) Component 2: Repair and/or reconstruct damaged houses in the provinces of Osh and Jalal-Abad and in the cities of Osh and Jalal-Abad.
  - (iii) Component 3: (a) component 3A: improve public infrastructure, including WSS in the cities of Osh and Jalal-Abad; and (b) component 3B: improve community infrastructure in the provinces of Osh and Jalal-Abad.
  - (iv) Component 4: Provide project management consultant (PMC) and design and supervision consultant (DSC) services.

### **C. Implementation**

5. The financing agreement indicated the Ministry of Finance of the Kyrgyz Republic as the project's executing agency as well as the implementing agency for component 1, and the State Directorate for Reconstruction and Development of Osh and Jalal-Abad (SDRD) as the implementing agency for components 2, 3, and 4. It also anticipated the transition of the implementing agency to another agency in the case of SDRD closure during project implementation.

6. The financing agreement also specified three international nongovernment organizations involved in the early activities in 2010 as implementing partners to carry out work related to component 2: (i) the Agency for Technical Cooperation and Development (ACTED), (ii) the Danish Refugee Council (DRC), and (iii) Save the Children (STC).

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<sup>1</sup> Asian Development Bank (ADB). 2010. *Report and Recommendation of the President to the Board of Directors: Proposed Loan and Grant to the Kyrgyz Republic for Emergency Assistance for Recovery and Reconstruction*. Manila.

7. The PMC was responsible for technical, financial, and social audits of all implementation activities under component 3, and supported the implementing agency in procurement activities as well as information and communication campaigns.

#### **D. Changes in Components, Implementation, and Financing**

8. **Project steering committee.** In August 2010, the Government of the Kyrgyz Republic established (as envisaged at appraisal) a project steering committee chaired by the Prime Minister and comprising all the main ministries involved in the EARR as well as representatives of several development partners including the Asian Development Bank (ADB). Following the completion of components 1 and 2, the project steering committee was disbanded.

9. **Implementing partners.** In April 2011, with ADB approval, the SDRD concluded cooperation agreements with ACTED and DRC. STC decided not to become involved and the DRC agreed to take over the house reconstruction program.

10. **Implementing agencies.** In January 2013, based on the government's decision to close the SDRD, implementation responsibility for components 3 and 4 was transferred to the State Agency for Architecture, Construction and Communal Services (SAACCS). By that time, the SDRD had successfully completed component 2.

11. **Scope of component 3.** Although included under component 2, the original scope of component 3A did not include the village of Bazar-Korgon. In view of the poor and mainly nonfunctional WSS in this village and to complement the reconstruction of houses in that community, the SDRD considered it important to include the village in component 3A. This was formalized through an amendment in the financing agreement in July 2013. During 2011, it was revealed that the community infrastructure originally planned to be included under component 3B (in the provinces of Osh and Jalal-Abad) had already been repaired or rebuilt by the government using financing received from other sources. To replace this activity, ADB and the government decided to consider a pilot project to improve school sanitation facilities. Much preparation went into this work, but it was eventually shelved due to high bid prices on the component 3A contracts, and the limited financial resources under the EARR.

12. **Resettlement.** The EARR was originally classified as category C for resettlement, but during preparations for component 3A, it became apparent that some of the envisaged improvement would involve involuntary resettlement. The classification was then changed to category B following the January–February 2013 ADB review mission. Three resettlement plans were prepared and approved by both the government and ADB by December 2013. A total of 40 houses were identified as affected households, and the total compensation paid by ADB was estimated at \$20,000. The subprojects of Osh and Bazar-Korgon under component 3A involved relatively minor resettlement issues such as removal of fences and trees (four households affected). In the Jalal-Abad subproject, on the other hand, there were 36 affected households, including landowners and leaseholders.

13. **Financing arrangement.** In early 2011, the government provided an exemption of import duties and indirect taxes, including sales and value-added taxes, related to all expenditures under components 2, 3, and 4, except for consulting services provided by the international consulting firms engaged under component 4. As a result of this decision, the government financing of the EARR was reduced from estimated 9.1% at appraisal to less than 1% at completion. The financing arrangement is detailed in Appendix 1.

## II. EVALUATION OF DESIGN AND IMPLEMENTATION

### A. Relevance of Design and Formulation

14. The design of the project was very relevant to the circumstances and well balanced in terms of addressing the three primary concerns of fiscal support, reconstruction and repair of houses, and improvement of WSS. The inclusion of Bazar-Korgon in component 3A was suitable as it not only provided WSS improvements but also supported the development of a new Bazar-Korgon *vodokanal* (water utility), which meant long-term capacity building and sustainability for investments. It was unfortunate that the school sanitation pilot project did not get implemented.

15. The design of the infiltration gallery for source development in Osh had been problematic. The gallery was used to resolve periodic turbidity overloads at the water source, which caused shutdown of the water from that source for an aggregate of 30 days each year. However, the amount of discharge from the infiltration gallery forecasted by the design was not met in 2016. Since this work was undertaken within the constraints of an emergency project, only 4 months of hydraulic investigations were undertaken as compared with proper hydraulic modeling and several years of monitoring of key parameters to precede the design in a conventional project.

### B. Project Outputs

16. The design and monitoring framework (DMF) is in Appendix 2. Paras. 17–26 provide an overview of the appraised and actual outputs.

17. **Component 1.** The budget support to be provided through component 1 was to ensure (i) uninterrupted service delivery for health and education institutions managed by central and local governments, (ii) continued provision of social safety nets to vulnerable groups, and (iii) maintenance of roads and urban services. Despite the delay until March 2011 in the release of the funds earmarked for component 1 for the 2010 budget support, the government provided the funds needed to protect the identified priority expenditures. Except for the transfers to the district heating company (a planned Som1.13 billion versus an actual Som0.74 billion), the amount disbursed under component 1 exceeded that intended for the education sector, health sector, social assistance, state transfers to local authorities, and road maintenance. The total actual amount of Som37.6 billion exceeded the original planned allocation of Som20.2 billion. The details are in Appendix 3.

18. **Component 2.** Permanent shelters were to be reconstructed with a living area up to a maximum of 100 square meters (m<sup>2</sup>) for 1,700 severely damaged houses. All reconstructed houses were to have WSS services, electricity, and heating facilities. A total of 1,629 houses were reconstructed or repaired and affected households were provided with an average total living area of 79 m<sup>2</sup> (Appendix 4). For the house construction, the self-help approach envisaged at appraisal was adopted, which was in line with the strategy developed by the government and international partners in the earlier emergency shelter program for 2010. The typical designs developed by the SDRD had to be modified for about 200 houses due to technical and other reasons.

19. There was a problem with restoration of property rights. The United Nations High Commissioner for Refugees provided support up to April 2012, and an amendment to the cooperation agreement with the DRC was made in June 2012 to continue support until November 2012. Another organization, the United States Agency for International Development, continued its assistance from April to August 2013. By end of December 2015, only 19 of the 1,533 category

or typology 3–4 houses remained unregistered due to changes made by owners (including some absentee owners) without the approval of concerned state agencies, or due to unresolved court cases. The remaining 96 category 1–2 houses were fully registered.

20. **Component 3A.** The EARR aimed to rehabilitate water intake works and treatment systems, and replace water transmission systems to supply continuous and reliable water to approximately 335,000 residents in the cities of Osh and Jalal-Abad. It also intended to develop detailed designs for long-term water supply and sewerage development in these two cities, to be financed through normal lending after the emergency assistance. The component 3A works were to complement the water and sewerage network improvement works being undertaken in these two cities with financing from the European Bank for Reconstruction and Development (EBRD) and the Swiss State Secretariat for Economic Affairs. As indicated in the project DMF, at least 20 water intake structures and treatment systems were to be constructed and at least 10 kilometers (km) of water transmission pipelines were to be reconstructed. Individual sanitation units were to be constructed for 500 damaged houses, and 70% of women's groups in the rehabilitated districts were to be trained in proper hygiene and sanitation.

21. In terms of the works outlined in the DMF, 32.6 km of transmission mains were constructed against the original target of 10.0 km, and 17 water intake structures and treatment systems were constructed versus the target of 20. However, other structures were built, including two embankments, one pipe bridge, and one electricity system. Rehabilitation of WSS in Bazar-Korgon (with 35,000 residents) was added as part of component 3A (Table 1).

**Table 1: Main Outputs for Component 3A**

City	Output
Osh	6 main structures or systems and 4.4 kilometers (km) of transmission mains
	Plotina intake works: infiltration gallery of 300 meters (m) and embankment of 364 m
	Transmission pipeline between Plotina and Ozgor of 4.4 km for handling 1,000 liters per second (l/sec)
	Ozgor water treatment rehabilitation (new chlorination equipment) for handling 160,000 cubic meters per day (m <sup>3</sup> /day) and new external pipework with flow regulation chambers
	Rehabilitated reservoir with a capacity of 6000 m <sup>3</sup>
Jalal-Abad	5 main structures or systems, 12.4 km of water transmission mains, and 4.4 km of sewage transmission mains
	Prigorodny new intake works: (i) 6 new wells and rehabilitation of 1 well, with a flow rate of 33 l/sec. per well; (ii) 2 new reservoirs with a capacity of 3,000 m <sup>3</sup> each; (iii) new chlorination operation; (iv) external pipe network with flow regulation chambers; and (v) external and internal 10-kilovolt power supply lines, 1.3 km, and 4 transformers
	Transmission pipeline: Intake to city using 2 parallel pipelines, each with a length of 6.2 km and a flow rate of 400 l/sec.
	Sewerage pipeline from Prigorodny to Jalal-Abad: 4.35 km with a diameter of 200–300 millimeters
	4 span bridges (each 72 m long) across the Kogart River for water and sewage pipelines
Bazar-Korgon	10 main structures or systems and 15.6 km of water transmission mains plus 1.6 km of sewage transmission mains
	Karacha intake works: (i) 1 new well with a flow rate of 33 l/sec and pump replacement for 2 existing wells each with a flow rate of 33 l/sec.; (ii) two new reservoirs, each with a capacity of 1,000 m <sup>3</sup> ; (iii) new 5,700 m <sup>3</sup> /day chlorination facility; (iv) external pipework with flow regulation chambers; and (v) major riverbank protection embankment with a length of 222 m
	Main distribution pipelines: replacement of 11.0 km and repair of 1.4 km of pipelines

City	Output
	Water supply and sewerage systems for the Enesai micro-district: (i) water supply pipelines with a total length of 3.4 km; (ii) sewerage pipelines with a total length of 1.6 km; (iii) containerized wastewater treatment plant with a capacity of 250 m <sup>3</sup> /day; and (iv) water and sewerage systems rehabilitated inside multistory units

Source: Asian Development Bank.

22. **Vodokanal.** Creation of a new Bazar-Korgon *vodokanal* from the former Drinking Water Supply Users Union was initiated in October 2014. ADB supplied the services of a public sector utility advisor, and in September 2015, the *vodokanal* was formally established. The tariff structure and investment plan were adopted by Parliament on 18 March 2016.

23. **Planning of water supply and sanitation.** The long-term planning envisaged at appraisal for WSS improvements in Osh and Jalal-Abad was not implemented. Instead the EBRD provided assistance.

24. **Procurement of equipment.** Although not specifically identified in the DMF, procurement of equipment to support the operation and maintenance of WSS services was included under component 3A. This included the following for each *vodokanal*: (i) a wheeled excavator, (ii) a truck-mounted crane, and (iii) a cargo truck-mounted workshop.

25. **Sanitation and women's group training on hygiene and sanitation.** The construction of individual sanitation units for damaged houses mentioned in the DMF was not undertaken under the project, but by STC during the emergency reconstruction phase in 2010. In Osh and Jalal-Abad, the training of women's groups on hygiene and sanitation was integrated into the EBRD project. In Bazar-Korgon, information and awareness activities including the involvement of women's groups were undertaken in early 2016.

26. **Component 4.** Implementation assistance was mainly provided by consultant firms and individual consultants. Due to the extended implementation period (especially for component 3A), the total provision of consulting services was higher than foreseen at appraisal: 246.4 person-months of international consulting inputs were used (compared to the estimated 136.0 person-months), and 393.2 person-months of national consulting inputs were used (compared to the estimated 246.0 person-months).

## C. Project Costs

27. The project cost at appraisal was estimated at \$110.0 million, while the actual cost at completion was \$98.3 million. The difference was largely due to the government exempting import duties and indirect taxes related to all expenditures under components 2, 3, and 4, except for those related to international consulting firm inputs under component 4 (para. 13). The appraised and actual costs for the different components is summarized in Table 2, and details are provided in Appendix 5. The actual overall cost on completion is \$3.9 million below the appraisal estimate exclusive of duties and indirect taxes. The fact that construction financing charges were not incurred (\$1.0 million) contributed to the lower actual overall cost.

**Table 2: Appraised and Actual Cost for Project Components**  
(\$'000)

Component	Description	Appraisal Cost Including Contingencies	Appraisal Cost Less Taxes and Duties	Actual Cost at Completion
1	Fiscal support	40,000	40,000	40,630
2	Housing reconstruction	31,283	27,643	26,918
3A	Infrastructure civil works	30,170	26,660	23,972
3A	Equipment and machinery	1,117	987	500
4	Implementation consultants	4,469	3,949	6,210
	Recurrent cost	1,961	1,961	33
	Financing charges	1,000	1,000	
	<b>TOTAL COST</b>	<b>110,000</b>	<b>102,200</b>	<b>98,263</b>

Source: Asian Development Bank.

28. During project implementation, the value of the special drawing right (SDR) depreciated significantly, especially from mid-2014 to mid-2015. There was a potential loss of \$3.2 million on funds available for components 3A, 3B, and 4. Recognizing the risk of a potential financing shortfall because of the depreciation of the value of the SDR, a reservoir component under component 3A works contracts was canceled in 2015 following a consultation with ADB.

29. **Component 1.** The full amount of loan and grant proceeds envisaged at appraisal was disbursed accordingly. However, due to appreciation of the value of the SDR against the United States dollar from project approval in September 2010 until disbursement in March 2011, the loan part of the tranche release was valued at \$17.13 million instead of the \$16.50 million at appraisal. The total value of the tranche release amounted to \$40.6 million instead of \$40.0 million.

30. **Component 2.** The cost of component 2 at completion was \$27.1 million (against \$27.6 million estimated at appraisal), including \$0.192 million paid prior to the project exemption for indirect taxes (para. 13). The actual cost does not reflect the value of labor contributed by the affected households themselves through the adopted self-help approach.

31. **Components 3A and 3B (civil works).** At appraisal, of the \$27.0 million base cost earmarked for civil works, \$20.0 million was allocated for WSS improvements and \$7.0 million for community infrastructure improvement. Component 3B was not implemented and \$7.0 million was reallocated to component 3A. The actual cost of the civil works under component 3A is estimated at \$23.9 million against the appraised figure of \$19.7 million, inclusive of contingencies but exclusive of indirect taxes and duties. This component therefore had a cost increase of about 25%. The main reasons were (i) the 2010 appraisal estimate was not based on feasibility-level cost estimates normally used for project preparation because of the emergency nature of the project, (ii) the increase in the scope of component 3A by the inclusion of WSS improvements in Bazar-Korgon village, and (iii) the high bid prices received for two of the three works contracts.

32. **Component 3A (equipment).** The actual cost of this part of component 3A was \$0.5 million against the appraisal estimate of \$1.0 million (including contingencies but excluding indirect taxes and duties). The risk of a financing shortfall led to the cancellation of the procurement of the second batch of equipment.

33. **Component 4.** The actual cost of consulting services for implementation of the project totaled \$6.6 million, which exceeded the appraisal estimate of \$3.9 million. The cost included \$0.3



million in non-resident tax associated with two international consulting firms and contributions provided to the country's social fund with respect to the national consultants; this portion was financed by the government. The main reason for the cost overrun was the extended implementation period, which required additional services.

34. **Recurrent costs.** The appraisal estimate included a recurrent cost of \$1.96 million for implementing agencies under components 2 and 3. However, most tasks to be undertaken by implementing agencies were undertaken by consultants, resulting in a lower actual recurrent cost of less than \$0.1 million.

35. **Financing charges during implementation.** The appraisal allowed \$1.0 million for interest on the proceeds withdrawn from the loan account at the rate of 1% per annum, but ADB did not apply these interest payments.

#### **D. Disbursements**

36. The first loan extension significantly affected the rate of contract awards and disbursement. The appraised and actual cumulative disbursements and cumulative contract awards are shown in Appendix 6. ADB's direct payment procedure was followed for the disbursement funds. This procedure, together with the government exemption from indirect taxes and duties, facilitated the disbursements.

#### **E. Project Schedule**

37. At the time of project approval by ADB on 23 September 2010, project completion was envisaged by 30 September 2013. The actual project completion date was 30 June 2016. The implementation schedule is shown in Appendix 7.<sup>2</sup> By 30 June 2016, overall progress was at 94% completion, with components 1 and 2 fully completed and components 3 and 4 substantially completed. However, actual emergency projects under components 1 and 2 were completed within 2 years, i.e., within the 3-year implementation period for ADB's post-conflict emergency projects. The grant and loan closing dates were extended three times from 31 March 2014 as indicated in the financing agreement: (i) a one year extension until 31 March 2015; (ii) then another one year extension until 22 March 2016; and (iii) a final 3-month extension until 30 June 2016. All these resulted in an effective 5.25-year grant and loan period.

38. **General.** There was a 3.5-month delay in loan and grant effectiveness, as the financing agreement needed to be ratified by the new post-conflict government in the Parliament. Component 1 was only affected by the delay in grant and loan effectiveness. The Ministry of Finance submitted the application for withdrawal of loan and grant proceeds on 18 February 2011 and disbursement was effected on 15 March 2011.

39. **Component 2.** The cooperation agreements with ACTED and DRC were concluded on 21 April 2011, 5 months after appraisal. Osh city refused to approve designs and issue building permits for 535 houses. This resulted in ADB proposing to suspend the project and cancel the entire project. The government later adopted an ordinance on 12 July 2011 that cleared the way for approval of designs and issue of building permits. In Osh city and Kara-Suu, there was a reassessment of the seismic design for basements. There were requests from households for minor modifications and to preserve existing basements, requiring individual designs for more

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<sup>2</sup> The 5-year implementation period is the maximum allowable period for post-conflict emergency projects in accordance with ADB's Disaster and Emergency Assistance Policy.

than 200 houses. There were difficulties in the implementing partners' procurement of a large number of bricks, and there was a shortage of skilled labor and a longer-than-usual winter.

40. **Component 3A (civil works).** There were significant delays encountered even prior to contract award. Design and preparation of bidding documents only started in June 2012, i.e., 16 months behind schedule due to the two-step approach to recruit the DSC. The appraisal estimate of 6 months to produce design and bid documents was unrealistic; it actually took 17 months. The essential engineering investigation for the Osh infiltration gallery was carried out in 4 months, but in retrospect should have taken much longer (para. 15). The lack of capacity of the DSC slowed implementation of this component. There were also significant additional rehabilitation requests from the local authorities. Moreover, there was an unforeseen need for the preparation of resettlement plans in the Jalal-Abad subproject. There were capacity constraints on behalf of local authorities to support the design process. Finally, unsuccessful prequalification processes required modification of bid documents. Contract implementation delays included (i) late mobilization by the contractor, (ii) difficulties faced by the contractor in finding acceptable local contractors, (iii) insufficient personnel resources allocated by the contractor, (iv) delays in the supply of goods, and (v) redesign of reservoirs and pipelines and the infiltration gallery intake at Plotina (Osh).

41. **Component 3A (equipment).** Although initiated in January 2012, three failed bid attempts for the procurement of maintenance equipment for Osh and Jalal-Abad meant that equipment was not delivered until the second quarter of 2014.

## **F. Implementation Arrangements**

42. The EARR's implementation arrangements as envisaged were substantially followed. Being the executing agency as well as the implementing agency for component 1, the Ministry of Finance provided overall supervision of EARR implementation. The SDRD served as implementing agency for components 2, 3, and 4. Considering the government's decision to close the SDRD, the responsibility for implementation of components 3 and 4 was transferred to the SAACCS in 2013 after the SDRD had already successfully completed component 2. The SAACCS continued implementation and monitoring of the EARR until completion. Moreover, three international nongovernment organizations (ACTED, DRC, and SRC) were involved in the early recovery activities in 2010 and carried out component 2 as implementing partners (paras. 5 to 10).

## **G. Conditions and Covenants**

43. All conditions and covenants included in the financing agreement were complied with during EARR implementation, and specific compliance for resettlement, environmental, gender, and grievance redress are discussed in paras. 44 to 51. The status of compliance with financial agreement covenants is in Appendix 9.

44. **Resettlement.** Following the reclassification of the EARR from category C to B in terms of involuntary resettlement, resettlement plans were prepared for each of the three subprojects under component 2 and 3A. All three resettlement plans were approved by both the government and ADB, and compensation payments were subsequently made to all identified affected persons prior to commencement of the works. The compliance reports confirmed that the resettlement plans were effectively implemented.

45. **Environment.** The environmental safeguard requirements in accordance with the applicable laws and regulations of the government and ADB's Safeguard Policy Statement (2009) were complied with. Following the completion of component 2, a special environmental monitoring report was prepared and submitted to ADB. For each of the three subprojects in component 3A, (i) initial environmental reports were prepared, (ii) environmental management plans were included in the bid documents, and (iii) implementation was monitored by the DSC. No major compliance issues were reported, and minor ones were resolved by the construction contractor. The local authorities have established sanitary protection zones around the three water intakes. Legislation for the sanitary protection zones has been adopted.

46. **Gender.** The political disturbance and community violence in the Kyrgyz Republic in 2010 and the consequent deaths, injuries, damage to property, and breakdown of infrastructure significantly affected women due to their vulnerabilities and already disadvantaged position in society. The report and recommendation of the President highlighted the likelihood of increase in the number of households headed by women after the incidents (footnote 1). These households were expected to be more likely to fall into extreme poverty due to prevailing gender inequalities in employment and other livelihood opportunities. The continued social tensions, which substantially affected business and livelihood activities, were foreseen to increase the dependence of women on social assistance to support their families.

47. The gender action plan was designed to address the specific vulnerabilities of women and to help them benefit from the project activities. Under output 1 (fiscal support), the gender action plan aimed to protect social expenditures relevant for female beneficiaries. Performance indicators included establishment of (i) a sex-disaggregated data collection system, (ii) targets for female beneficiaries with regard to social and monthly benefits, and (iii) targets for maternal and reproductive health expenditures. Achievement of these indicators would be supported through coordination with concerned agencies and consultation with the Ministry of Social Development and Labor and project team gender focal points. Output 2 aimed to ensure that women and female heads of households benefit from the house reconstruction activities through targets for (i) female land title holders, and (ii) beneficiaries of house reconstruction and financial support. Output 3 aimed to enhance the project output conducting behavioral change campaigns on sanitation and hygiene and importance of clean water, thus improving WSS.

48. The project was able to complete all four of its outputs and achieve six out of seven targets. A sex-disaggregated data collection and updating system on applicants and beneficiaries of social protection has been established. The targets for female beneficiaries of monthly benefits were achieved, with women comprising 52% of 80,544 social beneficiaries, and 54% of total unified monthly beneficiaries. Targets for house reconstruction were also met, with a total of 145 female-headed households having registered their newly reconstructed houses with the State Registration Service. Out of the 261 female-headed households that were identified as eligible for house reconstruction support, 134 were classified as especially vulnerable and were provided with the standard material aid package and additional support measures. Information and education programs on basic sanitation and hygiene were undertaken in Osh and Jalal-Abad cities, which have a combined population of 350,000. Separate awareness campaigns were also done for Bazar-Korgon village, with the assistance of local nongovernment organizations and through water users committees. These campaigns, which targeted women's groups, community leaders, and school teachers, included information on the benefits of clean drinking water, efficient use of water, the basics of sanitation and hygiene, and the establishment of social partnerships on water conservation at the community level.

49. The increase in health expenditures for maternal and reproductive health could not be determined due to the government's program-based accounting system, which could not disaggregate the maternal and health expenditures from the total health expenditures. By 2016, the total health budget is Som14.94 billion.

50. The achievement of the gender targets significantly contributed to the successful implementation of project outcomes. Women comprised about one-half of the beneficiaries of the project. Providing targets for the number of women beneficiaries of social expenditures, housing reconstruction, and WSS infrastructure (and working to achieve these targets) enabled the project activities to reach the intended beneficiaries, especially the more vulnerable segments of the population. Behavioral change campaigns helped support the sustainability of the project by equipping community leaders, women's organizations, and school teachers with the skills and information needed to teach the benefits of clean water, and sanitation and hygiene.

51. **Grievance review.** Grievance review mechanisms together with a complaints database were established for components 2 and 3A. A total of 284 complaints were received and all effectively addressed by the end of 2012, with 17 complaints deemed ineligible.

## **H. Consultant Recruitment and Procurement**

52. **Implementing partners.** Finally, only two implementing partners were directly engaged for the implementation of component 2. They were contracted through cooperation agreements specifically developed for the purpose, which were signed on 20 April 2011. The cooperation agreements specified that the reconstruction and the repair of houses were to be completed within a 9-month period. The ACTED contract was extended by 5.5 months and the DRC contract was extended by 11.5 months.

53. The implementing partners completed construction and repairs essentially within their budgets, despite the extended implementation period requiring more management services. The actual costs amounted to \$337 per m<sup>2</sup> for ACTED and \$316 per m<sup>2</sup> for DRC. These budget and cost figures included special payments to vulnerable households. ACTED supported 91 vulnerable households at an additional cost of \$61,912, and DRC supported 121 vulnerable households at an additional cost of \$174,809. Details on actual costs are in Appendix 11.

54. **Project management.** Procurement of the first PMC contract for 74 person-months of international consulting inputs and 149.9 person-months of national consulting inputs was effected through the ADB-approved advance procurement action. The selected firm, Crown Agents (based in the United Kingdom), was mobilized on 14 April 2011 but was unable to perform the tasks under the terms of reference, thereby resulting in contract termination on 30 September 2011. This termination, the project's status as an emergency project, and the imminent arrival of winter meant that additional delays could put the lives of the affected persons at risk.

55. Procurement of the second PMC contract with the same responsibilities was carried out using ADB's single-source selection method for the national firm Centre for Development (based in the Kyrgyz Republic), which was the national associate of Crown Agents. The contract was signed on 10 November 2011 for \$1.250 million. The second PMC contract was revised through 13 contract variations, including extension of the contract duration from 24 months to 55 months due to extended implementation period of component 3. A total of 86.9 person-months of international consulting inputs (individual consultants) and 100.4 person-months of national consulting inputs were engaged at a final cost of \$2.161 million.

56. **Design and supervision consultant.** ADB's quality- and cost-based selection method was used in recruitment of the DSC. The contract was signed on 10 May 2012 for \$2,340,563. Eptisa mobilized its team on 22 May 2012. The DSC contract was revised through 16 contract variations, including extension of the contract duration from the original 24 months to 49 months. The extended design and construction phase of component 3A and the increase in scope of the design work were the main reasons for the increase in services. The cost at contract completion was \$3,984,444, an increase of 69% compared to the original contract amount. Planned and actual consultants' services are detailed in Appendix 12.

57. **Individual consultants.** Eight individual national consultants were engaged through 10 contracts using two ADB selection methods. The single-source selection method was used for three contracts made during January–July 2011, while the individual consultant selection method was used for the other consultants. Two consultants (the procurement specialist and the social safeguards specialist) were engaged twice. A total of 77.6 person-months of individual consultant services were used.

58. **Audit arrangement.** An audit firm was contracted and provided five annual audits of project financial statements instead of three, due to the longer project implementation. The contract was amended through four variations that included a cumulative 32% increase in the total contract amount. The audit arrangement is detailed in Appendix 13.

59. **Equipment procurement for component 3A.** The procurement process was challenging, considering that after three failed procurement actions, only the fourth was successful. Details of the equipment procurement actions are in Appendix 14.

60. The civil works construction for WSS improvements in Osh, Jalal-Abad, and Bazar-Korgon started approximately 4 years after the envisaged commencement of the project.

## **I. Performance of Consultants, Contractors, and Suppliers**

61. The performance of the implementing partners, ACTED and DRC, in the reconstruction and repair of houses for affected households under component 2 was more than satisfactory. The overall performance of the second PMC was satisfactory. Despite the contract extension, only two changes in its team of experts were made, thereby allowing for continuity of services. One international expert under the second PMC was terminated early in 2012 due to performance issues.

62. The overall performance of the DSC and its associated firm was only partly satisfactory. The local firm associate had difficulty in providing prompt services, and the timely replacement of personnel was also an issue. With the DSC based in Osh and the local firm associate in Bishkek, coordination issues arose and a smooth working relationship was hampered. Significant changes in the team of experts had to be made, partly due to the extended design period. The services of two international and two national consultants were terminated. None of the key international experts who had worked during the design phase stayed for the construction phase. Following the completion of construction of the infiltration gallery at the Plotina water intake in Osh, the amount of discharge turned out to be lower than foreseen.

63. Individual consultants performed satisfactorily in the areas of procurement, social safeguards, resettlement, legal and property rights, environmental safeguards, and project coordination. Four consultants terminated their contracts for personal reasons.

64. Other than the late delivery of one of the three suppliers, the performance of the other two suppliers of equipment was satisfactory.

65. The civil works contractor's performance was overall satisfactory, except for factors causing delays in implementation (para. 40). The contractor did not notify the engineer of possible defects in the design or bill of quantities within the 28-day period agreed during negotiations.

## **J. Performance of the Borrower and the Executing Agency**

66. In general, the performance of the borrower and the executing agency was satisfactory. However, the project stalled because of the Ministry of Finance's indecisiveness regarding building permits for some 200 reconstructed houses that did not comply with regulations.

67. With the elimination of duties and indirect taxes on component 3A, the level of counterpart funding decreased to just 0.7% of total project costs.

68. The project encountered many technical issues, including that of the infiltration gallery intake at Plotina in Osh, which may have been resolved through the involvement of the Drinking WSS Development Department of the SAACCS.

69. Compliance with financing agreement covenants and safeguard requirements was satisfactory overall. However, while the second PMC was actively engaged, the SAACCS failed to be involved and did not take ownership of the project. The DSC assumed the role of the engineer for the large civil works contract.

70. The implementing partners for component 2 (ACTED and DRC) were actively engaged with stakeholders and provided a very good performance overall.

## **K. Performance of the Asian Development Bank**

71. ADB fielded 13 project review missions, including five during the first 15 months of the project. It took a strong position when house reconstruction was hampered in Osh city, compelling the government to remove impediments. In 2011, it provided an international consultant expert in project management to assist in the start-up activities. It also provided an international consultant expert to handle and dispose of asbestos debris.

72. ADB carried out a two-step approach to recruitment of the PMCs and DSC, which delayed project implementation. Following the completion of component 2 in mid-2012, project implementation officers assigned to the EARR were replaced three times. Due to many failed attempts at procurement, which may be attributed to a lack of international competition, the government was concerned about ADB's procedural norms. ADB reversed decisions on (i) allowing contractors to employ personnel from non-ADB member countries, and (ii) extending the loan and grant closing dates at the government's request in February 2016.

73. Overall, the performance of ADB was satisfactory. It tried to be flexible in resolving project implementation issues. It may have been better to split this project into two projects: (i) one for components 1 and 2, which responded to the real emergency; and (ii) one for component 3A, which addressed the need for WSS improvements through a conventional project.

### III. EVALUATION OF PERFORMANCE

#### A. Relevance

74. The project is rated *highly relevant*. The design of the project in terms of its components was highly relevant both to ADB and the Kyrgyz Republic in achieving the overall objectives of (i) restoring the country's immediate fiscal capacity to meet the sharp rises in incremental costs arising from 2010 conflicts, (ii) rebuilding damaged houses, and (iii) improving essential public infrastructure (WSS).

#### B. Effectiveness in Achieving Outcome

75. The project is rated *effective*. Components 1 and 2 were highly effective, as desired outcomes were reached. Component 3A was effective in achieving the project outcomes. The inclusion of Bazar-Korgon WSS improvements was commendable. However, the only partly achieved objective was the infiltration gallery intake at Plotina in Osh.

#### C. Efficiency in Achieving Outcome and Outputs

76. The project is rated *efficient*. Components 1 and 2 were implemented within the project time frame and utilized the funds according to the original scope, thus can be considered efficient. All issues under Component 2 were resolved in a reasonable time frame with assistance from the implementing partners. Component 3A was implemented in an efficient manner, as EIRR is equal or greater than 12%, in the project case, averaging 19.4%.

#### D. Preliminary Assessment of Sustainability

77. The good condition of the roads in the conflict areas of Osh, Jalal-Abad, and Bazar-Korgon indicated that the government had been effectively using the fiscal support to maintain existing services. Based on interviews with beneficiaries, it was confirmed that the reconstruction of houses was indeed most likely sustainable. The occupants clearly had a vested interest in maintaining the new and repaired houses.

78. The sustainability of investment in the urban WSS sector should be seen in the context of the financial health of the *vodokanals*. There is high nonrevenue water (over 75%) in both Osh and Jalal-Abad. This can best be reduced by (i) expansion of metering, which reduces wastage; and (ii) identification and repair or replacement of leaking pipes. The EBRD is currently assisting both these cities. For Bazar-Korgon, sustainability will depend on (i) obtaining further institutional support as well as maintenance equipment, (ii) extending the distribution system to provide individual house connections to the remaining 75% of the population, and (iii) extending metering to allow better cost recovery. Chlorination awareness programs would help ensure proper use of the facilities built under the project.

79. Project investments may be considered as likely sustainable. In the three *vodokanals*, despite having an extensive and diverse client base, cost recovery is reportedly just meeting operating costs but outcomes and outputs are partially achieved at the time of evaluation, and the *vodokanals* increasing collection rate up to 90% by 2016, makes it likely that sustainability outcome might be reached in the future. More details can be found in Appendix 15.

80. The project is rated *likely sustainable*.

81. **Financial and economic analysis.** The project is rated *efficient* in financial and economic terms. The financial internal rates of return (FIRRs) of the subprojects were reevaluated using discounted cash flow analysis. The cost streams include capital investment and operation and maintenance costs. Revenues are generated mainly from water sales. The FIRRs at project completion for the *vodokanals* were 2.8% for Osh, 5.1% for Jalal-Abad, and 1.4% for Bazar-Korgon, averaging 3.0%. The FIRR for the Osh *vodokanal* at project completion was lower than the estimate at appraisal of 8.6%. As actual subproject operating costs have been higher partly due to cost inflation while actual demand has been lower than projected, corresponding water and sewerage tariff adjustments are necessary to ensure sustainable operations. Nevertheless, each of the FIRRs for the three subprojects exceeds the reevaluated weighted average cost of capital estimated at 0.42%, thus reaffirming financial viability.

82. The economic internal rate of return (EIRR) was likewise reevaluated for each subproject. Costs were adjusted to reflect the shadow rates of traded goods. Project benefits are based on (i) willingness-to-pay tariffs for reticulated water supply; and (ii) expected values of safe drinking water that contribute to improved health, collection time savings, treatment and storage cost savings, recovered water from non-technical water losses, and generally improved beneficiary welfare. The estimated EIRRs for the three *vodokanals* at completion were 19.1% for Osh, 22.8% for Jalal-Abad, and 14.1% for Bazar-Korgon, averaging 19.4%. The recalculated EIRR for the Osh *vodokanal* was higher than the 13.6% estimated at appraisal. All three reevaluated EIRRs were higher mainly due to the lower overall project cost from the lower actual economic cost conversion factor applied, and additional benefits incorporated in the analysis. The recalculated EIRRs for the subprojects exceeds the threshold economic opportunity cost of capital of 12%, rendering the project economically viable. Details of the financial and economic analyses are in Appendix 16.

83. The project is rated *financially sustainable*, provided (i) the tariffs are affordable to consumers, and (ii) the government supports needed tariff adjustments. Besides minimum requirements for the FIRR and EIRR, subproject viability hinged on satisfying tariff affordability, as it predicates consumer acceptability and support of *vodokanal* operations.

## **E. Impact**

84. The impact of the project investments is rated *satisfactory*. The objectives have mostly been achieved as foreseen at appraisal. The WSS facilities built under the project will continue to provide a positive impact on the public health of the communities.

# **IV. OVERALL ASSESSMENT AND RECOMMENDATIONS**

## **A. Overall Assessment**

85. Overall, the project is rated *successful*. The project was mainly implemented as conceived except for the components 3A that encountered design problems and component 3B that had to be cancelled due to budget shortfall. Overall assessment of the project is in Appendix 17.

## **B. Lessons**

86. Based on the assessment of the project, a main lesson learned is that an emergency assistance project should not be risked by shortening essential engineering investigations for development of a major urban water supply source.



87. The inability to disaggregate maternal and reproductive health expenditures from total health expenditures during project implementation highlighted the need to determine the government's budgeting and accounting system during project design, so that target indicators are aligned with the kind of data being generated by the health data system. This may also include assessing the capacity of implementing agencies to generate, collect, or report on the needed data, and to implement the specific activities. Further, the collection of gender results data could be facilitated if total numbers of beneficiaries, trainees, and other targeted groups are recorded as they happen, instead of simply stating that the targeted proportions have been achieved.

88. A lesson learned from the three unsuccessful equipment procurements is the procurement process should be simpler, with fewer variables and similar equipment. Additionally, it would be prudent to use a two-envelope bidding procedure under any national competitive bidding.

## C. Recommendations

### 1. Project Related

89. **Future monitoring.** The financial health of the three *vodokanals* should be monitored until the end of the year. Increased revenue should be attained through a water metering rate of 100%.

90. **Additional assistance.** The *vodokanals* of Osh city and Jalal-Abad are receiving assistance from the EBRD and Swiss State Secretariat for Economic Affairs. The Bazar-Korgon *vodokanal* urgently needs more assistance to maintain the momentum created under the EARR. That assistance may best come from a bilateral source that could provide (i) institutional support, (ii) provision of maintenance equipment, (iii) extension of the distribution system, and (iv) metering to achieve 100% of all connections. The government should actively seek donor support for this work.

91. **Further action or follow-up.** ADB and the government should both follow up on the new investigations of the infiltration gallery for Osh city. An infiltration gallery expert may be recruited to prepare a report on past, current, and future actions.

92. **Timing of the project performance evaluation report.** It is recommended that the report be prepared 3 years after publication of this project completion report.

### 2. General

93. While in this case it was important to combine emergency and conventional aspects into a single project, in the future, more time needs to be given to prepare and implement the conventional aspects.

94. The government needs to build the capacity of the SAACCS and its Drinking WSS Development Department to enable them to serve not only as a strong implementing agency for WSS projects, but also as the highest competent technical authority on WSS in the country.

## APPRAISED AND ACTUAL FINANCING ARRANGEMENTS

		Appraised				Actual	
		With Duties and Taxes		Without Duties and Taxes		Without Taxes and Duties	
		Amount (\$ million)	Share of Total (%)	Amount (\$ million)	Share of Total (%)	Amount (\$ million)	Share of Total (%)
<b>ADB</b>							
	Grant	51.5	46.8	51.5	50.4	51.5	52.1
	Loan	48.5	44.1	48.5	47.5	46.7	47.2
	<b>Subtotal</b>	<b>100.0</b>	<b>90.9</b>	<b>100.0</b>	<b>97.9</b>	<b>98.2</b>	<b>99.3</b>
<b>Government</b>		10.0	9.1	2.2	2.2	0.7	0.7
	<b>Total</b>	<b>110.0</b>	<b>100.0</b>	<b>102.2</b>	<b>100.1</b>	<b>98.9</b>	<b>100.0</b>

Note: Numbers may not sum precisely because of rounding.

Source: Asian Development Bank.

### DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Targets with Indicators and Baselines	Achievements	Data Sources or Reporting Mechanisms	Assumptions and Risks
<b>Impact</b> Economic recovery and social reconciliation	<p>Increasing annual gross domestic product growth rate from –3.5% expected in 2010 to 5% by 2012 to 7% in 2015 (average gross domestic product growth of 5% from 2004 to 2008)</p> <p>No episodes of community tensions</p>	<p>Actual annual growth rates:  2010: –0.5%  2011: 6.0%  2012: –0.9%  2013: 10.9%  2014: 3.6%  2015: 1.4%</p> <p>No episodes of community tensions after 2010</p>	<p>Official government statistics</p> <p>Ministry of Finance reports</p> <p>Ministry of Economic Regulation reports</p> <p>National Bank of Kyrgyz Republic reports</p> <p>Reports from development partners</p>	<p><b>Assumptions</b></p> <p>Global economic recovery sustained</p> <p>Investment climate reforms implemented</p> <p>Good performance in gold production sustained</p> <p>Russia-Kazakhstan-Belarus Customs Union does not adversely affect Kyrgyz cross-border trade</p> <p>Political stability maintained</p> <p><b>Risk</b></p> <p>Energy situation deteriorates</p>
<b>Outcome</b> Critical social and public infrastructure assets rebuilt and essential public expenditures maintained in areas affected by the emergency	<p>Post-emergency fiscal stimulus achieved in 2010 (12.6% primary budget deficit in 2010)</p> <p>Number of homeless internally displaced people reduced to zero (baseline: 13,500 in 2010)</p>	<p>Actual primary budget deficit in 2010: 4.8%</p>	<p>Reports of State Directorate for Reconstruction and Development of Cities of Osh and Jalal-Abad</p> <p>Ministry of Economic Regulation reports</p> <p>Reports from development partners</p>	<p><b>Assumptions</b></p> <p>Political stability is attained after June 2010 referendum and October 2010 parliamentary elections</p> <p>Adequate and timely development partner funding</p> <p><b>Risk</b></p> <p>Community tensions continue unabated</p>
<b>Outputs</b> 1. Uninterrupted provision of education, health, social assistance, transport, and urban services	<p>Execution of EARR-supported expenditures in line with revised republican budget by the end of 2010 (education, Som2.1 billion; health, Som4.3 billion; social assistance, Som4.5 billion; road maintenance, Som1.35 billion; state transfers to local governments, Som6.8 billion; state</p>	<p>See Appendix 3 for achievements</p>	<p>Revised 2010 budget</p> <p>Ministry of Finance budget execution reports</p> <p>Ministry of Education and Science reports</p> <p>Ministry of Health reports</p> <p>National health accounts</p>	<p><b>Assumptions</b></p> <p>Parliament enacts revised republican budget</p> <p>Development partners fully fund the 2010 financing gap</p> <p>Institutional capacity in ministries upgraded, if not maintained</p> <p>The Kyrgyz Republic Development Fund is liquidated on time</p>

Design Summary	Performance Targets with Indicators and Baselines	Achievements	Data Sources or Reporting Mechanisms	Assumptions and Risks
	<p>transfers to the district heating company Som0.9 billion)</p> <p>Salaries of teachers (85% women) maintained and paid monthly</p> <p>By the end of 2010, health expenditures for maternal and reproductive health are at least as high as 2008 level of Som93 million</p> <p>By the end of 2010, the number of social assistance program beneficiaries is not lower than April 2010 levels (April 2010 baseline: [i] monthly benefits, 351,000 recipients of which 53% are women; [ii] monthly social benefits, 63,818 recipients of which 51% are women; [iii] compensation, 52,009 recipients including their families)</p> <p>Sex-disaggregated data on beneficiaries of monthly benefits and monthly social benefits collected for 2010</p> <p>More roads maintained by the end of 2010 (2010 target road repairs: 755 km of republican roads)</p>		<p>State Agency for Social Welfare reports</p> <p>Ministry of Transport and Communications reports</p> <p>Reports of the district heating company</p> <p>State Directorate for Reconstruction and Development of Osh and Jalal-Abad quarterly reports</p>	<p><b>Risks</b></p> <p>Revenue shortfall is larger than expected</p> <p>Unbudgeted energy subsidies are funded by the budget</p> <p>Community violence and political disturbances continue and expand fiscal costs</p> <p>Weak fiduciary controls</p> <p>Disbursement of EARR-supported expenditures spills over to 2011</p> <p>Systemic banking risks are aggravated requiring significant fiscal support</p>
2. Damaged houses repaired and/or reconstructed	Permanent shelters with living area of 100 m <sup>2</sup> reconstructed for approximately 1,700 severely damaged	Completed in 2012; by mid-July 2012, 1,533 houses rebuilt and 96 houses repaired; total living area		<p><b>Assumption</b></p> <p>Affected people participate and make decisions</p> <p><b>Risks</b></p> <p>Lack of construction</p>

Design Summary	Performance Targets with Indicators and Baselines	Achievements	Data Sources or Reporting Mechanisms	Assumptions and Risks
	houses	rebuilt = 77,242 m <sup>2</sup>		<p>licenses issued for international nongovernment organizations</p> <p>Lack of property titles and land ownership</p> <p>Lack of building permits and construction compliance certificates</p>
3. Critical community and public infrastructure rehabilitated and reconstructed	<p>At least 20 public water intake structures and treatment systems rehabilitated</p> <p>At least 10 km of water transmission pipelines reconstructed</p>	<p><b>Osh city</b> Plotina intake works: (i) infiltration gallery with a length of 300 m; and (ii) river embankment for gallery with length of 364 m</p> <p>Transmission pipeline between Plotina and Ozgor site: length: 4.4 km; design capacity: 1,000 l/sec</p> <p>Ozgor water treatment site: (i) rehabilitated chlorination building with new chlorination equipment for general capacity of water intake of 180,000 m<sup>3</sup>/day; and (ii) new external pipe network with regulation chambers</p> <p>Rehabilitated reservoir: capacity: 6,000 m<sup>3</sup></p> <p><b>Jalal-Abad city</b> Prigorodny new intake works: (i) 6 new wells and rehabilitation of</p>		<p><b>Risks</b> Limited institutional capacity of the <i>vodokanal</i> (water utility) in the two cities to properly maintain rehabilitated facilities</p> <p>Sudden increase in costs of construction items</p>

Design Summary	Performance Targets with Indicators and Baselines	Achievements	Data Sources or Reporting Mechanisms	Assumptions and Risks
		<p>existing well; capacity of 33 l/sec for each well; (ii) 2 new reservoirs with capacity of 3,000 m<sup>3</sup> each; (iii) new operational chlorination building with chlorination equipment for the general water intake capacity 34,500 m<sup>3</sup>/day; (iv) external pipe network with regulation chambers; and (v) external and internal 10-kilovolt power supply lines with a total length of 1.3 km and 4 transformers</p> <p>Transmission pipeline between Prigorodny and Jalal-Abad city's main distribution system: 2 parallel pipelines, each with a length of 6.2 km; total capacity: 400 l/sec</p> <p>Sewerage pipeline between Prigorodny micro-district and Jalal-Abad city's sewerage main system: length of sewerage pipeline: 4.38 km; diameter: 200–300 millimeters</p> <p>Bridge across the Kogart River for water and sewerage pipelines: 4-span bridge; length: 72 m</p> <p><b>Bazar-Korgon village</b> Karacha intake works:</p>		

Design Summary	Performance Targets with Indicators and Baselines	Achievements	Data Sources or Reporting Mechanisms	Assumptions and Risks
	<p>Individual sanitation units constructed for 500 damaged houses</p> <p>70% of women's groups in rehabilitated districts trained on hygiene and sanitation</p>	<p>(i) 1 new well with capacity of 33 l/sec and pump replacement for 2 existing wells, also for a capacity of 33 l/sec per well;</p> <p>(ii) 2 new reservoirs with capacity of 1,000 m<sup>3</sup> each;</p> <p>(iii) new container-type chlorination building with chlorination equipment for general capacity of water intake of 5,700 m<sup>3</sup>/day;</p> <p>(iv) external pipe network with regulation chambers; and</p> <p>(v) riverbank protection embankment with length of 222 m</p> <p>Main distribution pipeline: Replacement of 11.0 km and repair of 1.4 km of the 12.4 km-long existing pipeline water supply and sewerage systems for Enesai micro-district</p> <p>(i) water supply pipelines with a length of 3.4 km;</p> <p>(ii) sewerage pipelines with a length of 1.6 km;</p> <p>(iii) containerized wastewater treatment plant with capacity of 250 m<sup>3</sup>/day; and</p> <p>(iv) water supply and sewerage systems inside multistory apartment buildings rehabilitated</p>		

<b>Design Summary</b>	<b>Performance Targets with Indicators and Baselines</b>	<b>Achievements</b>	<b>Data Sources or Reporting Mechanisms</b>	<b>Assumptions and Risks</b>
		<p>Sanitation units provided through international nongovernment organizations prior to start of house reconstruction under the EARR</p> <p>Information and awareness campaigns were conducted in Osh and Jalal-Abad cities under European Bank for Reconstruction and Development and Swiss State Secretariat for Economic Affairs projects; information and awareness campaign conducted in Bazar-Korgon under the EARR</p>		

EARR = Emergency Assistance for Recovery and Reconstruction, km = kilometer, l/sec = liter per second, m = meter, m<sup>2</sup> = square meter, m<sup>3</sup> = cubic meter, m<sup>3</sup>/day = cubic meter per day.  
Source = Asian Development Bank.



**EXECUTION OF EMERGENCY ASSISTANCE FOR RECOVERY AND RECONSTRUCTION-  
SUPPORTED EXPENDITURES RELATED TO REPUBLICAN BUDGET**

(Som billion)

<b>Recurrent Expenditure Item</b>		<b>Planned Amount</b>	<b>Actual Amount</b>
1	Education sector expenditures (excluding [i] education special category grants from the republican budget to the local budget, and [ii] expenditures funded by "special means")	2.12	4.34
2	Health sector expenditures (excluding [i] expenditures funded by the health-wide approach, and [ii] expenditures funded by "special means")	4.30	5.83
3	Social assistance to the population (excluding externally financed programs)	4.49	10.50
4	State transfers to local governments	6.81	14.88
5	Road maintenance expenditures	1.35	1.35
6	State transfers to the district heating company	1.13	0.74
<b>Total</b>		<b>20.20</b>	<b>37.64</b>

Source: Asian Development Bank.

## COMPONENT 2: RECONSTRUCTION AND REPAIR OF HOUSES

### A. Details of Work Done and Location

Table A4: Details of Houses Reconstructed and Location

City/District	Reconstructed (Cat 3 and 4 Houses)		Repaired (Cat 2 Houses)	
	No.	Area (square meter)	No.	Area (square meter)
<b>Osh Oblast</b>				
Osh city	570	26,962	32	2,280
Kara-Suu district	633	34,420	35	1,968
<b>Subtotal</b>	<b>1,203</b>	<b>61,382</b>	<b>67</b>	<b>4,248</b>
<b>Jalal-Abad Oblast</b>				
Jalal-Abad city	118	4,620	17	890
Susak district	26	1,440	3	270
Bazar-Korgon	186	9,800	9	510
<b>Subtotal</b>	<b>330</b>	<b>15,860</b>	<b>29</b>	<b>1,670</b>
<b>Total</b>	<b>1,533</b>	<b>77,242</b>	<b>96</b>	<b>5,918</b>

Source: Asian Development Bank.

### B. Component 2 Implementation Schedule

1. House reconstruction and repair was to be undertaken over 11 months from early November 2010 to the end of September 2011 based on the appraisal estimate, but this period turned out to be not realistic. The cooperation agreements with the two implementing partners—the Agency for Technical Cooperation and Development, and the Danish Refugee Council (DRC)—were concluded on 21 April 2011, almost 5 months later than envisaged. The cooperation agreements foresaw completion of the housing component by 20 December 2011. However, this could not be realized. The Agency for Technical Cooperation and Development completed its program on 31 May 2012 and DRC on 10 July 2012.

2. Following the distribution of tools, households started the demolition of the remnants of their destroyed or damaged houses in early May 2011. The implementing partners initiated the procurement of construction materials in early June 2011; the supply of materials to affected households started in mid-June. Following these start-up activities, several factors delayed implementation; some factors were common for both implementing partners, while other factors affected only DRC's subproject in Osh city. The common factors included the following:

- (i) a large number of designs had to be finalized, which was a challenge given (a) the municipality architecture departments' limited resources, and (ii) the difficulties faced in adjusting the standard designs within existing plot sizes and boundaries set by city planning regulations;
- (ii) numerous requests from households for preserving existing basements and/or making minor adjustments, which required the adoption of individual designs for more than 200 houses;
- (iii) the requirement of the Osh city and Kara-Suu authorities for a reassessment of the seismic safety of existing basements to be used for the reconstruction;
- (iv) initial objections from the Ministry of Culture to the reconstruction of houses near Sulaiman-Too, a United Nations Educational, Scientific and Cultural Organization world heritage site;
- (v) difficulties by the implementing partners in procuring large quantities of quality bricks because of the limited capacity of local suppliers;

- (vi) difficulties in delivering construction materials to building sites in some densely populated areas of Kara-Suu district and Osh city;
- (vii) a shortage of skilled labor, which also led to higher labor costs and increased difficulties for poor and female-headed households that had to implement constructions works themselves; and
- (viii) the earlier and longer-than-usual winter, which necessitated stoppage of most of the outside construction works from the end of November 2011 to early March 2012.

3. Aside from the factors in para. 2, a long delay occurred in the beginning of the process of reconstruction of 585 houses by DRC in Osh city. The authorities refused to approve designs and issue building permits with reference to zoning regulations under a new but not yet approved city master plan. In view of this situation, the Asian Development Bank issued a notice to the Ministry of Finance on 1 July 2011 that it would suspend the project for the time being and cancel the entire project if all necessary building permits were not issued by 8 July 2011. In response, the Ministry of Finance assured the Asian Development Bank on 8 July 2011 that the building permits would be issued at the latest by 10 August 2011 and that the houses could be rebuilt on their original locations. Subsequently, the government adopted an ordinance on 12 July 2011 instructing the State Agency for Architecture, Construction and Communal Services and local authorities to ensure the approval of designs and the issuance of necessary permits for design and construction. Following the adoption of this ordinance, the authorities started the process for approving designs and issuing building permits.

**DETAILED PROJECT COSTS: APPRAISED AND AT COMPLETION**  
(\$'000)

Component	Description	2010		2011		2012		2013	
		Appraised	Actual	Appraised	Actual	Appraised	Actual	Appraised	Actual
<b>1</b>	<b>Fiscal support</b>	<b>40,000</b>			<b>40,630</b>				
<b>2</b>	<b>Housing reconstruction</b>			<b>31,283</b>	<b>17,696</b>		<b>9,369</b>		<b>46</b>
<b>3A</b>	<b>Infrastructure</b>					<b>30,170</b>			<b>20</b>
	Civil works					30,170			
	Compensation								20
<b>3B</b>	<b>Equipment and machinery</b>			<b>1,117</b>					<b>11</b>
<b>4</b>	<b>Implementation support</b>			<b>4,469</b>	<b>410</b>		<b>1,432</b>		<b>1,306</b>
	Consultants			4,469	410		1,432		1,307
	PMC			1,676	405		589		487
	DSC			2,793			817		784
	Procurement specialist				2		6		1
	Legal specialist						6		
	Project coordination specialist								16
	Safeguards (environment)						1		9
	Safeguards (resettlement and social audit)				3		7		3
							6		6
	<b>Recurrent costs</b>			<b>666</b>	<b>6</b>	<b>657</b>	<b>10</b>	<b>637</b>	<b>7</b>
	Salaries			112	3	112	7	112	1
	Safeguards unit			223		223		180	
	Administration			331	3	322	4	345	6
	<b>Financing charges during implementation</b>			<b>333</b>		<b>333</b>		<b>333</b>	
	<b>TOTAL</b>	<b>40,000</b>		<b>37,868</b>	<b>58,742</b>	<b>31,160</b>	<b>10,811</b>	<b>970</b>	<b>1,391</b>

Component	Description	2014		2015		2016		TOTAL		
		Appraised	Actual	Appraised	Actual	Appraised	Actual	Appraised	Appraised (excluding taxes and duties)	Actual
1	Fiscal support							40,000	40,000	40,630
2	Housing reconstruction							31,283	27,643	27,111
3A	Infrastructure		6,765		12,746		4,461	30,170	26,660	23,992
	Civil works		6,765		12,746		4,461	30,170	26,660	23,972
	Compensation									20
3B	Equipment and machinery		490					1,117	987	500
4	Implementation support		790		1,744		975	4,469	3,949	6,659
	Consultants		790		1,744		975	4,469	3,949	6,659
	PMC		365		438		239	1,676	1,481	2,522
	DSC		391		1,262		706	2,793	2,468	3,960
	Procurement specialist		1							10
	Legal specialist									6
	Project coordination specialist		25		26		17			85
	Safeguards (environment)		4		9		6			29
	Safeguards (resettlement and social audit)		1		4					19
			3		5		7			28
	Recurrent costs		6		2		1	1,961	1,879	33
	Salaries		1		1			336	336	13
	Safeguards unit							627	545	
	Administration		5		1		1	998	998	20
	Financing charges during implementation							1,000	1,000	
	<b>TOTAL</b>		<b>8,051</b>		<b>14,492</b>		<b>5,437</b>	<b>110,000</b>	<b>102,118</b>	<b>98,925</b>

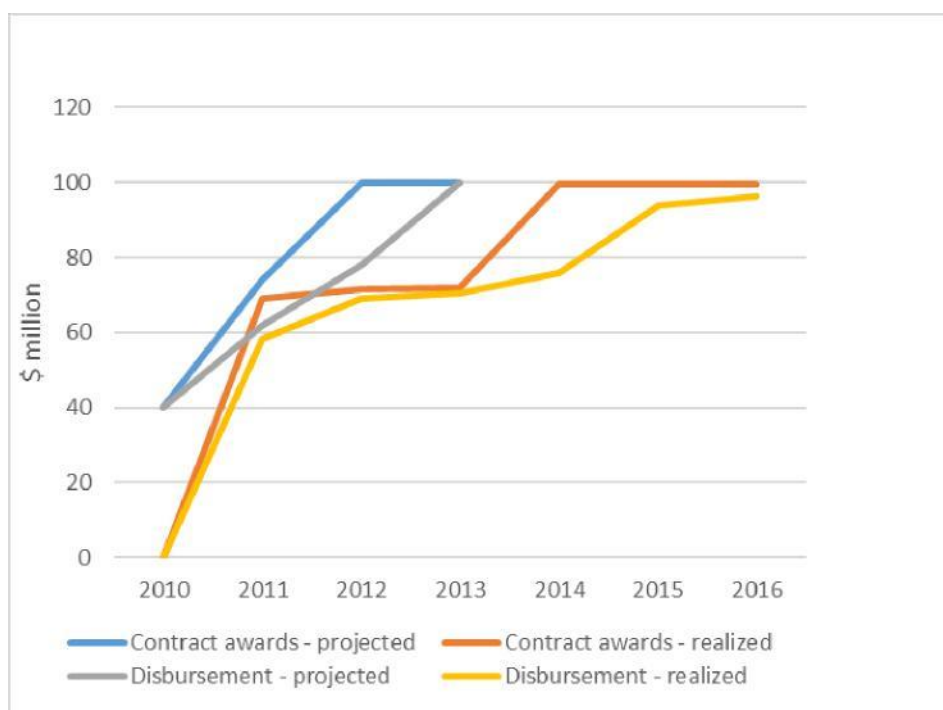
DSC = design and supervision consultant, PMC = project management consultant.

Source: Asian Development Bank.

### UTILIZATION OF GRANT AND LOAN PROCEEDS

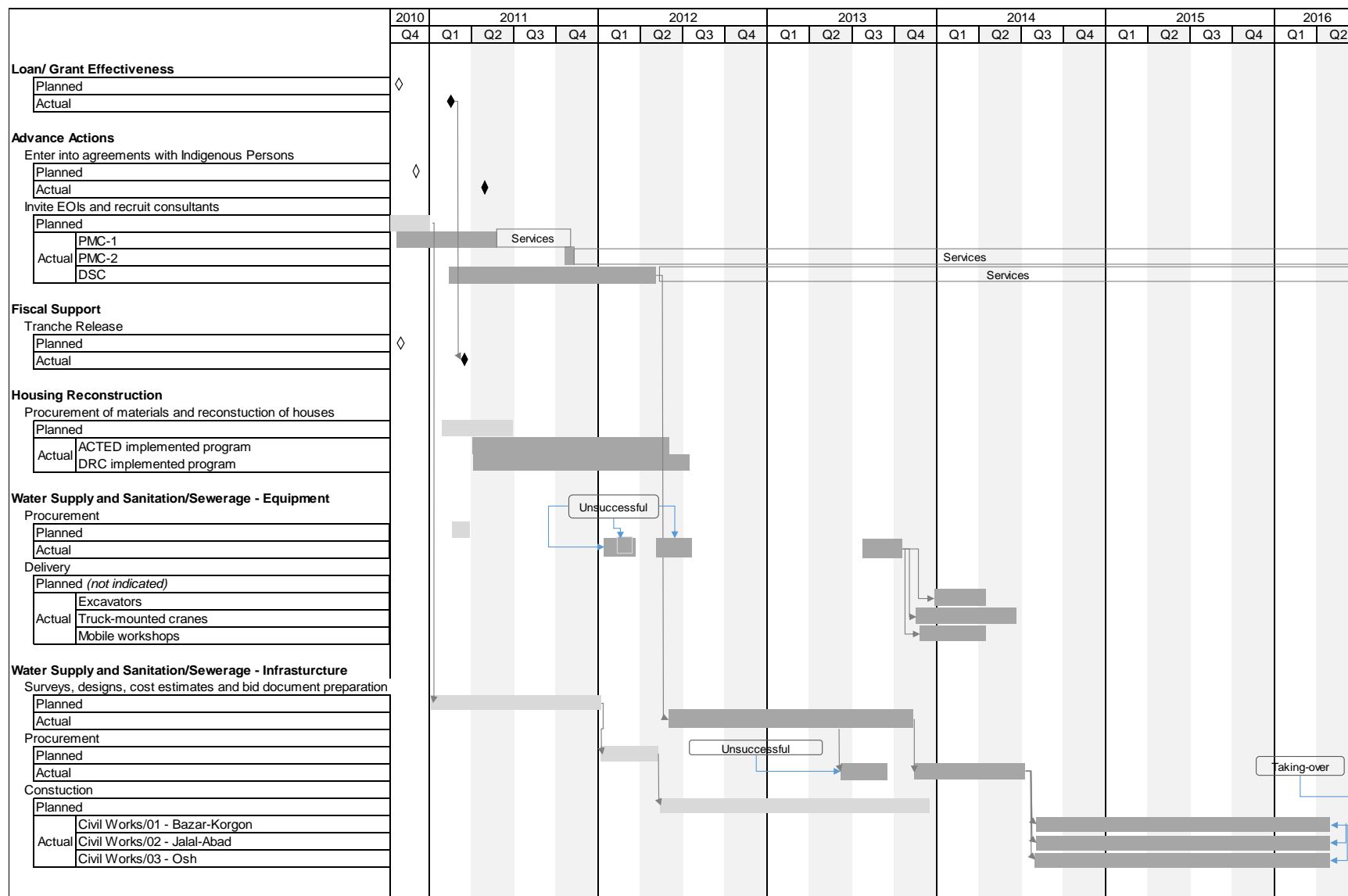
1. At the time of project appraisal, a 3-year implementation period was envisaged, and the contract awards and disbursement schedule was based on this period. However, because of the extended project implementation period, this schedule could not be adhered to. In Figure A6, S-curves representing the actual cumulative contract awards and disbursements show the delay in the release of the \$40 million tranche release under component 1 and the delay in the contract awards under component 3A.

**Figure A6: Contract Award and Disbursement S-Curves**



Source: Asian Development Bank.

## IMPLEMENTATION SCHEDULE



ACTED = Agency for Technical Cooperation and Development, DRC = Danish Refugee Council, DSC = design and supervision consultant, PMC = project management consultant, Q = quarter.

**SUMMARY OF IMPLEMENTATION DELAYS AND CAUSES**

<b>Implementation Delay</b>	<b>Months</b>	<b>Main Cause(s)</b>
Loan effectiveness	3.5	Financing agreement to be endorsed by new Parliament
Initial disbursement	4.5	Delay in loan effectiveness
House reconstruction and repair	7.0	Unrealistic appraisal estimate and issues of approval of designs and building permits
Design bid documents: civil works	16.0	Two-step PMC-DSC recruitment process
Design bid document: civil works preparation	11.0	Investigations for intake works Additional rehab requested by local author Insufficient capacity of DSC Unforeseen resettlement and redesign Capacity constraints of local authorities
Procurement of equipment	20.0	Three failed attempts at procurement
Procurement of civil works	18.0	Three failed attempts at procurement Lack of international contractor interest
PMC implementation	31.0	Extended component 3A implementation
DSC implementation	25.0	Extended component 3A implementation Increase in scope of design work Infiltration gallery design problems

DSC = design and supervision consultant, PMC = project management consultant.

Source: Asian Development Bank.



## STATUS OF COMPLIANCE WITH FINANCIAL AGREEMENT COVENANTS

Covenants of Financing Agreement	Compliance	Remarks
<b>Environmental (Safeguards)</b>		
Schedule 5, para. 7, Components 2 and 3: The Beneficiary, through SDRD, shall establish in SDRD a unit comprising 2 environmental safeguard specialists, 2 social safeguard specialists and 1 specialist responsible for property-related legal and regulatory matters within 1 month from the Effective Date.	Complied with.	The safeguards unit comprised 1 environmental safeguards specialist, 1 social safeguards specialist, and 1 legal and property rights specialist for component 2 implementation. Also, individual consultants with the required expertise were engaged.
<p>Schedule 5, para. 8, Components 2 and 3: The Beneficiary, through SDRD, shall ensure that the environmental safeguard requirements under applicable laws and regulations of the Beneficiary, ADB's Safeguard Policy Statement (2009), the EARF, the IEEs and EMPs are complied with in the implementation of Components 2 and 3. Specifically, the Beneficiary, through SDRD, shall:</p> <p>(a) ensure that applicable IEEs and EMPs shall be agreed upon between the Beneficiary and ADB prior to carrying out of physical activities;</p>	Complied with.	<p>Component 2 did not require an IEE and EMP.</p> <p>IEES and EMPs for Component 3A were agreed upon before carrying out physical activities.</p>
(b) ensure that potential adverse environmental impacts are minimized by implementing all mitigation measures identified in the IEEs and EMPs;	Complied with.	Site-specific EMPs were prepared for all component 3A contracts.
(c) ensure that the Implementing Partners engaged under Component 2, and the contractors engaged under Component 3, have primary responsibility for implementing the mitigation measures identified in the IEEs and EMPs;	Complied with.	Per the amendment done to the financial agreement, dated 15 April 2011, in Schedule 5, paragraph 8(c) was deleted in its entirety.
(d) monitor and record the implementation of the mitigation measures identified in the IEEs and EMPs;	Complied with.	The environmental specialist of the DSC monitored implementation of mitigation measures on a monthly basis by conducting field visits. Also, the SAACCS's environmental safeguards specialist performed monitoring on the basis of reports submitted by the contractor and DSC, including quarterly field visits.
(e) submit quarterly environmental reports to ADB within 1 month from the end of each quarter.	Complied with.	A special environmental monitoring report was

Covenants of Financing Agreement	Compliance	Remarks
		submitted in October 2012 for component 2. Quarterly environmental monitoring reports were submitted for component 3A covering Q4 2014 to Q2 2016. These were reviewed prior to being uploaded to the ADB website.
<b>Financials</b>		
Schedule 3A, para. 6, Component 1: Withdrawals under Component 1 from the Loan Account shall be made for financing Eligible Expenditures. An application for withdrawal from the Loan Account shall be submitted to ADB by the Beneficiary and in a form satisfactory to ADB	Complied with.	
Schedule 3A, para. 7, Component 1: Such withdrawal shall be accompanied by a certificate of the Beneficiary confirming that: (a) the aggregate amount of Counterpart Funds under Component 1 (\$40 million equivalent) shall be used to finance Eligible Expenditures; and (b) the value of Eligible Expenditures from 1 October 2010 to 31 December 2010 is greater than the amount of such Counterpart Funds.	Complied with.	
Schedule 3A, para. 8, Component 1: (a) Immediately after the Effective Date, the Beneficiary shall establish, in a manner satisfactory to ADB, a Special Account at NBKR for Component 1.	Complied with.	The special account was opened at NBKR on 21 January 2011.
(b) Whenever the Beneficiary withdraws proceeds of the Loan from the Loan Account, the Beneficiary shall promptly deposit the Loan proceeds into the Special Account.	Complied with.	
(c) Except as ADB may otherwise agree, the aggregate amount of Counterpart Funds under Component 1 (\$40,000,000 equivalent) shall be utilized not later than 31 December 2010 to meet the Eligible Expenditures from 1 October 2010 to 31 December 2010.	Complied with.	
Schedule 3A, para. 9, Component 1: Withdrawal from the Loan Account for Component 1 shall be liquidated based on: Monthly statements of account from NBKR and monthly certified statements from MOF for the period between 1 October 2010 and 31 December 2010 as described in para. 5 of Schedule 5 to this Financing Agreement; and a certified copy of applicable sections from the Beneficiary's budget execution report for Financial Year 2010 as described in para. 4 of Schedule 5 to this Financing Agreement.	Complied with.	There was a 3.5-month delay in loan and grant effectiveness due to the ADB requirement that the financing agreement be ratified by the new post-conflict government in the Parliament. Only component 1 was affected by the delay in grant and loan effectiveness.  Loan disbursements for component 1 were only made on 15 March 2011. The government advanced the funds for these expenditures, which were incurred in the previous quarter from

Covenants of Financing Agreement	Compliance	Remarks
		ADB's date of disbursement. Thus, the amounts were shown on a quarterly basis since there was no need for gradual liquidation.
Schedule 3A, para. 10, Component 1: Notwithstanding any other provision of this Financing Agreement, no withdrawal shall be made from the Loan Account for Component 1 until the revised national (Republican) budget for Financial Year 2010 of the Beneficiary has been approved for submission to Parliament.	Complied with.	
Schedule 3A, para. 11, Component 3 and 4: Withdrawals from the Loan Account may be made for reimbursement of expenditures incurred under Components 3 and 4 before the Effective Date, but not earlier than 12 months before the date of this Financing Agreement, in connection with equipment, machinery and Consulting Services, subject to a maximum amount equivalent to 20% of the Loan amount.	Not applicable.	Retroactive financing was not utilized.
Schedule 3B, para. 6, Component 1: Withdrawals under Component 1 from the Grant Account shall be made for financing Eligible Expenditures. An application for withdrawal from the Grant Account shall be submitted to ADB by the Beneficiary and in a form satisfactory to ADB.	Complied with.	
(Grant) Schedule 3B, para. 7, Component 1: Such withdrawal shall be accompanied by a certificate of the Beneficiary confirming that: (a) the aggregate amount of Counterpart Funds under Component 1 (\$40 million equivalent) shall be used to finance Eligible Expenditures; and (b) the value of Eligible Expenditures from 1 October 2010 to 31 December 2010 is greater than the amount of such Counterpart Funds.	Complied with.	
(Grant) Schedule 3B, para. 8, Component 1: (a) Whenever the Beneficiary withdraws proceeds of the Grant from the Grant Account, the Beneficiary shall promptly deposit the Grant proceeds into the Special Account.	Complied with.	
(Grant) (b) Except as ADB may otherwise agree, the aggregate amount of Counterpart Funds under Component 1 (\$40,000,000 equivalent) shall be utilized not later than 31 December 2010 to meet the Eligible Expenditures from 1 October 2010 to 31 December 2010.	Complied with.	
Schedule 3B, para. 9 Component 1: Withdrawal from the Grant Account for Component 1 shall be liquidated based on: monthly statements of account from NBKR and monthly certified statements from MOF for the period between 1 October 2010 and 31 December 2010 as described in para. 5 of Schedule 5; and	Complied with.	Grant disbursements for component 1 were only made on 15 March 2011. The government advanced the funds for these expenditures, which were incurred in the previous quarter from ADB's date of disbursement. Thus, the

Covenants of Financing Agreement	Compliance	Remarks
		amounts were shown on a quarterly basis since there was no need for gradual liquidation.
(Grant) a certified copy of applicable sections from the Beneficiary's budget execution report for Financial Year 2010 as described in para. 4 of Schedule 5.	Complied with.	
(Grant) Schedule 3B, para. 10, Component 1: Notwithstanding any other provision of this Financing Agreement, no withdrawal shall be made from the Grant Account for Component 1 until the revised national (Republican) budget for Financial Year 2010 of the Beneficiary has been approved for submission to Parliament.	Complied with.	
(Grant) Schedule 3B, para. 11, Component 2: Withdrawals from the Grant Account may be made for reimbursement of expenditures incurred under Component 2 before the Effective Date, but not earlier than 12 months before the date of this Financing Agreement. In connection with reconstruction and safeguard-related matters, subject to a maximum amount equivalent to 20% of the Grant amount.	Not applicable.	Retroactive financing not utilized.
(Grant) Schedule 3B, para. 12, Component 2 (d) have 3 payment installments for the reconstruction of the severely damaged houses and repairs of the partially damaged houses. Each Implementing Partner shall be paid: (i) on the first installment, an advance of 40% of the contract value under the agreement within 30 days following the execution of the agreement; (ii) on the second installment, 40% of the contract value under the agreement within 14 days following the date of approval of SDRD of a report from the implementing partner. Such report shall include from the relevant competent authorities for the reconstruction and repairs for that stage of works, reflect the level of reconstruction and repairs completed required under the agreement and be approved by SDRD within 5(Business) days following its submission by the implementing partner; and (iii) on the third installment, 20% of the contract value under the agreement within 14 days following the date of approval of SDRD of a report from the Implementing Partner and consultation with ADB. Such report shall include certification from the relevant competent authorities for the completion of reconstruction and repairs and be approved by SDRD within 5 (business) days following its submission by the Implementing Partner.	Complied with.	Changes to the percentages of the installments (40%, 40%, and 20%) were agreed within the amendment to the loan agreement signed on 15 April 2011. These changes were reflected in the cooperation agreements with the implementing partners (ACTED and DRC).
Schedule 5, para. 2, Counterpart Support: The Beneficiary shall ensure that SDRD is provided with adequate budgetary and human resources for the implementation of the EARR.	Complied with.	
Schedule 5, para. 3, Component 1: The Beneficiary, through MOF, shall ensure the use of Counterpart Funds under Component 1 (\$40,000,000 equivalent) for Eligible Expenditures under the Beneficiary's budget for Financial Year 2010, and shall, in particular, provide necessary budget appropriations to allow withdrawals from the Special Account in support of priority	Complied with.	

Covenants of Financing Agreement	Compliance	Remarks
programs and projects implemented under these categories from 1 October 2010 to 31 December 2010.		
Schedule 5, para. 4, Component 1: The Beneficiary, through MOF, shall furnish to ADB within 9 months from the end of Financial Year 2010, a certified copy of copy of applicable sections from the Beneficiary's budget execution report for Financial Year 2010 with a certified English translation.	Complied with.	
Schedule 5, para. 5, Component 1: The Beneficiary, through MOF, shall provide to ADB on a monthly basis within 15 days from the end of each month for the period between 1 October 2010 and 31 December 2010: (a) a statement of account from NBKR on the Special Account which shall include the date and amount of every withdrawal from the Special Account and the conversion rate for the Loan and/or Grant proceeds to Som for the date of conversion from the NBKR; and (b) a certified statement from MOF identifying the Eligible Expenditures and amounts for these expenditures.	Complied with.	
Schedule 5, para. 14: Accounting and Auditing: The Beneficiary shall ensure that SDRD maintain separate accounts and records for the Loan and Grant under Components 2 to 4 and in accordance with sound accounting principles. The accounts shall be audited annually in accordance with standards acceptable to ADB and the Beneficiary shall provide ADB with certified copies of the audited accounts promptly after their preparation (and no later than 6 months after the close of the Financial Year for the relevant accounts). As for Component 1, ADB reserves the right to audit the Special Account. Upon ADB request, the Beneficiary, through MOF, shall furnish to ADB such information concerning the Eligible Expenditures towards which the Loan and Grant proceeds have been applied and conversion and related records.	Complied with.	<p>Separate accounts for loan and grant funds were maintained.</p> <p>Annual audit reports for fiscal years 2011, 2012, 2013, 2014, and 2015, and the partial fiscal year 2016 (covering 1 January to 30 September), were submitted to ADB, and reviewed by the financial specialist accordingly.</p>
<b>Social</b>		
(Grant) Schedule 3B, para. 12, Component 2: (a) require the Implementing Partner (in conjunction with the affected families) reconstruct its share of the severely damaged houses for up to 100 square meters per house (from approximately 28 square meters per house and repair its share of the partially damaged houses which the Implementing Partner is responsible for is set forth in an annex to the agreement; and".	Complied with.	The affected households were provided an average 79 m <sup>2</sup> of living area.
(Grant) (a) require that Implementing Partners help reconstruct (in conjunction with the affected families) approximately 1,700 severely damaged houses for up to 100 square meters built-up area for each house (from approximately 28 square meters built-up area per house). <i>The estimated cost per square meter for such reconstruction is \$246;</i> <sup>1</sup>	Complied with.	
(Grant) (b) require that the Implementing Partners carry out the reconstruction with materials and techniques that meet applicable standards of the Beneficiary, including health and safety standards;	Not applicable.	This sub-clause was deleted through the amendment to the

<sup>1</sup> The original sub-clause, "*The estimated cost per square meter for such reconstruction is \$246;*" was deleted through amendment of the Financing Agreement in April 2011.

		financing agreement dated 15 April 2011.
(Grant) (c) require that the Implementing Partners comply with the mitigating measures in the IEEs and the EMPs and ensure that activities under Component 2 do not involve land acquisition, involuntary resettlement and/or indigenous people within the meaning of the ADB Safeguard Policy Statement (2009); and	Not applicable.	This sub-clause was deleted through the amendment to the financing agreement dated 15 April 2011.
Schedule 5, para. 6, Components 2 and 3: The Beneficiary, through SDRD, shall: (a) implement the Kyrgyzstan Emergency Shelter Strategy to restore property titles and reconstruct damaged houses for the affected families under Component 2. This includes collaboration with, and providing assistance to, the Implementing Partners and the affected families on the legal and regulatory requirements for restoring property titles and reconstruction of damaged houses; and	Complied with.	A total of 1,533 houses were reconstructed, and 96 houses repaired. All except 19 households registered their newly reconstructed houses with the State Registration Service.
(b) improve community infrastructure agreed through consultations between the Beneficiary, the communities and ADB.	Not complied with.	The covenant was not complied with because (i) community infrastructure was improved through other sources, and (ii) there were financing constraints.
Schedule 5, para. 9, Components 2 and 3: The Beneficiary, through SDRD, shall ensure that Components 2 and 3 do not involve land acquisition, involuntary resettlement and/or indigenous people within the meaning of the Safeguard Policy Statement (2009). If any land acquisition, involuntary resettlement and/or impact on indigenous people arises, the Beneficiary, through SDRD, shall prepare, disclose and implement a land acquisition and resettlement plan and/or an indigenous people development plan in accordance with applicable laws and regulations of the Beneficiary and the Safeguard Policy Statement (2009).	Complied with.	Component 2 did not involve land acquisition or involuntary resettlement.  Resettlement plans for all three component 3A subprojects were prepared and subsequently approved by ADB and the beneficiary. All affected persons received compensation in accordance with the provisions of the resettlement plans.
Schedule 5, para. 10, Components 2 and 3: The Beneficiary, through SDRD, shall ensure that the Implementing Partners engaged under Component 2, and the contractors engaged under Component 3, comply with core labor standards and applicable laws and regulations on labor and health and safety of the Beneficiary. This includes ensuring that the Implementing Partners and contractors provide equal pay for equal work, do not employ child labor, provide equal opportunities for men and women, and incorporate applicable workplace occupational safety norms.	Complied with.	
Schedule 5, para. 11, Components 2 and 3: The Beneficiary, through SDRD, shall monitor and record sex-disaggregated data on beneficiaries of its social assistance program.	Complied with (component 2).  Not applicable (component 3).	Component 3A did not include a social assistance program.

<p>Schedule 5, para. 12, Components 2 and 3: The Beneficiary, through SDRD, shall ensure that the Gender Action Plan is implemented in a timely manner.</p>	<p>Complied with.</p>	<p>ADB EARR: Gender action plan-related activities were carried out in Bazar-Korgon in February 2016.</p> <p>EBRD and SECO projects: Awareness and information campaigns were conducted in Osh and Jalal-Abad cities.</p> <p>DRC program: 171 households were identified as female-headed households, and 58 households as vulnerable households; all were provided special financial support to overcome their constraints</p> <p>ACTED program: 90 households were identified as female-headed households; 21 households were identified as vulnerable, all were provided additional financial support.</p>
<p>Schedule 5, para. 13, The Beneficiary, through SDRD, shall ensure that stakeholder consultations shall be carried out with all affected families under Component <u>2</u> and <u>beneficiaries of Component 3</u>.</p>	<p>Complied with.</p>	<p>The implementing partners carried out regular consultations with the affected families during component 2 implementation.</p> <p>During component 3A implementation, information campaigns were conducted among communities close to construction sites.</p>
<p><b>Particular Covenants</b></p>		
<p>Section 4.01. In the carrying out of the EARR, the Beneficiary shall perform, or cause to be performed, all obligations set forth in Schedule 5 to this Financing Agreement.</p>	<p>Complied with.</p>	
<p>Section 4.02. (a) The Beneficiary shall maintain, or cause to be maintained, records and documents adequate to identify the expenditures financed out of the proceeds of the Loan and the Grant and to record the progress of the EARR.</p>	<p>Complied with.</p>	

(b) The Beneficiary shall enable ADB's representatives to inspect any relevant records and documents referred to in paragraph (a) of this Section.		
<p>Section 4.03.</p> <p>(a) As part of the reports and information referred to in Section 6.05 of the Loan Regulations and Section 6.04 of the Grant Regulations, the Beneficiary shall furnish, or cause to be furnished, to ADB all such reports and information as ADB shall reasonably request concerning (i) the Counterpart Funds and the use thereof; and (ii) the implementation of the EARR.</p> <p>(b) Without limiting the generality of the foregoing or Section 6.05 of the Loan Regulations and Section 6.04 of the Grant Regulations, the Beneficiary shall furnish, or cause to be furnished, to ADB quarterly reports on the carrying out of the EARR.</p>	Complied with.	Progress reports were regularly submitted.
<b>Others</b>		
Schedule 5, para. 1, Implementation Arrangements: The Beneficiary, through MOF and SDRD, shall ensure that the EARR is implemented in accordance with the detailed arrangements set forth in the PAM. Any subsequent change to the PAM shall become effective only after approval of such change by the Beneficiary and ADB. In the event of any discrepancy between the PAM and this Financing Agreement, the provisions of this Financing Agreement shall prevail.	Complied with.	
Schedule 5, para. 15, Governance and Anticorruption: The Beneficiary, through MOF and SDRD, shall: (a) comply with ADB's Anticorruption Policy (1998, as amended to date) and acknowledge that ADB reserves the right to investigate directly, or through its agents, any alleged corrupt, fraudulent, collusive or coercive practice relating to the EARR; and (b) cooperate with any such investigation and extend all necessary assistance for satisfactory completion of such investigation.	Complied with.	

ADB = Asian Development Bank, ACTED = Agency for Technical Cooperation and Development, DRC = Danish Refugee Council, DSC= design and supervision consultant, EARF = environmental assessment review framework, EARR = Emergency Assistance for Recovery and Reconstruction, EBRD = European Bank for Reconstruction and Development , EMP = environmental management plan, IEE = initial environmental examination, MOF =Ministry of Finance, NBKR = National Bank of the Kyrgyz Republic, PAM = project administration manual, Q =quarter, SDRD = State Directorate for Reconstruction and Development of Osh and Jalal-Abad, SECO = State Secretariat for Economic Affairs.



## GENDER EQUALITY RESULTS

Table A10: Gender Action Plan Implementation Matrix

Rationale/Objectives	Activities	Performance Targets/Indicators	Gender Action Plan Status	Remarks
<b>Output 1: Fiscal Support</b>				
<b>Social expenditures relevant for female beneficiaries are protected</b>	Coordinate with concerned agencies for the systematic collection and analysis of sex-disaggregated data relevant to social services and social protection programs	Data capture and updating system for sex-disaggregated data on social protection applicants and beneficiaries is established.	<b>Activity completed and target achieved.</b> Sex-disaggregated data collection and updating system on social protection applicants and beneficiaries has been established.	
	Conduct consultations with the Social Policy Division of the Ministry of Social Development and Labor, and gender focal points on gender sensitivity of health and education service delivery and public health and education expenditures	At least 51% of monthly social benefits are allocated for female beneficiaries.	<b>Activity completed and target achieved.</b> Females comprise about 52% of the beneficiaries of monthly social benefits. Of the 80,544 total beneficiaries, 41,502 are women.	
		At least 53% of unified monthly benefits are allocated for female beneficiaries.	<b>Target achieved.</b> Females comprise 53% of the beneficiaries of unified monthly benefits.	
		Health expenditures for maternal and reproductive health increased to Som95 million.	The current total health budget is Som14.938 billion.	The Ministry of Finance clarified that due to the program-based budgeting system, the data on maternal and reproductive health could not be disaggregated from the total health budget.
<b>Output 2: House Reconstruction</b>				
<b>Women and female household heads of affected families receive adequate support</b>	Identify households with reconstruction needs and compensate them appropriately	100% of female-headed households hold land titles in their names and are compensated for the loss of their houses.	<b>Activity completed and target achieved.</b> While the project initially identified 147 female-headed households as possible registrants or holders of land titles, 145 actually registered their reconstructed houses with the State	

Rationale/Objectives	Activities	Performance Targets/Indicators	Gender Action Plan Status	Remarks
			Registration Service (87 for ACTED, 58 for DRC). The two remaining households did not register (as of 11 Feb 2012).	
		All households identified as female-headed by the implementing partners had their houses rebuilt or benefited from special financial support.	<b>Target achieved.</b> A total of 261 female-headed households with reconstruction needs were identified applying the eligibility criteria (171 were identified by DRC and 90 by ACTED). Of the 261 households, 134 were identified as vulnerable and in need of special assistance. In addition to the standard material aid package, these families were provided with support measures like special assistance, vulnerability support, manual transport support, and working brigade's assistance (113 for DRC, 21 for ACTED).	
Output 3: Community and Water Supply and Sanitation Infrastructure Improvement				
Water and sanitation improvements supported by behavioral change campaigns	Conduct behavioral change campaign on sanitation, hygiene, and importance of clean water for local women's groups	70% of local women's organizations trained on sanitation and hygiene	<b>Activity completed and target achieved.</b> Information and education programs on sanitation and hygiene were undertaken for the 335,000 residents of Osh and Jalal-Abad cities. These were implemented simultaneously under the EBRD and SECO projects and the EARR with the assistance of a local nongovernment organization and through water users committees. In the case of Bazar-Korgon village, an information and awareness campaign was implemented under the EARR in February	

Rationale/Objectives	Activities	Performance Targets/Indicators	Gender Action Plan Status	Remarks
			2016. Training was conducted among women's groups, school teachers and community leaders, focusing on the benefits of drinking clean water, efficient use of water, basics of sanitation and hygiene, and establishment of social partnerships related to water conservation issues at the community level. Women's groups, school teachers, and community leaders were trained and equipped with information materials to enable them to train members of the local community, women, and grades 6 and 7 students on the basic of sanitation and hygiene.	

ACTED = Agency for Technical Cooperation and Development, DRC = Danish Refugee Council, EARR = Emergency Assistance for Recovery and Reconstruction, EBRD = European Bank for Reconstruction and Development, SECO = Swiss State Secretariat for Economic Affairs.

Source: Asian Development Bank.

## BUDGETED AND ACTUAL COST INCURRED BY IMPLEMENTING PARTNERS

Cost Items	ACTED			DRC		
	Contract Amounts			Contract Amounts		
	(\$)			(\$)		
	Actual	Final	Final as % of Actual (%)	Actual	Final	Final as % of Actual (%)
Procurement of materials	5,538,878	5,531,654	99.9	12,384,529	12,242,283	98.9
Provision of material aid	1,098,158	867,285	79.0	2,505,781	2,155,685	86.0
Provision of material aid-winter damage repairs		143,286				
Traditional heating system					75,781	
Staff and management	2,035,347	2,183,347	107.3	3,133,664	3,673,664	117.2
<b>Subtotal</b>	<b>8,672,383</b>	<b>8,725,572</b>	<b>100.6</b>	<b>18,023,974</b>	<b>18,147,413</b>	<b>100.7</b>
Support for restoration of property titles					45,688	
<b>Subtotal</b>	<b>8,672,383</b>	<b>8,725,572</b>	<b>100.6</b>	<b>18,023,974</b>	<b>18,193,101</b>	<b>100.9</b>
Taxes and duties	901,677			2,016,086	191,868	
<b>TOTAL</b>	<b>9,574,060</b>	<b>8,725,572</b>		<b>20,040,060</b>	<b>18,384,969</b>	

ACTED = Agency for Technical Cooperation and Development, DRC = Danish Refugee Council.

Notes:

1. Total residential area reconstructed and/or repaired: 25,881 square meters for ACTED, and 57,252 square meters for DRC.

2. Unit cost based on subtotal A: \$337 per square meter for ACTED, and \$317 per square meter for DRC.

Source: Asian Development Bank.

## PLANNED AND ACTUAL SERVICES OF CONSULTANTS

**Table A12.1: Component 4 Outputs: Summary of Consulting Services**

Component 4 Outputs- Summary of Consulting Services Consultants	Inputs			
	Appraised (person-months)	Actual (person-months)	Difference between Appraised and Actual (person-months)	Difference between Appraised and Actual (%)
Project management consultants	166	224.8	58.8	35
Design and supervision consultants	216	337.2	121.2	56
Individual expert consultants		77.6		
<b>Total</b>	<b>382</b>	<b>639.6</b>	<b>180.0</b>	<b>47</b>

Source: Asian Development Bank.

**Table A12.2: Project Management Consultant 1: Crown Agents**

Positions as per Signed Contract	Person-Months		
	Original	Used	Balance
<b>International</b>			
Team leader	24	3.3	20.7
Water supply and sanitation engineer	12	4.2	7.8
Financial management specialist	7		7
Social development specialist	7	3.9	3.1
Procurement specialist	6	1.8	4.2
Structural and geotechnical engineer	6		6
Construction supervision engineer	12	1.0	11
<b>Total</b>	<b>74</b>	<b>14.2</b>	<b>59.8</b>
<b>National</b>			
Financial manager	23	4.6	18.4
Social development specialist 1	18	3.2	14.8
Social development specialist 2	18	1.9	16.1
Construction supervision engineer 1	18	4.5	13.5
Construction supervision engineer 2	18	4.6	13.4
Hygiene and sanitation specialist	18	2.4	15.6
Community awareness specialist	18	1.1	16.9
Public communication specialist	18	1.1	16.9
<b>Total</b>	<b>149</b>	<b>23.4</b>	<b>125.6</b>

Note: The original contract period was 12 months, while the actual contract period was 6 months.

Source: Asian Development Bank.

**Table A12.3: Project Management Consultant 2: Centre for Development**

Position as per Signed Contract	Person-Months		
	Original	Used	Balance
<b>International</b>			
Team leader	24	35.57	11.57
Senior social development specialist	7	2.79	(4.21)
Senior buildings supervision engineer	8	8	
Senior water supply and sanitation specialist		40.53	40.53
<b>Total</b>	<b>39</b>	<b>86.89</b>	<b>47.89</b>
<b>National</b>			
Financial management specialist	26	32.13	6.13
Buildings supervision engineer 1	8	8.55	0.55
Buildings supervision engineer 2	7	7.45	0.45
Buildings supervision engineer 3	6		(6.00)
Water supply and sanitation engineer		29.76	29.76
Community awareness & participation expert	8	5.07	(2.93)

Position as per Signed Contract	Person-Months		
	Original	Used	Balance
Social development specialist	11	7.27	(3.73)
Public relations specialist		10.21	10.21
<b>Total</b>	<b>66</b>	<b>100.44</b>	<b>34.44</b>

( ) = negative.

Note: The original contract period was 25.6 months, while the actual contract period was 52.1 months

Source: Asian Development Bank.

**Table A12.4: Design and Supervision Consultant: Eptisa**

Positions as per Signed Contract	Person-Months		
	Original	Used	Balance
<b>International</b>			
Team leader	21.0	35.50	14.5
Water treatment specialist	7.0	8.68	1.68
Wastewater treatment engineer	3.0	1.45	(1.55)
Electromechanical engineer	8.0	12.89	4.89
Geotechnical specialist	4.0	2.32	(1.68)
Quantity surveyor	9.0	11.55	2.55
Civil and Structural engineer	6.0	8.18	2.18
Hydraulic network modeler	2.0	2.41	0.41
Environmental specialist	2.0	4.82	2.82
Hydrogeologist	2.0	3.14	1.14
Financial expert	2.0	2.23	0.23
Senior construction supervisor	13.0	9.77	(3.23)
Resettlement specialist	3.0	6.46	3.46
Contract and Claim engineer	4.0	6.36	2.36
QA-QC engineer	2.0	6.77	4.77
Senior construction supervisor 2	10.0	19.18	9.18
Junior mechanical engineer	6.5	8.73	2.23
<b>Total</b>	<b>104.5</b>	<b>150.44</b>	<b>45.94</b>
<b>National</b>			
Water supply engineer	5	14.77	9.77
Wastewater and Sewerage System Engineer	4	5.98	1.98
Electromechanical engineer	8	8.33	0.33
Social development specialist	6	6.54	0.54
Environmental specialist	5	15.41	10.41
Civil and Structural engineer	6	11.73	5.73
Quantity surveyor	10	15.05	5.05
Geotechnical engineer	5	5.14	0.14
Surveyor	3	20.00	17.00
Hydrogeologist	5	5.32	0.32
Contracts engineer	14	20.64	6.64
Financial expert	2	3.23	1.23
Resettlement specialist	4	5.14	1.14
Construction supervision engineer 1	13	24.99	11.99
Construction supervision engineer 2	20	19.16	(0.84)
Construction supervision engineer 3	10	13.82	3.82
<b>Total</b>	<b>120</b>	<b>195.25</b>	<b>75.25</b>

( ) = negative.

Note: The original contract period was 21 months, while the actual contract period was 52.1 months.

Source: Asian Development Bank.

## AUDIT ARRANGEMENTS

1. An accounting firm was to be recruited for each year separately using the quality- and cost-based selection method. However, following the approval of the Asian Development Bank (ADB), national audit services were procured using the least-cost selection method (bi-data technical proposal). Following ADB's approval of the draft terms of reference and the request for proposals, the request for proposals was issued to five shortlisted audit firms on 28 November 2011. Two proposals were received and, following the evaluation and ADB's approval, the contract with the first-ranked firm was signed on 21 February 2012, 86 days after the issuance of the request for proposals. The original contract with a contract amount of \$21,210 included three annual audits. Because of the project's extended implementation period, the number of annual audits was increased to five. In total, the contract was amended through four variations, as presented in Table A13. The expenditures at contract completion amounted to \$28,056, or 32% above the original amount. The performance of the audit firm, Marka Audit, was satisfactory. All five audit reports were accepted by ADB.

**Table A13: Audit Services of Marka Audit**

Contract Variations				
Variation No.	Date	Time Extension (months)	Additional Cost (\$)	Reasons for the Contract Variation
1	9 April 2013			Change of employer from SDRD to SAACCS
2	20 May 2014	12.1		Time extension and one extra audit report with revised payment schedule
3	17 August 2015	11.6	6,746	Time extension and one extra audit report with revised payment schedule
4	29 April 2016	3.5		Time extension to 15 July 2016
<b>Total</b>		<b>27.2</b>	<b>6,746</b>	

SAACCS = State Agency for Architecture, Construction and Communal Services; SDRD = State Directorate for Reconstruction and Development of Osh and Jalal-Abad.

Notes:

1. The original contract (no. EARR/2688/CS/09) was signed on 21 February 2012 in the amount of \$21,210 and had a duration of 24 months. It included 3 annual audits.

2. The final contract amounted to \$28,056 and had a duration of 52.7 months (it was completed on 15 July 2016). It included five annual audits.

Source: Asian Development Bank.

## PROCUREMENT ACTIONS: EQUIPMENT

There were four variables in the four procurement attempts:

- (i) **Equipment.** Originally, equipment items included a water truck, sewer cleaning truck, truck crane, excavator, and mobile workshop. The successful procurement only had the truck crane, excavator, and mobile workshop.
- (ii) **Lots.** Procurement was offered in a single lot and separate lots. The successful procurement had separate lots.
- (iii) **Procurement mode.** International competitive bidding and national competitive bidding procurement were tried. The successful procurement adopted national competitive bidding procurement.
- (iv) **One-envelope versus two-envelope bidding.** The successful procurement used a two-envelope bidding process, where each bid was evaluated for technical responsiveness first, with only the technically successful ones opened to compare the prices.

1. The three unsuccessful equipment procurement attempts failed because of (i) no bids, (ii) technically non-responsive bids, and (iii) bids well above the estimated price.

**Table A14.1: Equipment Procurement Attempt 1 (Unsuccessful)**

Lot No.	Equipment	Units	Estimated Unit Cost □ (\$)	No. of Bids	Country of Bidder	No. of Qualified Bidders	Reasons for Rejection
1 <sup>a</sup>	Excavator	2	140,000	1	Kyrgyz Republic	0	Evaluated bidder's price was 95% above estimate
1 <sup>a</sup>	Crane	2	220,000				Bid was technically unresponsive

ADB = Asian Development Bank.

Notes:

1. Procurement mode: single-stage, one-envelope international competitive bidding.

2. Date of invitation for bids: 13 January 2012.

3. Date of bid submission: 24 February 2012.

4. Date of bid evaluation report submission to ADB: 5 March 2012.

5. Date of ADB approval and/or recommendation: 21 March 2012.

<sup>a</sup> Single lot.

Source: Asian Development Bank.

**Table A14.2: Equipment Procurement Attempt 2 (Unsuccessful)**

Lot No.	Equipment	Units	Estimated Unit Cost □ (\$)	No. of Bids	Countries of Bidders	No. of Qualified Bidders	Reasons for Rejection
1 <sup>a</sup>	Water truck	2	40,000	0			
1 <sup>a</sup>	Mobile workshop	2	36,000				
1 <sup>a</sup>	Sewer cleaning truck	1	60,000				

ADB = Asian Development Bank.

Notes:

1. Procurement mode: national competitive bidding.

2. Date of invitation for bids: 10 February 2012.

3. Date of bid submission: 10 March 2012.

4. Date of bid evaluation report submission to ADB: not applicable.

5. Date of ADB approval and/or recommendation: not applicable.

<sup>a</sup> Single lot.

Source: Asian Development Bank.



**Table A14.3: Equipment Procurement Attempt 3 (Unsuccessful)**

Lot No.	Equipment	Units	Estimated Unit Cost (\$)	No. of Bids	Countries of Bidders	No. of Qualified Bidders	Reasons for Rejection
1	Excavator	2	140,000	4	Kyrgyz Republic, Turkey	2	Evaluated bidders price more than 70% above estimate
2	Truck crane	2	170,000	1	Kyrgyz Republic	0	Non-responsive
3	Water truck	2	50,000	2	Kyrgyz Republic	1	Evaluated bidders price more than 141% above estimate
4	Mobile workshop	2	280,000	0			

ADB = Asian Development Bank.

Notes:

1. Procurement mode: national competitive bidding.
2. Date of invitation for bids: 4 May 2012.
3. Date of bid submission: 1 June 2012.
4. Date of bid evaluation report submission to ADB: 29 June 2012.
5. Date of ADB approval and /or recommendation: 17 July 2012

Source: Asian Development Bank.

**Table A14.4: Equipment Procurement Attempt 4 (Successful)**

Lot No.	Equipment	Units	Estimated Unit Cost (\$)	No. of Bids	Countries of Bidders	No. of Qualified Bidders	Evaluated Price (\$)
1	Excavator	2	160,000	5	Kyrgyz Republic, Turkey, PRC	3	\$95,585
2	Truck crane	2	180,000	3	Kyrgyz Republic, PRC	3	\$54,000
3	Mobile workshop	2	150,000	1	Kyrgyz Republic	1	\$99,000

ADB = Asian Development Bank, PRC = People's Republic of China.

Notes:

1. Procurement mode: single-stage, two-envelope national competitive bidding.
2. Date of invitation for bids: 26 July 2013.
3. Date of bid submission: 9 September 2013.
4. Date of bid evaluation report technical submission to ADB: 24 September 2013.
5. Date of bid evaluation report financial submission to ADB: 17 October 2013.
6. Date of ADB approval and/or recommendation: 23 October 2013.
7. Date of contract award lot 1: 24 December 2013.
8. Date of contract award lot 2: 11 November 2013.
9. Date of contract award lot 3: 14 November 2013.

Source: Asian Development Bank.

## SUSTAINABILITY OF INVESTMENTS

### A. General

1. Sustainability of investments for component 3A should be seen in the context of the financial health of the *vodokanals* (water utilities). In Osh and Jalal-Abad, there is very high non-revenue water (75% or more of production). This can best be reduced by (i) expansion of metering, which reduces wastage; and (ii) repair and replacement of pipes, which reduces leaks. The European Bank for Reconstruction and Development (EBRD) is currently funding such works in both Jalal-Abad and Osh. For Bazar-Korgon, sustainability will depend on financial support for operating equipment for (i) extension of the distribution system, (ii) further metering, and (iii) institutional support. It is a major achievement of the Government of the Kyrgyz Republic to have introduced water metering into the three project towns. Through improved cost recovery and reduction of non-revenue water, the government has greatly contributed to the sustainable development of the water sector.

### B. Bazar-Korgon (Population 35,000)

2. Following source development and bulk supply under the Emergency Assistance for Recovery and Reconstruction Project, 8,000 of the 35,000 residents of Bazar-Korgon are newly connected to piped water, while the remainder rely on some 30 water tankers to cart water to fill their home wells. This costs about five times the price of piped water.

3. Newly constructed sewerage lines and a wastewater treatment plant installed under the project have greatly improved the sanitary environment among the multistory residences in the heart of the town.

4. The water tariff in Bazar-Korgon, which is Som15 per cubic meter (m<sup>3</sup>) for water and Som9 per m<sup>3</sup> for wastewater, is higher than that of other *vodokanals* in the Jalal-Abad and Osh provinces. Yet the total revenues in a month (Som88,000) do not yet pay for the salaries of the staff (Som96,000). One advantage is that there is virtually no non-revenue water. This also means no wastage for those connected, as their consumption dropped. Household water bills now average Som150 in 2016, down from Som700 in 2010.

5. The Bazar-Korgon *vodokanal* director has formally sought further assistance from ADB for the following:

- (i) expansion of the distribution system, connecting 100% of the population and metering all consumers;
- (ii) supply of equipment required for maintenance, connecting more people, and metering of consumers; and
- (iii) institutional support on billing and collection in particular.
- (iv) <sup>1</sup>

6. The Bazar-Korgon *vodokanal* director is committed to building the *vodokanal* and serving the people.. IFIs Experience with other water utilities in Asia, like for example those in Armenia with VEOLIA and SAUR water operators, shows that a long-term committed leader is essential to produce good results, which bodes well for continued investment in the water supply of Bazar-

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<sup>1</sup> (In this regard, the possibility of setting up a water utility partnership and/or twinning arrangement through the Asian Development Bank-supported WaterLinks should be explored.)

Korgon. Sustainability of the investments to date will depend on the momentum of future investments.

### **C. Jalal-Abad (Population 105,000)**

7. The project provided new source development (seven wells) and sewerage in Jalal-Abad. There had been a problem before 2010 with a high concentration of nitrates and nitrites in well water in the city because sewerage was inadequate, and too many wells constructed for sanitation had contaminated the aquifer. Only 50%–60% of the population is served from the new source of 200 liters per second.

8. Under the EBRD-funded project, new distribution pipework will be constructed to replace an old leaking pipe, and metering of consumers will be done. The second phase of the EBRD project is expected to increase the wastewater treatment capacity from the current 6,000 meters per day (m<sup>3</sup>/day) to around 35,000 m<sup>3</sup>/day. A second stage source development with other donors is anticipated, which should result in 100% of demand met. This is expected to be completed by the end of 2019.

9. There have been some complaints from *vodokanal* costumers about the taste and smell of chlorine. The Jalal-Abad *vodokanal* director thought they would benefit from an awareness program about chlorination of water. The nongovernment organization Central Asian Alliance for Water may be able to deliver this.

10. The metering of connections has reportedly just started under the EBRD-funded project. Once complete, this will help reduce non-revenue water (currently estimated between 70% and 80% of production) by eliminating wastage. The EBRD funding will contribute to the replacement of 65 kilometers of the 205 kilometers of total distribution network.

11. There are 20,000 domestic connections covering 50,000 people in Jalal-Abad. The existing tariff is based on the number of people per household, but that will change when connections are metered, resulting in reduced consumption per household. Since 2014, the *vodokanal* has been able to meet its operation and maintenance (O&M) costs from water tariff revenues.

12. The Jalal-Abad *vodokanal* director is committed to developing the *vodokanal* and making it the best *vodokanal* in the country. This augurs well for the future development of water supply and sewerage in Jalal-Abad.

13. With a committed director and tariffs that already meet O&M costs, the future sustainability of water supply investments in Jalal-Abad is promising. The challenge will be overcoming the very high water losses partly through metering of consumption, and partly through replacement of old leaking pipes.

### **D. Osh (Population 400,000)**

14. The project supported the construction of an infiltration gallery at source and a comprehensive chlorination unit to match. This was most urgently needed to provide relief during periods of severe turbidity in the water. These can occur during a total of 30 days in 1 year, during which water supply to the city from this source (about 65% of all supply) must be stopped for 2 or 3 days at a time. Due to technical problems, the auxiliary supply from the project-built infiltration

gallery, which was supposed to achieve 800 liters per second of production capacity, failed to produce this capacity. The city and *vodokanal* will undertake further drilling investigations.

15. The inclusion of this component under an emergency assistance project conflicts with the importance of undertaking initial investigations. Only up to 4 months were given to this task, whereas at least 12 months (an annual season cycle) is an absolute minimum requirement. Generally, for designs to be reliable, at least 5 years of recorded (turbidity) data would be necessary, and hydraulic modeling would have to be undertaken.

16. Only 220,000 people are now served from about 65,000 connections.

17. Only about 1%–2% of domestic connections are metered, but all commercial and other non-domestic users are metered. The water bill is split into water and sewerage. This average water bill is around Som65–Som70 per household per month. There is some concern over collection efficiency, but 90% of bills are reportedly paid within 10 months. For the last 12 years, the *vodokanal* reports it has been covering at least O&M costs with tariff revenues.

18. The biggest concern is that the estimated 75% non-revenue water can only be rectified by installing water meters, and identifying and replacing or repairing leaking pipes. EBRD assistance is already being provided to address this concern.

19. The *vodokanal* indicated it has no need for a website to communicate with its customers.

20. Customers are generally satisfied with the water service. Some large families pay a water bill of up to Som250 per month, which they find difficult. There are many water leaks within the distribution network apparent in the city. The people are aware of the issue of unclean water and, although they get no warnings from the *vodokanal*, they listen to weather forecasts to anticipate periods of storms producing turbidity.

21. To sustain the water supply investments in Osh, the city and *vodokanal* should pursue further investigations of and modifications to the design of the source. It is also very important to actively pursue the objectives of the EBRD-funded project in bringing metering to all connections, and to replace or repair the leaking pipes. With a total population of 400,000 in the service area, this *vodokanal* could conceivably be independent of the local and national authority for payment of past loans and funding of new capital works.

## FINANCIAL ANALYSIS AND ECONOMIC EVALUATION

### A. Introduction

1. Post-project economic and financial analyses were prepared to reevaluate the expected economic and financial returns based on actual costs expended, and, where appropriate, to compare these returns with those projected during appraisal. Reevaluation based on the methodology accepted during appraisal allowed for a comparison of projected indicators with the indicators after project completion. Financial and economic reevaluation was conducted following project completion for component 3A (water supply and sanitation improvements in Osh, Jalal-Abad, and Bazar-Korgon), which complemented reconstruction efforts under the Emergency Assistance for Recovery and Reconstruction (EARR). Since component 3A, partly funded through an Asian Development Bank (ADB) loan, has potential on all sites for cost recovery for *vodokanals* (water utilities) as service providers, financial and economic viability and sustainability were measured using standard financial internal rate of return (FIRR) and economic internal rate of return (EIRR) estimations, while profit and loss statements were built up as the basis for tariff projections. The EARR did not require financial and economic evaluation for the other components due to their emergency (and non-revenue-generating) nature. During project preparation, financial and economic analyses were undertaken only for the Osh *vodokanal* subproject. In the ensuing comparison of results between the appraisal and reevaluation stages, the Osh appraisal results served as a proxy for the Jalal-Abad and Bazar-Korgon subprojects.

### B. Methodology

2. The economic and financial reevaluation was carried out in accordance with ADB guidelines.

3. <sup>1</sup> The EIRR was calculated based on actual investment costs, and actual and projected operating and maintenance (O&M) expenses. To calculate the EIRR, benefit and cost streams were discounted in the economic analysis, taking into account the economic cost of capital at 12%. A subproject was declared economically beneficial when the EIRR was greater than the economic cost of capital. The FIRR was calculated taking into account costs and revenue flows, and measured against the weighted average cost of capital (WACC), which was 1.26% at appraisal and 0.42% at reevaluation. A subproject was considered sustainable when the FIRR exceeded the WACC.

### C. Economic Analysis

4. **Economic benefits.** Economic and financial analyses assumptions applied at reevaluation were updated from appraisal estimates and also from actual post-construction operations data, including water and sewerage demand, tariffs, O&M costs, and statistical data (e.g., population served by the subproject, population growth rates, staff salaries, and average household income). At appraisal, the identified (and quantified) benefits for the water supply and sanitation subcomponent included (i) benefits from non-incremental water, (ii) benefits from incremental water, (iii) health benefits, and (iv) savings from reduced unaccounted-for-water. In the reevaluation, the same benefits were assessed in addition to (i) updated assumptions that determined cost savings in collection time, (ii) alternative supply or rehabilitation of existing source, (iii) water storage facility maintenance, (iv) water treatment, and (v) lost working days and

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<sup>1</sup> Guidelines for the Financial Governance and Management of Investment Projects Financed by ADB (2002); ADB. 1994. *Framework for the Economic and Financial Appraisal of Urban Development Sector Projects*. Manila; ADB. 1998. *Guidelines for the Economic Analysis of Water Supply Projects*. Manila.

wages. Details are discussed in paras 4-15., with calculations presented in Tables A18.1, A18.3, and A18.5 in Appendix 18.

5. The economic evaluation included both direct and indirect benefits. The higher standard of public hygiene has led to a decrease in waterborne diseases, less time spent on collecting water, and a decrease in or the elimination of household water treatment and maintenance costs. All these have been quantified in economic terms. Health benefits from the avoided cost of treating water-related disease will only be evident after several years of system operation, so these have not been quantified.

6. The water supply facilities with the project in place reduce the economic cost of obtaining water for each household. There are cost savings resulting from time saved (i) collecting water from alternative and supplementary sources, (ii) maintaining private water reservoirs or containers, and (iii) treating water using the traditional method of boiling. Collection time ranges from 0.2 to 1.5 hours (averaging 0.65 hours), depending on distance traveled by household members to alternative sources. The hourly minimum wage rate was used to measure the value of time saved. Water supplied by the project replaces private water supplies used by the existing households (non-incremental demand) and enables households to increase consumption (incremental demand). Cost savings also arise from elimination of the need to acquire and maintain containers to store collected water. As only parts of the project areas are sufficiently served, the cost savings benefit 50%–85% of the service area population that required improved services.

7. Resource cost savings were estimated by multiplying the non-incremental water consumed by the average economic price in the without-project situation. The value of incremental water and water from non-technical loss was based on the average willingness-to-pay as a proxy for the demand price of project water. The demand price of water without the project is the financial demand price of the various alternative sources in economic terms. The total value of non-incremental and incremental water comprises the total economic benefits of the water supply project.

8. Since the project is supplying water in bulk to Osh and Jalal-Abad, it cannot on its own fully reduce unaccounted-for-water, and part of the reduction in losses will be achieved through the European Bank for Reconstruction and Development project that provides a metering program. However, upgrading of the main lines and water sources should allow significant savings; overall, up to 30% of the potential benefits are allocated to the Osh *vodokanal* subproject and up to 20% to the Jalal-Abad *vodokanal* subproject.

9. Health benefits derive from savings due to absences from work resulting from waterborne and sanitation-related diseases. During disease episodes, household income earners are kept from work an average of about 4 days each year. To put a value on the labor savings, the daily minimum wage rate of Som300 was applied to the total days lost in a year.

10. **Economic costs.** Economic capital investment and O&M costs were reevaluated based on actual financial expenditures. The domestic price numeraire was applied at appraisal and at reevaluation. Economic costs excluded taxes and duties, and financial prices were converted to economic prices using reevaluated conversion factors. The shadow exchange rate factor at reevaluation was calculated at 1.09.<sup>2</sup> The conversion factor for labor (the shadow wage rate

<sup>2</sup> The shadow exchange rate factor was estimated using ADB-prescribed guidelines. The latest available data (July 2016) on Kyrgyzstan Republic imports and exports, taxes and duties, and subsidies were applied in the shadow exchange rate factor equation.

factor) was assumed at 1.0 for skilled labor and 0.7 for unskilled labor.<sup>3</sup> The economic life of the project was assumed over 25 years (2016–2041) after project completion in 2015. Recurrent cost was converted at 0.93 of financial cost, consistent with capital cost conversion. At appraisal, the Osh subproject was analyzed over a 22-year period (2021–2033). The shadow exchange rate factor for traded goods was calculated at 1.25, while the shadow wage rate factor was 1.0 for skilled labor and 0.7 for unskilled labor. The O&M cost was converted at 1.01 at appraisal. Table A16.1 summarizes the conversion of O&M costs from financial to economic costs applied in the reevaluation. Details are given in Tables A18.2, A18.4, and A18.6 in Appendix 18.

**Table A16.1: Financial and Economic Cost Conversion**

Subproject	Capital Cost			O&M Cost, 2017		
	Financial (Som million)	Economic (Som million)	Conversion rate	Financial (Som million)	Economic (Som million)	Conversion rate
Osh <i>vodokana</i> <sup>a</sup>	735.06	682.89	0.93	31.84	29.58	0.93
Jalal-Abad <i>vodokana</i> <sup>a</sup>	659.44	612.76	0.93	40.65	37.77	0.93
Bazar-Korgon <i>vodokana</i> <sup>a</sup>	400.67	372.75	0.93	2.93	2.73	0.93

<sup>a</sup> A *vodokanal* is a water utility.

O&M = operation and maintenance.

Source: Asian Development Bank.

11. **Benefit–cost ratio.** Subproject benefit–cost ratios were assessed to determine if benefits exceed costs, indicating economic sustainability. Results of the analysis showed that the benefit–cost ratios for the subprojects all exceeded 1.0 (Osh at 1.4, Jalal-Abad at 1.3, and Bazar-Korgon at 1.2), with an average of 1.3. At appraisal, the Osh *vodokanal* benefit–cost ratio was calculated at 1.5.

12. **Economic internal rate of return.** The Osh *vodokanal* subproject EIRR was recalculated at 19.1%, higher than the 13.6% estimated at appraisal owing to the application of more quantifiable benefits following project completion.<sup>4</sup> As the reevaluated EIRRs for individual subprojects and the overall project are higher than the ADB recommended discount rate of 12%, the project is considered economically viable. The EIRRs for the Osh subproject at appraisal and for the reevaluated subprojects and overall project are given in Table A16.2. Detailed calculation of the EIRRs is given in Tables A18.7, A18.8, A18.9, and A18.10 in Appendix 18.

13. **Sensitivity analysis.** At appraisal, the EIRR was most sensitive to a decrease in benefits, resulting in a below-minimum EIRR. At reevaluation, the EIRR remained robust despite cost overruns and a decrease in benefits, with subprojects most sensitive to increases in capital cost. At reevaluation, more project benefits had been quantified, producing a higher EIRR compared to appraisal. Table A16.2 summarizes the sensitivity results.

<sup>3</sup> Based on an assessment of the current labor situation in coverage areas.

<sup>4</sup> Based on sample interviews with beneficiaries, resource cost savings (including costs related to collection time, private well pump units and water storage, unit maintenance, and treatment) have been identified as actual benefits resulting from the project.

14.

**Table A16.2: Economic Internal Rate of Return and Sensitivity Analysis**

Subproject	At Appraisal							
	Base Case		Capital Cost +10%		O&M +10%		Benefit –10%	
	EIRR	ENPV	EIRR	ENPV	EIRR	ENPV	EIRR	ENPV
	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)
Osh	13.6	15,251	12.1	6,837	12.3	83,640	11.4	(3,608)
Jalal-Abad	N		N		N		N	
Bazar-Korgon	N		N		N		N	
<b>Total</b>	<b>13.6</b>	<b>15,251</b>	<b>12.1</b>	<b>6,837</b>	<b>12.3</b>	<b>83,640</b>	<b>11.4</b>	<b>(3,608)</b>

Subproject	At Project Completion							
	Base Case		Capital Cost +10%		O&M +10%		Benefit – 10%	
	EIRR	ENPV	EIRR	ENPV	EIRR	ENPV	EIRR	ENPV
	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)
Osh	19.1	248.6	7.3	200.5	18.6	225.8	6.5	152.9
Jalal-Abad	18.0	187.0	16.3	143.8	17.2	159.4	15.3	97.4
Bazar-Korgon	14.0	46.3	12.8	19.8	13.9	43.3	12.5	12.1
<b>Total</b>	<b>17.4</b>	<b>481.0</b>	<b>15.8</b>	<b>364.1</b>	<b>16.9</b>	<b>428.5</b>	<b>15.0</b>	<b>262.4</b>

( ) = negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.

Source: Asian Development Bank.

## D. Financial Analysis

15. The financial analysis assessed the capacity of subprojects to cover future costs, including capital investments and O&M costs and necessary replacements. Analysis was done for without-project and with-project scenarios, assessing increasing costs and revenues over a 25-year period. As with the appraisal methodology, the main financial parameters of sustainability at reevaluation were (i) the FIRR, which should be higher than the WACC; and (ii) water and sewerage tariff affordability, generally acceptable at 4%–7% of household income.

16. **Subproject revenues.** Revenues were calculated based on actual domestic and non-domestic demand as reported by each *vodokanal*. Subproject forecasts assumed water supply from existing alternative sources would eventually be replaced by supply from the project. Sales revenues were based on tariffs designed for full O&M cost recovery, but in accordance with tariff reforms that ensure affordability and social acceptability.

17. **Subproject costs.** Capital costs included all infrastructure investments, including provisions for project management support and related institutional development. O&M costs included costs related to staff wages and administration, water treatment, power and fuel, and maintenance. The annual depreciation expense was calculated at 2.5% (based on a 40-year useful life) for civil works and 6.7% (based on a 15-year useful life) for equipment. Detailed O&M costs are given in Tables 18.1A, 18.1B and 18.1C in Appendix 18.

18. **Tariffs and cost recovery.** 2016 subproject tariffs for house connections, institutional connections (schools, hospitals, government offices), and commercial/industrial establishments were used in the analysis. Future tariffs were determined to satisfy cost recovery options based on projected O&M costs, including depreciation and profit margins. It was assumed the tariff



collection rate would improve as services improve. AS of 2016 collection rate is about 80%–90% was assumed to increase gradually to a minimum of 90% by Year 10 (2026). Table A16.3 presents the revenue and expenditure picture, cash balance, and cost recovery levels (the operating ratio and the operating ratio with depreciation). Projected profit and loss statements are given in Tables A18.11, A18.12, and A18.13 in Appendix 18.

**Table A16.3: Projected Cost Recovery Tariffs and Financial Indicators**

	2016	2017	2018	2019	2020	2021	2026
Item	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 10
<b>Osh vodokanal<sup>a</sup></b>							
Average tariff (Som/m <sup>3</sup> )	10.48	10.48	12.26	12.26	14.34	14.34	22.97
Tariff increase (%)	8	-	17	-	17	-	17
Revenue (Som million)	63.2	63.3	74.8	74.3	97.1	100.9	188.7
O&M cost (Som million)	31.2	33.9	36.8	40.0	43.5	48.6	86.7
Operating income (Som million)	32.0	29.4	38.0	34.3	53.7	52.2	102.0
Cash at end of year (Som million)	115.6	145.4	182.9	217.8	270.2	294.0	552.6
Operating ratio	0.5	0.5	0.5	0.5	0.4	0.5	0.5
Operating ratio with depreciation	0.8	0.8	0.7	0.8	0.6	0.6	0.5
<b>Jalal-Abad vodokanal<sup>b</sup></b>							
Average tariff (Som/m <sup>3</sup> )	18.25	18.25	20.81	20.81	23.72	23.72	35.15
Tariff increase (%)	-	-	14	-	14	-	14
Revenue (Som million)	83.3	86.7	102.7	106.7	126.4	140.7	239.7
O&M cost (Som million)	39.9	43.3	47.0	51.1	55.5	62.1	97.9
Operating income (Som million)	43.5	43.4	55.7	55.6	70.9	78.6	141.8
Cash at end of year (Som million)	169.6	212.9	267.6	323.2	392.8	444.8	882.6
Operating ratio	0.5	0.5	0.5	0.5	0.4	0.4	0.4
Operating ratio with depreciation	0.7	0.7	0.6	0.6	0.6	0.5	0.5
<b>Bazar-Korgon vodokanal<sup>c</sup></b>							
Average tariff (Som/m <sup>3</sup> )	18.25	18.25	20.81	20.81	23.72	23.72	35.15
Tariff increase (%)	-	-	43	-	43	-	43
Revenue (Som million)	3.1	3.5	5.4	5.8	8.9	9.6	38.0
O&M cost (Som million)	2.6	3.1	3.7	4.3	5.1	6.1	14.7
Operating income (Som million)	0.5	0.3	1.7	1.5	3.9	3.5	23.4
Cash at end of year (Som million)	3.7	4.1	5.7	7.2	10.9		
Operating ratio	0.8	0.9	0.7	0.7	0.6	0.6	0.4
Operating ratio with depreciation	3.6	3.4	2.3	2.2	1.5	1.5	0.6

( ) = negative, m<sup>3</sup> = cubic meter, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

<sup>b</sup> Revenue in proportion to O&M cost. A ratio below 1.0 signifies efficiency to cover O&M cost, and the lower the ratio, the higher the cover.

<sup>c</sup> Revenue in proportion to O&M cost including depreciation.

Source: Asian Development Bank.

19. As of November 2016, the average tariff collection rate in the three subprojects areas was reportedly between 90% and 100%, with on-time collection between 80% and 90%. Tariffs in Osh have been adjusted twice since 2012. Based on historical data during 2012–2015, the Osh and Jalal-Abad *vodokanals* were able to fully recover O&M costs as well depreciation expenses (except in 2013 for Osh). The Bazar-Korgon *vodokanal* was also able to cover O&M cost in its initial year of operation (2016), but the very high operating ratio (including depreciation) in the same year showed an inability to recover even partial depreciation.

20. In the analysis, tariffs were corrected to account for inflation, as the costs were expressed nominally. In the discounted cash flows, tariffs were reflected in real terms. As a sustainability measure, initial tariff increases will start in 2018, 2 years after subproject completion, to give users time to adapt to tariff reforms, including tariffs that are (i) adjusted biennially, and (ii) in line with user willingness to pay. Actual financial performance data at project completion in 2015 and during initial operation in 2015–2016 revealed sufficient O&M cost recovery. Following the projected tariff schedule in Table A16.3, this level is seen to be sustainable until 2040 (Year 24) for the three *vodokanals*. Each operating ratio for Osh and Jalal-Abad is between 0.4 and 0.8, and between 0.3 and 0.9 for Bazar-Korgon. When depreciation is included, the operating ratio is slightly higher at between 0.6 and 0.9 for Osh, and between 0.5 and 0.8 for Jalal-Abad. Bazar-Korgon requires a substantial increase in the operating ratio, until 2023, to recover depreciation.

21. **Affordability analysis.** Affordability analysis was undertaken to ensure households, particularly low-income households, can afford the water and sewerage tariffs. Based on the generally accepted principle that water supply expenditure should not exceed 4%–5% of average household income, the projected water tariffs are considered affordable. With the price of sewerage service included, it is likely acceptable to charge consumers up to 5%–6%.

22. Current subproject water and sewerage tariffs are a fixed monthly payment calculated on constant consumption norms. Part of the tariff reforms is to apply volumetric tariffs based on metered usage. Reviews during appraisal showed a high willingness to acquire and pay for individual service connections because of difficulties encountered with existing supply sources, e.g., water delivery or collection from remote sources, maintenance of own system, and additional cost of treatment to avoid waterborne disease.

23. Table A16.4 demonstrates levels of affordability in 2012, and from 2016 to 2026 (i.e., year 10 of operation after construction) on a biennial basis in tandem with projected tariff increases. Average income data are derived from published national and regional statistics. The analysis reflects the impact of tariff increases on low-middle-income and low-income households. The proportion of spending to income for low-middle-income groups shows applied tariffs in the service areas throughout the study period, on average, to be within the defined maximum affordability of 5%. The average is 1.4% for Osh, 1.8% for Jalal-Abad, and 5.0% for Bazar-Korgon. For low-income households, expenditure is at 0.8% of income for Osh, 1.0% for Jalal-Abad, and 3.9% for Bazar-Korgon.

**Table A16.4: Tariff Affordability Analysis**

Subproject	Year	Low-Middle-Income Household Income □ (Som/month)	Low-Middle-Income Household Water and Sewer Bill □ (Som/month)	Income Allotted to Water for Low-Middle-Income Households □ (%)	Low-Income Household Income □ (Som/month)	Low-Income Household Water and Sewer Bill □ (Som/month)	Income Allotted to Water for Low-Income Households □ (%)
Osh	2012	6,514	65	1.0	4,485	27	0.6
	2016	8,077	95	1.2	5,769	40	0.7
	2018	8,653	111	1.3	6,180	46	0.8
	2020	9,269	130	1.4	6,621	54	0.8
	2022	9,929	153	1.5	7,092	64	0.9
	2024	10,636	179	1.7	7,597	74	1.0
	2026	11,394	209	1.8	8,138	87	1.1
	Average			1.4			0.8
Jalal-Abad	2012	6,514	127	2.0	4,485	53	1.2
	2016	8,077	127	1.6	5,769	53	0.9

Subproject	Year	Low-Middle- Income Household Income □ (Som/ □ month)	Low-Middle- Income Household Water and Sewer Bill □ (Som/mont h)	Income Allotted to Water for Low-Middle- Income Households □ (%)	Low- Income Househol d Income □ (Som/ month)	Low-Income Household Water and Sewer Bill □ (Som/ month)	Income Allotted to Water for Low- Income Househol ds □ (%)
	2018	8,653	145	1.7	6,180	60	1.0
	2020	9,269	165	1.8	6,621	69	1.0
	2022	9,929	189	1.9	7,092	79	1.1
	2024	10,636	215	2.0	7,597	90	1.2
	2026	11,394	245	2.2	8,138	102	1.3
	Average			1.8			1.0
Bazar-Korgon	2012	6,514	( - )	0.0	4,485	( - )	0.0
	2016	8,077	191	2.4	5,769	106	1.8
	2018	8,653	273	3.2	6,180	152	2.5
	2020	9,269	391	4.2	6,621	217	3.3
	2022	9,929	559	5.6	7,092	311	4.4
	2024	10,636	799	7.5	7,597	444	5.8
	2026	11,394	1,143	10.0	8,138	635	7.8
	Average			5.0			3.9

Source: Asian Development Bank.

24. **Weighted average cost of capital.** The WACC was calculated in real terms and used as a basis for measuring subproject financial viability. Funding sources were the ADB loan, weighted at 90.91%, and capital contributions from the government, weighted at 9.09%. Inflation was estimated at an annual average of 1.04% for foreign costs and 6.50% for local costs. The rates were computed on an after-tax basis, resulting in an WACC in real terms estimated at 0.42% at reevaluation. At appraisal, the applied WACC was 1.26%, a test rate in lieu of the negative value of the real cost of capital after applying tax and inflation on the nominal rate.

25. Applying the same test rate at reevaluation would have resulted in base case FIRR for the three subprojects at appraisal higher than the WACC. Table A16.5 presents the WACC at reevaluation, and Table A16.5A presents the WACC at appraisal.

**Table 16.5: Weighted Average Cost of Capital at Reevaluation**

Item	Total Cost	ADB Loan	Equity
Amount (Som million)	735.06	668.24	66.82
Weighting (%)	100.00	90.91	9.09
Nominal cost (%)		1.00	11.47
Tax rate (%)		0.00	0.00
Tax-adjusted nominal cost (%)		1.00	11.47
Inflation rate (%)		1.04	6.50
Real cost (%)	4.63	(0.04)	4.67
Real WACC (%)	0.42	0.00	0.42

( ) = negative, ADB = Asian Development Bank, WACC = weighted average cost of capital.

Source: Asian Development Bank.

**Table 16.5A: Weighted Average Cost of Capital at Appraisal**

Item	Total Cost	ADB Loan	Equity
Amount (Som million)	464.10	464.10	
Weighting (%)	100.00	100.00	0.00
Nominal cost (%)		1.26	6.70
Tax rate (%)		25.00	25.00
Tax-adjusted nominal cost (%)		0.95	5.03
Inflation rate (%)		5.00	7.50
Real cost (%)	(6.16)	(3.86)	(2.30)
Real WACC (%)	1.26	1.26	0.00

( ) = negative, ADB = Asian Development Bank, WACC = weighted average cost of capital.

Source: TA Consultant estimates.

26. **Financial internal rate of return and sensitivity analysis.** Based on the results of the reevaluation, the FIRR is 2.8% for Osh, 6.0% for Jalal-Abad, and 1.4% for Bazar-Korgon, averaging 3.4%. As the reevaluated FIRRs exceed the WACC, the project is considered financially viable. The reevaluated FIRR for Osh is lower than the appraised FIRR of 8.6%, as the appraised FIRR was based on lower cost estimates, a shorter implementation period, and overly optimistic demand forecasts.

27. The sensitivity analysis evaluated the effects on financial viability of a 10% increase in capital and O&M costs, and a 10% decrease in revenues. As at appraisal, all subprojects remained robust under the sensitivity scenarios. With a 10% increase in capital costs, the average FIRR decreased to 2.6%, while with a 10% increase in O&M costs, it decreased to 2.2%. When revenue decreased by 10%, the average FIRR fell to 1.2%. Table A16.6 presents the FIRR and sensitivity analysis. A detailed calculation of the FIRRs is given in Tables A18.14, A18.15, A18.16, and A18.17 in Appendix 18.

**Table A16.6: Financial Internal Rate of Return and Sensitivity Analysis**

At Appraisal								
Subproject	Base Case		Capital Cost +10%		O&M +10%		Revenue -10%	
	FIRR	FNPV	FIRR	FNPV	FIRR	FNPV	FIRR	FNPV
	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)
Osh	8.6	609.8	7.5	553.8	7.9	544.1	6.7	427.1
Jalal-Abad								
Bazar-Korgon								
<b>Total</b>	<b>8.6</b>	<b>609.8</b>	<b>7.5</b>	<b>553.8</b>	<b>7.9</b>	<b>544.1</b>	<b>6.7</b>	<b>427.1</b>
At Project Completion								
Subproject	Base Case		Capital Cost +10%		O&M +10%		Revenue -10%	
	FIRR	FNPV	FIRR	FNPV	FIRR	FNPV	FIRR	FNPV
	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)	(%)	(Som million)
Osh	2.8	245.9	2.0	172.5	1.3	80.6	0.2	(17.5)
Jalal-abad	6.0	505.8	4.9	439.7	4.4	314.2	3.1	197.6
Bazar Korgon	1.4	89.4	0.9	48.9	1.2	63.2	0.6	13.7
<b>Total</b>	<b>3.4</b>	<b>841.1</b>	<b>2.6</b>	<b>661.1</b>	<b>2.2</b>	<b>458.0</b>	<b>1.2</b>	<b>193.8</b>

( ) negative, FIRR = financial internal rate of return, FNPV = financial net present value, O&M = operation and maintenance.

Source: Asian Development Bank.

## OVERALL PROJECT RATING

Criterion	Weight	Definition	Rating Description	Rating Values	Score
Relevance	25%	The consistency of the project impact and outcome with country and sector priorities and the strategic objectives of the Asian Development Bank as well as the adequacy of its design in addressing identified development constraints.	Highly relevant Relevant Less relevant Irrelevant	3 2 1 0	3.00
Effectiveness	25%	The extent to which the project outcome as specified in the design and monitoring framework (either as agreed at approval or subsequently modified) was achieved.	Highly effective Effective Less effective Ineffective	3 2 1 0	2.00
Efficiency	25%	How resources were converted to results, using cost-benefit analysis based on a calculation of the economic internal rate of return for investment projects, if feasible, as well as other cost-effectiveness analysis. Other indicators such as a comparison between forecast unit costs (in the report and recommendation of the President) and actual unit costs and process efficiency should be considered when reliable economic internal rates of return or cost-effectiveness analyses cannot be conducted or do not cover the whole project.	Highly efficient Efficient Less efficient Inefficient	3 2 1 0	2.00
Sustainability	25%	The likelihood that institutional, financial, and other resources are sufficient to sustain the project's outcome over its economic life in an environmentally and socially sustainable way.	Most likely sustainable Likely sustainable Less likely sustainable Unlikely sustainable	3 2 1 0	2.00
<b>Overall assessment</b> (weighted average of the above criteria)		A "successful" rating encompasses an overall weighted average from 1.75 to 2.50	<b>Successful</b>		<b>2.25</b>

Source: Asian Development Bank.

## PER SUBPROJECT AND CONSOLIDATED ECONOMIC INTERNAL RATE OF RETURN ANALYSIS

**Table A18.1: Incremental and Non-incremental Water: Osh *Vodokanal***

<b>Incremental and Non-Incremental Water</b>							
<b>Item</b>	<b>2016 Year 0</b>	<b>2017 Year 1</b>	<b>2018 Year 2</b>	<b>2019 Year 3</b>	<b>2020 Year 4</b>	<b>2021 Year 5</b>	<b>2030 Year 14</b>
Production, existing (m <sup>3</sup> million)	13.018	13.018	13.018	13.018	13.018	13.018	13.018
Production, new (m <sup>3</sup> million)	16.383	16.383	16.383	16.383	16.383	16.383	16.383
NRW, existing (%)	60	60	59	60	59	59	59
NRW, new (%)	10	10	10	10	10	10	10
NRW, existing (m <sup>3</sup> million)	7.801	7.794	7.739	7.777	7.722	7.666	7.649
Water loss, existing (m <sup>3</sup> million)	1.638	1.638	1.638	1.638	1.638	1.638	1.638
Water loss, new (m <sup>3</sup> million)	9.439	9.432	9.378	9.415	9.360	9.304	9.287
Non-technical loss (m <sup>3</sup> million)	6.607	6.603	6.564	6.590	6.552	6.513	6.501
Technical loss (m <sup>3</sup> million)	2.832	2.830	2.813	2.824	2.808	2.791	2.786
Water sold, existing (m <sup>3</sup> million)	5.218	5.224	5.279	5.241	5.296	5.352	5.369
Water sold (m <sup>3</sup> million)	11.784	11.798	11.922	11.837	11.961	12.087	12.126
Non-incremental water (m <sup>3</sup> million)	5.218	5.224	5.279	5.241	5.296	5.352	5.369
Incremental water (m <sup>3</sup> million)	6.566	6.574	6.643	6.596	6.665	6.735	6.757
Consumption (m <sup>3</sup> million)	14.615	14.628	14.735	14.662	14.769	14.878	14.912

m<sup>3</sup> = cubic meter, NRW = non-revenue water.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

<b>Non-Incremental Benefits of Water</b>							
<b>Item</b>	<b>2016 Year 0</b>	<b>2017 Year 1</b>	<b>2018 Year 2</b>	<b>2019 Year 3</b>	<b>2020 Year 4</b>	<b>2021 Year 5</b>	<b>2030 Year 14</b>
Collection time/travel cost savings							
Annual collection/time (hour)	73	73	73	73	73	73	73
Unskilled labor, Minimum wage rate	37.52	38.83	40.19	41.60	43.06	44.56	60.74
Shadow wage rate factor (Som/hour)	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Total household resource cost savings (Som)	1,917	1,984	2,054	2,126	2,200	2,277	3,104
Share of unserved population potentially benefiting (%)	56	56	56	56	56	56	56
Net resource cost savings (Som)	1,079	1,116	1,155	1,196	1,238	1,281	1,746
Average annual household consumption (non-incremental) from wells (m <sup>3</sup> )	413	413	446	446	482	482	708
Price of non-incremental water <sup>a</sup> (Som/m <sup>3</sup> )	3	3	3	3	3	3	2
Non-incremental water (m <sup>3</sup> )	5.218	5.224	5.279	5.241	5.296	5.352	5.369
Value of non-incremental water	14	14	14	14	14	14	13

Source: Asian Development Bank.

**Incremental Benefits of Water**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
<b>Incremental Benefits of Water</b>							
Demand price with project (Som/m <sup>3</sup> )	2.99	2.99	2.99	2.99	2.99	2.99	2.99
Demand price (WTP price) without project <sup>a</sup> (Som/m <sup>3</sup> )	2.10	2.10	2.10	2.10	2.10	2.10	2.10
WTP Price with Project <sup>a</sup> (Som/m <sup>3</sup> )	2.54	2.54	2.54	2.54	2.54	2.54	2.54
Incremental water (m <sup>3</sup> )	6.566	6.574	6.643	6.596	6.665	6.735	6.757
Non-technical water <sup>b</sup> (m <sup>3</sup> )	6.607	6.603	6.564	6.590	6.552	6.513	6.501
Total incremental water (m <sup>3</sup> )	13.173	13.177	13.207	13.186	13.217	13.248	13.258
Value of incremental water <sup>c</sup> (Som)	33	34	34	34	34	34	34

m<sup>3</sup> = cubic meters, WTP = willingness-to-pay.

<sup>b</sup> Available water generated from non-revenue water improvement.

Source: Asian Development Bank

**Health Benefit: Avoided Cost of Lost Workdays**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Households reporting work absences due to illness (%)	20	20	20	20	20	20	20
Households reporting work absences due to illness (number)	14,873	15,171	15,474	15,783	16,099	16,421	19,625
Workdays lost per household per month (day)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Days lost due to unsanitary conditions (%)	50	50	50	50	50	50	50
Days lost due to unsanitary conditions (day)	2.00	2.00	2.00	2.00	2.00	2.00	2.00
Total working days lost per year (day)	357,712	364,866	372,164	379,607	387,199	394,943	471,993
Average daily wage	300	300	300	300	300	300	300
Avoided cost of lost workdays	107.37	109.52	111.71	113.95	116.23	118.55	141.68

Source: Asian Development Bank.

**Table A18.2: Operation and Maintenance Cost: Osh *Vodokanal*<sup>a</sup>**

Item	2014	2015	2016	2017
Unit financial O&M cost (Som/m <sup>3</sup> )	1.69	1.52	1.91	1.94
Cost of goods sold (Som/m <sup>3</sup> )	1.54	1.45	1.73	1.76
Distribution cost (Som/m <sup>3</sup> )	0.00	0.00	0.00	0.0049
General administrative cost (Som/m <sup>3</sup> )	0.15	0.06	0.18	0.18
Annual financial O&M, constant prices (Som million)	22.00	24.82	31.22	31.84
Cost of goods sold (Som million)	20.09	23.70	28.26	28.83
Distribution cost (Som million)	0.00	0.06	0.08	0.08
General administrative cost (Som million)	1.91	1.06	2.88	2.94
Annual financial O&M, current prices (Som million)	22.00	24.82	31.22	33.92
Annual economic O&M constant prices (Som million)	20.44	23.06	29.00	29.58

m<sup>3</sup> = cubic meter, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.



Table A18.3.1: Incremental and Non-incremental Water: Jalal-Abad *Vodokanal*<sup>a</sup>

Incremental and Non-Incremental Water							
Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Production, existing (m <sup>3</sup> million)	12.275	12.275	12.275	12.275	12.275	12.275	12.275
Production, new (m <sup>3</sup> million)	13.574	13.575	13.574	13.574	13.574	13.574	11.784
NRW, existing (%)	58	56	55	53	51	45	28
NRW, new (%)	10	10	10	10	10	10	10
NRW, existing (m <sup>3</sup> million)	7.119	6.913	6.701	6.482	6.257	5.578	3.403
Water loss, existing (m <sup>3</sup> million)	1.357	1.357	1.357	1.357	1.357	1.357	1.178
Water loss, new (m <sup>3</sup> million)	8.477	8.271	8.058	7.839	7.614	6.936	4.582
Non-technical loss (m <sup>3</sup> million)	5.934	5.790	5.641	5.488	5.330	4.855	3.207
Technical loss (m <sup>3</sup> million)	2.543	2.481	2.417	2.352	2.284	2.081	1.374
Water sold, existing (m <sup>3</sup> million)	5.155	5.361	5.574	5.793	6.018	6.696	8.872
Water sold (m <sup>3</sup> million)	10.856	11.290	11.738	12.199	12.673	14.101	17.388
Non-incremental water (m <sup>3</sup> million)	5.155	5.361	5.574	5.793	6.018	6.696	8.872
Incremental water (m <sup>3</sup> million)	5.701	5.929	6.164	6.406	6.655	7.405	8.516
Consumption (m <sup>3</sup> million)	13.399	13.772	14.155	14.550	14.957	16.182	18.763

m<sup>3</sup> = cubic meters, NRW = non-revenue water.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.3.2: Non-incremental Benefits: Jalal-Abad Vodokana<sup>a</sup>**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Collection time/travel cost savings							
Annual collection/travel time (hour)	385	385	385	385	385	385	385
Unskilled labor, minimum wage rate (Som/hour)	37.52	38.83	40.19	41.60	43.06	44.56	60.74
Shadow wage rate factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Subtotal: collection cost (Som)	10,113	10,467	10,833	11,213	11,605	12,011	16,370
Well/pump cost savings							
Unit cost (Som)							
Capital recovery of 10 years at 2015 interest rate (Som)	978	978	978	978	978	978	-
O&M cost, 5% of annualized capital cost (Som)	250	250	250	250	250	250	250
Subtotal: well/pump cost savings (Som)	1,228	1,228	1,228	1,228	1,228	1,228	250
Storage (drum) cost savings							
Unit cost (Som)							
Capital recovery of 10 years at current 2015 interest rate (Som)	78	78	78	78	78	78	-
O&M cost, 5% of annualized capital cost (Som)	20	20	20	20	20	20	20
Subtotal: storage cost savings (Som)	98	98	98	98	98	98	98
Total household resource cost savings (Som)	11,440	11,794	12,160	12,539	12,932	13,338	16,718
Share of unserved population potentially benefiting (%)	50	50	50	50	50	50	50
Net resource cost savings (Som)	5,720	5,897	6,080	6,270	6,466	6,669	8,359
Average annual household consumption (non-incremental) from wells (m <sup>3</sup> )	523	523	523	523	523	523	523
Price of non-incremental water <sup>a</sup> (Som/m <sup>3</sup> )	11	11	12	12	12	13	16
Non-incremental water (m <sup>3</sup> )	5.155	5.361	5.574	5.793	6.018	6.696	8.872
Value of non-incremental water (Som)	56	60	65	69	74	85	142

m<sup>3</sup> = cubic meter, O&M = operation and maintenance.

<sup>a</sup> Calculated by dividing resource cost savings by average annual consumption without the project (non-incremental).

Source: Asian Development Bank.

**Table A18.3.3: Incremental Benefits: Jalal-Abad Vodokana<sup>a</sup>**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Demand price with project (Som/m <sup>3</sup> )	5.70	5.70	5.70	5.70	5.70	5.70	5.70
Demand price (WTP price) without project <sup>a</sup> (Som/m <sup>3</sup> )	1.40	1.40	1.40	1.40	1.40	1.40	1.40
WTP price with project <sup>a</sup> (Som/m <sup>3</sup> )	3.55	3.55	3.55	3.55	3.55	3.55	3.55
Incremental water (m <sup>3</sup> )	5.701	5.929	6.164	6.406	6.655	7.405	8.516
Non-technical water <sup>b</sup> (m <sup>3</sup> )	5.934	5.790	5.641	5.488	5.330	4.855	3.207
Total incremental water (m <sup>3</sup> )	11.635	11.719	11.805	11.893	11.985	12.260	11.724
Value of incremental water <sup>c</sup> (Som)	41	42	42	42	43	44	42

m<sup>3</sup> = cubic meter, WTP = willingness-to-pay.

<sup>a</sup> WTP price as proxy for demand price for water from wells and other sources. Based on 20% accruing to the project.

<sup>b</sup> Available water generated from non-revenue water improvement.

<sup>c</sup> Current price of water multiplied by the volume of non-revenue water recovered.

Source: Asian Development Bank.

**Table A18.3.4: Avoided Cost of Illness: Jalal-Abad Vodokana<sup>a</sup>**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Households reported work absences due to illness (%)	20	20	20	20	20	20	20
Households reported work absences due to illness (number)	3,739	3,888	4,043	4,201	4,365	4,857	6,239
Workdays lost per household per month (day)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Days lost due to unsanitary conditions (%)	100	100	100	100	100	100	100
Days lost due to unsanitary conditions (day)	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Total working days lost per year (day)	179,469	186,648	194,042	201,657	209,499	233,116	299,489
Average daily wage (Som)	300	300	300	300	300	300	300
Avoided cost of lost workdays (Som million)	53.87	56.03	58.25	60.53	62.89	69.97	89.90

Source: Asian Development Bank.

**Table A18.4: Operation and Maintenance Cost: Jalal-Abad *Vodokanal*<sup>a</sup>**

<b>Item</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>
Unit financial O&M cost (Som/m <sup>3</sup> )	3.10	2.89	2.95	3.01
Materials (Som/m <sup>3</sup> )	0.39	0.36	0.36	0.37
Power and fuel (Som/m <sup>3</sup> )	0.69	0.67	0.68	0.69
Personnel (Som/m <sup>3</sup> )	1.34	1.49	1.52	1.55
Administrative (Som/m <sup>3</sup> )	0.23	0.19	0.20	0.20
Other production expense (Som/m <sup>3</sup> )	0.01	0.04	0.04	0.04
Miscellaneous (Som/m <sup>3</sup> )	0.44	0.15	0.16	0.16
Annual financial O&M, constant prices (Som million)	38.07	37.75	39.85	40.65
Materials (Som million)	4.84	4.64	4.92	5.02
Power and fuel (Som million)	8.50	8.69	9.22	9.40
Personnel (Som million)	16.39	19.40	20.59	21.00
Administrative (Som million)	2.85	2.54	2.59	2.65
Other production expense (Som million)	0.08	0.50	0.51	0.52
Miscellaneous (Som million)	5.43	1.99	2.03	2.07
Annual financial O&M, current prices (Som million)	38.07	37.75	39.85	43.29
Annual economic O&M, constant prices (Som million)	35.38	35.08	37.03	37.77

m<sup>3</sup>= cubic meters, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank

**Table A18.5.1: Incremental and Non-incremental Water: Bazar-Korgon *Vodokanal***

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Production, new (m <sup>3</sup> million)	0.195	0.195	0.195	0.195	0.195	0.195	0.195
Production, existing (m <sup>3</sup> million)	0.098	0.098	0.098	0.098	0.098	0.098	0.098
NRW, existing (%)	20	20	20	20	20	20	20
NRW, new (%)	10	10	10	10	10	10	10
NRW, existing (m <sup>3</sup> million)	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Water loss, existing (m <sup>3</sup> million)	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Water loss, new (m <sup>3</sup> million)	0.049	0.049	0.049	0.049	0.049	0.049	0.049
Non-technical loss (m <sup>3</sup> million)	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Technical loss (m <sup>3</sup> million)	0.039	0.039	0.039	0.039	0.039	0.039	0.039
Water sold existing (m <sup>3</sup> million)	0.156	0.156	0.156	0.156	0.156	0.156	0.156
Water sold (m <sup>3</sup> million)	0.312	0.332	0.347	0.362	0.378	0.395	0.480
Non-incremental water (m <sup>3</sup> million)	0.156	0.156	0.156	0.156	0.156	0.156	0.156
Incremental water (m <sup>3</sup> million)	0.156	0.176	0.191	0.206	0.222	0.239	0.324
Consumption (m <sup>3</sup> million)	0.351	0.371	0.386	0.401	0.417	0.434	0.519

m<sup>3</sup> = cubic meter, NRW = non-revenue water.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank

**Table A18.5.2: Non-incremental Benefits: Bazar-Korgon Vodokanal**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Collection time/travel cost savings							
Annual collection/time (hour)	548	548	548	548	548	548	548
Unskilled labor, minimum wage rate (Som/hour)	37.52	38.83	40.19	41.60	43.06	44.56	60.74
Shadow wage rate factor	0.70	0.70	0.70	0.70	0.70	0.70	0.70
Subtotal: collection cost savings (Som)	14,380	14,883	15,404	15,943	16,501	17,079	23,277
Well/pump cost savings							
Unit cost (Som)							
Capital recovery of 10 years at 2015 interest rate (Som)	978	978	978	978	978	978	-
O&M cost, 5% of annualized capital cost (Som)	250	250	250	250	250	250	250
Subtotal: well/pump cost savings (Som)	1,228	1,228	1,228	1,228	1,228	1,228	250
Storage (drum) cost savings							
Unit cost (Som)							
Capital recovery of 10 years at 2015 interest rate (Som)	78	78	78	78	78	78	-
O&M cost, 5% of annualized capital cost (Som)	20	20	20	20	20	20	20
Subtotal: storage cost savings (Som)	98	98	98	98	98	98	98
Total household resource cost savings (Som)	15,707	16,210	16,731	17,270	17,828	18,406	23,625
Share of unserved population potentially benefiting (%)	85	85	85	85	85	85	85
Net resource cost savings (Som)	13,393	13,823	14,267	14,727	15,202	15,695	20,146
Average annual household consumption (non-incremental) from wells (m <sup>3</sup> )	1,080	1,080	1,350	1,350	1,688	1,688	5,150
Price of non-incremental water <sup>a</sup> (Som/m <sup>3</sup> )	12	13	11	11	9	9	4
Non-incremental water (m <sup>3</sup> million)	0.156	0.156	0.156	0.156	0.156	0.156	0.156
Value of non-incremental water (Som million)	1.94	2.00	1.65	1.70	1.41	1.45	0.61

m<sup>3</sup> = cubic meter, O&M = operation and maintenance.

<sup>a</sup> Calculated by dividing resource cost savings by average annual consumption without the project (non-incremental).

Source: Asian Development Bank

**Incremental Benefits of Water**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Demand price with project (Som/m <sup>3</sup> )	24.05	24.05	24.05	24.05	24.05	24.05	24.05
Demand price (WTP Price) without project <sup>a</sup> (Som/m <sup>3</sup> )	7.00	7.00	7.00	7.00	7.00	7.00	7.00
WTP price with project <sup>a</sup> (Som/m <sup>3</sup> )	15.53	15.53	15.53	15.53	15.53	15.53	15.53
Incremental water (m <sup>3</sup> million)	0.156	0.176	0.191	0.206	0.222	0.239	0.324
Non-technical water <sup>b</sup> (m <sup>3</sup> million)	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Total Incremental Water (m <sup>3</sup> million)	0.166	0.185	0.200	0.216	0.232	0.248	0.333
Value of incremental water <sup>c</sup> (Som million)	2.58	2.88	3.11	3.35	3.60	3.86	5.18

m<sup>3</sup> = cubic meter, WTP = willingness-to-pay.

<sup>a</sup> WTP price as proxy for demand price for water from wells and other sources. Based on 100% accruing to the project.

<sup>b</sup> Available water generated from non-revenue water improvement.

<sup>c</sup> Current price of water multiplied by the volume of non-revenue water recovered.

Source: Asian Development Bank

**Table A18.5.3: Incremental Benefits of Water: Bazar-Korgon Vodokanal**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14
Households reported work absences due to illness (%)	30	30	30	30	30	30	30
Households reported work absences due to illness (number)	364	410	444	480	518	556	755
Workdays lost per household per month (day)	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Days lost due to unsanitary conditions (%)	100	100	100	100	100	100	100
Days lost due to unsanitary conditions (day)	4.00	4.00	4.00	4.00	4.00	4.00	4.00
Total working days lost per year (day)	17,467	19,664	21,332	23,060	24,848	26,698	36,224
Average daily wage (Som)	300	300	300	300	300	300	300
Avoided cost of lost workdays (Som million)	5.24	5.90	6.40	6.92	7.46	8.01	10.87

Source: Asian Development Bank.

**Table 18.6: Operation and Maintenance Cost: Bazar-Korgon Vodokanal<sup>a</sup>**

Item	2016	2017
Unit financial O&M cost (Som/m <sup>3</sup> )	13.07	13.33
Salary (Som/m <sup>3</sup> )	7.62	7.78
Power (Som/m <sup>3</sup> )	0.96	0.98
Chemicals (Som/m <sup>3</sup> )	0.36	0.37
Maintenance (Som/m <sup>3</sup> )	0.95	0.97
Administration (Som/m <sup>3</sup> )	0.67	0.69
Miscellaneous (Som/m <sup>3</sup> )	2.50	2.55
Annual financial O&M, constant prices (Som million)	2.55	2.93
Salary (Som million)	1.49	1.71
Power (Som million)	0.19	0.22
Chemicals (Som million)	0.07	0.08
Maintenance (Som million)	0.19	0.21
Administration (Som million)	0.13	0.15
Miscellaneous (Som million)	0.49	0.56
Annual financial O&M, current prices (Som million)	2.55	3.12
Annual economic O&M, constant prices (Som million)	2.37	2.73

m<sup>3</sup> = cubic meter, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.



**Table A18.7: Economic Internal Rate of Return and Sensitivity Analysis: Osh Vodokana<sup>a</sup>**  
(Som million)

(€m million)											
Benefits		Costs				Net Inflow (Outflow)				Benefits - Total Cost +10%	Implementation Delay by 1 Year
Year	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit - --10%		
2012	0.0	14.8	14.8	0.0	(14.8)	(16.3)	(14.8)	(16.3)	(14.8)	(16.3)	(14.8)
2013	0.0	22.2	22.2	0.0	(22.2)	(24.4)	(22.2)	(24.4)	(22.2)	(24.4)	(22.2)
2014	0.0	509.2	509.2	0.0	(509.2)	(560.1)	(509.2)	(560.1)	(509.2)	(560.1)	(509.2)
2015	150.0	159.7	136.6	23.1	(9.7)	(23.3)	(12.0)	(25.6)	(24.7)	(40.6)	(159.7)
2016	154.5	29.0	0.0	29.0	125.5	125.5	122.6	122.6	110.0	107.1	121.0
2017	157.2	29.6	0.0	29.6	127.6	127.6	124.6	124.6	111.9	108.9	124.9
2018	157.9	30.2	0.0	30.2	127.7	127.7	124.7	124.7	112.0	108.9	127.0
2019	160.5	30.8	0.0	30.8	129.7	129.7	126.6	126.6	113.6	110.5	127.1
2020	163.5	31.4	0.0	31.4	132.1	132.1	128.9	128.9	115.7	112.6	129.1
2021	167.1	33.0	0.0	33.0	134.1	134.1	130.8	130.8	117.4	114.1	130.5
2022	168.6	34.6	0.0	34.6	134.0	134.0	130.5	130.5	117.1	113.7	132.4
2023	172.2	36.3	0.0	36.3	135.8	135.8	132.2	132.2	118.6	115.0	132.2
2024	173.8	38.2	0.0	38.2	135.6	135.6	131.8	131.8	118.2	114.4	134.0
2025	177.4	40.1	0.0	40.1	137.3	137.3	133.3	133.3	119.6	115.5	133.7
2026	179.0	42.9	0.0	42.9	136.1	136.1	131.8	131.8	118.2	113.9	134.5
2027	182.6	45.9	0.0	45.9	136.7	136.7	132.2	132.2	118.5	113.9	133.1
2028	184.4	49.1	0.0	49.1	135.3	135.3	130.4	130.4	116.8	111.9	133.5
2029	188.0	52.5	0.0	52.5	135.5	135.5	130.2	130.2	116.7	111.4	131.8
2030	189.9	56.2	0.0	56.2	133.7	133.7	128.0	128.0	114.7	109.1	131.8
2031	193.5	61.3	0.0	61.3	132.2	132.2	126.1	126.1	112.9	106.8	128.6
2032	195.4	77.9	11.1	66.8	117.6	116.5	110.9	109.8	98.0	90.3	115.6
2033	199.1	72.8	0.0	72.8	126.4	126.4	119.1	119.1	106.4	99.2	122.7
2034	201.2	79.3	0.0	79.3	121.9	121.9	114.0	114.0	101.8	93.8	119.8
2035	205.0	86.5	0.0	86.5	118.5	118.5	109.9	109.9	98.0	89.4	114.8
2036	207.2	94.3	0.0	94.3	113.0	113.0	103.6	103.6	92.3	82.8	110.7
2037	211.1	102.7	0.0	102.7	108.3	108.3	98.1	98.1	87.2	77.0	104.5
2038	213.5	112.0	0.0	112.0	101.5	101.5	90.3	90.3	80.2	69.0	99.1
2039	217.4	122.1	0.0	122.1	95.3	95.3	83.1	83.1	73.6	61.4	91.4
2040	219.5	133.0	0.0	133.0	86.4	86.4	73.1	73.1	64.5	51.2	84.4
2041	223.2	145.0	0.0	145.0	78.2	78.2	63.7	63.7	55.9	41.3	74.4
EIRR (%)					19.1	17.3	18.6	16.7	16.5	14.3	15.5
ENPV	957.2	708.6	481.3	227.4	248.6	200.5	225.8	177.7	152.9	82.0	139.4
Sensitivity Indicator (%)											

Year	Benefits		Costs			Net Inflow (Outflow)					Implementation Delay by 1 Year
	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit - -10%	Benefits - Total Cost +10%	
EIRR						0.96	0.28	1.23	1.36	2.53	0.73
ENPV						1.94	0.91	2.85	3.85	6.70	1.69
<b>Switching Value (%)</b>											
EIRR						1.04	3.53	0.81	0.74	0.40	1.37
ENPV						0.52	1.09	0.35	0.26	0.15	0.00

( ) negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.8: Economic Internal Rate of Return and Sensitivity Analysis: Jalal-Abad Vodokana<sup>a</sup>**  
(Som million)

Year	Benefits		Costs		Net Inflow (Outflow)						Implementation Delay by 1 Year
	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit -10%	Benefits - Total Cost +10%	
2012	0.0	14.8	14.8	0.0	(14.8)	(16.3)	(14.8)	(16.3)	(14.8)	(16.3)	(14.8)
2013	0.0	22.2	22.2	0.0	(22.2)	(24.4)	(22.2)	(24.4)	(22.2)	(24.4)	(22.2)
2014	0.0	453.1	453.1	0.0	(453.1)	(498.4)	(453.1)	(498.4)	(453.1)	(498.4)	(453.1)
2015	131.7	157.7	122.6	35.1	(26.0)	(38.2)	(29.5)	(41.8)	(39.2)	(54.9)	(157.7)
2016	140.2	37.0	0.0	37.0	103.2	103.2	99.5	99.5	89.2	85.5	94.7
2017	146.7	37.8	0.0	37.8	108.9	108.9	105.1	105.1	94.2	90.5	102.5
2018	145.5	38.5	0.0	38.5	107.0	107.0	103.1	103.1	92.4	88.6	108.2
2019	152.1	39.3	0.0	39.3	112.8	112.8	108.9	108.9	97.6	93.7	106.2
2020	151.0	40.1	0.0	40.1	110.9	110.9	106.9	106.9	95.8	91.8	112.0
2021	167.3	42.1	0.0	42.1	125.2	125.2	121.0	121.0	108.5	104.3	108.9
2022	166.1	43.3	0.0	43.3	122.8	122.8	118.5	118.5	106.2	101.9	124.0
2023	174.2	43.9	0.0	43.9	130.2	130.2	125.8	125.8	112.8	108.4	122.1
2024	172.7	45.2	0.0	45.2	127.5	127.5	123.0	123.0	110.2	105.7	128.9
2025	176.3	46.1	0.0	46.1	130.3	130.3	125.6	125.6	112.6	108.0	126.7
2026	175.1	48.4	0.0	48.4	126.6	126.6	121.8	121.8	109.1	104.3	127.9
2027	179.5	51.8	0.0	51.8	127.7	127.7	122.5	122.5	109.7	104.6	123.2
2028	175.7	55.5	0.0	55.5	120.2	120.2	114.7	114.7	102.6	97.1	124.1
2029	180.1	59.4	0.0	59.4	120.8	120.8	114.8	114.8	102.8	96.8	116.3
2030	176.8	63.5	0.0	63.5	113.3	113.3	106.9	106.9	95.6	89.3	116.6
2031	181.2	69.2	0.0	69.2	112.0	112.0	105.1	105.1	93.9	87.0	107.6
2032	178.4	86.5	11.1	75.5	91.8	90.7	84.3	83.2	74.0	65.3	94.7
2033	182.8	82.2	0.0	82.2	100.6	100.6	92.4	92.4	82.3	74.1	96.1
2034	180.4	89.6	0.0	89.6	90.8	90.8	81.8	81.8	72.8	63.8	93.2
2035	184.9	97.7	0.0	97.7	87.2	87.2	77.5	77.5	68.7	59.0	82.7
2036	177.2	106.5	0.0	106.5	70.7	70.7	60.1	60.1	53.0	42.4	78.4
2037	181.6	116.1	0.0	116.1	65.5	65.5	53.9	53.9	47.3	35.7	61.2
2038	175.9	126.5	0.0	126.5	49.4	49.4	36.7	36.7	31.8	19.1	55.0
2039	180.1	137.9	0.0	137.9	42.2	42.2	28.4	28.4	24.2	10.4	38.0
2040	176.1	150.3	0.0	150.3	25.8	25.8	10.8	10.8	8.2	(6.9)	29.8
2041	180.3	163.9	0.0	163.9	16.4	16.4	0.1	0.1	(1.6)	(18.0)	12.3
EIRR (%)					18.0	16.3	17.2	15.5	15.3	12.8	14.4

Year	Benefits		Costs			Net Inflow (Outflow)					Implementation Delay by 1 Year
	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit -10%	Benefits - Total Cost +10%	
ENPV	896.3	709.3	432.4	276.9	187.0	143.8	159.4	116.1	97.4	26.5	85.6
<b>Sensitivity Indicator (%)</b>											
EIRR						0.97	0.43	1.38	1.52	2.87	0.96
ENPV						2.31	1.48	3.79	4.79	8.58	2.60
<b>Switching Value (%)</b>											
EIRR						1.09	2.48	0.77	0.70	0.37	1.11
ENPV						0.43	0.68	0.26	0.21	0.12	0.00

( ) = negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.9: Economic Internal Rate of Return and Sensitivity Analysis: Bazar-Korgon Vodokanal<sup>a</sup>**  
(Som million)

Year	Benefits	Costs			Net Inflow (Outflow)						Implementation Delay by 1 Year
	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit -10%	Benefits - Total Cost +10%	
2012	0.0	14.8	14.8	0.0	(14.8)	(16.3)	(14.8)	(16.3)	(14.8)	(16.3)	(14.8)
2013	0.0	22.3	22.3	0.0	(22.3)	(24.5)	(22.3)	(24.5)	(22.3)	(24.5)	(22.3)
2014	0.0	261.1	261.1	0.0	(261.1)	(287.2)	(261.1)	(287.2)	(261.1)	(287.2)	(261.1)
2015	0.0	74.6	74.6	0.0	(74.6)	(82.1)	(74.6)	(82.1)	(74.6)	(82.1)	(74.6)
2016	53.7	2.4	0.0	2.4	51.3	51.3	51.1	51.1	46.0	45.7	(2.4)
2017	56.5	2.7	0.0	2.7	53.7	53.7	53.5	53.5	48.1	47.8	51.0
2018	58.4	3.0	0.0	3.0	55.4	55.4	55.1	55.1	49.6	49.3	53.5
2019	61.1	3.3	0.0	3.3	57.7	57.7	57.4	57.4	51.6	51.3	55.1
2020	63.3	3.7	0.0	3.7	59.7	59.7	59.3	59.3	53.3	53.0	57.4
2021	66.1	4.1	0.0	4.1	62.0	62.0	61.6	61.6	55.4	55.0	59.2
2022	69.8	5.1	0.0	5.1	64.8	64.8	64.2	64.2	57.8	57.3	61.0
2023	74.1	6.2	0.0	6.2	67.9	67.9	67.3	67.3	60.5	59.9	63.7
2024	74.8	6.5	0.0	6.5	68.3	68.3	67.7	67.7	60.8	60.2	67.6
2025	75.7	6.8	0.0	6.8	68.9	68.9	68.2	68.2	61.3	60.7	68.0
2026	76.5	7.3	0.0	7.3	69.2	69.2	68.5	68.5	61.6	60.9	68.4
2027	77.5	7.8	0.0	7.8	69.7	69.7	68.9	68.9	61.9	61.2	68.7
2028	78.3	8.3	0.0	8.3	70.0	70.0	69.1	69.1	62.1	61.3	69.1
2029	79.3	8.9	0.0	8.9	70.4	70.4	69.5	69.5	62.4	61.5	69.4
2030	80.1	9.5	0.0	9.5	70.6	70.6	69.6	69.6	62.6	61.6	69.7
2031	81.1	10.4	0.0	10.4	70.7	70.7	69.7	69.7	62.6	61.6	69.7
2032	82.0	22.4	11.1	11.3	59.6	58.4	58.4	57.3	51.4	49.1	58.7
2033	82.9	12.4	0.0	12.4	70.6	70.6	69.4	69.4	62.3	61.1	69.6
2034	83.8	13.5	0.0	13.5	70.4	70.4	69.0	69.0	62.0	60.6	69.5
2035	84.8	14.7	0.0	14.7	70.1	70.1	68.7	68.7	61.6	60.2	69.2
2036	85.7	16.0	0.0	16.0	69.7	69.7	68.1	68.1	61.1	59.5	68.8
2037	86.7	17.4	0.0	17.4	69.2	69.2	67.5	67.5	60.6	58.8	68.3
2038	87.6	19.0	0.0	19.0	68.6	68.6	66.7	66.7	59.8	57.9	67.7
2039	88.6	20.7	0.0	20.7	67.8	67.8	65.8	65.8	59.0	56.9	66.9
2040	89.5	22.6	0.0	22.6	66.9	66.9	64.7	64.7	58.0	55.7	66.0
2041	90.5	24.6	0.0	24.6	65.9	65.9	63.4	63.4	56.8	54.3	64.9
EIRR (%)					14.0	12.8	13.9	12.7	12.5	11.3	12.3

Year	Benefits		Costs			Net Inflow (Outflow)					Implementation Delay by 1 Year
	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit -10%	Benefits - Total Cost +10%	
ENPV	342.0	295.7	265.2	30.5	46.3	19.8	43.3	16.8	12.1	(17.4)	7.0
<b>Sensitivity Indicator (%)</b>											
EIRR						0.86	0.09	0.95	1.04	1.95	0.91
ENPV						5.72	0.66	6.38	7.38	13.76	6.27
<b>Switching Value (%)</b>											
EIRR						1.58	15.92	1.44	1.31	0.70	1.50
ENPV						0.17	1.52	0.16	0.14	0.07	0.00

( ) = negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank

**Table A18.10: Economic Internal Rate of Return and Sensitivity Analysis: Consolidated *Vodokanals*<sup>a</sup>**  
(Som million)<sup>'</sup>

Year	Benefits		Costs		Net Inflow (Outflow)						Implementation Delay by 1 Year
	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit -10%	Benefits - Total Cost +10%	
2012	0.0	44.5	44.5	0.0	(44.5)	(48.9)	(44.5)	(48.9)	(44.5)	(48.9)	(44.5)
2013	0.0	66.7	66.7	0.0	(66.7)	(73.4)	(66.7)	(73.4)	(66.7)	(73.4)	(66.7)
2014	0.0	1,223.4	1,223.4	0.0	(1,223.4)	(1,345.7)	(1,223.4)	(1,345.7)	(1,223.4)	(1,345.7)	(1,223.4)
2015	281.7	392.0	333.8	58.1	(110.2)	(143.6)	(116.1)	(149.4)	(138.4)	(177.6)	(392.0)
2016	348.5	68.4	0.0	68.4	280.1	280.1	273.2	273.2	245.2	238.4	213.3
2017	360.3	70.1	0.0	70.1	290.2	290.2	283.2	283.2	254.2	247.2	278.4
2018	361.9	71.7	0.0	71.7	290.1	290.1	283.0	283.0	254.0	246.8	288.6
2019	373.6	73.4	0.0	73.4	300.2	300.2	292.9	292.9	262.9	255.5	288.5
2020	377.8	75.1	0.0	75.1	302.7	302.7	295.2	295.2	264.9	257.4	298.5
2021	400.4	79.2	0.0	79.2	321.3	321.3	313.3	313.3	281.2	273.3	298.6
2022	404.5	83.0	0.0	83.0	321.5	321.5	313.2	313.2	281.1	272.8	317.5
2023	420.4	86.4	0.0	86.4	334.0	334.0	325.3	325.3	291.9	283.3	318.1
2024	421.3	89.9	0.0	89.9	331.4	331.4	322.4	322.4	289.3	280.3	330.5
2025	429.4	92.9	0.0	92.9	336.5	336.5	327.2	327.2	293.5	284.2	328.3
2026	430.6	98.6	0.0	98.6	332.0	332.0	322.1	322.1	288.9	279.1	330.8
2027	439.6	105.5	0.0	105.5	334.1	334.1	323.6	323.6	290.2	279.6	325.1
2028	438.4	112.9	0.0	112.9	325.5	325.5	314.2	314.2	281.6	270.3	326.8
2029	447.4	120.8	0.0	120.8	326.6	326.6	314.6	314.6	281.9	269.8	317.6
2030	446.8	129.2	0.0	129.2	317.5	317.5	304.6	304.6	272.9	259.9	318.2
2031	455.8	140.9	0.0	140.9	315.0	315.0	300.9	300.9	269.4	255.3	305.9
2032	455.8	186.8	33.3	153.6	269.0	265.6	253.6	250.3	223.4	204.7	269.0
2033	464.9	167.4	0.0	167.4	297.6	297.6	280.8	280.8	251.1	234.3	288.4
2034	465.5	182.4	0.0	182.4	283.1	283.1	264.8	264.8	236.5	218.3	282.5
2035	474.7	198.9	0.0	198.9	275.9	275.9	256.0	256.0	228.4	208.5	266.7
2036	470.2	216.8	0.0	216.8	253.4	253.4	231.8	231.8	206.4	184.8	258.0
2037	479.3	236.3	0.0	236.3	243.1	243.1	219.4	219.4	195.1	171.5	233.9
2038	477.0	257.5	0.0	257.5	219.5	219.5	193.7	193.7	171.8	146.0	221.8
2039	486.1	280.7	0.0	280.7	205.4	205.4	177.3	177.3	156.8	128.7	196.3
2040	485.1	306.0	0.0	306.0	179.1	179.1	148.5	148.5	130.6	100.0	180.1
2041	494.0	333.5	0.0	333.5	160.5	160.5	127.1	127.1	111.1	77.7	151.6
EIRR (%)					17.4	15.8	16.9	15.3	15.0	13.0	14.3
ENPV	2,195.6	1,713.6	1,178.9	534.7	482.0	364.1	428.5	310.6	262.4	91.0	232.0

Year	Benefits		Costs			Net Inflow (Outflow)					
	Total Benefit	Total	Capital	O&M	Base Case	Capital Cost +10%	O&M Cost +10%	Total Cost +10%	Benefit -10%	Benefits - Total Cost +10%	Implementation Delay by 1 Year
<b>Sensitivity Indicator (%)</b>											
EIRR						0.94	0.30	1.23	1.36	2.53	0.81
ENPV						2.45	1.11	3.56	4.56	8.11	2.36
<b>Switching Value (%)</b>											
EIRR						1.16	3.66	0.89	0.81	0.43	1.36
ENPV						0.41	0.90	0.28	0.22	0.12	0.00

( ) = negative, EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.



**Table A18.11: Profit and Loss Statements: Osh Vodokanal<sup>a</sup>**

Item	2014 Year -2	2015 Year -1	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14	2040 Year 24
Service area population (number)	490,196	500,000	510,000	520,200	530,604	541,216	552,040	563,081	672,934	820,303
Served population as share of total (%)	44	44	44	44	44	44	44	44	44	44
Served population (number)	214,433	218,721	223,096	227,558	232,109	236,751	241,486	246,316	294,370	358,836
Connections (number)	71,478	72,907	74,365	75,853	77,370	78,917	80,495	82,105	98,123	119,612
Water production (m <sup>3</sup> million)	13.018	16.383	16.383	16.383	16.383	16.383	16.383	16.383	16.383	16.383
Non-revenue water (%)	68	60	60	60	59	60	55	53	40	30
Billed water volume (m <sup>3</sup> million)	4.148	6.553	6.566	6.574	6.643	6.596	7.372	7.655	9.830	11.468
Average water tariff (Som/m <sup>3</sup> )	6.55	6.55	7.07	7.07	8.27	8.27	9.68	9.68	21.22	49.71
Increase in water tariff (%)			8		17		17		17	25
Wastewater as share of billed water volume (%)	48	48	48	48	48	48	48	48	48	48
Billed wastewater volume (m <sup>3</sup> million)	1.991	3.145	3.152	3.156	3.189	3.166	3.539	3.674	4.718	5.505
Average wastewater tariff (Som/m <sup>3</sup> )	3.15	3.15	3.41	3.41	3.99	3.99	4.66	4.66	10.22	23.95
Increase in wastewater tariff (%)	0	0	8	0	17	0	17	0	17	25
Revenues (Som million)	36.97	58.40	63.20	63.28	74.81	74.28	97.14	100.86	283.96	776.00
Water tariff sales (Som million)	27.16	42.91	46.43	46.49	54.96	54.57	71.36	74.09	208.61	570.07
Wastewater tariff sales (Som million)	6.28	9.92	10.74	10.75	12.71	12.62	16.50	17.13	48.24	131.82
Other revenues (Som million)	3.53	5.58	6.04	6.04	7.14	7.09	9.28	9.63	27.12	74.11
O&M expense (Som million)	22.00	24.82	31.22	33.92	36.84	40.02	43.48	48.62	146.14	649.65
Income before depreciation (Som million)	14.97	33.58	31.98	29.36	37.97	34.26	53.66	52.24	137.82	126.35
Depreciation (Som million)	16.83	16.83	16.83	16.83	16.83	16.83	16.83	16.83	16.11	16.11
Income before interest (Som million)	(1.86)	16.75	15.15	12.53	21.14	17.43	36.83	35.41	121.71	110.24
Interest on loan (Som million)	-	-	-	-	-	-	-	6.68	4.68	9.80
Income before taxes (Som million)	(1.86)	16.75	15.15	12.53	21.14	17.43	36.83	28.73	117.03	100.44
Taxes (Som million)	-	1.68	1.52	1.25	2.11	1.74	3.68	2.87	11.70	10.04
Net Income (loss) (Som million)	(1.86)	15.08	13.64	11.28	19.03	15.69	33.15	25.85	105.32	90.40

Item	2014 Year -2	2015 Year -1	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14	2040 Year 24
Operating ratio	0.6	0.4	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.8
Operating ratio with depreciation	1.1	0.7	0.8	0.8	0.7	0.8	0.6	0.6	0.6	0.9

( ) = negative, m<sup>3</sup> = cubic meter, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.12: Profit and Loss Statements: Jalal-Abad *Vodokanal*<sup>a</sup>**

Item	2014 Year -2	2015 Year -1	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14	2040 Year 24
Service area population (number)	110,048	115,000	117,300	119,646	122,039	124,480	126,969	129,509	154,775	188,670
Served population as share of total (%)	50.0	50.0	51.0	52.0	53.0	54.0	55.0	60.0	64.5	69.5
Served population (number)	55,024	57,500	59,823	62,216	64,681	67,219	69,833	77,705	99,830	131,125
Connections (number)	17,195	17,969	18,695	19,442	20,213	21,006	21,823	24,283	31,197	40,977
Water production (m <sup>3</sup> million)	12.275	13.047	18.574	18.575	18.574	18.574	18.574	18.574	16.784	16.784
Non-revenue water (%)	58.0	58.0	58.0	56.3	54.6	52.8	51.0	45.4	27.7	27.7
Billed water volume (m <sup>3</sup> million)	5.155	5.480	5.701	5.929	6.164	6.406	6.655	7.405	8.516	8.516
Average water tariff (Som/m <sup>3</sup> )	11.41	11.01	11.01	11.01	12.55	12.55	14.31	14.31	27.55	78.67
Increase in water tariff (%)			0		14		14		14	30
Wastewater as share of billed water volume (%)	30	30	30	30	30	30	30	30	30	30
Billed wastewater volume (m <sup>3</sup> million)	1.547	1.644	1.710	1.779	1.849	1.922	1.996	2.222	2.555	2.555
Average wastewater tariff (Som/m <sup>3</sup> )	7.46	7.24	7.24	7.24	8.26	8.26	9.41	9.41	18.12	51.74
Increase in wastewater tariff (%)	0	0	0	0	14	0	14	0	14	30
Revenues (Som million)	78.04	80.09	83.32	86.66	102.70	106.73	126.41	140.66	311.47	889.31
Water tariff sales (Som million)	58.85	60.34	62.78	65.29	77.38	80.41	95.23	105.97	234.66	670.00
Wastewater tariff sales (Som million)	11.54	11.91	12.39	12.88	15.27	15.87	18.79	20.91	46.30	132.20
Other revenues (Som million)	7.65	7.84	8.16	8.49	10.06	10.45	12.38	13.78	30.51	87.10
O&M expense (Som million)	38.07	37.75	39.85	43.29	47.03	51.09	55.50	62.07	165.11	733.97
Income before depreciation (Som million)	39.96	42.34	43.47	43.36	55.67	55.64	70.90	78.59	146.35	155.34
Depreciation (Som million)	14.94	14.94	14.94	14.94	14.94	14.94	14.94	14.94	14.22	14.22
Income before interest (Som million)	25.02	27.40	28.53	28.42	40.73	40.70	55.96	63.65	132.13	141.11
Interest on loan (Som million)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.99	4.20	8.79
Income before taxes (Som million)	25.02	27.40	28.53	28.42	40.73	40.70	55.96	57.65	127.93	132.32
Taxes (Som million)	2.50	2.74	2.85	2.84	4.07	4.07	5.60	5.77	12.79	13.23
Net Income (loss) (Som million)	22.52	24.66	25.68	25.58	36.66	36.63	50.37	51.89	115.14	119.09
Operating ratio	0.5	0.5	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.8
Operating ratio with depreciation	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.5	0.6	0.8

( ) = negative, m<sup>3</sup> = cubic meter, O&M = operation and maintenance.<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.13: Profit and Loss Statements: Bazar-Korgon Vodokanal<sup>a</sup>**

Item	2016 Year 0	2017 Year 1	2018 Year 2	2019 Year 3	2020 Year 4	2021 Year 5	2030 Year 14	2040 Year 24
Service area population (number)	35,000	35,700	36,414	37,142	37,885	38,643	40,204	40,204
Served population as share of total (%)	15	16	17	18	19	20	26	26
Served population (number)	5,155	5,615	6,091	6,585	7,095	7,623	10,344	10,344
Connections (number)	1,213	1,366	1,481	1,601	1,726	1,854	2,516	2,516
Water production with project (m <sup>3</sup> million)	0.195	0.220	0.238	0.258	0.278	0.298	0.405	0.405
Non-revenue water (%)	20	20	20	20	20	20	20	20
Billed water volume (m <sup>3</sup> million)	0.156	0.176	0.191	0.206	0.222	0.239	0.324	0.324
Average water tariff (Som/m <sup>3</sup> )	15.00	15.00	21.45	21.45	30.67	30.67	183.42	766.99
Increase in water tariff (%)	0.		43		43		43	0
Wastewater as share of billed water volume (%)	30	30	30	30	30	30	30	30
Billed wastewater volume (m <sup>3</sup> million)	0.047	0.053	0.057	0.062	0.067	0.072	0.097	0.097
Average wastewater tariff (Som/m <sup>3</sup> )	9.00	9.00	12.87	12.87	18.40	18.40	110.05	460.19
Increase in wastewater tariff (%)	0	0	43	0	43	0	43	0
Revenues (Som million)	3.07	3.45	5.36	5.79	8.92	9.59	77.79	325.28
Water tariff sales (Som million)	2.34	2.64	4.09	4.42	6.81	7.32	59.38	248.30
Wastewater tariff sales (Som million)	0.42	0.47	0.74	0.80	1.23	1.32	10.69	44.69
Other revenues (Som million)	0.30	0.34	0.53	0.57	0.89	0.95	7.72	32.28
O&M expense (Som million)	2.55	3.12	3.68	4.32	5.05	6.07	24.77	110.09
Income before depreciation (Som million)	0.52	0.33	1.68	1.47	3.87	3.51	53.02	215.19
Depreciation (Som million)	8.47	8.47	8.47	8.47	8.47	8.47	7.75	7.75
Income before interest (Som million)	(7.95)	(8.14)	(6.79)	(7.00)	(4.60)	(4.96)	45.27	207.43
Interest on loan (Som million)	-	-	-	-	-	3.64	2.55	5.34
Income before taxes (Som million)	(7.95)	(8.14)	(6.79)	(7.00)	(4.60)	(8.60)	42.72	202.09
Taxes (Som million)	-	-	-	-	-	-	4.27	20.21
Net income (loss) (Som million)	(7.95)	(8.14)	(6.79)	(7.00)	(4.60)	(8.60)	38.45	181.88
Operating ratio	0.8	0.9	0.7	0.7	0.6	0.6	0.3	0.3
Operating ratio with depreciation	3.6	3.4	2.3	2.2	1.5	1.5	0.4	0.4

( ) = negative, m<sup>3</sup> = cubic meter, O&M = operation and maintenance.<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.14: Financial Internal Rate of Return and Sensitivity Analysis: Osh Vodokanal<sup>a</sup>**  
(Som million)

Year	Total Revenue	Costs			Base Case	Net Inflow (Outflow)			
		Capital	O&M	Total		Capital Cost +10%	O&M Cost +10%	Revenue - 10%	Implementation Delay by 1-year
2012	0.0	15.9	0.0	15.9	(15.9)	(17.5)	(15.9)	(15.9)	(15.9)
2013	0.0	23.9	0.0	23.9	(23.9)	(26.3)	(23.9)	(23.9)	(23.9)
2014	0.0	548.1	0.0	548.1	(548.1)	(602.9)	(548.1)	(548.1)	(548.1)
2015	58.4	147.1	24.8	171.9	(113.5)	(128.2)	(116.0)	(119.3)	(171.9)
2016	63.2	0.0	31.2	31.2	32.0	32.0	28.9	25.7	27.2
2017	59.4	0.0	31.8	31.8	27.6	27.6	24.4	21.6	31.4
2018	66.0	0.0	32.5	32.5	33.5	33.5	30.2	26.9	26.9
2019	61.5	0.0	33.1	33.1	28.4	28.4	25.0	22.2	32.8
2020	75.5	0.0	33.8	33.8	41.7	41.7	38.3	34.2	27.7
2021	73.6	0.0	35.5	35.5	38.1	38.1	34.6	30.8	40.0
2022	83.7	0.0	37.3	37.3	46.5	46.5	42.8	38.1	36.3
2023	81.3	0.0	39.1	39.1	42.1	42.1	38.2	34.0	44.6
2024	92.1	0.0	41.1	41.1	51.0	51.0	46.9	41.8	40.2
2025	89.0	0.0	43.1	43.1	45.9	45.9	41.5	37.0	48.9
2026	100.5	0.0	46.1	46.1	54.3	54.3	49.7	44.3	42.8
2027	96.8	0.0	49.4	49.4	47.4	47.4	42.5	37.7	51.1
2028	109.0	0.0	52.8	52.8	56.1	56.1	50.8	45.2	44.0
2029	104.7	0.0	56.5	56.5	48.2	48.2	42.5	37.7	52.4
2030	117.5	0.0	60.5	60.5	57.0	57.0	51.0	45.3	44.2
2031	112.4	0.0	65.9	65.9	46.5	46.5	39.9	35.3	51.6
2032	125.8	10.7	71.9	82.6	43.1	42.1	36.0	30.6	29.8
2033	120.1	0.0	78.3	78.3	41.8	41.8	33.9	29.8	47.4
2034	134.1	0.0	85.4	85.4	48.7	48.7	40.2	35.3	34.7
2035	127.9	0.0	93.1	93.1	34.8	34.8	25.5	22.0	41.0
2036	142.6	0.0	101.5	101.5	41.2	41.2	31.0	26.9	26.5
2037	135.8	0.0	110.6	110.6	25.3	25.3	14.2	11.7	32.0
2038	151.3	0.0	120.5	120.5	30.8	30.8	18.7	15.6	15.3
2039	143.9	0.0	131.4	131.4	12.5	12.5	(0.6)	(1.9)	19.9
2040	171.1	0.0	143.2	143.2	27.9	27.9	13.5	10.7	0.7
2041	160.6	0.0	156.1	156.1	4.5	4.5	(11.1)	(11.5)	15.0
FIRR					2.8%	2.0%	1.3%	0.2%	1.3%
FNPV	2,634.4	735.2	1,653.2	2,388.4	245.9	172.4	80.6	(17.5)	93.9
<b>Sensitivity Indicator (%)</b>									
FIRR						2.90	5.29	9.22	5.60
FNPV						2.99	6.72	10.71	6.62
<b>Switching Value (%)</b>									
FIRR						0.34	0.19	0.11	0.18
FNPV						0.33	0.15	0.09	0.15

( ) = negative, FIRR = financial internal rate of return, FNPV = financial net present value, O&M = operation and maintenance.

a A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.15: Financial Internal Rate of Return and Sensitivity Analysis: Jalal-Abad Vodokanal<sup>a</sup>**  
(Som million)

Year	Total Revenue	Costs			Net Inflow (Outflow)				
		Capital	O&M	Total	Base Case	Capital Cost +10%	O&M Cost +10%	Revenue - 10%	Implementation Delay by 1-year
2012	0.0	15.9	0.0	15.9	(15.9)	(17.5)	(15.9)	(15.9)	(15.9)
2013	0.0	23.9	0.0	23.9	(23.9)	(26.3)	(23.9)	(23.9)	(23.9)
2014	0.0	487.6	0.0	487.6	(487.6)	(536.4)	(487.6)	(487.6)	(487.6)
2015	80.1	131.9	37.7	169.7	(89.6)	(102.8)	(93.4)	(97.6)	(169.7)
2016	83.3	0.0	39.9	39.9	43.5	43.5	39.5	35.1	40.2
2017	81.4	0.0	40.7	40.7	40.7	40.7	36.6	32.6	42.7
2018	90.5	0.0	41.5	41.5	49.1	49.1	44.9	40.0	39.9
2019	88.3	0.0	42.3	42.3	46.1	46.1	41.8	37.2	48.3
2020	98.2	0.0	43.1	43.1	55.1	55.1	50.8	45.3	45.2
2021	102.6	0.0	45.3	45.3	57.4	57.4	52.8	47.1	53.0
2022	113.0	0.0	46.6	46.6	66.4	66.4	61.8	55.1	56.1
2023	109.1	0.0	47.3	47.3	61.9	61.9	57.1	50.9	65.7
2024	120.1	0.0	48.7	48.7	71.4	71.4	66.6	59.4	60.4
2025	116.0	0.0	49.6	49.6	66.4	66.4	61.4	54.8	70.5
2026	127.6	0.0	52.1	52.1	75.5	75.5	70.3	62.7	63.8
2027	119.8	0.0	55.8	55.8	64.1	64.1	58.5	52.1	71.8
2028	128.3	0.0	59.7	59.7	68.6	68.6	62.6	55.8	60.1
2029	120.4	0.0	63.9	63.9	56.6	56.6	50.2	44.5	64.4
2030	128.9	0.0	68.3	68.3	60.6	60.6	53.7	47.7	52.1
2031	121.0	0.0	74.5	74.5	46.6	46.6	39.1	34.5	54.4
2032	129.6	10.7	81.2	91.9	37.6	36.6	29.5	24.7	29.1
2033	121.7	0.0	88.5	88.5	33.2	33.2	24.3	21.0	41.1
2034	130.2	0.0	96.5	96.5	33.7	33.7	24.1	20.7	25.2
2035	122.3	0.0	105.2	105.2	17.1	17.1	6.6	4.9	25.1
2036	149.2	0.0	114.6	114.6	34.6	34.6	23.2	19.7	7.7
2037	140.1	0.0	124.9	124.9	15.2	15.2	2.7	1.2	24.3
2038	171.0	0.0	136.2	136.2	34.9	34.9	21.3	17.8	4.0
2039	160.6	0.0	148.4	148.4	12.2	12.2	(2.7)	(3.9)	22.6
2040	196.0	0.0	161.8	161.8	34.2	34.2	18.1	14.6	(1.2)
2041	184.1	0.0	176.4	176.4	7.7	7.7	(9.9)	(10.7)	19.7
FIRR					6.0%	4.9%	4.4%	3.1%	4.0%
FNPV	3,082.0	660.6	1,915.6	2,576.2	505.8	439.7	314.2	197.6	331.3
<b>Sensitivity Indicator (%)</b>									
FIRR						1.72	2.58	4.83	1.99
FNPV						1.31	3.79	6.09	2.10
<b>Switching Value (%)</b>									
FIRR						0.27	0.18	0.10	0.24
FNPV						0.77	0.26	0.16	0.48

( ) = negative, FIRR = financial internal rate of return, FNPV = financial net present value, O&M = operation and maintenance.

<sup>a</sup> A vodokanal is a water utility.

Source: Asian Development Bank.

**Table A18.16: Financial Internal Rate of Return and Sensitivity Analysis: Bazar-Korgon Vodokanal<sup>a</sup>**  
(Som million)

Year	Total Revenue	Costs		Net Inflow (Outflow)					
		Capital	O&M	Total	Base	Capital	O&M	Revenue -	Implementation
2012	0.0	15.9	0.0	15.9	(15.9)	(17.5)	(15.9)	(15.9)	(15.9)
2013	0.0	23.9	0.0	23.9	(23.9)	(26.3)	(23.9)	(23.9)	(23.9)
2014	0.0	280.6	0.0	280.6	(280.6)	(308.7)	(280.6)	(280.6)	(280.6)
2015	0.0	80.2	0.0	80.2	(80.2)	(88.2)	(80.2)	(80.2)	(80.2)
2016	3.1	0.0	2.6	2.6	0.5	0.5	0.3	0.2	(2.6)
2017	3.2	0.0	2.9	2.9	0.3	0.3	0.0	(0.0)	0.1
2018	4.7	0.0	3.2	3.2	1.5	1.5	1.2	1.0	0.0
2019	4.8	0.0	3.6	3.6	1.2	1.2	0.9	0.7	1.1
2020	6.9	0.0	3.9	3.9	3.0	3.0	2.6	2.3	0.9
2021	7.0	0.0	4.4	4.4	2.6	2.6	2.1	1.9	2.5
2022	11.0	0.0	5.5	5.5	5.6	5.6	5.0	4.5	1.5
2023	12.0	0.0	6.6	6.6	5.3	5.3	4.7	4.1	4.4
2024	16.1	0.0	7.0	7.0	9.1	9.1	8.4	7.5	5.0
2025	15.1	0.0	7.3	7.3	7.8	7.8	7.0	6.3	8.8
2026	20.3	0.0	7.8	7.8	12.4	12.4	11.7	10.4	7.3
2027	19.0	0.0	8.4	8.4	10.7	10.7	9.8	8.8	11.9
2028	25.5	0.0	9.0	9.0	16.6	16.6	15.7	14.0	10.1
2029	24.0	0.0	9.6	9.6	14.4	14.4	13.4	12.0	16.0
2030	32.2	0.0	10.3	10.3	21.9	21.9	20.9	18.7	13.7
2031	30.2	0.0	11.2	11.2	19.1	19.1	17.9	16.0	21.0
2032	40.6	10.7	12.2	22.9	17.7	16.6	16.5	13.6	7.3
2033	38.1	0.0	13.3	13.3	24.8	24.8	23.5	21.0	27.3
2034	51.2	0.0	14.5	14.5	36.7	36.7	35.3	31.6	23.6
2035	48.0	0.0	15.8	15.8	32.3	32.3	30.7	27.5	35.4
2036	64.5	0.0	17.2	17.2	47.3	47.3	45.6	40.9	30.9
2037	60.6	0.0	18.7	18.7	41.8	41.8	40.0	35.8	45.8
2038	81.3	0.0	20.4	20.4	60.9	60.9	58.9	52.8	40.1
2039	76.4	0.0	22.3	22.3	54.1	54.1	51.9	46.5	59.1
2040	71.7	0.0	24.3	24.3	47.4	47.4	45.0	40.3	52.1
2041	67.3	0.0	26.5	26.5	40.9	40.9	38.2	34.1	45.3
FIRR					1.4%	0.9%	1.2%	0.6%	0.7%
FNPV	757.5	405.3	262.7	668.0	89.4	48.9	63.2	13.7	27.2
<b>Sensitivity Indicator (%)</b>									
FIRR							1.97	5.89	4.10
FNPV							2.94	8.47	5.90
<b>Switching Value (%)</b>									
FIRR							0.99	0.33	0.48
FNPV							0.34	0.12	0.17

( ) = negative, FIRR = financial internal rate of return, FNPV = financial net present value, O&M = operation and maintenance.

a A vodokanal is a water utility.

Source: Asian Development Bank.

**Table A18.17: Financial Internal Rate of Return and Sensitivity Analysis: Consolidated *Vodokanals*<sup>a</sup>**  
(Som million)

Year	Total Revenue	Costs		Total	Base	Net Inflow (Outflow)			
		Capital	O&M			Capital	O&M	Revenue -	Implementation
2012	0.0	47.8	0.0	47.8	(47.8)	(52.6)	(47.8)	(47.8)	(47.8)
2013	0.0	71.8	0.0	71.8	(71.8)	(78.9)	(71.8)	(71.8)	(71.8)
2014	0.0	1,316.4	0.0	1,316.4	(1,316.4)	(1,448.0)	(1,316.4)	(1,316.4)	(1,316.4)
2015	138.5	359.2	62.6	421.8	(283.3)	(319.2)	(289.5)	(297.1)	(421.8)
2016	149.6	0.0	73.6	73.6	76.0	76.0	68.6	61.0	64.9
2017	144.0	0.0	75.4	75.4	68.6	68.6	61.1	54.2	74.2
2018	161.2	0.0	77.2	77.2	84.0	84.0	76.3	67.9	66.8
2019	154.6	0.0	79.0	79.0	75.6	75.6	67.7	60.2	82.2
2020	180.7	0.0	80.9	80.9	99.8	99.8	91.7	81.8	73.8
2021	183.2	0.0	85.2	85.2	98.0	98.0	89.5	79.7	95.5
2022	207.8	0.0	89.3	89.3	118.5	118.5	109.6	97.7	94.0
2023	202.4	0.0	93.0	93.0	109.3	109.3	100.0	89.1	114.8
2024	228.3	0.0	96.7	96.7	131.5	131.5	121.9	108.7	105.6
2025	220.0	0.0	100.0	100.0	120.0	120.0	110.0	98.0	128.2
2026	248.4	0.0	106.1	106.1	142.3	142.3	131.6	117.4	113.9
2027	235.7	0.0	113.5	113.5	122.1	122.1	110.8	98.6	134.8
2028	262.8	0.0	121.5	121.5	141.3	141.3	129.1	115.0	114.2
2029	249.1	0.0	130.0	130.0	119.1	119.1	106.1	94.2	132.8
2030	278.7	0.0	139.1	139.1	139.6	139.6	125.7	111.7	110.0
2031	263.7	0.0	151.6	151.6	112.1	112.1	97.0	85.8	127.1
2032	295.9	32.2	165.2	197.5	98.4	95.2	81.9	68.8	66.2
2033	279.9	0.0	180.1	180.1	99.8	99.8	81.7	71.8	115.8
2034	315.5	0.0	196.3	196.3	119.2	119.2	99.5	87.6	83.5
2035	298.2	0.0	214.0	214.0	84.2	84.2	62.8	54.4	101.5
2036	356.4	0.0	233.3	233.3	123.1	123.1	99.8	87.5	65.0
2037	336.5	0.0	254.3	254.3	82.3	82.3	56.9	48.6	102.1
2038	403.7	0.0	277.1	277.1	126.5	126.5	98.8	86.2	59.4
2039	380.9	0.0	302.1	302.1	78.8	78.8	48.6	40.7	101.6
2040	438.8	0.0	329.3	329.3	109.5	109.5	76.6	65.7	51.6
2041	412.0	0.0	358.9	358.9	53.1	53.1	17.2	11.9	79.9
FIRR					3.4%	2.6%	2.2%	1.2%	2.1%
FNPV	6,473.8	1,801.2	3,831.5	5,632.7	841.1	661.0	458.0	193.7	452.4
<b>Sensitivity Indicator (%)</b>									
FIRR						2.29	3.48	6.42	3.10
FNPV						2.14	4.56	7.70	3.56
<b>Switching Value (%)</b>									
FIRR						0.35	0.23	0.13	0.26
FNPV						0.47	0.22	0.13	0.28

( ) = negative, FIRR = financial internal rate of return, FNPV = financial net present value, O&M = operation and maintenance.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.



**Table A18.18: Historical Profit and Loss Statements: Osh Vodokana<sup>a</sup>**  
(Som)

Indicator	Chart of Account	2012	2013	2014	2015	2016 <sup>b</sup>
<b>Major operation</b>						
Revenue: main operating income and profit (loss) on biological assets	010	100,813,900.00	118,346,600.00	115,336,666.09	91,223,174.62	133,829,155.92
Cost of sales of goods, services, or expenses for the production of biological assets	020	94,941,500.00	109,771,154.00	118,305,665.93	110,897,935.03	141,601,720.33
Net income before tax (010–020)	030	5,872,400.00	8,575,446.00	(2,968,999.84)	(19,674,760.41)	(7,772,564.41)
<b>Income and Expenses from Other Operating Activities</b>						
Other income from operating activities	040			12,292,707.09	15,985,824.18	16,929,641.32
Other expenses from operations	050					
Total: income and expenses from operations (040–050)	060	0.00	0.00	12,292,707.09	15,985,824.18	16,929,641.32
<b>Operating Expenses for the Period</b>						
Distribution costs	070			845.00	288,220.00	390,573.33
including depreciation	071					
General administrative expenses	080	6,358,500	9,612,075.00	11,221,891.96	4,939,948.48	14,431,242.77
including depreciation	081					
Total operating expenses (070+080)	090	6,358,500	9,612,075	11,222,737	5,228,168	14,821,816
Profit (loss) from operating activities (030+-060–090)	100	(486,100)	(1,036,629)	(1,899,030)	(8,917,105)	(5,664,739)
<b>Income and Expenses from Non-Operating Activities</b>						
Investment returns	110					
Interest	120					
Income (loss) from foreign exchange differences on foreign currency transactions	130					
Other non-operating income and expenses	140			(39,850)		
Total income and expenses from non-operating activities (110–120+130+140)	150	0	0	(39,850)	0	0
Profit (loss) before taxes (100+150)	160	(486,100)	(1,036,629)	(1,859,180)	(8,917,105)	(5,664,739)
Expenses for income tax	170					
Profit (loss) from ordinary activities (160–170)	180	(486,100)	(1,036,629)	(1,859,180)	(8,917,105)	(5,664,739)
Extraordinary items, net of income tax	190					
Net profit (loss) for the reporting period (180+190)	200	(486,100)	(1,036,629)	(1,859,180)	(8,917,105)	(5,664,739)

( ) = negative.

<sup>a</sup> A *vodokanal* is a water utility.

<sup>b</sup> Data based on actual 9 months (January–September 2016) projected to 12 months.

Source: Asian Development Bank

**Table A18.19: Historical Operation and Maintenance Costs: Jalal-Abad *Vodokanal*<sup>a</sup>**  
(Som)

Cost	2014	2015		
		Total WSS	Water Supply	Sanitation
<b>Production</b>				
Materials	4,836.6	4,637.2	3,246.0	1,391.2
Power and fuel	8,496.0	8,686.5	6,080.6	2,605.9
Personnel	13,629.0	15,869.6	11,108.7	4,760.9
Social insurance	2,351.0	2,737.5	1,916.3	821.2
<b>Subtotal</b>	<b>29,312.6</b>	<b>31,930.8</b>	<b>22,351.6</b>	<b>9,579.2</b>
<b>Administrative</b>				
Personnel	2,758.7	3,528.5	2,470.0	1,058.5
Social insurance	475.9	608.7	426.1	182.6
Maintenance	58.9	60.0	42.0	18.0
Communication	200.1	190.0	133.0	57.0
Bank service charge	26.5	30.0	21.0	9.0
Other service charges	675.3	738.3	516.8	221.5
Travel	206.8	210.0	147.0	63.0
Stationery	57.4	95.0	66.5	28.5
Sanitation	17.9	18.0	12.6	5.4
Staff bonus	638.2	450.0	315.0	135.0
Electric utility	88.1	89.0	62.3	26.7
Other administrative	403.1	55.0	38.5	16.5
<b>Subtotal</b>	<b>5,606.9</b>	<b>6,072.5</b>	<b>4,250.8</b>	<b>1,821.7</b>
<b>Other Production Expense</b>				
Other production expense	76.9	495.3	346.7	148.6
<b>Subtotal</b>	<b>76.9</b>	<b>495.3</b>	<b>346.7</b>	<b>148.6</b>
<b>Miscellaneous</b>				
Expenditures	172.4	180.0	126.0	54.0
Sewerage	11.5	15.0	10.5	4.5
Loan payment	3,589.1	781.2	546.8	234.4
Miscellaneous travels	60.6	55.0	38.5	16.5
Training	21.5	22.0	15.4	6.6
Repairs	1,332.7	850.0	595.0	255.0
Lab maintenance	23.0	67.7	47.4	20.3
Other	217.5	16.6	11.6	5.0
<b>Subtotal</b>	<b>5,428.3</b>	<b>1,987.5</b>	<b>1,391.2</b>	<b>596.3</b>

WSS = water supply and sewerage.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.20: Historical Operation and Maintenance Costs: Bazar-Korgon Vodokanal<sup>a</sup>**

Item	Budget 2017	Item (Summary)	Unit Cost 2017
Power (Som)	102,615	Power	0.96
Chemicals (Som)	56,600	Chemicals	0.36
Amortization (Som)	-		
Clothing (Som)	17,000	Administration	0.67
Salary (Som)	1,190,000	Salary	7.62
Other (Som)	195,615	Miscellaneous	2.50
Spare parts (Som)	122,000	Maintenance	0.95
Other expenses (Som)	165,000	Miscellaneous	
Bank services (Som)	8,000	Administration	
Stationery (Som)	40,000	Administration	
Vehicle spare parts (Som)	26,000	Maintenance	
Training (Som)	40,000	Administration	
Furniture (Som)	30,000	Miscellaneous	
Purchase of mini-truck (Som)	200,000		
Petrol (Som)	48,000		
Taxes (Som)	96,300		
Total cost (Som)	2,337,130		13.07
Water to be sold (m <sup>3</sup> )	156,105		
Tariff (Som/m <sup>3</sup> )	14.97		
Rounded water tariff			
Residential (Som/m <sup>3</sup> )	15.00		
Multi-story (Som/m <sup>3</sup> )	15.00		
Sewerage (Som/m <sup>3</sup> )	9.00		

m<sup>3</sup> = cubic meter.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.

**Table A18.21: Tariff Schedule Calculation: Osh Vodokanal<sup>a</sup>**

Item	Tariff Type	Unit	Volume	Days	Tariff	Subtotal	Sales Tax (%)	VAT (%)	Total Price
Street standpost	Water	lpcd	40	365	5.31	212.40	2		79.08
Outhouse standpost	Water	lpcd	115	365	5.31	610.65	2		227.34
Badly organized apartment	Water	lpcd	120	365	5.31	637.20	2		237.23
Badly organized apartment	Sewerage	lpcd	120	365	1.70		2		75.95
Well-organized apartment, no hot	Water	lpcd	137	365	5.31	727.47	2		270.84
Well-organized apartment, no hot	Sewerage	lpcd	137	365	1.70		2		86.71
Residential with water, sewage, heat	Water	lpcd	300	365	5.31	1,593.00	2		593.07
Residential with water, sewage, heat	Sewerage	lpcd	300	365	1.70		2		189.87
Green watering	Water	10 m <sup>2</sup>	1	1	212.66		2		216.91
Household with car	Water	car	1	1	46.20		2		47.12
Household with cattle	Water	cattle	1	1	25.35		2		25.86
Government	Water	m <sup>3</sup>	1	1	4.20		2	12	4.80
Government	Sewerage	m <sup>3</sup>	1	1	3.40		2	12	3.88
Industrial	Water	m <sup>3</sup>	1	1	8.64		2	12	9.87
Industrial	Sewerage	m <sup>3</sup>	1	1	5.70		2	12	6.51
Business	Water	m <sup>3</sup>	1	1	22.52		2	12	25.73
Business	Sewerage	m <sup>3</sup>	1	1	15.21		2	12	17.38

lpcd = liter per capita per day, m<sup>2</sup> = square meter, m<sup>3</sup> = cubic meter, VAT = value-added tax.

<sup>a</sup> A *vodokanal* is a water utility.

Source: Asian Development Bank.