



Completion Report

PUBLIC

Project Number: 52256-006
Grant Number: 0704
July 2022

Kyrgyz Republic: Osh-Plotina Water Treatment Plant Chlorine Neutralization Unit

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Asian Development Bank

CURRENCY EQUIVALENTS

Currency unit – som (Som)

		At Approval 17 August 2020	At Project Completion 27 September 2021
Som1.00	=	\$0.01	\$0.01
\$1.00	=	Som69.84	Som84.72

ABBREVIATIONS

AAFS	–	audited activity financial statements
ADB	–	Asian Development Bank
COVID-19	–	coronavirus disease
CPS	–	country partnership strategy
EARR	–	Emergency Assistance for Recovery and Reconstruction
EIRR	–	economic internal rate of return
MOF	–	Ministry of Finance
OP1–OP7	–	operational priorities 1–7
O&M	–	operation and maintenance
PCR	–	project completion report
SAEMR	–	semiannual environmental monitoring report
SEFF	–	small expenditure financing facility
SPS	–	Safeguard Policy Statement
WTP	–	water treatment plant

NOTES

- (i) The fiscal year (FY) of the Government of Kyrgyz Republic and its agencies ends on 31 December.
- (ii) In this report, “\$” refers to United States dollars.

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CONTENTS

	Page
BASIC DATA	i
I. PROJECT DESIGN AND IMPLEMENTATION	1
A. Rationale	1
B. Project Impact, Outcome, and Output	1
C. Project Costs and Financing	2
D. Disbursements	2
E. Project Schedule	2
F. Implementation Arrangements	2
G. Procurement	2
H. Poverty, Social, and Gender Equality	3
I. Safeguards	3
J. Monitoring and Reporting	3
II. EVALUATION OF PERFORMANCE	4
A. Relevance	4
B. Effectiveness	4
C. Efficiency	4
D. Sustainability	5
E. Development Impact	5
F. Performance of the Borrower and the Executing Agency	5
G. Performance of the Asian Development Bank	5
H. Overall Assessment	6
III. ISSUES, LESSONS, AND RECOMMENDATIONS	6
A. Issues and Lessons	6
B. Recommendations	7
APPENDIXES	
1. Design and Monitoring Framework	8
2. Project Cost at Approval and Actual	9
3. Project Cost by Financier	10
4. Disbursement of ADB Grant Proceeds	12
5. Contract Awards of ADB Grant Proceeds	13
6. Status of Compliance with Subgrant Covenants	14
7. Contribution to Strategy 2030 Operational Priorities	18
8. Economic Reevaluation	19
9. Osh Subproject and Consolidated Economic Internal Rate of Return Analysis	23

BASIC DATA

A. Project Identification

1. Project number and project title 52256-006 Osh-Plotina Water Treatment Plant Chlorine Neutralization Unit
2. Mode of financial assistance Small expenditure financing facility: grant
3. Country The Kyrgyz Republic
4. Borrower The Kyrgyz Republic
5. Executing agency The Department of Drinking Water Supply and Sewerage Development under the State Agency of Architecture, Construction, Housing and Communal Services under the Cabinet of Ministers of the Kyrgyz Republic.
6. Products

Item ^a	Approval Number	Financing Amount (\$ million)	Financing Source	Product Modality and Nature of Activities
Grant	0704	0.500	ADB	SEFF
Government		0.125		
Project Total		0.625		

ADB = Asian Development Bank, SEFF = small expenditure financing facility.

B. Milestone Dates by Product

Item	Grant 0704
Project approval clearance	26 April 2019
Fact-finding mission	
– Date started	20 May 2019
– Date completed	24 May 2019
Loan negotiations	15 August 2020
Date of Board approval	17 August 2020
Date of subgrant agreement	17 November 2020
Date of subgrant effectiveness	17 November 2020
Project completion date	
– At approval	1 December 2021
– Actual	4 June 2021
Subgrant closing date	
– In subgrant agreement at approval	31 May 2022
– Latest Revised	4 June 2021
Financial closing date	27 September 2021

C. Project Cost and Financing

1. Project cost \$ (million)

Cost ^a	Estimate at Approval	Actual
Foreign exchange cost	0.500	0.316
Local currency cost	0.125	0.035
Total	0.625	0.351

^a Including government financing and cofinancing.

2. Cost breakdown by project component \$ (million)

Component^a	Estimate at Approval	Actual
Chlorine neutralization unit upgrade at Osh–Plotina WTP	0.525	0.316
Consulting services/contingencies	0.100	0.035
Total	0.625	0.351

WTP = water treatment plant

^a Including government financing and cofinancing.

3. Financing plan and actual \$ (million)

Cost	Estimate at Approval	Actual
Implementation cost		
Borrower financed	0.125	0.035
Asian Development Bank financed	0.500	0.316
Total implementation cost	0.625	0.351

4. Disbursements

a. Disbursement dates by product

	First Disbursement^b	First Disbursement, Excluding Capitalization	Final Disbursement^c
Grant 0704	29 March 2021	29 March 2021	21 September 2021

^b Including disbursement to advance account.^c Including refund.

b. Grant disbursed amount (\$ million)

Category	Original Allocation (1)	Increased/ (Decreased) during Implementatio n (2)	Canceled during Implementatio n (3)	Last Revised Allocatio n (4=1+2-3)	Amount Disburse d (5)	Undisburse d Balance (6=4-5)
Works and consulting services	0.500	0.000	0.000	0.500	0.316	0.184 ^d

^d Cancelled on financial closure.

D. Project Implementation

1. Project Schedule

Item	Estimate at Approval	Actual
Date of contract with consultant(s)		
"HLB Marka Audit" LLC	30 December 2019	27 April 2021
Individual consultants	30 November 2019	19 November 2020
Equipment and supplies		
Date of procurement		17 December 2020
Completion of equipment installation	30 October 2019	4 June 2021
Completion of tests and commissioning	30 August 2020	4 June 2021

2. Project Implementation Indicators

Project Indicator	Description
Project readiness	Procurement-ready
Signing to first disbursement (days)	132
Grant closing to financial closing (days)	115

3. Project Performance Ratings

Year		Overall	Contract Awards	Disbursement	Financial Management	Output	Safeguards
2020	Q1						
	Q2						
	Q3						
	Q4	At risk	At risk	At risk	On track	On track	On track
2021	Q1	For attention	For attention	For attention	On track	On track	On track
	Q2	For attention	For attention	For attention	On track	On track	On track
	Q3	On track	On track	On track	On track	On track	On track

Q = quarter.

4. Asian Development Bank Missions

Name of Mission	Date	No. of Persons	No. of Person -Days	Specialization of Members ^a	Virtual Mission (Yes/No)
Fact-finding mission	20–24 May 2019	8	5	a,b,c,d,e,f,g,h,i	No
Project completion mission	11–15 April 2022	2	5	c, j, k	No

^a a - Senior Urban Development Specialist, CWUW; b - Senior Partnerships Specialist, SPSP; c - Senior Project Officer, KYRM; d - Associate Operations Analyst, CWUW; e - Project Administration Unit Head, KYRM; f - Principal Counsel, OGC; g - Principal Financial Management Specialist, PPFMD; h - Environmental Specialist, CWOD-PSG; i - Social development Specialist, CWOD-PSG; j - Senior Operations Assistant, CWUW; k - Project Analyst, KYRM; CWOD-PSG = Portfolio, Results, Safeguards and Gender Unit; CWUW = Urban Development and Water Division; KYRM = Kyrgyz Resident Mission; OGC = Office of the General Counsel; PPFMD = Procurement, Portfolio, and Financial Management Department; SPSP = Strategic Partnerships Division

I. PROJECT DESIGN AND IMPLEMENTATION

1. The first activity under the small expenditure financing facility (SEFF) supported the physical upgrade of the chlorine neutralization unit at the Osh-Plotina water treatment plant (WTP) in the Kyrgyz Republic, which had been rehabilitated in 2016 under the Emergency Assistance for Recovery and Reconstruction (EARR) project. The activity made the operations of the WTP safe and sustainable, and benefited the urban population of the city of Osh through access to safe and reliable water supply. The subgrant activity was signed by the Asian Development Bank (ADB) on 17 August 2020 and countersigned by the Ministry of Finance (MOF) of the Kyrgyz Republic on 17 November 2020.

A. Rationale

2. ADB's operational strategy for the Kyrgyz Republic has been set out in its periodic country partnership strategies (CPSs) and country operations business plans. The CPS for 2018–2022 emphasized ADB's assistance to the provision of access to clean drinking water and centralized sewerage systems. The strategic thrust of the country operations business plan for 2018–2020 continued to emphasize water supply and sanitation, responding to the government's request and its commitment to sector reform.¹ Aligned with its Strategy 2030,² ADB will support improved water supply and sanitation, and stronger climate and disaster resilience.

3. The first activity of the SEFF helped enhance the efficiency and sustainability of the completed EARR project by upgrading infrastructure investments made under the project to conform with the latest performance standards. One of the subcomponents of the EARR project was the rehabilitation of the Osh-Plotina WTP. The EARR project was closed on 23 November 2016, and the project completion report (PCR) concluded that it had been "successful." However, it was recognized that the upgrade of the chlorine neutralization unit at the Osh-Plotina WTP remained a priority so as to meet the latest water supply standards with the highest safety levels available in the market. The unit was upgraded under the first SEFF activity to a higher international standard and gave more than 400,000 people access to safe and reliable water supply.

B. Project Impact, Outcome, and Output

4. The activity supported the impact defined in the EARR project and partly the EARR project outcome—critical social and public infrastructure assets rebuilt in areas affected by the emergency. Additionally, it was in line with the EARR project output—critical community and public infrastructure rehabilitated and reconstructed. The WTP's previously rehabilitated chlorination building, including new chlorination equipment, was found to be deficient in its emergency response to potential leakages of chlorine and in the safety of the WTP operation. The activity achieved the output of enhancing the EARR project's efficiency and sustainability by upgrading the chlorine neutralization unit. The unit can now better respond to any chlorine leakage, which is essential for the safe and sustainable operation of the Osh-Plotina WTP, the health and safety of surrounding communities, and reliable water supply to the population of Osh City. The activity contributed to the EARR project's development impact in terms of economic recovery and social reconciliation in project areas.

¹ ADB. 2018. *Country Partnership Strategy: Kyrgyz Republic, 2018–2022—Supporting Sustainable Growth, Inclusion, and Regional Cooperation*. Manila; and ADB. 2017. *Country Operations Business Plan: Kyrgyz Republic, 2018–2020*. Manila.

² ADB. 2018. *Strategy 2030: Achieving a Prosperous, Inclusive, Resilient, and Sustainable Asia and the Pacific*. Manila.

C. Project Costs and Financing

5. The project cost at appraisal was estimated at \$0.625 million, while the actual cost at completion was \$0.351 million. The difference arose largely from the lower bid price received for the key procurement, i.e., supply and installation of the chlorine-neutralizing equipment at the Osh-Plotina WTP. The appraised and actual costs are presented in Appendix 2.

6. The government provided exemption from import duties and indirect taxes, such as sales and value-added taxes, relating to the supply of the equipment, except for the consulting services provided by the national consultants. As a result of this decision, the government's financing of the activity was reduced from an estimated 20% at appraisal to 6% at completion. The financing arrangement is detailed in Appendix 3.

D. Disbursements

7. The appraised and actual cumulative disbursements and cumulative contract awards are shown in Appendix 4. ADB's advance fund procedure was followed for the disbursement of funds—66% of ADB financing was disbursed in March 2021 as initial advance to the advance account, of which only 63% was utilized and liquidated. The liquidation submitted in September 2021 was accepted by the Controller's Department of ADB. The difference between the projected ADB financing and the utilized amount was cancelled and returned to the SEFF pool.

E. Project Schedule

8. At the time of ADB's project approval on 17 August 2020, the subgrant closing was envisaged by 31 May 2022. The actual project completion date was 4 June 2021, and the actual project closing date was 27 September 2021, i.e., 8 months ahead of the envisaged subgrant closing date.

F. Implementation Arrangements

9. The implementation arrangements were followed as envisaged. The Department of Drinking Water Supply and Sewerage Development under the Kyrgyz State Agency for Architecture, Construction, Housing and Communal Services was both the executing and implementing agency for the activity. ADB recruited international consultants who supported the department in preparing the bid documents and technical specifications for the chlorine neutralization unit. The department worked closely with the Osh Mayor's Office and Osh municipal water operator Osh Vodokanal on advance procurement and facilitated the tax exemption.

G. Procurement

10. Given the novelty of the financing modality, and the outbreak of coronavirus disease (COVID-19) and the subsequent lockdown, the facility agreement could only be signed 3 months after the approval date and ratified 6 months after its signing. The SEFF became effective on 24 June 2020. The official request from the MOF for the first activity under SEFF had been received on 20 July 2020, and on 17 August 2020, ADB sent the subgrant agreement to the MOF for countersigning. Because of political turmoil in October 2020, the countersigning of the subgrant agreement by the MOF took 3 months from the approval date. As soon as the subgrant became effective, the executing agency managed to finalize the advance procurement of the supply and installation of the equipment using the Open Competitive Bidding 1 Stage-1 Envelop

method, and the recruitment of two individual national consultants using the individual consultant selection method, both starting in June 2020. The individual national consultants—a project management specialist and a supervision engineer—were recruited for a total of 68 person-days. Their input requirements increased during the activity's implementation, and the actual inputs totaled 128 person-months. The audit services were procured through the shopping method (non-consulting services) in April 2021. The activity's implementation was delayed by 1 year but thanks to advance procurement actions, the supplier's good performance, and the executing agency's support in receiving tax exemption, the supply and installation of the neutralization unit was completed in the second quarter of 2021.

11. The contract award projections were realistic, but because of the low-price bid received, they proved to be 60% from the expected contract amount.

12. The national consultants, the suppliers, the executing agency, and ADB performed well. During the PCR mission, ADB requested the Osh Mayor's Office to complete the registration of the installed neutralization unit in its balance sheet and the corresponding transfer to Osh Vodokanal for operation and maintenance (O&M); and requested the supplier to provide visual instructions for operators on how to detect leakages and address possible emergency situations. The Osh Mayor's Office confirmed that it would complete the required actions by 31 May 2022. The supplier introduced the respective instructions at the site at the end of May 2022 and conducted a knowledge-refreshing O&M training for the water operator's staff.

H. Poverty, Social, and Gender Equality

13. The activity partly contributed to the operational priorities of ADB's Strategy 2030 (OP1, OP3, OP4, and OP5, as per Appendix 7). As part of Osh's critical public infrastructure, the safety of operations at the WTP is crucial for the staff of the water operator, and for the surrounding communities and the environment. The chlorine neutralization unit benefits the rural population adjacent to the WTP by ensuring its health and safety through the provision of an added layer of security in the event of large-scale chlorine leakage in the WTP.

I. Safeguards

14. ADB's Safeguard Policy Statement (2009) was complied with. The activity site lies within the area of the Osh-Plotina WTP owned by Osh Vodokanal, and moreover is inside the chlorination plant building, which is why the activity was classified *category C* for resettlement and indigenous people's impacts.

15. The activity was classified *category B* for environment impacts in accordance with the Safeguard Policy Statement. An initial environmental examination with an environmental management plan was prepared and disclosed on ADB's website in July 2019. The supplier developed a site-specific environmental management plan and submitted two semiannual environmental monitoring reports (SAEMRs) in 2021, both of which were being disclosed on ADB's website. No major issues with noncompliance were reported.

J. Monitoring and Reporting

16. All covenants indicated in Schedule 1 of the facility agreement (13 covenants) and the subgrant agreement (11 covenants) were complied with.

17. As required by the financing agreement, the executing agency submitted to ADB all the monitoring reports, including quarterly and annual progress reports, SAEMRs, and the government's activity completion report. Audited activity financial statements (AAFS) for 2020–2021 with unqualified opinions were submitted to ADB on 22 October 2021, accepted by ADB on 3 December 2021, and disclosed on ADB's website. In line with the facility agreement (special operations) dated 25 December 2019, clause 4.02, the audit requirement is limited to AAFS. Therefore, after consultation with ADB's Procurement, Portfolio and Financial Management Department and the Portfolio, Results, Safeguards and Gender Unit, the requirement to submit audited entity financial statements was lifted because the executing agency is a non-profit government organization financed from the state budget. The financial management action plan was fulfilled, except for the assignment of an internal auditor, who will be engaged under another ADB-financed project (Loan 3742/Grant 0628-KGZ: Issyk-Kul Wastewater management).

II. EVALUATION OF PERFORMANCE

A. Relevance

18. The activity is rated *relevant*. The upgrade of the chlorine neutralization unit at the Osh-Plotina WTP to ensure the latest water supply and safety standards was a high priority for Osh Vodokanal and Osh City's population. It was consistent with the CPS 2018–2022 priorities of providing improved water supply and sanitation.

19. The activity design was appropriate and focused on enhancing the safety deficiency in the water supply. The activity's scope remained relevant throughout. It achieved the output of enhancing the EARR project's efficiency and sustainability and supported the project's objective to improve essential public infrastructure. The supply and installation of the equipment was combined with capacity building, i.e., the water operator's staff was trained in safety operations. The modality proves to be appropriate for such a small procurement.

B. Effectiveness

20. The activity is rated *effective* in achieving the output envisaged at appraisal. It upgraded the EARR project's infrastructure investments to conform with the latest performance standards. Upon completion of the activity, the improved safety of the water supply system ensured the supply of safe, reliable water to connected consumers. The activity also contributed to the achievement of the EARR project's output and outcome.

C. Efficiency

21. The output was achieved as planned and because the requirement to submit audited entity financial statements was lifted, the activity was closed on 27 September 2021—8 months earlier than indicated in the subgrant agreement. The activity was successfully delivered way below the cost estimated during preparation.

22. The economic analysis for the completed EARR project was updated in view of the actual additional costs associated with the subgrant for the activity. The updated analysis showed that the overall project will remain viable, with a recalculated economic internal rate of return (EIRR) of 18.7%, quite similar to that calculated during the activity preparation (18.8%) and the EIRR reflected in the EARR PCR (19.1%). The outputs did not change, and the increase in capital expenses is negligible in relation to the size of the linked project. Since the reevaluated EIRR for the individual component in Osh City is higher than the ADB-recommended economic opportunity

cost of capital of 12% and given that the component was implemented within the given time frame and at a lower cost than originally envisaged, the activity is rated *highly efficient*.

D. Sustainability

23. The activity is rated *likely sustainable*. The staff of Osh Vodokanal had its capacity for sustainable O&M of the equipment strengthened, and also received personal protective gear where needed and a reasonable volume of caustic soda for O&M.

24. The activity's sustainability depends on the financial sustainability of the water operator. The recalculated average financial internal rate of return is 2.3%, compared with the initial estimate of 2.4%. Within the span of 5 years up to 2022, Osh Vodokanal managed to expand the water supply network, increased the number of customers by 14%, and doubled the average tariff since 2012. The main remaining challenge is a significant volume of nonrevenue water (more than 75% at the EARR project's completion in 2016), which can be reduced by expanding the water metering and rehabilitating the old water supply network. Since 2017, Osh Vodokanal, supported by the European Bank for Reconstruction and Development, has installed an initial 2,000 water meters, and will install 10,000 more by 2023, which will bring the overall metered coverage to about 17% and reduce nonrevenue water by 15%–20%. In parallel with actions to reduce its operating expenses, Osh Vodokanal in 2022 plans to increase its tariffs for water supply users by 35% and those for users of its sewerage services by 61%. While the O&M costs for the installed chlorine neutralization unit are insignificant and can be accommodated by Osh Vodokanal, the tariff increase will improve its overall financial sustainability. However, given the post-COVID-19 economic situation and the geopolitical situation in Ukraine, which led to high inflation rates and an increase in poverty in the Kyrgyz Republic, it might be difficult for the Osh City Council to approve the tariff increase to the proposed levels, although some increase is possible. This makes it likely that the sustainability outcome might be reached soon.

E. Development Impact

25. The activity supported the contribution of the EARR project to a positive impact on the public health of communities, in line with Strategy 2030's OP1, OP3, OP4, and OP5; and also in line with Sustainable Development Goal 6: clean water and sanitation.

26. As a small and targeted activity, it is not expected to significantly and directly contribute to development impact, so the development impact is not rated.

F. Performance of the Borrower and the Executing Agency

27. Despite the delayed ratification of the facility agreement, which took more than 6 months because of the COVID-19 outbreak, the executing agency effectively used advance procurement to avoid startup delays. With the elimination of duties and indirect taxes on the supply contract, the level of counterpart funding decreased to 6% of total project costs. The activity was financially closed 8 months ahead of the envisaged activity completion date. In general, the performance of the borrower and the executing agency was *satisfactory*.

G. Performance of the Asian Development Bank

28. The administration of the activity was delegated to ADB's Kyrgyz Republic Resident Mission. This helped ensure close monitoring of the activity and consultations with the executing

agency despite the travel restrictions caused by COVID-19. Overall, ADB's performance was *satisfactory*.

H. Overall Assessment

29. The activity fully delivered the output earlier than planned and at a lower cost than originally estimated. The criteria are rated below.

Overall Ratings		
Criteria		Rating
Relevance		Relevant
Effectiveness		Effective
Efficiency		Highly efficient
Sustainability		Likely sustainable
Overall Assessment		Successful
Development impact	Not rated. Being small and targeted, SEFF activities are not expected to significantly and directly contribute to the development impact.	
Borrower and executing agency		Satisfactory
Performance of ADB		Satisfactory

ADB = Asian Development Bank.

Source: Asian Development Bank.

III. ISSUES, LESSONS, AND RECOMMENDATIONS

30. The modality was found to be useful and practical in responding promptly to small-value requests such as the first activity covering the supply and installation of equipment to reinforce the sustainability of outputs achieved under the linked ADB-financed project. The main issues and lessons are provided below.

A. Issues and Lessons

31. The activity helped build the capacity of Osh Vodokanal for the safe and sustainable operation of the chlorine neutralization unit, which was upgraded to a higher international standard. The staff involved was trained once the equipment was installed, with a refresher course in June 2022, and was also provided with personal protective gear.

32. The preparation of a subgrant activity requires financial resources, not included in the activity, to conduct due diligence on the executing or implementing agency's financial management and procurement, and on environmental and social safeguards, which should be made available once required. The availability of funds will expedite the recruitment of consultants and the processing of the activity.

33. The processing and approval of the first activity took significant time because of limited familiarity with a new modality, and the establishment of new processes within both ADB and the Government of the Kyrgyz Republic.

34. To ensure timely processing and utilization of the facility funds it is recommended to approve the final list of activities for the remaining funds within 2 years from the effectivity date, to allow sufficient time for their processing and implementation, especially if activities envision civil works, which require more staff and financial resources to conduct due diligence than a consultancy engagement for project readiness.

35. According to para. 58 of the Safeguard Policy Statement and para. 30 of the Operations Manual section F1/OP,³ ADB's monitoring and supervision activities are carried out on an ongoing basis until a PCR is issued. As the subgrant consultants are not available and the subgrant was financially closed, the executing agency has administrative and financial difficulties in engaging the environmental safeguard consultant required to prepare and submit the SAEMRs to ADB until the activity completion report is issued.

B. Recommendations

36. It is recommended that additional funds be allocated to the respective resident mission or division's budget for activity preparation and consultant recruitment.

37. **Further action or follow-up.** ADB supported the executing agency in the preparation of the SAEMRs from January–June 2022 until the PCR is issued and will continue to do so for July–December 2022. ADB will conduct follow-up meetings with the Osh Mayor's Office and site visits to Osh Vodokanal to review the on-site O&M instructions and receive confirmation on the documented registration of the chlorine neutralization unit by the municipality.

38. **Timing of the activity performance evaluation report.** It is recommended that the evaluation report be prepared within a year after publication of this activity completion report.

³ <https://www.adb.org/sites/default/files/institutional-document/31483/om-f1.pdf>

DESIGN AND MONITORING FRAMEWORK

Results Chain	Performance Indicators	Project Achievements ^a
Output Project efficiency and sustainability enhanced	One chlorine neutralization unit upgraded at Osh-Plotina WTP	Achieved. The contract agreement based on the results of the tender for Supply and installation of chlorine neutralization equipment at the Osh-Plotina WTP was concluded on 17 December 2020 with "CIC LLC" for \$293,222.71. The term for equipment delivery, installation and commissioning was 150 CD from the date of signing the contract. Also, CIC LLC provided a bank guarantee in the amount of \$29,322 for a period until 17 June 2021. "CIC LLC" has carried out the supply, installation, and all related services in accordance with the contract and within the agreed timeframe. Osh Vodokanal has accepted all the work done. The final payment to the Contractor was made on 21 July 2021.
Actual Key Activities with Milestones 1. Project sustainability enhanced 1.1 The bidding documents were developed and completed in the middle of May 2020 and advertised in June 2020. 1.2 The bid was advertised on 1 June 2020. The recruitment of national consultants was initiated on 19 June 2020. The recruitment of audit firm was advertised on 17 March 2021. 1.3 Contracts with the Project Management Specialist and Supervision Engineer were signed on 19 November 2020. The contract on supply and installation of chlorine neutralization equipment at the Osh-Plotina WTP was awarded to "CIC LLC" on 17 December 2020 with the contract amount of \$293,222.71. The contract for Audit services was concluded with "HLB Marka Audit" LLC on 27 April 2021. 1.4 The equipment was delivered, cleared and installed in June 2021. The full payment to the supplier was made on 21 July 2021 after acceptance by Osh Vodokanal of the equipment and works done under this contract.		
Actual Inputs Asian Development Bank: \$315,829.64 Kyrgyz Government: \$35,186 (tax exemption)		

CD = calendar days; WTP = Wastewater Treatment Plant.

Source: Asian Development Bank.

PROJECT COST AT APPROVAL AND ACTUAL
(\$'000)

Item	Estimate at Approval			Actual		
	Foreign Exchange	Local Currency	Total Cost	Foreign Exchange	Local Currency	Total Cost
A. Consultants						
1. Audit Firm	0.030		0.030	0.013	0.000	0.013
2. Project management Office	0.010	0.000	0.010	0.010	0.000	0.010
Subtotal (A)	0.040	0.000	0.040	0.023	0.000	0.023
B. Goods/Civil Works						
1. Supply and installation of chlorine neutralization unit for Osh-Plotina water treatment plant	0.360	0.125	0.485	0.293	0.035	0.328
Subtotal (B)	0.360	0.125	0.485	0.293	0.035	0.328
C. Contingencies	0.100	0.000	0.100	0.000	0.000	0.000
Total (A+B+C)	0.500	0.125	0.625	0.316	0.035	0.351

Sources: Asian Development Bank estimates.

PROJECT COST BY FINANCIER

Table A3.1: Project Cost at Approval by Financier

Item	ADB Grant		Government		Total Cost	
	Amount (\$ million)	% of Total Cost	Amount (\$ million)	% of Total Cost	Amount (\$ million)	Taxes and Duties
A. Consulting Services						
Consultants						
Project management	0.040	80.00	0.010	20.00	0.050	0.010
Subtotal (A)	0.040	80.00	0.010	20.00	0.050	0.010
B. Works and Goods						
Civil works	0.360	80.00	0.090	20.00	0.450	0.090
Subtotal (B)	0.360	80.00	0.090	20.00	0.450	0.090
Total Base Cost (A+B)	0.400	80.00	0.100	20.00	0.500	0.100
C. Contingencies	0.100	20.00	0.025	20.00	0.125	0.025
D. Financial Charges During Implementation	0.000	0.00	0.000	0.00	0.000	0.000
Total Project Cost (A+B+C+D)	0.500	80.00	0.125	20.00	0.625	0.125
% Total Project Cost						100.00

Note: Numbers may not sum precisely because of rounding.

Source: Asian Development Bank

Table A3.2: Project Cost at Completion by Financier

Item	ADB Grant		Government		Total Cost	
	Amount (\$ million)	% of Total Cost	Amount (\$ million)	% of Total Cost	Amount (\$ million)	Taxes and Duties
A. Consulting Services						
Consultants						
Project management	0.023	100.00	0.000	0.000	0.023	0.000
Subtotal (A)	0.023	100.00	0.000	0.000	0.023	0.000
B. Woks and Goods						
Civil works	0.293	88.00	0.035	12.00	0.328	0.035
Subtotal (B)	0.293	88.00	0.035	12.00	0.328	0.035
Total Base Cost (A+B)	0.316	94.00	0.035	6.00	0.351	0.035
C. Contingencies	0.00	0.000	0.000	0.00	0.000	0.000
D. Financial Charges During Implementation	0.00	0.000	0.000	0.00	0.000	0.000
Total Project Cost (A+B+C+D)	0.316	94.00	0.035	6.00	0.351	0.00
% Total Project Cost					100.00	

Note: Numbers may not sum precisely because of rounding.

Source: Asian Development Bank

DISBURSEMENT OF ADB GRANT PROCEEDS

Table A4: Annual and Cumulative Disbursement of ADB Grant Proceeds^a

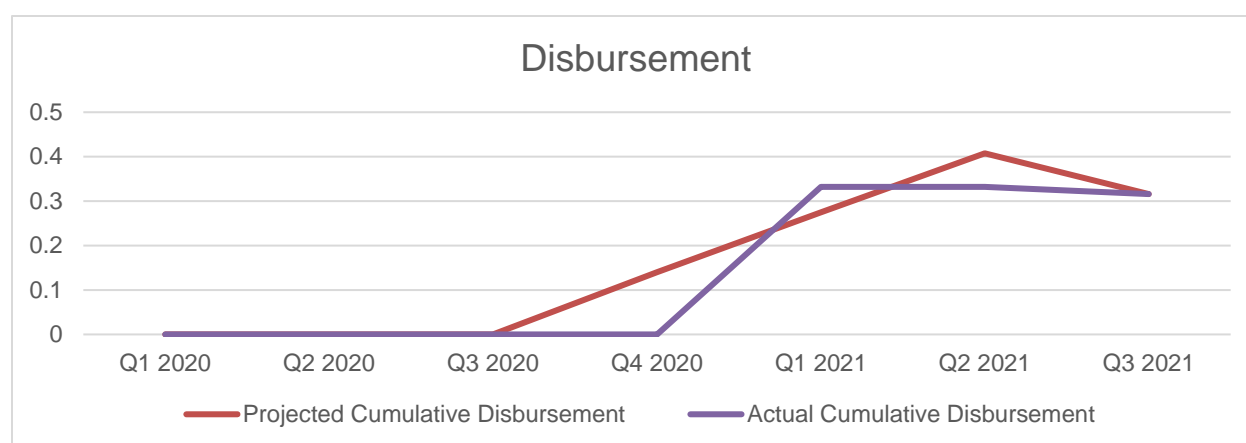
Year	Annual Disbursement		Cumulative Disbursement	
	Amount (\$ million)	% of Total	Amount (\$ million)	% of Total
2021	0.316	63.0	0.316	63.0
Total	0.316	63.0		

ADB = Asian Development Bank.

^a Includes disbursements to advance accounts.

Source: Asian Development Bank.

Figure A4: Projected and Actual Cumulative Disbursement of ADB Grant Proceeds
(\$ million)



ADB = Asian Development Bank.

Sources: ADB estimates

CONTRACT AWARDS OF ADB GRANT PROCEEDS

Table A5: Annual and Cumulative Contract Awards of ADB Grant Proceeds

Year	Annual Contract Awards		Cumulative Contract Awards	
	Amount (\$ million)	% of Total	Amount (\$ million)	% of Total
2020	0.303	60.6	0.303	61.0
2021	0.013	2.6	0.316	63.0
Total^a	0.316^a	63.2%^a		

ADB = Asian Development Bank.

^a \$0.184 (36.8%) was cancelled during grant financial closure.

Source: Asian Development Bank.

Figure A5: Projected and Actual Cumulative Contract Awards of ADB Grant Proceeds
(\$ million)



ADB = Asian Development Bank.

Sources: ADB estimates

STATUS OF COMPLIANCE WITH SUBGRANT COVENANTS

Covenant	Reference in Subgrant Agreement (SA) and Facility Agreement (FA)	Status of Compliance
The Recipient shall ensure through the Activity Executing Agency that the Activity does not include any activities which are classified as (i) category A for environmental impact under the SPS or (ii) category A or B for social impact under the SPS.	SA paragraph 3 (a)	Complied with. The project did not have any activity classified as category A for environmental impact and category A or B for social impact.
The Recipient shall ensure or cause the Activity Executing Agency to ensure that the preparation, design, construction, implementation, operation and decommissioning of the Activity comply with (a) all applicable laws and regulations of the Recipient relating to environment, health, and safety; (b) the Environmental Safeguards; (c) the EARF; and (d) all measures, and requirements set forth in the IEE and EMP, and any corrective or preventative actions set forth in a Safeguards Monitoring Report.	SA paragraph 3 (b)	Complied with. The project complied with all requirements. There was no any issues in complying with the covenants on time.
The Recipient shall make available or cause the Activity Executing Agency to make available necessary budgetary and human resources to fully implement the EMP.	SA paragraph 3 (c)	Complied with. The government share was financed on time and in full amount.
The Recipient shall ensure or cause the Activity Executing Agency to ensure that all bidding documents and contracts for Works contain provisions that require contractors to: (i) comply with the measures and requirements relevant to the contractor set forth in the IEE and the EMP (to the extent they concern impacts on affected people during construction), and any corrective or preventative actions set out in a Safeguards Monitoring Report	SA paragraph 3 (d)	Complied with. All environmental requirements set forth in IEE and EMP were included in the bidding documents and in the contract.
The Recipient shall ensure or cause the Activity Executing Agency to ensure that all bidding documents and contracts for Works contain provisions that require contractors to: (ii) make available a budget for all such environmental and social measures;	SA paragraph 3 (d)	Complied with. The contract cost covered all environmental and social measures included in the bidding documents.
The Recipient shall ensure or cause the Activity Executing Agency to ensure that all bidding documents and contracts for Works contain provisions that require contractors to: (iii) provide the Recipient with a written notice of any unanticipated environmental, resettlement or indigenous peoples risks or impacts that arise during construction, implementation or operation of the Activity that were not considered in the IEE or the EMP;	SA paragraph 3 (d)	Complied with. No unanticipated risks or impacts arise during construction and implementation of the contract. The contractor issued an Operation Manual with described risks and proposed preventive measures. The contractor also provided the training on operation, maintenance, measures to be undertaken in case of leakage of chlorine gas.
The Recipient shall ensure or cause the Activity Executing Agency to ensure that all bidding documents and contracts for Works contain provisions that require contractors to: (iv) adequately record the condition of roads, agricultural land and other infrastructure prior to starting to transport materials and construction;	SA paragraph 3 (d)	Complied with.
The Recipient shall ensure or cause the Activity Executing Agency to ensure that all bidding documents	SA paragraph 3 (d)	Complied with. The cost item on inland transportation, insurance and

Covenant	Reference in Subgrant Agreement (SA) and Facility Agreement (FA)	Status of Compliance
and contracts for Works contain provisions that require contractors to: (v) fully reinstate pathways, other local infrastructure, and agricultural land to at least their pre-project condition upon the completion of construction.		other incidental costs for delivery of the Unit was included in the contract.
The Recipient shall do the following or shall cause the Activity Executing Agency to do the following: (iii) report any actual or potential breach of compliance with the measures and requirements set forth in the EMP promptly after becoming aware of the breach.	SA paragraph 3(e)	Complied with. There no breach of compliance with the measures and requirements set forth in the EMP reported was reported by engineer-supervisor.
The Recipient shall do the following or shall cause the Activity Executing Agency to do the following: (i) submit semi-annual/annual Safeguards Monitoring Reports to ADB and disclose relevant information from such reports to affected persons promptly upon submission;	SA paragraph 5	Complied with. EMRs were prepared and disclosed.
The Recipient shall do the following or shall cause the Activity Executing Agency to do the following: (ii) if any unanticipated environmental and/or social risks and impacts arise during construction, implementation or operation of the Activity that were not considered in the IEE or the EMP, promptly inform ADB of the occurrence of such risks or impacts, with detailed description of the event and proposed corrective action plan;	SA paragraph 5	Complied with. There are no any unanticipated environmental and/or social risks or impacts arise during construction, implementation or operation.
The Recipient shall cause the proceeds of the Activity Subgrant to be applied exclusively to the financing of expenditures on the Activity in accordance with the Activity Subgrant Agreement and these General Terms and Conditions.	FA, Article III, 3.01	Complied with. Expenses of the Activity were audited, liquidated and accepted by ADB.
Except as ADB may otherwise agree, the proceeds of the Activity Subgrant shall be allocated to items of expenditure, and disbursed on the basis of the withdrawal percentage for each item of expenditure, as set forth in the Allocation Table	FA, Article III, 3.02	Complied with
Except as ADB may otherwise agree, the Activity Subgrant proceeds shall be disbursed in accordance with the Loan Disbursement Handbook.	FA, Article III, 3.04	Complied with
The Recipient shall ensure that: (a) the procurement of Goods, Works and Services is carried out in accordance with the Procurement Policy and the Procurement Regulations; (b) Goods, Works and Services shall be procured based on the detailed arrangements set forth in the Procurement Plan, including the procurement and selection methods, the type of bidding documents, and ADB's review requirements. The Recipient may modify the detailed arrangements set forth in the Procurement Plan only with the prior agreement of ADB, and such modifications must be set out in updates to the Procurement Plan; and (c) (i) all Goods and Works procured and Services obtained (including all computer hardware, software and systems, whether separately procured or incorporated within other goods and services procured) do not violate or infringe any industrial property or intellectual property right or claim of any third party; and (ii) all contracts for the procurement of Goods, Works and Services contain appropriate representations, warranties and, if	FA, Article III, 3.05	Complied with

Covenant	Reference in Subgrant Agreement (SA) and Facility Agreement (FA)	Status of Compliance
appropriate, indemnities from the contractor, supplier, consultant or service provider with respect to the matters referred to in this subparagraph.		
The Recipient shall not award or shall cause the Activity Executing Agencies or Activity Implementing Agencies, as applicable, not to award, any Works contract for an Activity which involves environmental impacts until the Activity Executing Agency or Activity Implementing Agency, as applicable, has: (a) obtained the final approval of the IEE from the relevant environment authority of the Recipient; and (b) incorporated the relevant provisions from the EMP into the Works contract.	FA, Article III, 3.06	Complied with. IEE was obtained and EMP provisions were included in the works contract.
Withdrawals from the Activity Subgrant Account in respect of Goods, Works, and Services shall be made only on account of expenditures relating to: (a) Goods which are produced in and supplied from and Works and Services which are supplied from such member countries of ADB as shall have been specified by ADB from time to time as eligible sources for procurement; and (b) Goods, Works, and Services which meet such other eligibility requirements as shall have been specified by ADB from time to time.	FA, Article III, 3.07	Complied with
The Recipient shall enable ADB's representatives to inspect the Activity, the Goods and Works, and any relevant records and documents.	FA, Article III, 3.08	Complied with
(a) The Recipient shall ensure through the Activity Executing Agency or the Activity Implementing Agency, as applicable, that the Activity Subgrant does not finance any activities which are classified as category A for environment and social impact under the SPS. (b) The Recipient shall ensure or cause the Activity Executing Agency or Activity Implementing Agency, as applicable, to ensure that no proceeds of the Activity Subgrant are used to finance any activity included in the list of prohibited investment activities provided in Appendix 5 of the SPS.	FA, Article III, 3.09	Complied with
The Recipient shall ensure or cause the Activity Executing Agency or Activity Implementing Agency, as applicable, to ensure that the Activity Subgrant Schedule 1 to the Facility Agreement is only used to support (a) activities in a sector that has been targeted for ADB support under the current or any future ADB country partnership strategy for the Recipient and (b) an activity that is of a type identified in the "Activity" row of the Form of Activity Subgrant Request attached as Schedule 2 to the Facility Agreement.	FA, Article III, 3.10	Complied with
The Recipient shall ensure the exemption of taxes, duties and fees for all Activities under the Facility.	FA, Article III, 3.11	Complied with
The Recipient shall ensure that each Activity is implemented in accordance with the detailed arrangements set forth in the applicable AAM. Any subsequent change to the applicable AAM shall become effective only after approval of such change by the Recipient and ADB. In the event of any discrepancy between the AAM and the related Activity Subgrant	FA, Article IV, Section 4.01	Complied with

Covenant	Reference in Subgrant Agreement (SA) and Facility Agreement (FA)	Status of Compliance
Agreement, the provisions of the Activity Subgrant Agreement shall prevail.		
(a) The Recipient shall cause each Activity Executing Agency or Activity Implementing Agency, as applicable, to (i) maintain separate accounts and records for the Activities; (ii) prepare annual financial statements for the Activities in accordance with financial reporting standards acceptable to ADB; (iii) have such financial statements audited annually by independent auditors whose qualifications, experience and terms of reference are acceptable to ADB, in accordance with auditing standards acceptable to ADB; (iv) as part of each such audit, have the auditors prepare a report, which includes the auditors' opinion(s) on the financial statements and the use of the Activity Subgrant proceeds, and a management letter (which sets out the deficiencies in the internal control of the Activities that were identified in the course of the audit, if any); and (v) furnish to ADB, no later than 6 months after the end of each related fiscal year, copies of such audited financial statements, audit report and management letter, all in the English language, and such other information concerning these documents and the audit thereof as ADB shall from time to time reasonably request.	FA, Article IV, Section 4.02	Complied with. APFS was prepared and accepted by ADB.
(b) ADB shall disclose the annual audited financial statements for the Activities and the opinion of the auditors on the financial statements within 14 days of the date of ADB's confirmation of their acceptability by posting them on ADB's website.	FA, Article IV, Section 4.02	Complied with. APFS was disclosed on ADB's website on time.

Sources: Progress Reports

CONTRIBUTION TO STRATEGY 2030 OPERATIONAL PRIORITIES

OP No.	Corporate Results Framework Indicators (Outputs and Outcomes)	Expected Value	Achieved Value	Expected and Implemented Method	Assessment
1.3	Poor and vulnerable people with improved standards of living (number)	48,680	48,680		Achieved. Osh city population (permanent registration 322,000 people ¹ , actual population: 400,000 people) including 46,800 poor people (11.7% ²) benefited from the improved water supply, Ozgur village population (10,000 people) including poor 1,880 people (18.8%) benefited from the improved safety at Osh-Plotina WTP and decreased risk of chlorine chemical pollution.
1.3.1	Infrastructure assets improved (number)	1	1		Achieved. The chlorine neutralization unit has been installed at Osh-Plotina WTP.
3.3	People benefiting from strengthened environmental sustainability (number)	410,000	410,000		Achieved. Osh city (400,000) benefited from carbon-free working system and Ozgur village population (10,000 people) and water operator's personnel benefited from the improved safety at Osh-Plotina WTP.
3.3.1	Pollution control enhancing infrastructure assets established or improved (number)	1	1		Achieved. The chlorine neutralization unit has been installed at Osh-Plotina WTP.
4.1	People benefiting from improved services in urban areas (number)	400,000	400,000		Achieved. Osh city population (400,000 people) benefited from the improved water supply.
4.1.2	Urban infrastructure assets established or improved (number)	1	1		Achieved. The chlorine neutralization unit at Osh-Plotina Osh-Plotina WTP has been upgraded to meet international standards.
5.1	People benefiting from increased rural investment (number)	10,000	10,000		Achieved. Ozgur village population (10,000 people) benefited from the improved safety at Osh-Plotina WTP.
5.1.1	5.1.1 Rural infrastructure assets established or improved (number)	1	1		Achieved. The chlorine neutralization unit at Osh-Plotina WTP has been upgraded to meet international standards.

Source: Asian Development Bank.

¹ <https://www.gov.kg/files/news/froala/1414587ce8a3208483d86e378d48e3668185f53f.pdf>² <http://stat.kg/ru/statistics/uroven-zhizni-naseleniya/>

ECONOMIC REEVALUATION

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 estimated during appraisal. Reevaluation based on the methodology followed 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 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.

2. This revised economic reevaluation includes the activity no.1 Osh-Plotina chlorine neutralization unit costs.

B. Methodology

3. The economic and financial reevaluation was carried out in accordance with ADB guidelines.¹ 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, more project benefits were realized and therefore, the same benefits were

¹ 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.

assessed in addition to (v) cost savings in water collection time, (vi) cost savings on use of alternative supply or rehabilitation of existing source, (vii) avoided cost of water storage facility maintenance, (viii) avoided cost of water treatment, and (ix) avoided lost working days and wages. Details are discussed in paras 5-16, with calculations presented in Tables A8.1 below for Osh city and in Tables A18.3, and A18.5 in Appendix 18 of the PCR for EARR project.

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 during appraisal.

6. The water supply facilities that were constructed through the project reduced 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) cost savings from 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 (EBRD) 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 1.09.² The conversion factor for labor (the shadow wage rate factor) was assumed at 1.0 for skilled labor and 0.7 for unskilled labor.³ 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 A9.1 in Appendix 9 summarizes the conversion of O&M costs from financial to economic costs applied in the reevaluation for Osh subproject. Details for Jalal-Abad and Bazar-Korogon subprojects are given in Tables A18.2, A18.4, and A18.6 in Appendix 18 of the EARR PCR.

Table A8.1: 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> ^a	763.74	712.31	0.93	31.84	29.70	0.93
Jalal-Abad <i>Vodokana</i> ^a	659.44	612.76	0.93	40.65	37.77	0.93
Bazar-Korgon <i>Vodokana</i> ^a	400.67	372.75	0.93	2.93	2.73	0.93

^a 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 *Vodokana* benefit–cost ratio was calculated at 1.5.

12. **Economic internal rate of return.** The Osh *Vodokana* subproject EIRR was recalculated at 18.7%, higher than the 13.6% estimated at appraisal owing to the application of more quantifiable benefits following project completion.⁴ 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 at appraisal and *highly efficient* at re-evaluation. The EIRRs for the Osh subproject at appraisal and for the reevaluated subprojects and overall project are given in Table A8.2. Detailed calculation of the EIRRs is given in Tables A9.1 below and in Tables A18.8, A18.9, and A18.10 in Appendix 18 of the EARR PCR.

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 A8.2 summarizes the sensitivity results.

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

³ Based on an assessment of the current labor situation in coverage areas.

⁴ 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.

Table A8.2: Economic Internal Rate of Return and Sensitivity Analysis

Subproject	At Appraisal							
	Base Case		Capital Cost +10%		O&M +10%		Benefit –10%	
	EIRR (%)	ENPV (Som million)	EIRR (%)	ENPV (Som million)	EIRR (%)	ENPV (Som million)	EIRR (%)	ENPV (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	
Total	13.6	15,251	12.1	6,837	12.3	83,640	11.4	(3,608)

Subproject	At Project Completion							
	Base Case		Capital Cost +10%		O&M +10%		Benefit – 10%	
	EIRR (%)	ENPV (Som million)	EIRR (%)	ENPV (Som million)	EIRR (%)	ENPV (Som million)	EIRR (%)	ENPV (Som million)
Osh	18.7	234.7	16.9	185.3	18.2	211.9	16.1	139.0
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
Total	17.3	468.1	15.6	348.9	16.7	414.5	14.9	248.5

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

Source: Asian Development Bank.

OSH SUBPROJECT AND CONSOLIDATED ECONOMIC INTERNAL RATE OF RETURN ANALYSIS

Table A9.1: Incremental and Non-incremental Water: Osh Vodokanal

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 ³ million)	13.018	13.018	13.018	13.018	13.018	13.018	13.018
Production, new (m ³ 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 ³ million)	7.801	7.794	7.739	7.777	7.722	7.666	7.649
Water loss, existing (m ³ million)	1.638	1.638	1.638	1.638	1.638	1.638	1.638
Water loss, new (m ³ million)	9.439	9.432	9.378	9.415	9.360	9.304	9.287
Non-technical loss (m ³ million)	6.607	6.603	6.564	6.590	6.552	6.513	6.501
Technical loss (m ³ million)	2.832	2.830	2.813	2.824	2.808	2.791	2.786
Water sold, existing (m ³ million)	5.218	5.224	5.279	5.241	5.296	5.352	5.369
Water sold (m ³ million)	11.784	11.798	11.922	11.837	11.961	12.087	12.126
Non-incremental water (m ³)	5.218	5.224	5.279	5.241	5.296	5.352	5.369
Incremental water (m ³ million)	6.56	6.574	6.643	6.596	6.665	6.735	6.757
Consumption (m ³ million)	14.615	14.628	14.735	14.662	14.769	14.878	14.912

m³ = cubic meter, NRW = non-revenue water.

Source: Asian Development Bank.

Non-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
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 ³)	413	413	446	446	482	482	708
Price of non-incremental water (Som/m ³)	3	3	3	3	3	3	2
Non-incremental water (m ³)	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
Incremental Benefits of Water							
Demand price with project (Som/m ³)	2.99	2.99	2.99	2.99	2.99	2.99	2.99
Demand price (WTP price) without project ^a (Som/m ³)	2.10	2.10	2.10	2.10	2.10	2.10	2.10
WTP Price with Project (Som/m ³)	2.54	2.54	2.54	2.54	2.54	2.54	2.54
Incremental water (m ³)	6.566	6.574	6.643	6.596	6.665	6.735	6.757
Non-technical water (m ³)	6.607	6.603	6.564	6.590	6.552	6.513	6.501
Total incremental water (m ³)	13.173	13.177	13.207	13.186	13.217	13.248	13.258
Value of incremental water (Som)	33	34	34	34	34	34	34

m³ = cubic meters, WTP = willingness-to-pay.

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

Table A9.2: Operation and Maintenance Cost: Osh Vodokanal

Item	2014	2015	2016	2017
Unit financial O&M cost (Som/m ³)	1.69	1.52	1.91	1.94
Cost of goods sold (Som/m ³)	1.54	1.45	1.73	1.76
Distribution cost (Som/m ³)	0.00	0.00	0.00	0.0049
General administrative cost (Som/m ³)	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

m³ = cubic meter, O&M = operation and maintenance.

Source: Asian Development Bank.

Table A9.3: Economic Internal Rate of Return and Sensitivity Analysis: Osh Vodokanal
(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		14.9	14.9	0.0	(14.9)	(16.4)	(16.4)	(14.9)	(16.4)	(14.9)
2013	0.0		22.3	22.3	0.0	(22.3)	(24.5)	(24.5)	(22.3)	(24.5)	(22.3)
2014	0.0		511.2	511.2	0.0	(511.2)	(562.3)	(562.3)	(511.2)	(562.3)	(511.2)
2015	150.0		160.3	137.2	23.1	(10.3)	(24.0)	(26.3)	(25.3)	(41.3)	(160.3)
2016	154.5		29.1	0.0	29.1	125.4	125.4	122.5	109.9	107.0	120.9
2017	157.2		29.7	0.0	29.7	127.5	127.5	124.5	111.7	108.8	124.8
2018	157.9		30.3	0.0	30.3	127.6	127.6	124.6	111.8	108.8	126.9
2019	160.5		30.9	0.0	30.9	129.6	129.6	126.5	113.5	110.4	127.0
2020	163.5		31.5	0.0	31.5	132.0	132.0	128.8	115.6	112.5	128.9
2021	167.1		59.9	26.8	33.1	107.2	104.5	101.2	90.5	84.5	103.6
2022	168.6		34.7	0.0	34.7	133.8	133.8	130.4	117.0	113.5	132.3
2023	172.2		36.5	0.0	36.5	135.7	135.7	132.1	118.5	114.8	132.1
2024	173.8		38.3	0.0	38.3	135.5	135.5	131.6	118.1	114.2	133.9
2025	177.4		40.2	0.0	40.2	137.1	137.1	133.1	119.4	115.4	133.5
2026	179.0		43.0	0.0	43.0	136.0	136.0	131.7	118.1	113.8	134.3
2027	182.6		46.1	0.0	46.1	136.6	136.6	132.0	118.3	113.7	133.0
2028	184.4		49.3	0.0	49.3	135.1	135.1	130.2	116.7	111.7	133.4
2029	188.0		52.7	0.0	52.7	135.3	135.3	130.0	116.5	111.2	131.6
2030	189.9		56.4	0.0	56.4	133.5	133.5	127.8	114.5	108.8	131.6
2031	193.5		61.5	0.0	61.5	132.0	132.0	125.9	112.7	106.5	128.4
2032	195.5		105.8	38.7	67.0	89.7	85.8	79.1	70.1	59.6	87.8
2033	199.2		73.1	0.0	73.1	126.1	126.1	118.8	106.2	98.9	122.4
2034	201.2		79.6	0.0	79.6	121.6	121.6	113.6	101.5	93.5	119.5
2035	205.0		86.8	0.0	86.8	118.2	118.2	109.5	97.7	89.0	114.4
2036	207.3		94.6	0.0	94.6	112.6	112.6	103.2	91.9	82.4	110.4
2037	211.1		103.1	0.0	103.1	108.0	108.0	97.6	86.8	76.5	104.1
2038	213.5		112.4	0.0	112.4	101.1	101.1	89.8	79.7	68.5	98.7
2039	217.4		122.5	0.0	122.5	94.9	94.9	82.6	73.1	60.9	91.0
2040	219.5		133.6	0.0	133.6	85.9	85.9	72.6	64.0	50.6	83.9

Year	Benefits		Costs			Net Inflow (Outflow)					
	Total Benefit	Total	Capital	O&M	Base Case	Capital	O&M	Total	Benefit	Benefits -	Implementation Delay by 1 Year
						Cost +10%	Cost +10%	Cost +10%		Total Cost +10%	
2041	223.2		145.6	0.0	145.6	77.6	77.6	63.1	55.3	40.7	73.9
EIRR (%)					18.7%	16.9%	18.2%	16.4%	16.1%	13.9%	15.1%
ENPV	957.3	0.0	722.6	494.3	234.7	185.3	211.9	162.4	139.0	66.7	125.5
Sensitivity Indicator (%)											
EIRR						0.99	0.29	1.27	1.40	2.60	0.78
ENPV						2.11	0.97	3.08	4.08	7.16	1.90
Switching Value (%)											
EIRR						1.01	3.41	0.79	0.72	0.38	1.28
ENPV						0.47	1.03	0.32	0.25	0.14	0.00

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

Table A9.4: Economic Internal Rate of Return and Sensitivity Analysis: Consolidated *Vodokanals*
(Som million)

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
2012	0.0	0.0	44.5	44.5	0.0	(44.5)	(49.0)	(44.5)	(49.0)	(44.5)	(49.0)
2013	0.0	0.0	66.8	66.8	0.0	(66.8)	(73.5)	(66.8)	(73.5)	(66.8)	(73.5)
2014	0.0	0.0	1,225.4	1,225.4	0.0	(1,225.4)	(1,347.9)	(1,225.4)	(1,347.9)	(1,225.4)	(1,347.9)
2015	281.7	0.0	392.6	334.4	58.2	(110.9)	(144.3)	(116.7)	(150.1)	(139.0)	(178.3)
2016	348.5	0.0	68.5	0.0	68.5	280.0	280.0	273.1	273.1	245.1	238.3
2017	360.3	0.0	70.2	0.0	70.2	290.1	290.1	283.1	283.1	254.1	247.1
2018	361.9	0.0	71.8	0.0	71.8	290.0	290.0	282.9	282.9	253.9	246.7
2019	373.6	0.0	73.5	0.0	73.5	300.1	300.1	292.8	292.8	262.7	255.4
2020	377.8	0.0	75.3	0.0	75.3	302.6	302.6	295.0	295.0	264.8	257.2
2021	400.5	0.0	106.1	26.8	79.3	294.4	291.7	286.4	283.8	254.3	243.7
2022	404.5	0.0	83.1	0.0	83.1	321.4	321.4	313.1	313.1	281.0	272.6
2023	420.4	0.0	86.6	0.0	86.6	333.8	333.8	325.2	325.2	291.8	283.1
2024	421.3	0.0	90.0	0.0	90.0	331.2	331.2	322.2	322.2	289.1	280.1
2025	429.4	0.0	93.1	0.0	93.1	336.3	336.3	327.0	327.0	293.4	284.1
2026	430.6	0.0	98.8	0.0	98.8	331.8	331.8	322.0	322.0	288.8	278.9
2027	439.6	0.0	105.7	0.0	105.7	334.0	334.0	323.4	323.4	290.0	279.4
2028	438.4	0.0	113.1	0.0	113.1	325.3	325.3	314.0	314.0	281.5	270.1
2029	447.4	0.0	121.0	0.0	121.0	326.4	326.4	314.3	314.3	281.7	269.6
2030	446.8	0.0	129.5	0.0	129.5	317.3	317.3	304.4	304.4	272.7	259.7
2031	455.8	0.0	141.1	0.0	141.1	314.7	314.7	300.6	300.6	269.2	255.0

	Benefits	Costs	Net Inflow (Outflow)								
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%	Implementation Delay by 1 Year
2032	455.8	0.0	214.7	60.9	153.8	241.1	235.0	225.7	219.6	195.5	174.0
2033	464.9	0.0	167.7	0.0	167.7	297.3	297.3	280.5	280.5	250.8	234.0
2034	465.5	0.0	182.7	0.0	182.7	282.8	282.8	264.5	264.5	236.2	218.0
2035	474.7	0.0	199.2	0.0	199.2	275.6	275.6	255.6	255.6	228.1	208.2
2036	470.2	0.0	217.1	0.0	217.1	253.1	253.1	231.4	231.4	206.1	184.4
2037	479.3	0.0	236.7	0.0	236.7	242.7	242.7	219.0	219.0	194.7	171.1
2038	477.0	0.0	258.0	0.0	258.0	219.0	219.0	193.2	193.2	171.3	145.5
2039	486.1	0.0	281.2	0.0	281.2	204.9	204.9	176.8	176.8	156.3	128.2
2040	485.1	0.0	306.5	0.0	306.5	178.6	178.6	148.0	148.0	130.1	99.5
2041	494.0	0.0	334.1	0.0	334.1	159.9	159.9	126.5	126.5	110.5	77.1
EIRR (%)						17.3%	15.6%	16.7%	15.1%	14.9%	12.8%
ENPV	2,195.7	0.0	1,727.6	1,192.0	535.6	468.1	348.9	414.5	295.3	248.5	75.8
Sensitivity Indicator (%)											
EIRR							0.95	0.30	1.24	1.37	2.57
ENPV							2.55	1.14	3.69	4.69	8.38
Switching Value (%)											
EIRR							1.14	3.57	0.87	0.79	0.42
ENPV							0.39	0.87	0.27	0.21	0.12

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