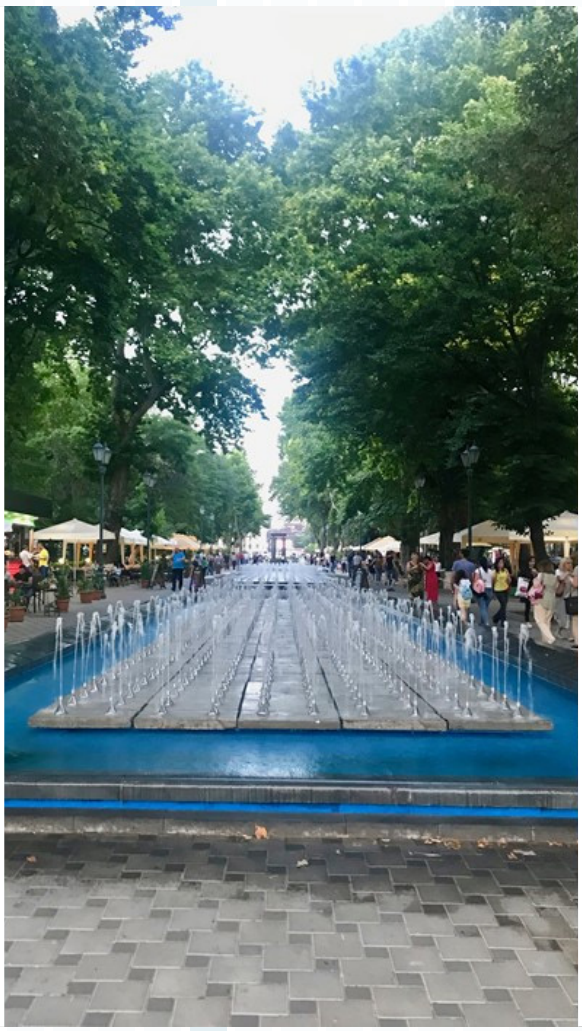
Performance Evaluation Report

Armenia: Water Supply and Sanitation Sector Project


Independent Evaluation ADB

Raising development impact through evaluation

Performance Evaluation Report
October 2020

Armenia: Water Supply and Sanitation Sector Project

Project Numbers: 40296-013 and 45299-001
Loans Numbers: 2363 and 2860
Independent Evaluation: PE-839

Independent Evaluation ADB

NOTES

(i) In this report, "$" refers to United States dollars.
(ii) For an explanation of rating descriptions used in Asian Development Bank evaluation reports, see Asian Development Bank. 2016. Guidelines for the Evaluation of Public Sector Operations. Manila.

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Abbreviations

ADB	–	Asian Development Bank
AWSC	–	Armenia Water and Sewerage Company
DMF	–	design and monitoring framework
EIRR	–	economic internal rate of return
EOCC	–	economic opportunity cost of capital
FGD	–	focus group discussion
FIRR	–	financial internal rate of return
FNPV	–	financial net present value
IED	–	Independent Evaluation Department
m^3	–	cubic meter
NRW	–	nonrevenue water
O&M	–	operation and maintenance
PCR	–	project completion report
PMU	–	project management unit
PPMS	–	project performance management system
PPP	–	public–private partnership
PSP	–	private sector participation
PSRC	–	Public Services Regulatory Commission
SCWE	–	State Committee for Water Economy
VAT	–	value-added tax
WACC	–	weighted average cost of capital
WSS	–	water supply and sanitation

Currency Equivalents

Currency Unit – dram (AMD)

Loan 2363

		At Appraisal (29 August 2007)	At Project Completion (31 December 2012)	At Evaluation (28 February 2020)
AMD1.00	=	$0.00297	$0.00248	$0.00208
$1.00	=	AMD336.50	AMD403.58	AMD478.87

Loan 2860

		At Appraisal (16 January 2012)	At Project Completion (30 April 2017)	At Evaluation (28 February 2020)
AMD1.00	=	$0.00257	$0.00206	$0.00208
$1.00	=	AMD389.00	AMD484.68	AMD478.87

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Ramachandra Jammi (Senior Evaluation Officer, Independent Evaluation Group, World Bank) and Tomoo Ueda (Principal Evaluation Specialist, IED) made valuable contributions as peer reviewers. It was prepared under the overall guidance of Marvin Taylor-Dormond, Director General, IED and Nathan Subramaniam, Director, Sector and Project Division, IED.

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IED retains full responsibility for this report.

Basic Data

Loans Nos. 2363 and 2860-ARM: Water Supply and Sanitation Sector Project

Safeguard classification:	B for Environment, B for involuntary resettlement, and C for indigenous peoples
Sector classification:	Water and other urban infrastructure and services
Thematic classification:	Inclusive social development (Loan 2363) Environmental sustainability (Loan 2860)
Borrower:	Armenia
Executing agency:	State Committee for Water Economy

Key Project Data	At Appraisal ($ million)	Actual ($ million)
Total project cost	95.00	92.62
ADB loan amount	76.00	74.25
Borrower counterpart	19.00	18.37

Key Dates	Loan 2363	Loan 2860 (Additional Financing)
Appraisal	13 April–13 May 2007	23–28 September 2011
Loan negotiations	6–7 September 2007	9–21 February 2012
Board approval	31 October 2007	12 April 2012
Loan signing	18 December 2007	3 May 2012
Loan effectiveness (expected)	16 February 2008	2 June 2012
Loan effectiveness (actual)	28 May 2008	14 September 2012
Loan closing (expected)	30 June 2013	31 October 2017
Loan closing (actual)	20 February 2013	31 October 2017

Type of Mission	Number of Missions	Number of Person-Days
Inception	2	16
Review	10	92
Disbursement	1	2
Midterm review	1	7
Independent evaluation	1	9

Source: Asian Development Bank.

Executive Summary

The Water Supply and Sanitation Sector Project aimed to improve public health and the environment for beneficiaries in 29 project towns and 160 villages through provision of improved access to safe, reliable, and sustainable water supply and sanitation services. Overall, the evaluation assessed the project *successful*. The project has resulted in improved continuity and quality of water supply in the project towns and villages, and it contributed significantly to the enabling environment for private sector participation in Armenia's water supply and sanitation services. Attention to sanitation has been lacking, however, and nonrevenue water was not sufficiently addressed. This evaluation offers the following recommendations: Asian Development Bank should (i) continue policy dialogue with the government and other stakeholders on tariff reform to support sustainable delivery of water supply and sanitation services, (ii) accelerate its support for sanitation in Armenia, and (iii) include, among its water supply and sanitation investments in Armenia, specific measures to tackle and monitor nonrevenue water.

Evaluation Purpose and Process

This project performance evaluation report presents the findings of an independent evaluation of the Water Supply and Sanitation Sector Project in Armenia, supported by the Asian Development Bank (ADB). The independent evaluation mission was fielded in June 2019. The findings and lessons drawn from the evaluation will also feed into the forthcoming thematic evaluation of ADB support for public–private partnerships (PPPs).

The project was financed by two ADB sector project loans. Loan 2363 provided $36.0 million and Loan 2860 (additional financing) totaled $40.0 million. Loan 2363 became effective on 16 February 2008 and Loan 2860 on 14 September 2012. Loan 2363 closed on 20 February 2013, while Loan 2860 closed on 31 October 2017. The project was physically completed on 30 April 2017, with financial closing on 17 January 2018. ADB prepared the project completion report (PCR) in September 2018.

This independent evaluation adopted a mixed-method approach that involved desk review of project information; discussions with ADB project staff; discussions with relevant state, provincial, and district agencies; a field mission, including site visits to project towns; key informant interviews; and focus group discussions (FGDs) with water users in nine project towns and two non-project towns.

Program Rationale

The purpose of the project was to improve public health and environment for beneficiaries living in 29 towns and about 160 villages. Since independence in 1991, Armenia has had to contend with declining water and sanitation infrastructure as a consequence of the curtailment of centrally managed operation and maintenance (O&M) systems. This led to a high rate of nonrevenue water (NRW) and subjected people to unsafe and unreliable water supply and sanitation (WSS) services.

Expected Results

The envisaged outcome of the project was improved access to safe, reliable, and sustainable WSS services in the project towns and villages, managed in a commercial manner with environmentally-sound practices. Project interventions comprised two main components: (i) a program of rehabilitation and replacement of WSS systems, and (ii) capacity development to improve the operational and management efficiency of the Armenia Water and Sewerage Company (AWSC).

Performance Assessment

Overall, the project was assessed *successful*. The investment has resulted in significantly improved levels of service in the project areas in terms of both supply continuity and water quality. For the longer term, lack of progressive tariff to support O&M and thus, continued subsidies put these gains and the overall sustainability at risk.

Relevance. The project was aligned with ADB and government strategies for the sector. The project's continuing relevance was supported by ADB's country partnership strategy, 2014–2018, which identified WSS as one of three focus sectors and emphasized the need for continued support for an enabling environment on PPP in the water sector. On the government side, project relevance was initially supported in the National Water Policy of 2005. Continuing priority for improvements in the sector is further enunciated in the Protocol on Water and Health Action Plan of 2014. The design of the project in terms of water supply provision was generally sound, and the additional financing extended the project reach to a total of 29 towns and 160 villages, a significant increase from the original 16 towns and 125 villages. Even though the overall project goal was improved public health and environment, however, there were no specific outcome or output indicators for sanitation. Some updates of indicators and targets in the design and monitoring framework (DMF) at the time of additional financing did impact on project relevance. Specifically, the outcome indicator aiming for full recovery of O&M costs by 2012 in all project towns and villages covered by the AWSC was removed, and the NRW target was increased from 30% to 70% (Output 3). These changes in the DMF effectively reduced the focus on cost recovery and reflected a poor understanding of actual NRW levels and achievable targets at the time of project appraisal.

In the project's final year, the government decided to pursue a national lease with Veolia, which included all areas covered by the AWSC under the project. Leasing was not ADB's preference during appraisal in 2007, which was rather to build up capacity through a management contract. Nevertheless, ADB did in 2016 provide support for preparation of the national lease through a separate policy-based loan: Infrastructure Sustainability Support Program (Phase 2). Although the PCR assessed the project highly relevant, this evaluation finds the project *relevant*, due to shortcomings in the DMF and lack of attention to sanitation that limited the extent to which the project could achieve its overall goal.

Effectiveness. Project outcomes were measured through two groups of indicators (six indicators in total): (i) level of service—number of beneficiaries and continuity of water supply in hours per day meeting Armenian water quality standards; and (ii) improved AWSC capacity—decrease in NRW, increased water metering level, improved collection ratio, and improved staff productivity. Rehabilitation and replacement of water supply systems, which accounted for around 95% of total project cost, was successfully delivered to 894,785 residents (target was 700,000) in the project towns and villages. This achievement is indicated by the improved continuity of water supply in the districts ranging from 18–19 hours per day (target was 15 hours per day) based on 2017–2018 data (up from 2–8 hours at appraisal). This information was validated in the FGDs conducted during the mission, with five of the nine project towns reporting 24-hour water supply and an overall satisfaction with water quality. NRW remains at persistently high levels by international standards. Loan 2363 (2008–2012) reduced NRW to 72.7% by 2012, while Loan 2860 (2013–2015) effected a reduction to 79.0% in its coverage areas. The PCR target of 70% has not yet been met, but the trajectory in the project areas is following a favorable trend.

Other institutional indicators, such as the percentage of metered customers against the total number of customers, indicated a steady increase over the project period, with 57,660 meters installed by end of project (target was 40,000). Increased productivity is also inferred from the reduction of AWSC staff per 1,000 customers: from 5.64 to 5.14 (2008–2012) and from 9.20 to 7.50 (2013–2015). Tariff collection efficiency was at 91.0% by December 2015 and under national lease is reported as reaching 94.5% in 2018 (the project target was 95.0%). Two of the nine output indicators were not achieved: the NRW target of 70%, which was repeated as an output indicator, and an indicator

to ensure that all households headed by women had 15 hours per day water supply, which could not be confirmed as households were not registered at AWSC by gender. Overall, 5 of the 6 outcome indicators and 7 of the 9 output indicators were achieved. This evaluation assesses the project *effective*.

Efficiency. Economic analysis at project completion was done for four subprojects (Abovyan, Ararat, Lori, and Gegharqunik) that also had been assessed at appraisal and completion. Economic analysis at evaluation found (at base case) all four subprojects to have economic internal rates of return (EIRRs) above the 12.0% acceptable threshold. Sensitivity analysis found that the subprojects have EIRRs above 12.0% and all are robust under sensitivity assumptions except for Abovyan, which under the worst-case scenario has an EIRR of 7.1%. In terms of process efficiency, most civil works were completed on schedule and there were no major delays in implementation. Most contracts were implemented as planned, and just one was terminated due to poor contractor performance. This evaluation finds the project *efficient*.

Sustainability. The water supply services observed in those project towns visited were generally in good operating condition. Customers are paying their water bills on time. Due to operating costs higher than estimated, AWSC did not achieve full cost recovery from 2007 to 2016. This situation changed when the lease contract with Veolia Djur became effective in 2016. A feature of the lease contract was to be an absence of operating subsidies, as a national tariff was expected to cover O&M costs. Key performance indicators measured continuity of supply, water quality, NRW and customer satisfaction.

The tariff agreed between Veolia Djur and the government was AMD180 per cubic meter and was considered an affordable tariff, characterized by its not exceeding 2.5% of consumer spending in the poorest quintile (with consumption assumed at 70 liters per capita). Although tariffs were subject to adjustments beyond 2017, the government did not approve of any increase and tariffs may remain at 2017 levels until 2025. Audited financial statements for the operator indicated an overall loss from 2017 to 2018. These losses are an effect of forgone tariff increases. Unless subsidies are given by the government, the situation is seen to bring about further losses in the next 5 years. The reevaluations of financial internal rates of return were lower for all subprojects than were those at appraisal, and for three subprojects they are below the 2.04% recomputed weighted average cost of capital. All four subprojects are more sensitive to decreases in revenues than they are to increases in O&M costs in the same proportion. Despite the improved water systems, this evaluation assesses the project overall *less than likely sustainable*, because the stagnant tariff levels will lead to poor cost recovery, insufficient O&M, and persisting high levels of NRW. It is unclear what tariff adjustments will be allowed after 2025, as acceptability to customers remains uncertain.

Other Assessments

Impact. The project has improved the level of service to customers. This is reflected in the improved public satisfaction with the availability, quantity, and quality of water. The percentage of households receiving 24-hour water supply rose from 38% in 2008 to 65% in 2016, and this was confirmed by this evaluation's FGDs. All project households have access to potable water for at least 15 hours per day that meets Armenian standards. No specific data on improved health conditions was available, but the FGDs reported an absence of waterborne diseases since project completion. Overall, the project's development impact is assessed *satisfactory.*

ADB and executing agency performance. ADB's performance was *satisfactory* overall and provided adequate supervision during implementation. Quality at entry for the original loan was below par, however, given issues highlighted in relation to the DMF. Performance of the State Committee for Water Economy and AWSC was *satisfactory*. They provided sufficient counterpart funds and adequate staffing to run the project. This evaluation shows, however, that loan covenants concerning the project performance management system (the project's monitoring and evaluation system), tariff reform, and the government PCR were not fully complied with.

Issues

There is insufficient investment in water supply and sanitation infrastructure to maintain and improve upon the project gains. New water sources and a program of upgrading and rehabilitation of existing systems require continued investment to maintain and improve the gains already achieved and for the expansion to communities not yet connected. Both periodic maintenance (currently assumed by the government) and capital works are required if levels of service are to be maintained and improved.

Acceptability of tariff increases remains an intransigent challenge. Tariff adjustments will not be allowed until 2025, although price levels and the acceptability of new rates to water customers remain uncertain. Across all stakeholders, and led by the government, there is clear need for wider debate and communication in a transparent and apolitical manner as to the purpose, rationale, and justification for progressive tariffs.

There are an estimated 570 off-grid villages not covered under the national lease. These constitute a key gap in coverage for the sector in Armenia. Fiscal constraints have caused the postponement of proposals by various development partners to improve water supply in areas outside the existing service area. Easing of these constraints is seen in 2020, which can pave the way for reevaluation of the proposals.

Sanitation has not been sufficiently addressed in ADB support for the sector. The project did not lead to major improvements in sanitation and/or sewerage. The government opted to sequence the interventions, focusing first on water supply before sanitation. Beneficiaries interviewed are keen to see improvements in sanitation, although willingness to pay for sanitation services is variable.

Nonrevenue water remains an unresolved and neglected issue. Unacceptably high NRW losses persist throughout the project areas, but FGDs and meetings with government agencies suggest these constitute a low priority of the government. These inefficiencies bring with them real economic losses, and climate change will likely lead to more pressure on demand for water resources across sectors. Within the sector, growing population and efforts to reach off-grid villages will heighten demand and the need to better manage available resources.

Poor formulation of DMF indicators and targets across the results chain diminished the ability to track and attribute project performance. Continuity of water supply, collection efficiency, and NRW were adopted as indicators for both outcome and output objectives. The project logic was therefore impeded, because causal linkages between outputs and outcomes cannot be clearly traced. This extended to projects impact objectives, which had no specific indicators to measure improvements in public health or environment.

Lessons

Long-term engagement is needed to foster private sector participation in water supply provision. Together with other development partners, ADB has contributed significantly to the development of an enabling environment for private sector engagement in the provision of WSS services in Armenia. This would not have been possible without ADB's long-term engagement in the sector through this project and other interventions. ADB support to draft the PPP law (approved in June 2019) and continuing support on regulations will further enhance the enabling environment. In hindsight, better sequencing of support for the wider PPP regulatory environment in advance of the national lease would have enhanced the project's impact. However, the new law provides much-needed traction for continued private sector participation in WSS.

A simplified monitoring and evaluation system, with direct reporting to the executing agency, would have led to better assessment of the project's performance. The project encountered discontinuity in the collection of performance achievement data needed for periodically assessing output and outcome achievements. The performance management system under the project was functional only for the duration of each loan's implementation and was interrupted in 2016 as AWSC was effectively absorbed by the private operator under the lease contract. A simplified monitoring system lodged under the

executing agency and focused on selected key indicators could have facilitated continuous monitoring and better suited the project.

Nonrevenue water will remain a neglected issue without serious government and development partner support and targeted project actions. Target reduction of NRW losses is unusually high, at 70%, and reflects its being a low priority of the government and ADB. There also was no mention in the project design of specific actions to reduce NRW. There was success in increasing metered connections, and this could have led to better monitoring of losses. Instead, however, it was collection efficiency that mainly benefitted from improved metering. Reduction in NRW was discussed in the PCR, but that report did not expound upon how this was achieved and what worked and did not work regarding this particular issue.

Recommendations

ADB should continue policy dialogue with the government and wider stakeholders on tariff reform to support sustainable delivery of water supply and sanitation services. This is consistent with the principle of cost recovery for O&M that is explicitly embedded in the project's rationale, design, and loan covenants. Further, a good communication strategy explaining the rationale behind progressive tariffs and coupled with demonstrable improvements in levels of service is imperative for achieving transparency and customer buy-in.

ADB should accelerate its support for sanitation in Armenia. Sanitation was part of the project formulation as articulated in impact and outcome statements, albeit without specific indicators. The actual investment into sanitation was minimal, however, as a result of the government's giving it low priority. FGD and interview results confirmed the customers' demand for improved sanitation facilities. Together with other development partners, ADB can take advantage of this opportunity to put greater attention on sanitation and thereby to realize health and environmental benefits not achievable through water supply investments alone.

ADB water supply and sanitation investments should include specific measures to tackle and monitor NRW. There is an abundance of water resources in Armenia relative to its neighboring countries, but the high levels of NRW are not sustainable and run counter to international good practice. Competing demands resulting from population increase, necessary expansion to unserved communities, such other sectoral demands as agriculture, and the negative impacts of climate change will further constrain available resources. Future projects in the sector need therefore to emphasize the importance of targeted corrective measures to diminish losses from NRW.

CHAPTER 1
Introduction

1. Armenia gained independence upon dissolution of the Soviet Union. This meant the ending of central management for infrastructure systems, including in water supply and sanitation (WSS). The post-Soviet era brought about a deficiency of investments and management skills in the sector, and that led to deteriorating WSS infrastructure and poorly maintained systems. This followed similar trends in other newly independent former Soviet republics, post-1991, and has led to urgent need to rehabilitate aging WSS infrastructure that has passed its economic life. Consequences have included water shortages and poor quality, a lack of wastewater disposal facilities, and high levels of unaccounted for water.

2. Recognizing these issues, the Government of Armenia requested assistance from the Asian Development Bank (ADB) to augment investments in the sector made by other development partners. Further investments and service improvements were consistent with public policies, which included (i) the Water Code of 2002; (ii) Fundamental Provisions of the National Water Policy, 2005; and (iii) the National Water Program, 2006.

3. ADB assistance aimed to improve access to safe and reliable WSS services by improving systems and strengthening the Armenia Water and Sewerage Company (AWSC).

A. Evaluation Purpose and Process

4. This project performance evaluation report provides insights to help improve project design and effectiveness of future ADB-financed WSS projects. The findings and lessons drawn from the evaluation will also feed into the forthcoming thematic evaluation of ADB support for public–private partnership (PPP) programmed for delivery by the Independent Evaluation Department (IED) in 2020.

5. The project was supported by two ADB loans. The first loan became effective in May 2008 and closed on 20 February 2013, some 4 months ahead of the target of 30 June 2013.[1] The second loan, for additional financing, became effective in September 2012 and closed on schedule on 31 October 2017.[2] Having found the project highly relevant, effective, efficient, and likely to be sustainable, the project completion report (PCR), circulated in September 2018, rated the project successful.[3]

B. Expected Impact, Outcome, and Outputs

6. The Water Supply and Sanitation Sector Project targeted an improved public and health environment for some 700,000 beneficiaries in 29 project towns and 160 villages through the provision of improved access to safe, reliable, and sustainable WSS services (Appendix 1). The project had two main components: (i) municipal infrastructure rehabilitation and improvement, and (ii) management improvement and development. The first of two impact targets identified were the percentage of households with 24-hour water supply to increase to 65% in 2016 in all project towns and villages. All

[1] ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of Armenia for the Water Supply and Sanitation Sector Project.* Manila (Loan 2363).
[2] ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for Additional Financing to Armenia for the Water Supply and Sanitation Sector Project.* Manila (Loan 2860).
[3] ADB. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila (Loans 2363 and 2860).

households in these town and villages had access by 2016 to reliable supplies of potable water for at least 15 hours per day on average and meeting Armenian quality standards. The second impact target was improved public satisfaction with the availability, quality, and quantity of water. About $77 million, or 81% of the appraised total project cost, was allocated to infrastructure investments.

7. Activities under component A, municipal infrastructure rehabilitation and improvement, related to a program of rehabilitation and replacement of WSS systems, as well as further improvements of water services. The interventions aimed to reduce leakages to improve supply pressure through the construction of necessary water supply infrastructure. Nonrevenue water (NRW) was to be reduced to 70% in project towns and villages by 2016. The cleanup of existing sewers and repairs and/or replacement of damaged sewers was also targeted in order to address the pollution they caused to the water supply in towns and villages, but these activities were minor compared to those for water supply, which was the government priority. Component A was to alleviate the WSS conditions in 29 towns and 160 villages. Component B, management improvement and capacity development, aimed to improve technical, financial, and management capacity of AWSC by 2016.

CHAPTER 2
Design and Implementation

A. Rationale

8. The collapse of the Soviet Union resulted in decline of WSS systems and their management in Armenia. At project appraisal, consumers faced serious problems of shortage and poor quality of drinking water, as well as lack of wastewater disposal facilities. Some 60% of WSS infrastructure in 50 towns and 300 villages was in poor condition, and about 50% of the water and sewer networks required major rehabilitation and/or replacement. Mechanical and electrical equipment was obsolete. System designs and standards were outdated. Sewer pipes were broken and systems clogged, while wastewater treatment plants were not fully operational. Unaccounted for water ranged from 40% to 90% among towns and villages, and a majority of the population received water for only 2–8 hours a day. Poor sanitation facilities and leaking sewers caused serious health risks and environmental hazards.[4]

9. At appraisal, the AWSC was responsible for managing WSS systems in 37 towns and 300 villages. A private international contractor was hired in 2004 under a management contract with AWSC. The management contract was utilized because (i) tariffs were too low to support commercial operations, and the government needed either to increase these progressively or develop a system of public subsidies compatible with private sector participation; (ii) the regulatory framework was new at that time and needed to be tested before implementing a long-term private sector arrangement; (iii) the country lacked a good track record in PPP; and (iv) the government faced difficulties in getting key stakeholders to agree to long-term involvement of the private sector in WSS. It was reported that the management contractor brought about more efficiency in the AWSC during its first 2.5 years of operation (footnote 2). Other WSS systems administrators in Armenia included the Yerevan Water and Sewerage Company and three smaller operators responsible for managing WSS systems in a number of municipalities.

10. ADB played an important role in supporting development of the WSS sector in Armenia since approving a loan for the Water Supply and Sanitation Sector Project in 2007, 2 years after the country became a member of ADB. Other development partners also have been active in the WSS sector, including the World Bank, KfW, and European Bank for Reconstruction and Development.

B. Formulation

11. The project was prepared through a small-scale technical assistance grant, approved in April 2007 with funding of $150,000.[5] The technical assistance aimed to (i) review sector policy; (ii) review and strengthen the sector investment program; (iii) undertake technical and financial due diligence and propose measures for improving the project executing and implementing agencies' financial and technical capacity; (iv) undertake technical, financial, and economic feasibility study of the core investment subprojects; (v) assess the required social and environmental issues in the sector and assist the executing and implementing agencies in preparing all the required safeguard frameworks; and (vi) develop a sector investment project that would increase coverage, quality, and technical and

[4] ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of Armenia for the Water Supply and Sanitation Sector Project*. Manila (Loan 2363).
[5] ADB. 2007. *Technical Assistance to Armenia for the Municipal Services & Infrastructure Development Sector*. Manila (TA 4925).

financial sustainability of WSS services in the selected project areas, thereby improving health and quality of life of their residents.

12. The outputs of the assistance described above led to the design of a sector loan facility that included a road map and a medium-term investment program. The impact of the technical assistance was improved health and living conditions of about 724,000 people in 18 towns and 276 rural settlements in the Ararat, Armavir, Kotayk, and Syunik provinces of Armenia.

C. Cost, Financing, and Executing Arrangements

13. The total project cost of the original loan and additional financing at appraisal was $95 million, including interest costs during construction. ADB financing was to be $76 million, while Armenia counterpart funds were planned at $19 million. Thus, the financing ratio was to be 80/20. The project cost at appraisal comprised (i) $76.7 million for infrastructure investments, (ii) $1.7 million for management improvement and development, (iii) $14.3 million in contingencies, and (iv) $2.3 million for financing charges during implementation. The actual project cost at completion was $92.62 million and ADB financing was $74.25 million, almost 80% of total cost. Borrower financing was $18.37 million, or 20% of the total cost. Actual financing charges during construction were $1.74 million (Appendix 2).

14. The executing agency for the project was the State Committee for Water Economy (SCWE), which was primarily responsible for coordination and implementation through a project coordination unit staffed with a project coordinator and an administrative assistant. The project implementing agency was the AWSC, operating under a management contract with Société d'Aménagement Urbain et Rural, an international water management company. The PCR had noted that this arrangement provided efficiency and effectiveness in project implementation, because it added another layer of management expertise in the planning, design, and implementation of subprojects.

15. During the closing stages of the project, significant changes in implementation arrangements occurred with the merging of the AWSC, three other regional utilities, and the Yerevan Water Company, into one entity operating under a lease arrangement with Veolia Djur Closed Joint Stock Company (Veolia Djur). The project management unit (PMU) was transferred to the Water Sector Project Implementation Unit—an agency under the SCWE. This and the turnover of PMU staff impacted on the delivery of final progress reports.

D. Consultants and Scheduling

16. Under Loan 2363, some 1,366 person-months of national consulting services for engineering and management of improvement services were estimated at appraisal—796 person-months of professional staff and 570 person-months of support staff inputs. The actual person-months at project completion totaled 969 and included 639 professional staff and 330 support staff.

17. Under Loan 2860, a total of 1,466 person-months of consulting services was estimated at appraisal for national consulting services in engineering design, construction supervision, capacity building, and public awareness campaigns. This was broken down into 546 person-months of key staff outputs, 600 person-months of non-key staff outputs, and 320 person-months of administrative support. The actual person-months total at project completion was 1,941—509 for professional staff and 1,432 for support staff.

18. The PMU, supported by a team of consultants, was responsible for implementation, including (i) selecting subprojects, (ii) overseeing the consulting firm's activities (subproject feasibility studies, detailed engineering designs, public awareness campaign implementation, and construction supervision), (iii) project procurement, (iv) additional construction supervision of all subprojects by PMU

WSS engineers, and (v) establishing a detailed project performance management system (PPMS; the project's monitoring and evaluation system).

19. A national consulting company was engaged through quality- and cost-based selection to provide services, including project design, supervision of civil works, and public awareness campaigns under both loans. According to the PCR, the addition of subprojects necessitated an increase in scope in the design and civil works supervision services and the contract amount was increased by 15%.

E. Safeguard Arrangements and Gender Action Plan

20. The project had a positive impact on women and children through the provision of potable water, which reduced women's time and labor inputs for its collection. The project was categorized as effective gender mainstreaming, and a gender action plan was prepared. The project was categorized B for environment and involuntary resettlement, and C for indigenous peoples. Initial environmental examinations for all subprojects were prepared by the PMU. According to the PCR, environment management plans were prepared for each design package, and the PMU coordinated their implementation. No major deviations or noncompliance were noted, and only minor issues had to be corrected by the contractors. Environmental quality monitoring was undertaken regularly. The PCR also shows that there were no major issues regarding indigenous peoples or involuntary resettlement, which involved only the acquisition of small areas of municipal land that, in most cases, were leased to AWSC for long-term use.

F. Outputs

21. Appendix 1 compares outputs and outcome achievements to the performance targets in the project's design and monitoring framework (DMF).

22. **Component A: Municipal infrastructure rehabilitation and improvement.** This was expected to rehabilitate water supply systems in 29 towns and up to 160 villages by 2016 and install about 40,000 water meters or chambers in all the project areas.[6] This was expected to benefit about 700,000 residents in the project towns and villages. Physical accomplishments of the project comprised (i) 2,140 kilometers of water main and network constructed and/or rehabilitated, (ii) 4.4 kilometers of sewerage system constructed, (iii) 59 water supply daily regulation reservoirs constructed and/or rehabilitated, (iv) four chlorination stations constructed and/or rehabilitated, (v) 21 pumping stations constructed and/or rehabilitated, and (vi) three drinking water treatment plants rehabilitated.

23. **Component B: Management improvement and capacity development.** This aimed to improve operational and management efficiency of the AWSC by (i) increasing awareness of municipal infrastructure rehabilitation and improvement through public awareness and media campaigns, (ii) strengthening service contracts between the AWSC and municipal governments governing the use of locally owned distribution networks and the contracts between the company and communities taking bulk water supply, (iii) developing a disconnection policy for nonpayers, and (iv) preparing a strategy to develop the AWSC's human resources by improving staff training and development.

24. Under the public awareness campaign, booklets on "water sanitary and hygienic issues and effective water usage" were prepared and distributed through courses conducted in 10 regions. Financial management improvement involved the introduction of new accounting procedures, a computerized billing and collection system, and a system of mapping asset inventories. Training programs relevant to the AWSC's Human Resource Development Strategy were also conducted to improve staff skills in technical, financial, operational, and commercial areas of operation.

[6] Under the original loan, 16 towns and about 125 villages. This was increased under the additional financing. Similarly, the targeted beneficiaries increased to 576,000 residents.

G. Loan Covenants, Monitoring, and Reporting Arrangements

25. For Loan 2363, 32 out of 34 loan covenants were satisfactorily complied with, 1 not complied with and 1 only partially complied with. The noncompliance related to the tariff adopted in 2009 not being sufficient for full cost recovery; the partial compliance related to submission of a project completion report to ADB 3 months after physical completion of the project. Because additional financing was provided, it was agreed that a combined PCR for the two loans would be provided instead.

26. For Loan 2860, 39 out of 42 loan covenants were complied with. Two covenants were partially complied with. The first only partially complied with, under Section 4.04, Article 4 of the loan agreement, called for the borrower to "take all actions which shall be necessary on its part to enable AWSC to perform its obligations under the project agreement, including the establishment and maintenance of tariffs." The second required the AWSC to furnish reports to ADB, including quarterly progress reports during implementation. The issue over reporting was attributed to the transfer of AWSC to the national utility under Veolia Djur in January 2017. A PCR was submitted but was not according to the required ADB format, and after several requests by ADB for rectification, no action was taken. The one covenant not complied with related to the submission of a tariff plan by the SCWE to the Public Services Regulatory Commission (PSRC).

CHAPTER 3
Performance Assessment

27. The overall rating of the project related to the project's performance and development results rather than those of the executing agency and ADB. Following IED guidelines, four core criteria were rated: (i) relevance of the project to the government and ADB development strategies and of the design to achieve project objectives, (ii) effectiveness of the project's outputs and its outcome, (iii) efficiency of the project's utilization of resources, and (iv) sustainability of the project's outputs and outcome. Noncore assessments were undertaken of the project's development impact and the performance of ADB and the borrower.

A. Relevance

28. ADB has played an important role in supporting WSS development in Armenia since the country became a member of ADB in 2005. In 2007, ADB approved a loan to Armenia for the Water Supply and Sanitation Sector Project covering 16 towns and 125 villages. This was followed by additional financing that extended coverage to 29 towns and 160 villages and called for improving the operational efficiency and financial management of Armenia Water and Sewerage Company (AWSC), a government-owned company providing WSS services. AWSC was managed and operated by Société d'Aménagement Urbain et Rural. These loans were generally well aligned with ADB and government policies and strategies, including ADB's Strategy 2020, ADB's Water Operational Plan 2010–2020, and the government's National Water Policy 2005.

29. At the time of approval, ADB's guiding strategy for Armenia highlighted the need for reforms of state-owned water utilities and reported their providing poor levels of service.[7] On average, water was available for 12 hours a day to only about 30% of consumers. Major sector constraints were (i) lack of finance for operation and maintenance (O&M), rehabilitation, and capital investment; and (ii) lack of management capacity in the territorial branches of the WSS companies. Sanitation faced similar problems and required significant investments in infrastructure. These constraints on water supply provision were well-targeted by the project and supported its overall relevance at approval. The project's continued relevance was supported by ADB's country partnership strategy, 2014–2018, which identified WSS as one of the three key sectors of focus and highlighted the need for continued support for the PPP enabling environment, including in the water sector. The sector lending modality was relevant since it allowed flexibility in the selection of interventions and their location.

30. Sanitation, however, was not given the same priority as water supply. There were no specific outcome or output indicators for sanitation, even though the overall project goal was improved public health and environment. Overall under the project, only 4.4 kilometers of sewer network was constructed against some 2,140 kilometers of water supply mains and distribution networks. Interviews with the government and ADB during the IED mission indicated that the lack of investment in sanitation was largely driven by the priorities of the government. Nevertheless, given the complementarity between water and sewer, the project relevance is diminished in terms of its overall impact to "improve public health and environment."

[7] ADB. 2006. *Armenia's Economic Report and Interim Operational Strategy for 2006–2009*. Manila.

31. In the context of water supply provision, the design of the project was generally sound and the additional financing allowed expansion of the project to cover 29 towns and 160 villages. At the time of additional financing, the DMF outcome and output targets were updated. However, there were some issues with the DMF and changes at approval of additional financing. The outcome indicator aiming for full recovery of O&M costs in all project towns and villages covered by the AWSC by 2012 was removed, for example, and the NRW target was increased from 30% to 70% (Output 3). These changes reduced the project's focus on cost recovery and reflected a weak understanding of actual NRW and achievable targets at the time of project preparation. Furthermore, targets were not provided in the DMF to track the outcome indicator for improvements in the technical, financial, and managerial capacity of the AWSC, although they are to some extent available in Output 3. In some cases, the output indicators in the PCR duplicate indicators used for outcomes. For example, continuity of water supply, NRW, and collection efficiency are all repeated as output indicators.

32. In the last year of the project, the government entered into a national lease agreement with Veolia Djur, which covered all areas under AWSC within the project. This had not been anticipated at appraisal, although ADB technical assistance had supported a study in 2007 on options for PPPs in water supply and sanitation and the lease arrangement was one of three identified options.[8] Although not ADB's preferred option at appraisal, ADB did provide some support for preparation of the national lease through a separate policy-based loan[9] related to determining the annual maintenance expenditure levels for inclusion in the lease. This policy support was assessed relevant by IED.[10]

33. The PCR assessed the project highly relevant. The project did, in fact, provide much-needed financial support to Armenia for the provision of water supply and supported the enabling environment for private sector participation. It also was in line with government and ADB strategies. Relevance was nevertheless diminished because of the shortcomings in the DMF and the lack of investments in sanitation. The project is assessed *relevant*.

B. Effectiveness

34. Project outcomes were measured through two groups of indicators comprising six individual indicators: (i) level of service (number of beneficiaries, continuity of water supply in hours per day meeting Armenian water quality standards), and (ii) improved AWSC capacity (decrease in NRW, increase in water metering level, improved collection ratio, and improved staff productivity). The PPMS was established and covered outcome and output indicators for the two loans over the project implementation period, 2008–2016. The PPMS was not maintained after 2015, however. The PPMS for Loan 2363 provided data for 2008–2012 while that for Loan 2860 provided data for 2013–2015. Performance data for 2016 and beyond is not available. Under Covenant 16 of Loan 2860, AWSC was required to update and submit to ADB the outputs of the PPMS at 6-month intervals for at least 3 years after the project's completion. This requirement was not fully complied with. As indicated in Appendix 10 of the PCR, "the lack of subproject monitoring post 2012, the absence of the complete range of 2016 data, and no monitoring by the new project implementation unit in 2017, means that there are key data gaps, and it is difficult to fully quantify the project benefits once the new subproject investments became fully operational." Veolia Djur assumed responsibility for operation of water supply systems in the project areas from 1 January 2017, and the annual reports of the company in 2017 and 2018, received by IED from SCWE, were used to report on key indicators at district level. Detailed performance data at the project village or town level was not provided by Veolia Djur. The assessment of effectiveness was supplemented by information obtained during the key informant interviews and seven focus group discussions (FGDs) conducted during the IED mission.

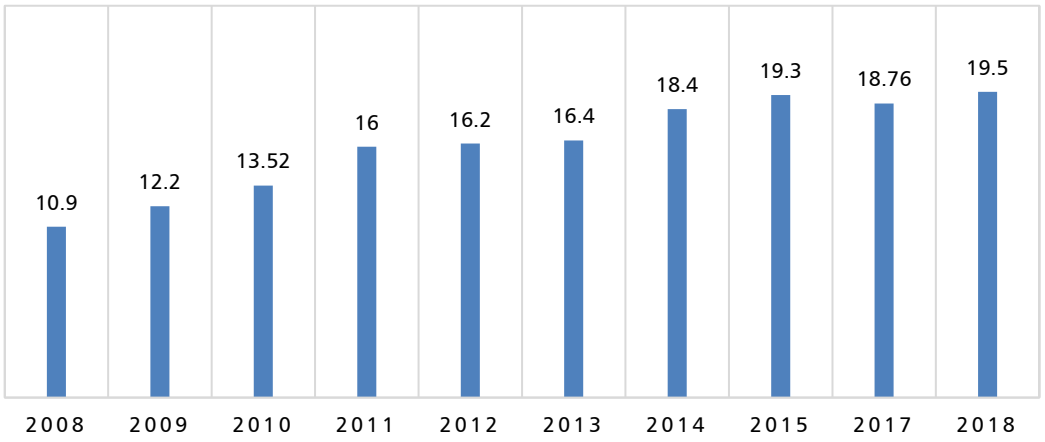
[8] ADB. 2007. *Technical Assistance to the Republic of Armenia for the Study on Analysis and Evaluation of the Options for Public–Private Partnership in Water Supply and Sanitation System of Armenia.* Manila.

[9] ADB. 2016. *Report and Recommendation of the President to the Board of Directors: Proposed Policy-Based Loan and Technical Assistance Grant to Armenia for the Infrastructure Sustainability Support Program (Phase 2).* Manila.

[10] IED. 2019. *Validation Report: Infrastructure Sustainability Support Program (Phase 2) in Armenia.* Manila: ADB.

35. At completion, improved water supply had been delivered to 894,785 residents (target was 700,000) in the project towns and villages. The continuity of water supply increased steadily over the implementation period from 10.9 hours in 2008 to 19.3 hours in 2015 (Figure 1), up from 2 to 8 hours at appraisal. The target had been for at least 15 hours per day by 2012. Data for ADB-covered regions from 2017 and 2018 indicates that supply has been maintained between 18 and 19 hours per day since the national lease came into operation. This data is consistent with comments made during the FGDs, when 24-hour water supply was reported for five of the nine project towns visited, and all except Sarukhan reporting having water at least 15 hours per day. At Sarukhan, FGD participants reported water availability 12 hours per day (Appendix 5). Water quality was generally reported as satisfactory during the FGDs.

Figure 1: Daily Average Drinking Water Provision
(hours)



Note: Data is reported in each case only for regions covered by the Asian Development Bank project. Data for 2016 is unavailable.
Sources: Project performance management system (2008–2015); Veolia Annual Reports (2017–2018).

36. NRW is excessively high in Armenia compared to international norms. The fact that it is a relatively water-rich country within its region and gravity-fed drinking water systems are generally in use may have contributed to the government's giving lower priority to tackling NRW. Table 1 shows the changes in NRW from 2008 to 2018. It should be noted that each sequential loan covered largely different towns and villages and only the data shown for 2017 and 2018 are for district level. Progressive reduction in NRW is evident under Loan 2363 between 2008 and 2012, and subsequently under Loan 2860 between 2013 and 2015.

Table 1: Percentage of Nonrevenue Water

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Percentage	83.0	82.1	80.2	73.5	72.7	83.3	80.3	78.6	…	79.2	79.2

… = data not available.
Sources: Project performance management system (2008–2015) and Veolia Annual Reports (2017–2018).

37. The NRW levels in years 2017 and 2018 after the national lease became effective are flat at 79.2%, but this is national level data. To determine the extent to which this outcome indicator has been achieved is problematic, because no target is provided at outcome level. At output level, three different targets are available: the report and recommendation of the President for Loan 2363 states 30%, the report and recommendation of the President for Loan 2860 states 75%, and the PCR says 70%. Although for both

loans the project achieved a downward trajectory for NRW, it did not reach the target of 70% in either case.

38. The PCR states in para. 67 that lessons learned from this project provided insights into NRW and water management know-how that are being applied in other ADB projects. The PCR does not provide explicit lessons to tackle NRW, but a contemporaneous study by ADB and SCWE does provide some detailed recommendations (Box).

Technical Measures to Tackle Nonrevenue Water

Asian Development Bank together with the State Committee for Water Economy conducted a study on nonrevenue water and energy efficiency performance of water utilities in Armenia between June and October 2013. The study highlighted poor information as a key technical obstacle to reducing nonrevenue water and concluded that the dominant component of nonrevenue water consists in physical losses in both the distribution system and on customer properties. To address these points, the study's recommendations included the following technical measures:

(i) Fully equip the network with reliable flow, level, and pressure logger-transmitters.
(ii) Establish a shared geographic information system for all the underground services in each service area and require all utilities to collect and share information from every excavation they carry out, uncover, and/or repair on the infrastructure.
(iii) Progressively compile and calibrate network models of each distribution system.
(iv) Routinely measure night flows to target more detailed surveys on high-loss areas.
(v) Once network repairs are completed, adopt a district metering area approach and ensure that customer meters are of high standard.

Sources: Asian Development Bank and State Committee for Water Economy and Asian Development Bank. 2014. *Development of Nonrevenue Water Management Action Plan—Final Report*. Yerevan.

39. Table 2 indicates that the percentage of customers with metered connections has increased from 66% in 2008 to 83% in 2015. No targets had been provided at appraisal or in the PCR. The years 2017 and 2018 show lower figures, because the data refers to the service area of Veolia Djur and therefore includes Lori, Nor Akunq, Shirak, and Yerevan. Data specific to ADB project areas has not been available since completion.

Table 2: Percentage of Metered Customers

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Percentage	66	73	76	80	81	80	82	83	…	69	67

… = data not available.
Sources: Project performance management system (2008–2015); Veolia Annual Reports (2017–2018).

40. The PCR states that the numbers of staff in AWSC per 1,000 consumers fell from 5.64 in 2008 to 5.14 in 2012 (under Loan 2363) and from 9.2 in 2013 to 7.5 in 2015 (under Loan 2860). According to the PCR, these changes reflect improved productivity of AWSC. Nevertheless, no targets are provided. Tariff collection efficiency also improved over the course of the loans, reaching 91% by December 2015. Under the national lease, it is reported to have reached 94.5% in 2018 against a project target of 95%.

41. There were three outputs comprising nine individual indicators. The most significant output is Output 1, which requires that water supply systems in 29 towns and up to 160 villages be rehabilitated, replaced in part or in full, and/or extended by 2016. Based on project documentation, interviews with the government and ADB, site visits, and FGDs, it appears that this target was achieved. A further breakdown at output level for population or households would have been useful to better track beneficiaries reached. This is articulated only at the overall project outcome level. In those towns and villages, the project is reported as reaching a population of 894,785 against a target of 700,000. Output

1 also targeted installation of 40,000 meters. That target was exceeded, as actual installation reached 57,660 meters. Output 2 repeats the target of continuity of water supply, which was achieved, plus requirements for a sex-disaggregated customer and complaints database and the involvement of a nongovernment organization in the awareness campaigns of each subproject. Both of these targets were achieved. Another indicator for Output 2 required that all households headed by women in project towns and villages have access to potable water supply of 15 hours per day. Achievement or nonachievement of this indicator cannot be confirmed, as households were not registered at AWSC by gender. Output 3 called for reducing NRW to 70%, that collection rates be raised to 95%, and that further management training be provided to AWSC. Overall, output targets have been achieved except those for NRW and supply to households headed by women.

42. The gender action plan had 15 targets, of which 12 were achieved, 1 was partially achieved (the number of jobs taken up by women at civil works contractors was not appropriately measured), and 2 were not achieved (regarding the sex-disaggregated customer database and the target for women in managerial positions within AWSC). The PCR indicates that the gender action plan resulted in practical benefits for women and girls through gender-responsive and sustainable water supply provision to households, schools, and kindergartens. The FGDs revealed that new water connections to houses improved the quality of life for women and encouraged the construction of indoor bathrooms, installation of new taps in kitchens, and enabled the connection of washing machines and other appliances.

43. Overall, 5 of the 6 outcome indicators and 7 of the 9 output indicators were achieved. At the outcome level and output, the project was generally successful in reaching its stated objectives and the project is assessed *effective*.

C. Efficiency

44. **Process efficiency.** Efficient project processes were set up for procurement, contract, project, and financial management. Most civil works and purchases were completed on time and there were no major delays in implementation. Expenditures on infrastructure investments were $88.8 million,[11] or 97.8% of total project cost. These covered 18 subprojects under Loan 2363 and an incremental 10 subprojects under Loan 2860. There were 71 civil works contracts under Loan 2363 and 29 under Loan 2860. Procurement arrangements were successful and most contracts were implemented as planned. Only one contract was terminated, and this was because of nonperformance by the contractor. A few contracts were extended beyond their completion dates because of unexpected technical issues that arose during construction, thereby necessitating design changes during implementation. Water supply systems in 29 towns and 160 villages were rehabilitated or extended, and 57,660 water meter chambers were installed. Overall, almost 900,000 residents in the project towns and villages directly or indirectly benefited from improved water supply.

45. Respondents participating in FGDs held during the evaluation mission indicated that there were very few problems during implementation, although the quality of water meters and their meter chambers were questioned in a number of villages (e.g., in Akunq and Odzun). There were some issues regarding poor construction (in Stepanavan, for example, the contractor left the excavated channels open), but work improved over time. Water sourcing is generally from springs or rivers, and the project included improvements to a number of these. In most cases, the water is clean. Tariffs were not adjusted as planned during implementation, however, and prices have been frozen at 2017 levels until 2025. Low tariffs were seen by the government as a means of stimulating economic growth.

[11] Investments by category were as follow (all figures net of taxes): works, $58.76 million; materials and equipment $24.69 million; design and supervision and project technical and financial audits, $5.38 million.

46. **Economic efficiency.** Quantifiable benefits of the project were identified at appraisal. These encompassed incremental and non-incremental water and time savings. Improved public health and environments in the selected towns and villages was the project's key impact. At appraisal, health benefits and improved productivity were identified as benefits but were not quantified. These benefits also were not quantified at project completion although they were likely to have increased returns. The sanitation component was not prioritized and only minor investments took place to improve the sewerage systems in place.

47. Participants in the FGDs indicated that although investments in sanitation and sewerage were small (the government indicated that it had prioritized investments in water supply first to have the greatest impact on economic development), residents did improve in-house sanitation facilities and living standards were dramatically improved. Respondents in Lchashen village indicated that after the project people installed modern kitchen appliances, including dishwashers and washing machines, while those from Sarukhan Village and Odzun, for example, relocated toilets and bathrooms from outside in the yard to inside their houses.

48. At appraisal, economic internal rates of return (EIRRs) were computed for five typical subprojects: Loan 2363—Abovyan and Ararat with five rural communities; Loan 2860—Gegharqunik, Lori, and Ararat. These EIRRs were assessed against the economic opportunity cost of capital (EOCC) of 12%. All EIRRs were above the EOCC. The Abovyan subproject had the highest EIRR, at 25%, and Gegharqunik the lowest, at 17.6%. Using the same methodology and an EOCC of 12%, the economic analysis at completion was undertaken for four of the five subprojects. (The Ararat subproject with five rural communities was not implemented under Loan 2363 and was not reevaluated.) The results show that the EIRRs for three of the subprojects were lower at completion (Appendix 3), and this reflected reduced economic benefits and markedly higher economic costs than estimated at appraisal, as noted in the financial reevaluation of the subprojects (Appendix 4). The Lori subproject was the exception, at 23.2% against 19.2% at appraisal. Three of the four subprojects were economically viable with EIRRs above the EOCC. Only the Gegharqunik subproject, with an EIRR of 10.5%, was below the EOCC (Table 3).

Table 3: Subproject Economic Internal Rates of Return
(%)

Subproject	Appraisal	Completion	Evaluation
Abovyan	25.0	13.7	18.7
Lori	19.2	23.2	34.1
Ararat	21.0	17.3	27.5
Gegharqunik	17.6	10.5	20.9

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

49. Because the subprojects were completed some years ago and actual capital costs were known, sensitivity analysis was undertaken only for (i) 20% increase in O&M cost, (ii) 20% decrease in benefits, (iii) 20% decrease in O&M cost, and (iv) combined 20% increase in O&M cost and decrease in benefits. The sensitivity scenarios for all four subprojects indicate that they are sensitive to some of these changes. All subprojects have EIRRs above 12% in all sensitivity tests, except for Abovyan, whose EIRR falls to 7.1% under the worst-case scenario. The subprojects are more sensitive to decreasing revenues than increasing O&M costs.

50. Considering the economic viability and robustness under the sensitivity assumptions, smooth implementation of contracting and construction, continued maintenance of the assets, and successful impact of the water supply improvements on the residents of the towns and villages, the project is assessed *efficient,* the same as at completion.

D. Sustainability

51. All water supply systems in towns and villages selected for the FGDs were operating and appeared to be in good order. The completed infrastructure remains in good condition and the systems and assets were being maintained. Good pressure was experienced everywhere, but there were still some interruptions in supply (e.g., in Odzun). In Malishka, the participants said any issues were dealt with promptly; in Lchashen village, they were satisfied with the service; but in Odzun, the people indicated a need to improve the level of services. Water quality had generally improved also in most villages, except that in Stepanavan people indicated a problem with water quality. Elsewhere, for example in Odzun, it was stated that there was no sediment and no taste issues, but the water was warmer than before. Most connections were metered, although there were questions regarding the reliability of some of the meters (e.g., regarding possibly inaccurate readings and susceptibility to tampering). Nevertheless, customers could and were paying their bills, generally through the local post office, and late payments were few.

52. Despite the improvements under the project, NRW remains high at levels unacceptable by international standards—79.2% according to Veolia Djur figures for 2017 and 2018. This is higher than the DMF output performance target of 70% but indicates a small improvement on the baseline figures of 83.0% under Loan 2363 and 83.3% under Loan 2860. Reasons given for high NRW were (i) commercial losses due to nonpayment of bills, (ii) manipulation of water meters, (iii) physical losses from leaking pipes, and (iv) use of water for small-scale irrigation and/or farming and for drinking water fountains in the towns and villages. Nevertheless, improvements are expected inasmuch as one of the key performance indicators in the national lease is the reduction of NRW over time according to prescribed levels.

53. Project investments were designed to rehabilitate and expand physical infrastructure of the previously existing water supply systems while improving operational efficiency and performance through increased customer access, better water quality, and longer hours of service. At appraisal, tariffs were to be based on cost recovery and would repay the loan. Although the implementing agency, AWSC, did increase its revenues from 2007 to 2016, operating costs were higher than estimated and the government did not approve tariff increases. Hence, the AWSC tariff did not achieve cost recovery and a government subsidy covered the shortfall. Changes took place in 2016, however, that impacted the implementation arrangements during the closing stages of the project. AWSC, three other regional utilities, and the Yerevan Water and Sewerage Company were combined into one national entity operating under a lease contract with Veolia Djur. By that time, most of the civil works contracts had been completed, but the changes impacted the operations and maintenance of the completed subprojects. A single national tariff was adopted for water supply and sanitation services, thus extending the principle of cross-subsidies from consumers in Yerevan, where there were higher operating costs, to those outside the capital city. Under the national lease, there were to be no operating subsidies and the future national tariff was expected to cover all O&M costs.

54. The national lease was structured as a so-called "enhanced lease." A fee of AMD89.75 billion, to be paid over the 15-year contract period, would cover debt service payments of the previous water supply companies. The lease also set minimum levels of mandatory capital works for each year, with the lessee internally financing them. The contract included four key performance indicators: continuity of supply and water quality (both in the previous PPPs) and two new indicators for NRW and consumer satisfaction, with penalties charged if the targets were not met. Other internal benchmarking indicators were also included, but these were not made subject to penalties. Performance monitoring is carried out by independent technical auditors. The government, using public funds and through the SCWE as lessor, assumed responsibility for financing and implementing much of the future capital investment program.[12]

[12] The mandatory capital program of Veolia Djur generally refers to periodic maintenance requirements and minor extensions rather than major capital works.

55. The tariff in Veolia Djur's bid, some AMD180 per cubic meter (m^3), was approved by PSRC in December 2016 and became effective on 1 January 2017. This introduced the concept of an "affordable tariff," where drinking water charges should not be more than 2.5% of consumer spending of those in the poorest quintile of household incomes while assuming daily consumption of 70 liters per capita.[13] In the second year, 2018, and beyond, tariffs are subjected to a mandatory adjustment, according to specified indicators: (i) change of retail water supply volume, (ii) adjustment for inflation, and (iii) changes in electricity tariffs to the company.[14] Mandatory adjustments were prescribed from 2018 onwards. PSRC approved a tariff of AMD191.4/m^3 for 2018, but the government rejected this and maintained the tariff at the same level as in 2017. The difference was committed as a subsidy in the state budget for 2019. In August 2018, an application was submitted to adjust tariffs for the third year of the lease. A rate of AMD202.3/m^3 was recommended, but, according to a memorandum of understanding of November 2018, the tariff for 2019 was retained at the 2017 level and would remain as such until 2025. As compensation, the government agreed to assume the mandatory capital investment program contained in the lease agreement for that period.

56. Audited financial statements for Veolia Djur show an overall loss of AMD3.6 billion in 2017, but an operating profit of AMD0.8 billion. Net financing costs, including the annual lease payments, contributed some AMD4.4 billion to the loss.[15] Losses increased to AMD3.8 billion in 2018 as net financing costs were higher at AMD4.9 billion, but Veolia Djur achieved an operating profit of about AMD1.2 billion, an improvement over 2017.[16] The current ratio deteriorated from 1.1 in 2017 to 0.9 in 2018. Nevertheless, revenues rose by 11.2% while the cost of sales was up by 7.2%, leading to a 20.8% increase in gross profit. Figures for the first quarter of 2019 show further losses[17] of some AMD0.68 billion and an operating profit of AMD1.4 billion. It is uncertain as to whether this outcome includes or excludes the committed subsidies in lieu of the tariff increase. The impact of the foregone tariff increase will reduce the operating profit and impact on the bottom line unless the cash subsidies are paid by the government and the mandatory capital works are assumed as agreed.

57. Financial analysis had been undertaken at appraisal for the representative subprojects identified at that time, and financial internal rates of return (FIRRs) and financial net present values (FNPVs) were computed and subjected to sensitivity tests against anticipated changes in O&M costs and revenues. Five projects were assessed at appraisal, and all were viable with FIRRs greater than the weighted average cost of capital (WACC). At completion, four subprojects were evaluated, the fifth being dropped because it had not been implemented under the second loan. The subproject FIRRs and FNPVs at completion were lower than at appraisal. The FIRRs of three subprojects were below the WACC of 2.2%. Only one subproject, Abovyan, had an FIRR above the WACC, at 5.8%. The reduced FIRRs reflect the lower revenues expected as a result of the government's decision to defer the proposed tariff increase for AWSC until the establishment of Veolia Djur in 2016 and the decision not to implement the planned tariff increases during project implementation.

58. The reevaluation shows FIRRs for all subprojects are below those at appraisal, and for three subprojects they are below the recomputed WACC of 2.04%. Only Abovyan is higher, with an FIRR of 6.5%. The returns at evaluation are lower than those at completion for three subprojects, with only that for Abovyan being slightly higher. The latter reflects lower O&M cost estimates and their phasing, as well as the fact that the subproject had been implemented under the first loan and thus revenues accrued earlier. FNPVs are negative and FIRRs are below the WACC for all subprojects except for Abovyan. Details of the financial analysis are in Appendix 4, and Table 4 compares the returns at evaluation, appraisal, and completion.

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[13] According to the government's National Development Program, 2014–25.

[14] Veolia Djur. Review of Drinking Water Tariffs (Adjustment). 2018. This presentation indicates that further adjustments also can be made because of additional revenue from the use of water for other purposes, and the supply of drinking water for irrigation. This item was included in the request for the tariff adjustment.

[15] Veolia Djur Financial Statements for 2017. KPMG Armenia. 30 June 2018.

[16] Veolia Djur Financial Statements for 2018. KPMG Armenia. 23 July 2019.

[17] Velia Djur. Quarterly Report. January–March 2019. April 2019.

Table 4: Subproject Financial Internal Rates of Return
(%)

Subproject	Appraisal	Completion	Evaluation
Abovyan	7.8	5.8	6.5
Lori	6.3	1.2	(2.2)
Ararat	6.5	0.9	0.4
Gegharqunik	4.9	(7.0)	0.2

( ) = negative.
Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

59. Because the subprojects were completed some years ago and actual capital costs were known, sensitivity analysis was undertaken only for (i) 20% increase in O&M cost reflecting rising electricity costs, (ii) 20% decrease in revenue where further tariff increase are deferred, (iii) 20% decrease in O&M cost representing the case where Veolia Djur has and will reduce energy and operating costs, and (iv) combined 20% increase in O&M cost and decrease in revenue. These are extreme cases and have been tested for comparison with the estimates at completion. The results for all four subprojects indicate that they are more sensitive to decreases in revenues than they are to increases in O&M costs of the same proportion. The Abovyan subproject remains viable except for the worst case, where O&M increases and revenues decline, both by 20%. Ararat and Gegharqunik perform similarly, and FIRRs fall below the WACC and are negative when O&M costs are assumed to increase by 20%. The Lori subproject is most sensitive to changes, and negative FIRRs are computed for all options including the base case. Appendix 4 details the computations. FNPVs under sensitivity assumptions are negative for all subprojects, except where O&M costs decrease.

60. A World Bank review of water sector PPPs in Armenia in 2017 noted that while tariffs in Yerevan covered all O&M costs and debt service, tariff levels were yet to achieve full cost recovery for the rest of the country and nonrevenue water losses were also reported to have remained at persistently high levels.[18] The World Bank's Municipal Water Project aimed to support improvement in the quality and availability of the water supply in selected areas of the AWSC and was evaluated in 2018. That evaluation reported that the financial sustainability of AWSC had not improved and the annual financial results were moving deeper into the negative each year. That meant that subsidies to the company needed to be increased because tariffs had not changed since 2009.[19]

61. Overall, the project is assessed *less than likely sustainable*. Project investments improved water systems and services in 29 towns and 160 villages and evidence from the field visits show that the improvements were acceptable. The systems are functioning well and are being maintained. Nevertheless, NRW, which was high before the project, remains excessive by international standards even today. Mandatory adjustments in the water tariff, as specified in the national lease, have not been permitted by the government in lieu of subsidies and the assumption of further investments. The original project design required an annual tariff plan that takes into account service costs, including inflation, and that fully covers operating costs. Even after 2025, the year that tariffs can increase, it is uncertain at what level water prices will be and whether the necessary increase will be acceptable to customers. Subsidies also imply a transfer of resources from other necessary government programs, possibly impacting their sustainability.

[18] P. Marin, D. Muzenda, and A. Andreasyan. 2017. *Review of Armenia's Experience with Water Public–Private Partnerships.* Washington, DC: World Bank.
[19] Independent Evaluation Group. 2018. *Project Performance Assessment Report: Municipal Water Project.* Washington, DC: World Bank.

CHAPTER 4
Other Assessments

A. Development Impact

62. The project's impact at appraisal was "improved public health and environment in project towns and villages." At the time of additional financing, this was specifically expressed as relating to 29 project towns and up to 160 villages. There were three performance indicators to measure the impact: (i) improved public satisfaction with the availability, quality, and quantity of water (but no baseline or target was provided); (ii) percentage of households with 24-hour water supply was expected to increase from 38% in 2008 to 65% in 2016, and (iii) all project households were to have access by 2016 to reliable supplies of potable water for at least 15 hours per day on average that meets Armenian quality standards.

63. Based on data from the PPMS, public satisfaction with the level of service improved from 42% in 2008 to about 91% by the end of 2016. Data on public satisfaction was not available after 2016. The findings of the FGDs indicated overall satisfaction, although there were some issues with levels of service, particularly concerning the performance of installed water meters.

64. The PCR states that some 40% and 49% of the project's villages and towns under Loan 2363 (in 2012) and Loan 2860 (in 2015), respectively, had 24-hour water supply. Figures for November 2016 presented in the PCR show an increase to 52%. This is below the expected target of 65% by 2016, although the FGDs did find 24-hour water supply in five of the nine cases.

65. The project was successful in exceeding the target of 15 hours per day water supply on average in project towns and villages. More recent data for project districts indicate this rising trend has been maintained. Although the PCR does not report whether Armenian water standards have been met, 2018 data reported by Veolia Djur for its service area indicate that some 89.5% of samples met the applicable standards, up from 84% in 2017.

66. The project's development impact is assessed *satisfactory*. No specific data in the project towns and villages concerning human health were available, although the FGDs generally reported an absence of waterborne diseases after the project was completed. No significant impact can be expected on the environment because the project provided little support for sanitation-related issues. The FGDs indicate households would support improvements in sanitation.

B. ADB Performance

67. ADB's performance is rated *satisfactory*. Supervision of the project was transferred to the Armenia Resident Mission in 2015 and benefited from having a senior urban development specialist based there during implementation. Positive relations between ADB and executing agency and former staff in the implementation agency were witnessed during the evaluation mission. There is no doubt that this represents an optimal arrangement to provide appropriate sector support and supervision during implementation. Strong safeguard support was provided by national consultants.

68. Quality at entry in the original loan was less strong. The original loan's DMF was weak in its internal consistency, with the same indicators adopted at impact, outcome, and output levels. Baseline

data and performance targets were not adequately developed. Efforts were made at the time of the additional financing to rectify these shortcomings and improve the DMF by providing the indicators, baselines, and targets. The additional financing also capitalized on the successful implementation of the original loan.

69. The decision by the government to enter into a national lease agreement for WSS had important implications for the project. Although all subprojects were completed at the time of the lease, the hiatus effectively removed communication channels between the ADB and the new implementation agency, Veolia Djur. Efforts could have been made by ADB to ring-fence reporting commitments made under the project loans, specifically maintenance of the PPMS and preparation of a government PCR. This would have improved the ability to evaluate project performance and benefits.

C. Borrower and Executing Agency Performance

70. The performance of the borrower and the executing agency is *satisfactory*. SCWE and AWSC, the implementing agency, provided the required staffing and counterpart funding. Interviews with former staff in the project coordination unit and AWSC reflected a strong working relationship with ADB.

71. Core loan covenants were generally complied with, although this evaluation shows that those concerning the PPMS, tariff reform, and the government PCR were not fully complied with. At the time of the government's decision on the lease agreement with Veolia Djur, steps could have been taken to ensure the continued collection of performance data and regular reporting on the subprojects to better assess project benefits.

CHAPTER 5

Overall Assessment, Issues, Lessons, and Recommendations

A. Overall Assessment

72. Table 5 summarizes the ratings of the PCR and ratings of the project performance evaluation. The project was rated *successful* overall. The project has resulted in improved continuity and quality of water supply in the project towns and villages, as well as having contributed significantly to the enabling environment for private sector participation in the sector in Armenia. Shortcomings in the DMF and insufficient attention to sanitation diminished project relevance. Sensitivity to decreases in revenues, lack of progressive tariff, continued subsidies, and persistently high NRW put sustainability at risk.

Table 5: Overall Assessment of Project Performance

Evaluation Criteria	Project Completion Report	Project Performance Evaluation Report	Key Reasons for Disagreements and Comments
Relevance	Highly relevant	Relevant	Shortcomings in the design and monitoring framework and insufficient attention to sanitation
Effectiveness	Effective	Effective	
Efficiency	Efficient	Efficient	
Sustainability	Likely sustainable	Less than likely sustainable	Sensitivity to decreases in revenues, lack of progressive tariff, and continued subsidies put sustainability at risk. Nonrevenue water remains excessive by international standards.
Overall assessment	**Successful**	**Successful**	
Preliminary assessment of impact	Satisfactory	Satisfactory	
Borrower and executing agency	Satisfactory	Satisfactory	
Performance of Asian Development Bank	Satisfactory	Satisfactory	

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

B. Issues

73. **There is no sufficient investment in the water supply and sanitation infrastructure to maintain and improve on the project gains.** Interviews with beneficiaries confirm that in terms of water availability, continuity of supply, and water quality, residents of ADB project villages and towns generally have improved access to water supply services compared with the pre-project situation. The FGDs provided some evidences, however, that in cases where the water system expands to serve neighboring villages there can be a negative impact on levels of service. New water sources and a program of upgrading and rehabilitation of existing systems require continued investment to maintain and improve the gains achieved and for expansion to communities not yet connected. The mandatory capital program of the national lease, currently assumed by the government, generally refers to periodic maintenance

requirements and minor extensions rather than major capital works. Both periodic maintenance and capital works are required to maintain and improve the levels of service.

74. **Acceptability of tariff increases remains an intransigent challenge.** The lack of progressive tariffs and continued subsidies to the operator continue to put sustainability of the water system at risk. The findings of the FGDs have shown that further tariff increases without appropriate improvement in services and better communications with customers are likely to generate resistance. FGDs in non-project villages indicate they currently have no meters and receive water for free. The project and the national lease assumed there were to be no operating subsidies and the future national tariff was expected to cover all O&M costs. The PSRC approves tariff increases, but the government subsidizes the operator. There is a clear need for wider debate across all stakeholders regarding the purpose, rationale, and justification for progressive tariffs. The government should lead these discussions while communicating its position, ensuring transparency, and avoiding the debate's politicization.

75. **There are an estimated 570 off-grid villages that are not covered under the national lease and represent a key gap in coverage for the sector in Armenia.** Proposals have been made to improve water supply in these villages, which are outside the current service area of Veolia Djur, under internationally funded assistance programs. These programs have been cancelled or postponed, however, because of national fiscal constraints. These constraints are likely to be eased until 2020, thus providing opportunity to reevaluate such proposals.

76. **Sanitation has not been addressed sufficiently in ADB support for the sector.** Almost no sanitation and/or sewerage improvements were financed under the two loans, despite their inclusion in the original project design. The government chose a sequenced pathway, whereby water supply issues were addressed first and investments in sanitation were to follow. Most beneficiaries interviewed wished to see such improvements, but they expressed variable willingness to pay.

77. **Nonrevenue water remains an unresolved and neglected issue.** Although NRW losses remain unacceptably high within the project areas, the findings of the FGDs and meetings with government officials indicate that reducing NRW was not a priority. The need to address NRW will be heightened by the combination of economic losses associated with these inefficiencies, climate change that likely will put more pressure on available water resources, and efforts to reach villages that currently remain off-grid.

78. **Poor formulation of DMF indicators and targets across the results chain diminished the ability to track and attribute project performance**. Continuity of water supply, collection efficiency, and NRW were adopted as indicators for both outcome and output objectives. The project logic was therefore impeded, as causal linkages between outputs and outcomes cannot be clearly traced. Specific actions at output level, for example through improved O&M practices, training, or technological solutions, could have been identified along with associated indicators and targets so that project outcomes could be clearly attributed to project activities. This extended to the project's impact objectives, which had no specific indicators to measure improvements in public health or environment.

C. Lessons

79. **Long-term engagement is needed to foster private sector participation in water supply provision.** Along with other development partners, ADB has contributed significantly to the development of an enabling environment for private sector engagement in the provision of WSS services in Armenia. This would not have been possible without ADB's long-term engagement in the sector through this project and other interventions. ADB support to draft the PPP law (approved in June 2019) and continuing support on regulations will further enhance the enabling environment. In hindsight, better sequencing of support for the wider PPP regulatory environment in advance of the national lease would have enhanced the project's impact. The new law nevertheless provides much-needed traction for continued private sector participation in the sector.

80. **A simplified monitoring and evaluation system, with direct reporting to the executing agency, would have led to better assessment of the project's performance**. The ability to evaluate project performance and benefits was seriously compromised when the collection of performance data was discontinued even though collection was required under the loan agreement. The PPMS for the project was complex and was maintained only for the duration of each loan's implementation period. The decision by the government to pursue a national lease effectively interrupted the PPMS reporting cycle for the additional financing loan in 2016. Even though AWSC was effectively absorbed by the new operator, reporting could have been maintained with the executing agency. Although the interruption in reporting under the additional financing loan is understandable, no reason was given as to why performance data was not collected for towns and villages supported under the first loan through to 2015. A less onerous and more simplified PPMS focused on selected key indicators could have facilitated more continuous monitoring.

81. **Nonrevenue water will remain a neglected issue without serious government and development partner support and targeted project actions.** The project's high target levels for NRW, at 70%, reflected a low priority given by both government and ADB. There were no specific actions outlined in the project design to achieve reductions in NRW. Metering should have improved the ability to monitor and control losses. Although impressive results in metering were achieved, the priority appears to have been to improve collection efficiency rather than seriously address NRW. Even for the demonstration village of Malishka, which performed well (achieving 100% water supply coverage and metering, 24-hour water supply, and 100% collection efficiency), no NRW results were presented in the PCR. While the PCR highlighted success in addressing NRW, there was no commensurate discussion on reasons for these achievements or indications as to what worked well and what did not. By the same token, the high key performance indicator target set in the national lease, at circa 80%, also reflects that the government gives this low priority.

D. Recommendations

82. This evaluation proposes three recommendations:

83. **ADB should continue policy dialogue with the government and wider stakeholders on tariff reform to support sustainable delivery of water supply and sanitation services.** Embedded in the project's rationale, design, and loan covenants is the principle of cost recovery for O&M of water supply services. However, this was not sufficient to effect change. A communication strategy beyond any individual project is needed to explain in a transparent manner the rationale and justification for progressive tariffs in the sector. This is needed to ensure the long-term sustainability of the water supply system, both in terms of maintaining existing services and expanding the system to unserved communities.

84. **ADB should accelerate its support for sanitation in Armenia.** In both its impact and outcome statements, sanitation was part of the project's logic formulation. Largely due to government priorities, however, the actual investment in sanitation was minimal. The FGDs with project beneficiaries and interviews with government officials confirm the clear need for improved sanitation. In cooperation with the government and other development partners, ADB should devote greater attention to sanitation in order to achieve environmental and health benefits that are not attainable through water supply investments alone.

85. **ADB water supply and sanitation investments should include specific measures to tackle and monitor NRW.** While water resources are reasonably plentiful in Armenia relative to neighboring countries, the toleration of such high levels of NRW is unsustainable. Population increase, expansion to unserved communities, sectoral demands beyond drinking water, and negative impacts of climate change will all place future constraints on available resources. All future projects with water supply components should include specific measures that allow robust detection and monitoring of NRW so that corrective actions can be taken.

Appendixes

APPENDIX 1: DESIGN AND MONITORING FRAMEWORK

Design Summary	Performance Indicators/Targets	Project Achievements	Achievements at Evaluation
Impact Improved public health and environment in about 29 project towns and 160 villages	Public satisfaction with the availability, quality, and quantity of water is improved.	The public satisfaction with the availability, quality, and quantity of water increased to 90% on average by the end of 2016. Loan 2363: 2008 – 42% 2009 – 51% 2010 – 66% 2011 – 78% 2012 – 89% Loan 2860: 2013 – 62% 2014 – 74% 2015 – 88% 2016 – 91%	No comparable data was available, but focus group discussions (FGDs) mostly reported satisfaction with level of service.
	The percentage of households with 24-hour water supply increases to 65% in 2016 in all project towns and villages.	For Loan 2363 project towns and villages, it increased from 25% (2008) to 40% (2012). For Loan 2860 project towns and villages, it increased from 33% (2013) to 49% (2015). As of November 2016, the percentage of households with 24-hour water supply in the project increased to 52%.	Five of nine FGDs reported 24-hour water supply.
	All households in project towns and villages have access by 2016 to reliable supplies of potable water for at least 15 hours per day on average that meets Armenian quality standards.	The average number of daily hours of drinking water services in all project towns and villages is more than 16 hours per day by 2016. For Loan 2363 loan project towns and villages it is 16.2 hours per day on average by 2012. For Loan 2860- loan project towns and villages it is 19.3 hours per day on average by 2015.	Based on FGDs and available data, this target has been achieved.
Outcome Improved access to safe, reliable, and sustainable water supply and sanitation in about 29 towns and up to 160 project villages, managed on commercial principles and with environmentally sound practices	About 700,000 residents in the project towns and villages directly or indirectly benefit by 2012 from reliable supplies of potable water for at least 15 hours per day that meets Armenian water quality standards.	1. The project positively changed the lives of more than 894,785 residents of 29 towns and 160 villages across Armenia by 2016. 2. The average number of daily hours of drinking water services in all project towns and villages is more than 16 hours per day by 2016. For Loan 2363 project towns and villages, it is 16.2 hours per day on average by 2012. For Loan 2860 project towns and villages, it is 19.3 hours per day on average by 2015.	Based on FGDs and available data, the target for continuity of supply and water quality has been achieved.

Design Summary	Performance Indicators/Targets	Project Achievements	Achievements at Evaluation
		There is an inconsistency with this performance target and indicator, as it refers to 2012 (when it should be 2016) and the wording does not use the same terminology as Output indicator No. 2 and the Impact indicator, which is "15 hours per day on average."	
	The technical, financial, and managerial capacity of the Armenia Water and Sewerage Company (AWSC) is further improved by 2016.	3. The technical capacity of AWSC improved as follows: Water losses reduced Loan 2363: from 83% (2008) to 72.7% (2012) Loan 2860: from 83.3% (2013) to 78.6% (2015)	The project completion report target of 70% has not been achieved.
		4. Metering level increased. Loan 2363: from 65% (2008) to 81% (2012) Loan 2860: from 80% (2013) to 83% (2015)	No target was provided, but the metering has been increased.
		5. The financial capacity of AWSC improved as follows: Revenue collection with the second loan project increased up to 92% (2015) on average. For Loan 2363 project towns and villages, it was 79% by 2012. For Loan 2860 project towns and villages, it was 92% by 2015.	Data since project completion was not available, but project performance management system (PPMS) data indicate these targets were achieved. Current operator reports collection ratio of 94.5%.
		6. The management capacity of AWSC improved as follows: Productivity (number of employees per 1,000 consumers) improved (per project). Loan 2363: from 5.64 (2008) to 5.14 (2012) Loan 2860: from 9.2 (2013) to 7.5 (2015)	Data since project completion was not available, but PPMS data indicate these targets were achieved.
Outputs 1. Extended program of rehabilitation and replacement of water supply and sewerage systems in more project towns and villages	Water supply systems in 29 towns and up to 160 villages are rehabilitated, replaced in part or in full, and/or extended by 2016. About 40,000 water meters are installed in all project areas.	1. Water supply systems in 29 towns and 160 villages are rehabilitated, replaced in part or in full, and/or extended by 2016. 2. 57,660 water meter chambers are installed in all project areas.	Based on FGDs and available data, this target has been achieved. Based on FGDs and available data, this target has been achieved.

Design Summary	Performance Indicators/Targets	Project Achievements	Achievements at Evaluation
2. Further improvements in water services as per updated performance targets and indicators in more project towns and villages	All households in project towns and villages have access by 2016 to reliable supplies of potable water for at least 15 hours per day on average that meets Armenian water quality standards.	3. The average number of daily hours of drinking water services in all project towns and villages is more than 16 hours per day on average. For Loan 2363 project towns and villages, it was 16.2 hours per day on average by 2012. For Loan 2860 project towns and villages, it was 19.3 hours per day on average by 2016.	Based on FGDs and available data, this target has been achieved.
	A sex-disaggregated customer and complaints database is in place.	4. Sex-disaggregated customer complaints database established with all the incoming calls and complaints recorded and analyzed by the AWSC Call center staff.	Data since project completion was not available, but PPMS data indicate these targets were achieved.
	One local nongovernment organization and/or female community leaders are involved in the outreach and awareness campaign in each project town.	5. Public outreach and awareness campaigns/trainings undertaken in all 10 subproject towns under Loan 2860. Of 285 participants, 185 (65%) were female. One nongovernment organization was involved during public outreach and awareness meetings in all subproject towns.	Data since project completion was not available, but PPMS data indicate these targets were achieved.
	All households headed by women in project towns and villages have access by 2017 to potable water supply 15 hours per day.	6. While the average time of daily water supply in all project towns and villages is more than 16 hours per day, the project covered all households in the identified communities. The households were not registered at AWSC by gender, however, and AWSC was unable to disaggregate the data	Cannot be confirmed, as households were not registered at AWSC by gender.
3. Extended program to further expand the AWSC's operational and institutional capacity	Nonrevenue water is reduced to 70% in project towns and villages by 2016. [Note: at appraisal Loan 2363 had a NRW target of 30%]	7. AWSC achieved the target with the nonrevenue water (losses) reduced to 67.3 % in overall AWSC service perimeter, including the project area (based on AWSC quarterly report QIII 2016) by September 2016. Loan 2363: 2008 – 83% 2009 – 82.1% 2010 – 80.2% 2011 – 73.5% 2012 – 72.7% Loan 2860: 2013 – 83.3% 2014 – 80.3% 2015 – 78.6%	Based on available data, this target has not been achieved in the project areas.

Design Summary	Performance Indicators/Targets	Project Achievements	Achievements at Evaluation
	Tariff collection efficiency in project towns and villages is improved to 95% by 2016.	8. AWSC achieved the target with the tariff collection efficiency of approximately 91% in all towns and villages under the AWSC service area on average as of December 2015. Loan 2363: 2008 – 61% 2009 – 65% 2010 – 74% 2011 – 76% 2012 – 79% Loan 2860: 2013 – 93% 2014 – 93% 2015 – 93%	PPMS data indicate these targets were achieved, and current operator reports collection ratio of 94.5%.
	The AWSC human resource management strategy is further developed to include further management training provided to AWSC staff, with 25% of training participants being women.	9. AWSC introduced a sex-disaggregated human resources database and during the project implementation period more than 53 training programs were conducted with 660 participants in total. These included 165 females (25%).	Data since project completion was not available, but PPMS data indicate these targets were achieved.

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

APPENDIX 2: PROJECT COST

Table A2.1: Project Cost by Component
($ million)

Item		Amount
A.	Base Cost	
	1. Component A: Infrastructure investment	37.4
	2. Component B: Management improvement and development	0.8
B.	Contingencies	5.6
C.	Financing charges during implementation	1.2
	Total	**45.0**

Sources: Asian Development Bank. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of Armenia for the Water Supply and Sanitation Sector Project.* Manila (Loan 2363); and ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for Additional Financing to Armenia for the Water Supply and Sanitation Sector Project.* Manila (Loan 2860).

Table A2.2: Project Cost at Appraisal and Actual
($ million)

Component/ Item		Appraisal Estimate			Actual		
		Loan 2363	Loan 2860	Total Project	Loan 2363	Loan 2860	Total Project
A.	**Infrastructure Investments**						
1.	Civil works	13.50	35.10	48.60	19.63	39.12	58.76
3.	Materials and equipment	20.30	2.00	22.30	21.17	3.52	24.69
4.	Design and supervision	3.60	2.20	5.80	2.47	2.91	5.38
	Subtotal (A)	**37.40**	**39.30**	**76.70**	**43.28**	**45.55**	**88.83**
B.	**Management Improvement and Development**						
1.	Training and public outreach program	0.60	0.00	0.60	0.00	0.00	0.00
2.	Project management consultants	0.20	0.90	1.10	1.21	0.83	2.04
	Subtotal (B)	**0.80**	**0.90**	**1.70**	**1.22**	**0.83**	**2.05**
	Total Base Cost (A+B)	**38.20**	**40.20**	**78.40**	**44.49**	**46.38**	**90.87**
C.	**Contingencies**						
1.	Physical	2.70	3.70	6.40	0.00	0.00	0.00
2.	Price	2.90	5.00	7.90	0.00	0.00	0.00
	Subtotal (C)	**5.60**	**8.70**	**14.30**	**0.00**	**0.00**	**0.00**
D.	**Financing Charges during Implementation**	**1.20**	**1.10**	**2.30**	**0.80**	**0.94**	**1.74**
	Total (A+B+C+D)	**45.00**	**50.00**	**95.00**	**45.29**	**47.32**	**92.62**

Source: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila.

APPENDIX 3: ECONOMIC PERFORMANCE OF SUBPROJECTS REEVALUATION

A. Introduction

1. The economic reevaluation was undertaken in accordance with Asian Development Bank (ADB) guidelines. It is based on a reevaluation of the representative subprojects identified in the project completion report (PCR).[1] Four subprojects were reevaluated: Abovyan, Ararat, Gegharqunik, and Lori. These were the same subprojects evaluated at appraisal.[2]

2. Following the PCR economic analyses, this reevaluation focuses on computation of the economic internal rates of return (EIRRs) and economic net present values (ENPVs). Non-incremental and incremental project costs and benefits were computed based on the actual costs incurred during implementation. Some updates have been made from the PCR analysis. Where variations in assumptions have been adopted, these are detailed.

B. Methodology

3. The project economic benefits include both quantifiable and nonquantifiable benefits. The quantifiable benefits identified at appraisal were used in the PCR evaluation and cover incremental water supply, non-incremental water, and time and water savings. Neither at appraisal nor for the PCR were health benefits and enhanced productivity from improved access to better-quality water and associated lower disease and health costs quantified. They nevertheless were identified as benefits. Because this appraisal replicated the PCR assessment, these benefits also were not quantified but are recognized as such.

4. Economic benefits from the cost savings on non-incremental supply to connected and unconnected user households are estimated based on the resource cost savings. The incremental benefits of increased volume of sales are estimated and based on the incremental demand and willingness to pay.

5. The standard methodology for calculating EIRRs and ENPVs of the subprojects was used in determining the economic costs and benefits. Financial prices were converted to economic values by deducting taxes and other transfer charges, and a standard wage rate factor of 0.7 was applied for unskilled labor.[3] The economic opportunity cost of capital of 12% used is the same as at appraisal and as adopted in the PCR. The domestic price numeraire was adopted for the analysis.

6. In estimating the economic costs and benefits, subproject economic costs were based on the actual capital investment and projected operation and maintenance (O&M) expenditures, and for the economic benefits the subproject non-incremental and incremental water volumes were estimated based on the subproject investment, improved system efficiency, and consumer demand. The benefits were estimated using economic prices for incremental and non-incremental water as outlined above. In common with the PCR analysis, this reevaluation adopted the following assumptions, and where changes are made these are noted:

(i) Assumed life of the project was 25 years.
(ii) Capital investment costs were detailed for each subproject, with the actual subproject

[1] ADB. 2018. *Completion Report. Armenia: Water Supply and Sanitation Sector Project in Armenia.* Manila (Loans 2363 and 2860).
[2] ADB. 2007. *Report and Recommendation of the President to the Board of Directors: Proposed Loan to the Republic of Armenia for the Water Supply and Sanitation Sector Project.* Manila (Loan 2363); and ADB. 2012. *Report and Recommendation of the President to the Board of Directors: Proposed Loan for Additional Financing to Armenia for the Water Supply and Sanitation Sector Project.* Manila (Loan 2860).
[3] Following the PCR's assumption, the standard wage rate factor for skilled labor was taken to be 1.0.

capital investment cost spread over the construction contract period, less taxes of 20%. Costs included design and supervision and project management at 8.9% of the civil works, materials, and equipment costs.

(iii) In the PCR analysis, O&M costs had been based on figures extracted from the PPMS. Because it proved difficult to corroborate the data, these were replaced by taking the average overall O&M cost of water produced, as computed from the annual financial reports of Veolia Djur for 2017 and 2018 at AMD21 per cubic meter. These include staff salaries, bonuses and other equivalent fees, materials, electricity, depreciation and amortization, activities conducted by other organizations, and facility maintenance expenses. For the four subprojects, the unit cost was applied to the actual amount of water produced each year up to 2016 and projections thereafter. Unit O&M costs were assumed not to increase over the period in real terms. The PCR had included O&M costs for year zero, before any capital outlays. For this analysis, these costs were excluded, and project-related O&M was assumed to take place from the last year of the capital expenditures. Taxes at 20% of the cost were excluded, and the economic cost of unskilled labor was taken to be 0.7 of the financial cost.

(iv) Economic prices of non-incremental and incremental water were assumed to be the resource cost savings and average incremental economic cost of the water. The economic non-incremental water price covered time and cost savings, which included the cost of water collection, water storage costs, tanker-supplied water costs, and the cost of bottled water use. The reevaluation followed the PCR estimates, although a number of assumptions were updated, including hourly wages, cost of tanker water and storage, and others. The economic incremental water price was based on the average of the economic price of (i) household willingness to pay per cubic meter of water (based upon previous survey data updated for domestic inflation), and (ii) the incremental economic cost per cubic meter of water for the subproject.

C. Economic Reevaluation

7. The subproject EIRRs and ENPVs were recalculated for the project performance evaluation report and compared to those at project completion. Three of the reevaluated subproject EIRRs are lower than at project completion but still above the 12% economic cost of capital assumed both at completion and appraisal. For the Gegharqunik subproject, the EIRR, at 10.5%, is below the opportunity cost of capital. Table A3.1 compares the reevaluated EIRRs with those at appraisal and completion. The subproject EIRRs for three of the subprojects were lower at completion than at appraisal, reflecting lower actual economic benefits and markedly higher economic costs than estimated at appraisal.

Table A3.1: Subproject Economic Internal Rates of Return

	Economic Internal Rates of Return		
Subproject	Appraisal	Completion	Evaluation
Abovyan	25.0%	13.7%	18.7
Lori	19.2%	23.2%	34.1
Ararat	21.0%	17.3%	27.5
Gegharqunik	17.6%	10.5%	20.9

Sources: Asian Development Bank. 2018. Completion Report: Water Supply and Sanitation Sector Project in Armenia. Manila; and Asian Development Bank (Independent Evaluation Department).

8. Because the subprojects were completed some years ago and actual capital costs were known, sensitivity analysis was only undertaken for (i) 20% increase in O&M cost, (ii) 20% decrease in benefits, (iii) 20% decrease in O&M cost, and (iv) combined 20% increase in O&M cost and decrease in benefits. The sensitivity scenarios for all four subprojects indicate that they are sensitive to some of these changes. All subprojects have EIRRs above 12% under all sensitivity tests, except for Abovyan whose

EIRR falls to 7.1% under the worst-case scenario. The subprojects are more sensitive to decreasing revenues than increasing O&M costs (Table A3.2).

Table A3.2: Subproject Sensitivity Analysis

Subproj-320ect	Abovyan	Lori	Ararat	Gegharqunik
At completion				
Base case	13.7	23.2	17.3	10.5
20% decrease in O&M cost	17.7	25.4	20.0	13.0
20% increase in O&M cost	9.7	21.2	14.7	8.0
20% decrease in benefits	6.8	17.7	12.0	5.8
Combined 20% increase in O&M and 20% decrease in benefits	2.1	15.8	9.5	3.1
At evaluation				
Base case	18.7	34.1	27.5	20.9
20% decrease in O&M cost	22.4	35.7	29.8	23.1
20% increase in O&M cost	14.9	32.5	25.3	18.6
20% decrease in benefits	11.4	26.2	20.1	14.5
Combined 20% increase in O&M and 20% decrease in benefits	7.1	24.5	17.7	12.0

O&M = operation and maintenance.
Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

9. Tables A3.3, A3.4, A3.5, and A3.6 show summary figures used in the EIRR and ENPV computations for each subproject, including the results of sensitivity runs.

Table A3.3: Abovyan Subproject Economic Analysis

			Economic Cost			Net Revenues							
Year	Benefit	Delayed Benefit	Capital	O&M	Total	Base Case	Capital + 20%	O&M +20%	O&M –20%	Revenue –20%	1-year Delay in Benefit	O&M +/Benefit –20%	Capital +/Revenue –20%
2008													
2009		-	151.06		151.06	(151.06)	(181.27)	(151.06)	(151.06)	(151.06)	(151.06)	(151.06)	(181.274)
2010		-	302.12		302.12	(302.12)	(362.55)	(362.55)	(302.12)	(302.12)	(302.12)	(302.12)	(362.548)
2011	218.23	-	302.12	112.33	414.45	(196.23)	(256.65)	(218.69)	(173.76)	(239.87)	(414.45)	(262.34)	(300.298)
2012	219.92	218.23		113.18	113.18	106.74	106.74	84.10	129.38	62.73	105.05	40.12	62.757
2013	258.50	219.92		186.85	186.85	71.64	71.64	34.27	109.01	19.94	33.06	(17.43)	19.944
2014	282.81	258.50		186.85	186.85	95.95	95.95	58.58	133.32	39.39	71.64	2.02	39.390
2015	290.50	282.81		186.85	186.85	103.64	103.64	66.27	141.02	45.54	95.95	8.17	45.545
2016	295.05	290.50		186.85	186.85	108.20	108.20	70.83	145.57	49.19	103.64	11.82	49.188
2017	393.71	295.05		186.85	186.85	206.85	206.85	169.48	244.22	128.11	108.20	90.74	128.112
2018	396.86	393.71		186.85	186.85	210.00	210.00	172.63	247.37	130.63	206.85	93.26	130.632
2019	399.43	396.86		186.85	186.85	212.58	212.58	175.21	249.95	132.69	210.00	95.32	132.691
2020	402.03	399.43		186.85	186.85	215.17	215.17	177.80	252.54	134.77	212.58	97.40	134.766
2021	404.64	402.03		186.85	186.85	217.78	217.78	180.41	255.16	136.86	215.17	99.49	136.857
2022	407.27	404.64		186.85	186.85	220.42	220.42	183.05	257.79	138.96	217.78	101.59	138.963
2023	409.92	407.27		186.85	186.85	223.07	223.07	185.70	260.44	141.08	220.42	103.71	141.084
2024	412.60	409.92		186.85	186.85	225.74	225.74	188.37	263.11	143.22	223.07	105.85	143.222
2025	415.29	412.60		186.85	186.85	228.43	228.43	191.06	265.80	145.38	225.74	108.00	145.375
2026	418.00	415.29		186.85	186.85	231.14	231.14	193.77	268.52	147.54	228.43	110.17	147.545
2027	420.73	418.00		186.85	186.85	233.88	233.88	196.51	271.25	149.73	231.14	112.36	149.730
2028	423.48	420.73		186.85	186.85	236.63	236.63	199.26	274.00	151.93	233.88	114.56	151.932
2029	426.26	423.48		186.85	186.85	239.40	239.40	202.03	276.77	154.15	236.63	116.78	154.151
2030	429.05	426.26		186.85	186.85	242.20	242.20	204.82	279.57	156.37	239.40	119.01	156.385
2031	431.88	429.05		186.85	186.85	245.02	245.02	207.65	282.39	158.65	242.20	121.28	158.646
2032	434.72	431.88		186.85	186.85	247.87	247.87	210.50	285.24	160.92	245.02	123.55	160.923
2033	437.59	434.72		186.85	186.85	250.74	250.74	213.36	288.11	163.22	247.87	125.85	163.218
		Discount Rate @ WACC 12%			EIRR	18.7%	15.9%	14.9%	22.4%	11.4%	14.0%	7.1%	9.4%
					ENPV	369.77	251.61	159.80	579.74	(32.31)	131.39	(242.28)	(150.47)

EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance, WACC = weighted average cost of capital.

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

Table A3.4: Lori Subproject Economic Analysis

			Financial Cost			Net Revenues							
Year	Revenue	Delayed Benefit	Capital	O&M	Total	Base Case	Capital + 20%	O&M +20%	O&M –20%	Revenue –20%	1-year Delay in Benefit	O&M +/Benefit –20%	Capital +/Revenue –20%
2013				-	-	-	-	-	-	-	-	-	
2014		-	564.66		564.659	(564.659)	(677.590)	(564.659)	(564.659)	(564.659)	(564.659)	(564.659)	(677.590)
2015		-	913.57		913.574	(913.574)	(1,096.288)	(913.574)	(913.574)	(913.574)	(913.574)	(913.574)	(1,096.288)
2016	632.49	-	266.34	128.59	394.933	237.553	184.285	211.836	263.271	111.056	(394.933)	85.338	57.788
2017	855.88	632.486		185.55	185.548	670.336	670.336	633.226	707.445	499.159	446.938	462.049	499.159
2018	862.73	855.884		187.03	187.033	675.698	675.698	638.292	713.105	503.152	668.851	465.746	503.152
2019	868.89	862.731		188.53	188.529	680.361	680.361	642.656	718.067	506.583	674.202	468.877	506.583
2020	875.10	868.890		190.04	190.037	685.060	685.060	647.052	723.067	510.040	678.853	472.033	510.040
2021	881.35	875.097		191.56	191.557	689.794	689.794	651.483	728.106	513.524	683.540	475.212	513.524
2022	887.65	881.352		193.09	193.090	694.565	694.565	655.947	733.183	517.034	688.262	478.416	517.034
2023	894.01	887.654		194.63	194.635	699.371	699.371	660.445	738.298	520.570	693.020	481.643	520.570
2024	900.41	894.006		196.19	196.192	704.215	704.215	664.977	743.453	524.134	697.814	484.895	524.134
2025	906.86	900.407		197.76	197.761	709.095	709.095	669.543	748.648	527.724	702.645	488.172	527.724
2026	913.36	906.856		199.34	199.343	714.013	714.013	674.144	753.882	531.342	707.513	491.473	531.342
2027	919.91	913.356		200.94	200.938	718.968	718.968	678.781	759.156	534.987	712.418	494.799	534.987
2028	926.51	919.906		202.55	202.545	723.961	723.961	683.452	764.470	538.660	717.361	498.141	538.660
2029	933.16	926.507		204.17	204.166	728.992	728.992	688.159	769.826	542.361	722.341	501.528	542.361
2030	939.86	933.158		205.80	205.799	734.062	734.062	692.902	775.222	546.090	727.359	504.930	546.090
2031	946.63	939.861		207.45	207.446	739.184	739.184	697.695	780.673	549.858	732.416	508.369	549.858
2032	953.45	946.629		209.11	209.105	744.345	744.345	702.524	786.166	553.655	737.524	511.834	553.655
2033	960.32	953.450		210.78	210.778	749.545	749.545	707.390	791.701	557.481	742.672	515.325	557.481
2034	967.25	960.323		212.46	212.464	754.785	754.785	712.293	797.278	561.336	747.859	518.843	561.336
2035	974.23	967.250		214.16	214.164	760.066	760.066	717.233	802.898	565.220	753.086	522.387	565.220
2036	981.26	974.230		215.88	215.877	765.386	765.386	722.211	808.562	569.133	758.352	525.958	569.133
2037	988.35	981.263		217.60	217.604	770.747	770.747	727.227	814.268	573.077	763.659	529.556	573.077
2038	995.49	988.352		219.35	219.345	776.150	776.150	732.281	820.019	577.051	769.007	533.182	577.051
			Discount Rate										
			@ WACC		EIRR	34.1%	29.0%	32.5%	35.7%	26.2%	25.9%	24.5%	22.2%
			12%		ENPV	2,754.0	2,469.6	2,523.1	2,984.9	1,687.9	2,130.6	1,457.0	1,403.5

EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance, WACC = weighted average cost of capital.
Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila; and Asian Development Bank (Independent Evaluation Department).

Table A3.5: Ararat Subproject Economic Analysis

			Economic Cost			Net Benefits							
Year	Economic Benefits	Delayed Benefits	Capital	O&M	Total	Base Case	Capital + 20%	O&M +20%	O&M –20%	Benefits –20%	1-year Delay in Benefit	O&M +/Benefit –20%	Capital +/Revenue –20%
2013				-	-	-	-	-	-	-	-	-	-
2014		-	722.58	-	722.58	(722.58)	(867.09)	(722.58)	(722.58)	(722.58)	(722.58)	(867.09)	(867.094)
2015		-	722.58	-	722.58	(722.58)	(867.09)	(722.58)	(722.58)	(722.58)	(722.58)	(867.09)	(867.094)
2016	672.22	-	361.29	241.55	602.84	69.38	(2.88)	21.07	117.69	(65.06)	(602.84)	(113.37)	(137.319)
2017	786.83	672.22		241.55	241.55	545.29	545.29	496.98	593.60	387.92	430.67	339.61	387.920
2018	793.13	786.83		241.55	241.55	551.58	551.58	503.27	599.89	392.96	545.29	344.65	392.955
2019	796.96	793.13		241.55	241.55	555.41	555.41	507.10	603.72	392.02	551.58	347.71	396.019
2020	800.81	796.96		241.55	241.55	559.27	559.27	510.96	607.57	399.10	555.41	350.79	399.103
2021	804.69	800.81		241.55	241.55	563.14	563.14	514.83	611.45	402.21	559.27	353.90	402.206
2022	808.60	804.69		241.55	241.55	567.05	567.05	518.74	615.36	405.33	563.14	357.02	405.329
2023	812.52	808.60		241.55	241.55	570.98	570.98	522.67	619.29	408.47	567.05	360.16	408.473
2024	816.48	812.52		241.55	241.55	574.93	574.93	526.62	623.24	411.64	570.98	363.33	411.637
2025	820.46	816.48		241.55	241.55	578.91	578.91	530.60	627.22	414.82	574.93	366.51	414.821
2026	824.47	820.46		241.55	241.55	582.92	582.92	534.61	631.23	418.03	578.91	369.72	418.026
2027	828.50	824.47		241.55	241.55	586.95	586.95	538.64	635.26	421.25	582.92	372.94	421.251
2028	832.56	828.50		241.55	241.55	591.01	591.01	542.70	639.32	424.50	586.95	376.19	424.497
2029	836.64	832.56		241.55	241.55	595.09	595.09	546.78	643.40	427.76	591.01	379.46	427.765
2030	840.75	836.64		241.55	241.55	599.20	599.20	550.89	647.51	431.05	595.09	382.74	431.053
2031	844.93	840.75		241.55	241.55	603.39	603.39	555.08	651.70	434.40	599.20	386.09	434.400
2032	849.14	844.93		241.55	241.55	607.60	607.60	559.29	655.91	437.77	603.39	389.46	437.769
2033	853.38	849.14		241.55	241.55	611.84	611.84	563.53	660.15	441.16	607.60	392.85	441.159
2034	857.65	853.38		241.55	241.55	616.10	616.10	567.79	664.41	444.57	611.84	396.26	444.572
2035	861.94	857.65		241.55	241.55	620.39	620.39	572.09	668.70	448.01	616.10	399.70	448.006
2036	866.26	861.94		241.55	241.55	624.72	624.72	576.41	673.03	451.46	620.39	403.15	451.463
2037	870.61	866.26		241.55	241.55	629.07	629.07	580.76	677.37	454.94	624.72	406.63	454.943
2038	874.99	870.61		241.55	241.55	633.44	633.44	585.13	681.75	458.44	629.07	410.14	458.445
			Discount Rate										
			@ WACC		EIRR	27.5%	23.3%	25.3%	29.8%	20.1%	21.0%	17.7%	16.8%
			12%		ENPV	1,943.3	1,647.6	2,240.5	961.7	1,371.5	664.4	4,620.1	666.0

EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance, WACC = weighted average cost of capital.
Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila; and Asian Development Bank (Independent Evaluation Department).

Table A3.6: Gegharqunik Subproject Economic Analysis

			Economic Cost			Net Benefits							
Year	Economic Benefits	Delayed Benefits	Capital	O&M	Total	Base Case	Capital + 20%	O&M +20%	O&M –20%	Benefit –20%	1-year Delay in Benefit	O&M +/Benefit –20%	Capital +/Benefit –20%
2013				-	-	-	-	-	-	-	-	-	-
2014		-	673.22	-	673.22	(673.22)	(807.86)	(673.22)	(673.22)	(673.22)	(673.22)	(673.22)	(807.86)
2015		-	906.93	-	906.93	(906.93)	(1,088.32)	(906.93)	(906.93)	(906.93)	(906.93)	(906.93)	(1,088.32)
2016	508.07	-	310.65	245.92	556.57	(48.50)	(110.63)	(97.69)	0.68	(150.12)	(556.57)	(199.30)	212.25
2017	679.12	508.07		245.92	245.92	433.21	433.21	384.02	482.39	297.38	262.15	248.20	297.38
2018	684.56	679.12		245.92	245.92	438.64	438.64	389.46	487.82	301.73	433.21	252.54	301.73
2019	688.20	684.56		245.92	245.92	442.28	442.28	393.10	491.46	304.64	438.64	255.46	304.64
2020	691.86	688.20		245.92	245.92	445.95	445.95	396.76	495.13	307.57	442.28	258.39	307.57
2021	695.55	691.86		245.92	245.92	449.64	449.64	400.45	498.82	310.52	445.95	261.34	310.52
2022	699.27	695.55		245.92	245.92	453.35	453.35	404.17	502.53	313.50	449.64	264.31	313.50
2023	703.01	699.27		245.92	245.92	457.09	457.09	407.91	506.27	316.49	453.35	267.31	316.49
2024	706.77	703.01		245.92	245.92	460.86	460.86	411.67	510.04	319.50	457.09	270.32	319.50
2025	710.57	706.77		245.92	245.92	464.65	464.65	415.47	513.83	322.54	460.86	273.35	322.54
2026	714.38	710.57		245.92	245.92	468.47	468.47	419.28	517.65	325.59	464.65	276.41	325.59
2027	718.23	714.38		245.92	245.92	472.31	472.31	423.13	521.49	328.66	468.47	279.48	328.66
2028	722.10	718.23		245.92	245.92	476.18	476.18	427.00	525.36	331.76	472.31	282.58	331.76
2029	725.99	722.10		245.92	245.92	480.08	480.08	430.89	529.26	334.88	476.18	285.69	334.88
2030	729.92	725.99		245.92	245.92	484.00	484.00	434.82	533.18	338.02	480.08	288.83	338.02
2031	733.90	729.92		245.92	245.92	487.98	487.98	438.80	537.17	341.20	484.00	292.02	341.20
2032	737.91	733.90		245.92	245.92	491.99	491.99	442.81	541.18	344.41	487.98	295.23	344.41
2033	741.95	737.91		245.92	245.92	496.03	496.03	446.85	545.22	347.64	491.99	298.46	347.64
2034	746.02	741.95		245.92	245.92	500.10	500.10	450.91	549.28	350.89	496.03	301.71	350.89
2035	750.11	746.02		245.92	245.92	504.19	504.19	455.01	553.37	354.17	500.10	304.99	354.17
2036	754.23	750.11		245.92	245.92	508.31	508.31	459.13	557.50	357.47	504.19	308.28	357.47
2037	758.23	754.23		245.92	245.92	512.46	512.46	463.28	561.65	360.79	508.31	311.60	360.79
2038	762.56	758.38		245.92	245.92	516.64	516.64	467.46	565.83	364.13	512.46	314.95	364.13
			Discount Rate										
			@ WACC		EIRR	20.9%	17.6%	18.6%	23.1%	14.5%	16.3%	12.0%	11.9%
			12%		ENPV	1,015.02	739.09	744.81	1,285.22	265.88	577.93	(4.33)	(11.26)

EIRR = economic internal rate of return, ENPV = economic net present value, O&M = operation and maintenance, WACC = weighted average cost of capital.

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila; and Asian Development Bank (Independent Evaluation Department).

APPENDIX 4: PROJECT AND SUBPROJECT FINANCIAL PERFORMANCE REEVALUATION

A. Introduction

1. The financial reevaluation covered two assessments: (i) the sustainability of current water supply and sanitation services under the national lease contract of Veolia Djur Closed Joint Stock Company (Veolia Djur) entered into in late 2016, which involved assuming responsibility for operations and maintenance of the project investments; and (ii) a reevaluation of the representative subprojects identified in the project completion report (PCR).[1] Four subprojects were evaluated: Abovyan, Ararat, Gegharqunik, and Lori. The financial reevaluation adopted a methodology similar to that of the PCR and updated the PCR's projections. Both assessments followed appropriate Asian Development Bank (ADB) guidelines. The reevaluation undertook discounted cash flow analysis to compute financial internal rates of return (FIRRs) and financial net present values (FNPVs) for the subproject investments. Constant 2018 prices were used in the computations. Sensitivity analyses were conducted by varying revenues and costs. Where the assumptions used differ from those made in the PCR, these are detailed.

B. Sustainability of Current Services

2. The integration of the Armenia Water and Sewerage Company (AWSC), the other regional utilities (Lori Water and Sewerage Company, Nor Akunq Water and Sewerage Company, and Shirak Water and Sewerage Company) with the Yerevan Water and Sewerage Company into one national company in late 2016 resulted in significant changes to the project's implementation arrangements in its closing stages. Although most of the civil works were completed by the end of 2016, these changes nevertheless affected the operations and maintenance of the completed subprojects.

3. The single national lease contract for water supply and sanitation services combined the service areas of utilities that previously had been public–private partnerships (PPPs).[2] Upon expiry of these PPP contracts in 2016, a single lease operator was selected competitively.[3] One national tariff was adopted for water supply and sanitation services, extending the principle of cross-subsidies from Yerevan consumers, where operating costs were higher, to those outside the capital city.

4. The government decision on the national lease was justified by (i) the benefits from economies of scale through lower operating costs of the private operator and reduced supervision costs for the government, (ii) opportunities to reduce energy use by adopting a national system with increased gravity-fed water and more efficient pumping, (iii) reduction in nonrevenue water (NRW), and (iv) the need to expand wastewater treatment. Nevertheless, the establishment of one national company recognized that the overall population to be served was small by international standards, while the opportunity for competition among the different private water operators—a possible incentive for better performance—would be lost.

5. Under the lease contract, there would be no operating subsidies and the future national tariff would cover all operation and maintenance (O&M) costs. Bidding was based on technical competence and the lowest tariff. The tariff, which is defined in the lease, was to have mechanisms for price

[1] Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila (Loans 2363 and 2860).

[2] AWSC's management contract with Société d'Aménagement Urbain et Rural (SAUR), Yerevan Water and Sewerage Company lease contract with Veolia Djur, and the single management contract for the three regional service providers with MVV Decon GmbH, MVV Energie AG, and AEG Service LLC.

[3] Hence the right to operate water systems under contracts with Yerevan Djur, AWSC, Lori WSC, Shirak WSC, and Nor Akunq WSC was transferred to one private water operator for 15 years.

adjustment subject to approval by the Public Sector Regulatory Commission (PSRC). The change to a lease contract aimed to improve the likelihood of achieving financial sustainability of water supply and sewerage services in Armenia.

6. The national lease was structured as an "enhanced lease." A lease fee of AMD89.75 billion, paid over the 15-year contract period. The lease set minimum levels of mandatory capital works for each year, with the lessee internally financing these (costing an annual average of AMD2.5 billion or AMD37.5 million over the lease period). The contract included four key performance indicators: continuity of supply and water quality (both in the previous PPPs) and two new indicators for NRW and consumer satisfaction, with penalties charged if the targets were not met. Other internal benchmarking indicators were also included but were not subject to penalties. Performance monitoring is carried out by independent technical auditors. The government, using public funds and through the State Committee for Water Economy as lessor, assumed responsibility for financing and implementing much of the capital investment program.[4]

7. The contract was signed on 21 November 2016 and Veolia Djur was established as the national water operator. The proposed tariff was approved by PSRC in December 2016 and became effective on 1 January 2017. The arrangement introduced the concept of an "affordable tariff," whereby drinking water charges should not be more than 2.5% of consumer spending by those in the poorest quintile of household incomes, assuming daily consumption of 70 liters per capita.[5] This threshold is much lower than the typical affordability indicators used in most countries, which is up to 5% of household incomes. The Veolia Djur tender met this condition. Armenian water charges are reported to be among the lowest in the region, and they are likely to remain as such.

8. The national tariff for retail water supply and wastewater treatment services during 2017, the first year of the contract, was AMD180.0 per cubic meter (m^3) and included value added tax (VAT) at 20%. The rate is proportioned 85% for water supply and 15% for sewerage services. In 2018 and beyond, tariffs are subject to mandatory adjustment according to specified indicators:[6] (i) change in retail water supply volume, (ii) adjustment for inflation, and (iii) changes in electricity tariffs to the company.[7] According to the contract, no other criteria can be taken into account in establishing the service tariff.

9. At project appraisal, sustainability was based on an assumption of regular tariff increases every 3 years while ensuring that they were within the affordable limits of low-income households, set at approximately 5% of average household income. Project loan covenants included the necessary tariff policy, but it was not implemented. Tariff increases took place in 2004 and 2005 prior to the project, and only one increase occurred during the 2007–2017 project period, that being on 1 April 2009. Under the additional financing (i.e., Loan 2860, approved in 2012), the tariff reform policy plan was raised again and was expected to be implemented. This did not happen because the government, in 2013, deferred any increases until after the establishment of a national water utility. Water tariffs before 2017 are shown in Table A4.1.

[4] The mandatory capital program of Veolia Djur generally refers to periodic maintenance requirements and minor extensions rather than major capital works.

[5] According to the government's National Development Program, 2014–25.

[6] A retail base tariff was agreed for each year of the lease period along with a base volume of retail water supplied. Sixty percent of the base tariff is subject to adjustment for inflation, 13% for electricity tariffs, while 27% is not subject to adjustment.

[7] Veolia Djur. Review of Drinking Water Tariffs (Adjustment). 2018. This presentation indicates that further adjustments also can be made because of additional revenue from the use of water for other purposes and the supply of drinking water for irrigation. This item was included in the request for the tariff adjustment.

Table A4.1: Water Tariffs before Veolia Djur

Water Supply and Sanitation Companies	Price per m^3 of Water (including VAT)	Years of Validity
Nor Akunq	AMD202.63	2010–2016
Yerevan Djur (Veolia Djur)	AMD170.26	2013–2016
Armenian Water and Sewerage Closed Joint Stock Company	AMD179.78	2009–2016
Lori Water and Sewerage	AMD180.98	2010–2016
Shirak Water and Sewerage	AMD172.20	2010–2016

m^3 = cubic meter, VAT = value-added tax.
Source: Asian Development Bank (Independent Evaluation Department).

10. The project investments rehabilitated and expanded physical infrastructure—water mains, supply networks, reservoirs, pumping stations, water meters—and improved operational efficiency and performance through increased customer services in terms of access to water, better quality, and improved hours of supply. The service would be operated commercially, with increased revenues from more customers, greater water use, and improved collections. The PCR notes that AWSC increased its revenue through higher sales volume and improved collections. It met key performance target indicators, but, because the government did not approve tariff increases, those tariffs charged by AWSC did not achieve cost recovery. Subsidies were required to cover the shortfall. These ranged from AMD1.21 billion in 2008 to AMD2.17 billion in 2015. Once Veolia Djur became the lessee, tariff increases were delayed until 2017. Only then did the tariff rise to AMD180/m^3 as the result of the tender and the lease. As shown in Table A4.1, however, the water tariff actually went down in 2017 for people living in the Nor Akunq service area, while there were increases for those living in Yerevan and Shirak service areas. There was very little change within the former Lori and AWSC service areas.

11. As prescribed in the lease, mandatory adjustment of tariffs was permitted from 2018 onward. PSRC approved a tariff of AMD191.414/m^3, including VAT, for 2018, but this was rejected by the national government, seeking to maintain it at the same AMD180/m^3 (inclusive of VAT level) as in 2017. The difference of AMD11.414/m^3 was committed as a subsidy in the state budget for 2019.[8] In August 2018, Veolia Djur applied to the PSRC to adjust tariffs for the third year of the lease. The request was for a rate of AMD205.125/m^3 for 2019. The PSRC did some recalculation and it recommended AMD202.272/m^3. According to a memorandum of understanding of November 2018 between the State Committee for Water Economy and Veolia Djur, the retail service tariff for 2019 was retained at the 2017 level. The recommended AMD10.858/m^3 increase (inclusive of VAT) for 2019 (i.e., AMD202.272/m^3–AMD191.414/m^3) would be implemented only in 2025. The tariff would therefore remain at the 2017 level until 2025.

12. The financial analysis at appraisal had been based on determining the level of cost recovery from users required to cover all O&M expenditures as well as capital investments over time needed to achieve financial sustainability. The analysis assumed each subproject would contribute to financial sustainability of the AWSC. The government policy shifted the focus from financial sustainability for each utility to sustainability for Veolia Djur.

13. Audited financial statements for Veolia Djur show an overall loss of AMD3.6 billion in 2017, but an operating profit of AMD0.8 billion.[9] Contributing to the loss were net financing costs of AMD4.4 billion, including the annual lease payments. Losses increased to AMD3.8 billion in 2018, as net financing

[8] Government of Armenia. Decision N57-N. 31 January 2019. "Subsidizing the Potable Water Supply and Wastewater Services," outlined the amount to be provided to Veolia Djur to retain the retail tariff of potable water supply and wastewater services from 1 December 2018 to 30 November 2019 at AMD180.000, instead of the approved AMD191.414, as follows: (i) AMD9.702 subsidy, including VAT, from AMD162.702, including VAT, per cubic meter of potable water supplied to customers; and (ii) AMD1.712 subsidy, including VAT, from the AMD28.712, including VAT, per cubic meter of wastewater disposed.

[9] Veolia Djur Financial Statements for 2017. KPMG Armenia. 30 June 2018.

costs were higher, at AMD4.9 billion, but Veolia Djur achieved an operating profit of about AMD1.2 billion, which was an improvement over 2017. The company has negative equity as a result of the accumulated losses. Long-term liabilities increased by 7% as their share of total equity and liabilities rose from 82.3% in 2017 to 86.3% in 2018. Total assets, however, grew by 2.1% from AMD41.6 billion in 2017 to AMD42.5 billion in 2018. The current ratio deteriorated from 1.1 in 2017 to 0.9 in 2018 because of lower cash balances that contributed to a 1% decline in current assets while current liabilities increased by almost 26%. Nevertheless, revenues rose by 11.2% while the cost of sales increased by 7.2%, leading to a 20.8% gain in gross profit.[10] Figures for the first quarter of 2019 show further losses of some AMD0.68 billion and an operating profit of AMD1.4 billion.[11] It is not clear whether this outcome includes or excludes the committed subsidies in lieu of tariff increase. The impact of the foregone tariff rise will reduce the operating profit and impact on the bottom line unless the cash subsidies are paid by the government and the mandatory capital works are assumed as agreed.

C. Subproject Financial Analysis

14. The financial reevaluation was undertaken for all four subprojects reappraised and documented in the PCR. FIRRs and NPVs were computed, and their sensitivities were tested to changes in the projection assumptions.

1. Assumptions for Financial Reevaluation

15. The financial model used for the PCR analysis was amended and updated where possible with the latest information. The analysis was based on actual costs and with projections made in constant 2018 prices.[12] Actual capital cost figures used at project completion were retained as the base for the reevaluation. Some changes were made to the estimates of revenues and costs, however, and particularly to estimates of O&M and of revenues according to revised assumptions on demand and actual tariffs charged by Veolia Djur. The basic assumptions used and the changes made are as described below:

(i) Financial projections were made over a period of 25 years, starting with the first year of capital outlays.

(ii) Capital investment costs were adopted as presented in the PCR, with investment spread over the contract period. The civil works for the Abovyan subproject, financed under Loan 2363, were started in 2009 and completed in 2011 under one contract. For the three Loan 2860 subprojects, there were a number of civil works contracts: in Ararat, three from 2013 to 2015; Lori, three from 2013 to 2016, with two completed in 2015; and Gegharqunik, five during 2014–2016, with three completed in 2015. The figures used at completion related only to materials, equipment, and construction costs. Therefore, design and supervision and project management costs were added. In the total project, these were 8.9% of total civil works, materials, and equipment costs.[13] This percentage was therefore added to the actual contract costs (Table A4.2).

[10] Veolia Djur Financial Statements for 2018. KPMG Armenia. 23 July 2019.
[11] Velia Djur. Quarterly Report. January–March 2019. April 2019.
[12] The PCR indicates that a project performance management system (PPMS) was established covering all key performance indicators, numbers of consumers, hours of water, water produced and water billed, collection rates, NRW, energy use, and average O&M cost. The PPMS was maintained for the subprojects under Loan 2363 to 2012, and for the subprojects under Loan 2860 from 2013 to 2016. With the integration of AWSC into a national water utility at the end of 2016, closure of the project implementation unit within AWSC, and termination of most of its staff, PPMS data was not collected or available for 2016. The lack of subproject monitoring post 2012 and the absence of full 2016 data mean there are key data gaps and it is difficult to fully quantify project benefits once the new subproject investments became operational.
[13] Footnote 1, Appendix 3. Project Cost at Appraisal and Actual.

Table A4.2: Actual Project Costs
($ million)

Item	Loan 2363	Loan 2860	Total Project
Civil works	19.63	39.12	58.76
Materials and equipment	21.17	3.52	24.69
Subtotal A	**40.80**	**42.64**	**83.45**
Design and supervision	2.47	2.91	5.38
Project management consultants	1.22	0.83	2.05
Subtotal B	**3.69**	**3.74**	**7.43**
Subtotal B as % of Subtotal A	**9.04%**	**8.77%**	**8.90%**

Source: Asian Development Bank (Independent Evaluation Department).

(iii) In the PCR analysis, O&M costs were based on figures extracted from the PPMS. Because it proved difficult to corroborate the data, these were replaced by taking the average overall O&M cost of water produced, as computed from the annual financial reports of Veolia Djur for 2017 and 2018 at AMD21 per cubic meter. These include staff salaries, bonuses and other equivalent fees, materials, electricity, depreciation and amortization, activities conducted by other organizations, and facility maintenance expenses. For the four subprojects, the unit cost was applied to the actual amount of water produced each year up to 2016 and projections thereafter. Unit O&M costs were assumed not to increase in real terms over the period.[14] The PCR had included O&M costs for year zero before any capital outlays, but these costs were excluded and project-related O&M was assumed to occur from the last year of the capital expenditures.

(iv) The tariff rates used followed those in Table A4.1 up to 2016 and the Veolia Djur lease contract tariff thereafter. No increase was assumed until 2025, when the deferred rate of AMD202.3/m^3 (less 20% VAT) was adopted as deflated to 2018 prices. Thereafter the same rate was applied, since 60% of the tariff share is subject to adjustment for inflation, 13% for electricity tariffs, and 27% is not subject to adjustment. No real change in electricity costs was assumed. This implied that revenues after 2025 increase in line with inflation.

(v) Actual revenue collection rates in the subprojects were used where available. Actual rates as reported under the Veolia Djur contract of 85.5% for 2017 and 92.4% for 2018 were used. Projections assumed an improvement of 0.5% per annum thereafter until the 95% level was reached. VAT at 20% was deducted from the revenues.

(vi) Veolia Djur reports indicate that NRW for 2017 and 2018 were 79.16% and 79.23%, respectively. These figures were used for 2017 and 2018 as a base. Actual figures, where available, were used for past years. Projections assumed annual improvement according to the target set in the Veolia Djur contract of 51.2% for 2031 at the end of the contract,[15] but further improvements of 1% per annum were assumed thereafter.

(vii) In calculating household sizes and population growth rates, current household size in Armenia in 2017 was estimated to be 3.8 persons, while population growth rates were assumed to match the projected increases in urban population nationwide according to the United Nations figures implying 0.23% per annum (the PCR had used 0.8% per annum).

(viii) Per capita consumption reflected the growth in households provided with improved water supply, and especially those moving from 4–12 hours of supply per day to 12–24 hours. The base consumption of Veolia Djur's customers in 2017 and 2018 of about 93 liters per capita was increased to 150 in 2019 and held constant thereafter. That is lower than the PCR figure of 200 liters, the assumptions behind which were not reported.

[14] The assumption in the PCR analysis is that there would be an efficiency improvement with O&M of 0.8% per year, inasmuch as reductions in energy costs are indicated, as per the performance indicators in the Veolia lease contract. This is by no means certain, however, and no change has been assumed.

[15] Baseline of 81.2% less 30% as per lease contract, stated in key performance indicators.

2. Weighted Average Cost of Capital

16. The mean weighted average cost of capital (WACC) for the subprojects was estimated in the PCR to be 2.19%. A revised computation reduced the WACC to 2.04% to reflect changes in the cost of government funding, the actual proportions of ADB and government funding, and more accurate computations of real interest rates. The revised calculation is shown as Table A4.3, with the funding allocation based on actual ADB financing for each loan.

Table A4.3: Weighted Average Cost of Capital

Source	Amount ($ million)	Percentage	Interest (% per annum)	PCR Figures	Reevaluated
Loan 2363	36.32	39.2%	2.93%		
Loan 2860	37.93	41.0%	2.31%		
Subtotal (loans)	**74.25**	**80.2%**	**2.61%**	**2.93%**	**2.61%**
Government equity	18.37	19.8%	11.08%	11.08%	11.35%[a]
Total	**92.62**	**100.0%**			
Tax rate/loan interest less tax		20.0%		2.34%	2.18%
Inflation on foreign exchange				1.50%	1.50%
Local inflation				3.50%	3.50%
Real cost (loan)				0.84%	0.67%
Real cost (equity)				7.58%	7.58%
Real WACC				**2.19%**	**2.04%**

PCR = project completion report, WACC = weighted average cost of capital.
[a] 90-day treasury bill rate (average 2008–2012 of 9.5%) + 2.0% risk premium.
Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

3. Results of the Financial Reevaluation

17. The subproject FIRRs and FNPVs were recalculated using the changes in assumptions stated above. The FIRRs at project completion were significantly lower than at appraisal, and the FIRRs for three subprojects were below the revised WACC. Only one subproject, Abovyan, had an FIRR (at 5.8%) above the WACC. The government's failure to adopt the planned tariff increases during project implementation meant revenues were lower than at appraisal. Meanwhile, actual O&M costs were higher, including those for energy. Table A4.4 compares the FIRRs at appraisal, completion, and this evaluation. At evaluation, Abovyan and Gegharqunik subprojects had higher FIRRs compared to the completion estimates, the latter nevertheless was below the WACC. The Lori and Ararat subprojects had lower FIRRs at evaluation (the former being negative) and were below the WACC. All FIRRs at evaluation were below those at appraisal. The changes largely reflect the rephrasing and recomputation of the O&M costs. FNPVs for Ararat, Gegharqunik, and Lori were negative.

Table A4.4: Subproject Financial Internal Rates of Return

Subproject	Appraisal	Completion	Evaluation
Abovyan	7.8%	5.8%	6.5%
Lori	6.3%	1.2%	(2.2%)
Ararat	6.5%	0.9%	0.4%
Gegharqunik	4.9%	(7.0%)	0.2%

( ) = negative.
Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

18. Because the subprojects were completed some years ago and actual capital costs were known, sensitivity analysis was undertaken only for (i) 20% increase in O&M cost, representing the case where Veolia Djur has and will reduce energy and operating costs; (ii) 20% decrease in revenue; (iii) 20%

decrease in O&M cost, and (iv) combined 20% increase in O&M cost and decrease in revenue. The sensitivity scenarios for all four subprojects indicate that they are sensitive to all these changes. The results show that all four subprojects are more sensitive to decrease in revenues than to increase in O&M costs of the same proportion. The Abovyan subproject remains viable only when O&M decreases by 20%. Ararat, Gegharqunik, and Lori perform similarly, and when O&M costs are assumed to increase by 20% and revenues decrease by 20% FIRRs fall below the WACC and are negative. Under the worst-case scenarios—revenue decreases, increases in O&M, and a combination of both—all four subprojects are negative. The Ararat, Gegharqunik, and Lori subprojects are likely to require operational subsidies within the overall Veolia Djur operations to be financially viable. Table A4.5 details the figures at completion and for this evaluation. FNPVs under the sensitivity assumptions for all subprojects were negative, except for the case where O&M costs alone were assumed to decrease

Table A4.5: Subproject Sensitivity Analysis
Financial Internal Rates of Return
(%)

Subproject	Abovyan	Lori	Ararat	Gegharqunik
At completion				
Base case	5.8	1.2	0.9	(7.0)
20% decrease in O&M cost	10.2	3.5	3.8	(2.4)
20% increase in O&M cost	1.1	(1.2)	(2.3)	(14.5)
20% decrease in benefits	(1.2)	(3.0)	(4.0)	
Combined 20% increase in O&M and 20% decrease in benefits	(9.1)	(6.4)	(8.9)	
At evaluation				
Base case	6.5	(2.2)	0.4	0.2
20% decrease in O&M cost	11.5	1.5	4.6	4.3
20% increase in O&M cost	(1.3)	(8.1)	(6.1)	(6.1)
20% decrease in benefits	(6.0)	(11.7)	(10.0)	(9.9)
Combined 20% increase in O&M and 20% decrease in benefits	Out of range	Out of range	Out of range	Out of range

( ) = negative, O&M = operation and maintenance.
Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia.* Manila; and Asian Development Bank (Independent Evaluation Department).

Tables A4.6, A4.7, A4.8, and A4.9 detail the figures for each subproject.

Table A4.6: Abovyan Subproject Financial Analysis

			Financial Cost			Net Revenues				
Year	Revenue	Delayed Revenue	Capital	O&M	Total	Base Case	O&M +20%	O&M –20%	Revenue –20%	O&M+/ Rev–20%
2008				-	-	-	-		-	-
2009		-	213.53	-	213.53	(213.53)	(213.53)	(213.53)	(213.53)	(213.53)
2010		-	427.07	-	427.07	(427.07)	(427.07)	(427.07)	(427.07)	(427.07)
2011	144.31	-	427.07	122.00	549.07	(404.76)	(429.16)	(380.35)	(433.62)	(458.02)
2012	145.40	144.31		122.92	122.92	22.48	(2.10)	47.06	(6.60)	(31.18)
2013	276.28	145.40		163.15	163.15	113.13	80.50	145.76	57.88	25.25
2014	294.34	276.28		187.79	187.79	106.55	65.99	144.11	47.68	10.12
2015	311.89	294.34		194.99	194.99	116.89	77.90	155.89	54.52	15.52
2016	307.20	311.89		244.19	244.19	63.01	14.17	111.85	1.57	(47.27)
2017	374.44	307.20		276.91	276.91	97.53	42.14	152.91	22.64	(32.74)
2018	413.21	374.44		303.94	303.94	109.27	48.48	170.06	26.63	(34.16)
2019	418.76	413.21		306.37	306.37	112.39	51.11	173.66	28.63	(32.64)
2020	406.29	418.76		308.82	308.82	97.47	35.71	159.24	16.21	(45.55)
2021	402.86	406.29		311.29	311.29	91.57	29.31	153.83	11.00	(51.26)
2022	399.45	402.86		313.78	313.78	85.66	22.91	148.42	5.77	(56.98)
2023	394.39	399.45		316.29	316.29	78.10	14.84	141.36	(0.78)	(64.04)
2024	388.99	394.39		318.82	318.82	70.16	6.40	133.93	(7.63)	(71.40)
2025	431.13	388.99		321.37	321.37	109.76	45.48	174.03	23.53	(40.74)
2026	434.58	431.13		323.95	323.95	110.63	45.85	175.42	23.72	(41.07)
2027	438.06	434.58		326.54	326.54	111.52	4621	176.83	23.91	(41.40)
2028	441.56	438.06		329.15	329.15	112.41	46.58	178.24	24.10	(41.73)
2029	445.09	441.56		331.78	331.78	113.31	46.95	179.67	24.29	(42.06)
2030	448.65	445.09		334.44	334.44	114.22	47.33	181.11	24.49	(42.40)
2031	452.24	448.65		337.11	337.11	115.13	47.71	182.55	24.68	(42.74)
2032	455.86	452.24		339.81	339.81	116.05	48.09	184.01	24.88	(43.08)
2033	459.51	455.86		342.53	342.53	116.98	48.48	185.49	25.08	(43.43)
WACC	2.04%	Discount Rate @ WACC			FIRR	6.46%	(1.25%)	11.52%	(5.98%)	NA[a]
					FNPV	620.33	(335.94)	1,576.60	(664.29)	(1,620.56)

FIRR = financial internal rate of return, FNPV = financial net present value, NA = not applicable, O&M = operation and maintenance, WACC = weighted average cost of capital.

[a] Out of computational range.

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila; and Asian Development Bank (Independent Evaluation Department).

Table A4.7: Lori Subproject Financial Analysis

			Financial Cost			Net Revenues				
Year	Revenue	Delayed Revenue	Capital	O&M	Total	Base Case	O&M +20%	O&M –20%	Revenue –20%	O&M+/ Rev–20%
2013				-	-	-	-	-	-	-
2014		-	763.05		763.05	(763.05)	(763.05)	(763.05)	(763.05)	(763.05)
2015		-	1,234.56		1,234.56	(1,234.56)	(1,234.56)	(1,234.56)	(1,234.56)	(1,234.56)
2016	233.37	-	359.92	160.74	520.66	(287.29)	(319.44)	(255.14)	(333.97)	(366.11)
2017	291.62	233.37		231.94	231.94	56.69	13.30	106.08	1.36	(45.02)
2018	315.92	291.62		233.63	233.63	82.28	35.56	129.01	19.10	(27.63)
2019	311.53	315.92		234.19	234.19	77.34	30.50	124.18	15.03	(31.80)
2020	307.20	311.53		234.75	234.75	72.45	25.50	119.40	11.01	(35.94)
2021	302.92	307.20		235.32	235.32	67.61	20.54	114.67	7.02	(40.04)
2022	298.70	302.92		235.88	235.88	62.81	15.64	109.99	3.08	(44.10)
2023	294.52	298.70		236.45	236.45	58.07	10.78	105.36	(0.83)	(48.12)
2024	289.18	294.52		237.02	237.02	52.16	4.76	99.56	(5.67)	(53.08)
2025	318.73	289.18		237.58	237.58	81.14	33.62	128.66	17.40	(30.12)
2026	319.49	318.73		238.16	238.16	81.34	33.70	128.97	17.44	(30.19)
2027	320.26	319.49		238.73	238.73	81.53	33.79	129.28	17.48	(30.27)
2028	321.03	320.26		239.30	239.30	81.73	33.87	129.59	17.52	(30.34)
2029	321.80	321.03		239.87	239.87	81.92	33.95	129.90	17.56	(30.41)
2030	322.60	321.80		240.47	240.47	82.13	34.03	130.22	17.61	(30.49)
2031	323.41	322.60		241.07	241.07	82.33	34.12	130.55	17.65	(30.56)
2032	324.22	323.41		241.68	241.68	82.54	34.20	130.87	17.70	(30.64)
2033	325.03	324.22		242.28	242.28	82.74	34.29	131.20	17.74	(30.72)
2034	325.84	325.03		242.89	242.89	82.95	34.37	131.53	17.78	(30.79)
2035	326.65	325.84		243.49	243.49	83.16	34.46	131.86	17.83	(30.87)
2036	327.47	326.65		244.10	244.10	83.37	34.55	132.19	17.87	(30.95)
2037	328.29	327.47		244.71	244.71	83.58	34.63	132.52	17.92	(31.03)
2038	329.11	328.29		245.33	245.33	83.78	34.72	132.85	17.96	(31.10)
WACC	2.04%	Discount Rate at WACC			FIRR	(2.20%)	(8.10%)	1.54%	(11.74%)	NA[a]
					FNPV	(947.53)	(1,767.42)	(127.63)	(2,032.37)	(2,852.27)

FIRR = financial internal rate of return, FNPV = financial net present value, NA = not applicable, O&M = operation and maintenance, WACC = weighted average cost of capital.

[a] Out of computational range.

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila; and Asian Development Bank (Independent Evaluation Department).

Table A4.8: Ararat Subproject Financial Analysis

			Financial Cost			Net Revenues				
Year	Revenue	Delayed Revenue	Capital	O&M	Total	Base Case	O&M +20%	O&M –20%	Revenue –20%	O&M+/ Rev–20%
2013				-	-	-	-	-	-	-
2014		-	531.68	-	531.68	(531.68)	(531.68)	(531.68)	(531.68)	(531.68)
2015	-	-	1,595.04	-	1,595.04	(1,595.04)	(1,595.04)	(1,595.04)	(1,595.04)	(1,595.04)
2016	330.11	-	531.68	234.94	766.62	(436.51)	(483.50)	(389.53)	(502.54)	(549.52)
2017	437.96	330.11		348.32	348.32	89.64	19.98	159.31	2.05	(67.62)
2018	477.09	437.96		352.83	352.83	124.26	53.70	194.83	28.85	(41.72)
2019	473.11	477.09		355.65	355.65	117.45	46.32	188.58	22.83	(48.30)
2020	469.14	473.11		358.50	358.50	110.64	38.94	182.34	16.81	(54.89)
2021	465.19	469.14		361.37	361.37	103.82	31.55	176.09	10.78	(61.49)
2022	461.26	465.19		364.26	364.26	97.00	24.15	169.85	4.75	(68.10)
2023	457.35	461.26		367.17	367.17	90.18	16.74	163.61	(1.29)	(74.73)
2024	451.56	457.35		370.11	370.11	81.45	7.43	155.47	(8.86)	(82.88)
2025	500.48	451.56		373.07	373.07	127.41	52.80	202.03	27.32	(47.30)
2026	504.48	500.48		376.05	376.05	128.43	53.22	203.64	27.53	(47.68)
2027	508.52	504.48		379.06	379.06	129.46	53.65	205.27	27.75	(48.06)
2028	512.59	508.52		382.09	382.09	130.49	54.07	206.91	27.98	(48.44)
2029	516.69	512.59		385.15	385.15	131.54	54.51	208.57	28.20	(48.83)
2030	520.82	516.69		388.23	388.23	132.59	54.94	210.24	28.43	(49.22)
2031	524.99	520.82		391.34	391.34	133.65	55.38	211.92	28.65	(49.61)
2032	529.19	524.99		394.47	394.47	134.72	55.83	213.61	28.88	(50.01)
2033	533.42	529.19		397.62	397.62	135.80	56.27	215.32	29.11	(50.41)
2034	537.69	533.42		400.81	400.81	136.88	56.72	217.05	29.35	(50.81)
2035	541.99	537.69		404.01	404.01	137.98	57.18	218.78	29.58	(51.22)
2036	546.33	541.99		407.24	407.24	139.08	57.63	220.53	29.82	(51.63)
2037	550.70	546.33		410.50	410.50	140.20	58.10	222.30	30.06	(52.04)
2038	555.10	550.70		413.79	413.79	141.32	58.56	224.07	30.30	(52.46)
WACC	2.04%	Discount Rate at WACC			FIRR	0.38%	(6.09%)	4.62%	(9.97%)	NA[a]
					FNPV	(466.06)	(1,763.19)	831.07	(2,180.65)	(3,477.78)

FIRR = financial internal rate of return, FNPV = financial net present value, NA = not applicable, O&M = operation and maintenance, WACC = weighted average cost of capital.

[a] Out of computational range.

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila; and Asian Development Bank (Independent Evaluation Department).

Table A4.9: Gegharqunik Subproject Financial Analysis

			Financial Cost			Net Revenues				
Year	Revenue	Delayed Revenue	Capital	O&M	Total	Base Case	O&M +20%	O&M –20%	Revenue –20%	O&M+/ Rev–20%
2013				-	-	-	-	-	-	-
2014		-	990.72	-	990.72	(990.72)	(990.72)	(990.72)	(990.72)	(990.72)
2015		-	1,133.66	-	1,133.66	(1,133.66)	(1,133.66)	(1,133.66)	(1,133.66)	(1,133.66)
2016	244.99	-	457.16	175.11	632.28	(387.29)	(422.31)	(352.27)	(436.29)	(471.31)
2017	420.25	244.99		334.23	334.23	86.02	19.17	152.86	1.97	(64.88)
2018	457.80	420.25		338.56	338.56	119.24	51.53	186.95	27.68	(40.03)
2019	453.97	457.80		341.27	341.27	112.70	44.45	180.96	21.91	(46.35)
2020	450.16	453.97		344.00	344.00	106.16	37.36	174.96	16.13	(52.67)
2021	446.37	450.16		346.75	346.75	99.62	30.27	168.97	10.35	(59.00)
2022	442.60	446.37		349.52	349.52	93.08	23.17	162.98	4.56	(65.35)
2023	438.85	442.60		352.32	352.32	86.53	16.07	156.99	(1.24)	(71.70)
2024	433.30	438.85		355.14	355.14	78.16	7.13	149.18	(8.50)	(79.53)
2025	480.24	433.30		357.98	357.98	122.26	50.66	193.85	26.21	(45.39)
2026	484.08	480.24		360.84	360.84	123.24	51.07	195.41	26.42	(45.75)
2027	187.95	484.08		363.73	363.73	124.22	51.48	196.97	26.63	(46.11)
2028	491.86	487.95		366.64	366.64	125.22	51.89	198.54	26.84	(46.48)
2029	495.79	491.86		369.57	369.57	126.22	52.30	200.13	27.06	(46.86)
2030	499.76	495.79		372.53	372.53	127.23	52.72	201.73	27.28	(47.23)
2031	503.76	499.76		375.51	375.51	128.25	53.14	203.35	27.49	(47.61)
2032	507.79	503.76		378.52	378.52	129.27	53.57	204.97	27.71	(47.99)
2033	511.85	507.79		381.54	381.54	130.31	54.00	206.61	27.94	(48.37)
2034	515.94	511.85		384.60	384.60	131.35	54.43	208.27	28.16	(48.76)
2035	520.07	515.94		387.67	387.67	132.40	54.86	209.93	28.38	(49.15)
2036	524.23	520.07		390.77	390.77	133.46	55.30	211.61	28.61	(49.54)
2037	528.43	524.23		393.90	393.90	134.53	55.75	213.31	28.84	(49.94)
2038	532.65	528.43		397.05	397.05	135.60	56.19	215.01	29.07	(50.34)
WACC	2.04%	Discount Rate at WACC			FIRR	0.21%	(6.11%)	4.31%	(9.97%)	NA[a]
					FNPV	(507.272)	(1,742.470)	727.925	(2,139.014)	(3,374.211)

FIRR = financial internal rate of return, FNPV = financial net present value, NA = not applicable, O&M = operation and maintenance, WACC = weighted average cost of capital.

[a] Out of computational range.

Sources: Asian Development Bank. 2018. *Completion Report: Water Supply and Sanitation Sector Project in Armenia*. Manila; and Asian Development Bank (Independent Evaluation Department).

APPENDIX 5: RESULTS OF FOCUS GROUP DISCUSSIONS

1. This appendix summarizes the findings of nine focus group discussions held during June and September 2019. Those in June took place during the independent evaluation mission to Armenia.

A. Akunq, Kotayk Region

Date	27 June 2019
Venue	Akunq community administration
District	Kotayk Region
Name of Facilitator	Ruzanna Martirosyan
Participants	12 in total, 3 women and 9 men

2. Overall, the participants were satisfied with the project and its outputs. It resulted in good water pressure, 24-hour supply, and individual connections with water meters. Average payments for water by households is from AMD5,000 to AMD6,000 a month. Before the project, households had individual connections, but the water pressure was low and water quality poor. Water formerly contained chlorine and rust. The project works started in 2012 but were completed only in 2017. No problems or issues arose during project implementation regarding dust, noise, or difficulties of access during construction.

3. The improved water supply positively affected the sanitation conditions of households, as new bathrooms with internal water taps were constructed, washing machines were purchased and installed, and new taps were placed in kitchens. These conveniences allowed people to improve the quality of their lives. Within this community, however, only 40% of households improved their sewerage and/or sanitation systems, most making these improvements themselves.

4. Households now pay more for water than before the project. Residents indicated that they pay between 5% and 10% of their average monthly income for water supply, much lower than the proportions paid for other utilities (e.g., gas and electricity) and other communal services. Residents indicated that they could not pay any more for water. The idea of pricing water under a stepped tariff, with a lower rate for the first 5 cubic meters (m^3) per month of consumption and a higher rate for amounts above was not popular. Instead they would try to use drinking water more efficiently[1] and to consume 20% less.

5. The participants noted that no waterborne diseases had occurred up to the day of the meeting.

6. People expect more support in the future, particularly for improving the sewer system and implementing similar water supply projects in nearby villages. Most, however, were unable or unwilling to invest their own funds for further improvements.

[1] This also reflects the use of potable water for irrigation, and during summer months some use the treated water for their gardens.

B. Malishka, Vayots Dzor Region

Date	29 June 2019
Venue	Malishka, one of the bed and breakfasts
District	Vayots Dzor Region
Name of Facilitator	Ruzanna Martirosyan
Participants	6 in total, no women, 6 men

7. Overall, the participants were satisfied with the project and its outputs. It resulted in good water pressure, 24-hour supply, individual connections with water meters, and reconstructed pipelines. Previously, in some areas there had been no piped water supply and people were buying from water carts. Now, every household has water supplied through household connections. Average payment for water ranges from AMD3,000 to AMD6,000 per month per household. Before the project, the respondents had individual connections with low water pressure and were paying about AMD100 per person per month (i.e., much less than now).

8. The project started in 2008 and was completed in 2010. No problems were faced during implementation regarding dust, noise, and difficulty with access.

9. The improved water supply positively affected the sanitation conditions of households, as new bathrooms with internal water taps were connected, washing machines were purchased and installed, and new taps were placed in the kitchens. These conveniences allowed people to improve the quality of their lives. There is no sewer system in the area, and households use pit latrines or septic tanks.

10. The project was designed by "HGSN" LLC, but now some streets have problems due to the distribution network's design. There are eight streets where the network design does not permit reticulation, being just pipelines off the main lines, and at the end of the street water remains in the pipes and can become stagnant.

11. The idea of a stepped tariff, with a lower rate for the first 5 m^3/month of water consumed and a higher rate for additional consumption, was not favored by the participants.

12. Participants noted that no waterborne diseases had occurred up to the day of the meeting.

13. In the future, people expect more investment in the sewer sector. The main need is for construction of a new sewerage system, but they indicated that they would not be able to pay for its construction.

C. Lchashen, Gegharqunik Region

Date	27 June 2019
Venue	Lchashen community administration
District	Gegharqunik Region
Name of Facilitator	Ruzanna Martirosyan
Participants	6 in total, 4 women and 2 men

14. Overall, the participants were satisfied with the project and its outputs. The project improved water pressure and supplied water for 14–15 hours daily through individual connections with water meters. Average payment for water is from AMD2,000 to AMD4,000 monthly per household. Before the project, most residents did not have individual connections and collected water in buckets

15. The project works started in 2015 and were finished in 2016. Residents faced some problems and issues during project implementation, such as dust and noise, but the main problem highlighted related to the roads, which were not reconstructed properly after the project.

16. The improved water supply positively affected the sanitation conditions of households, as new bathrooms with internal water taps were built, washing machines were purchased and installed, and new taps were placed in the kitchens. These conveniences allowed people to improve the quality of their lives. There is no sewer system in the community.

17. Households now pay more for water than before the project. But they pay a much lower price for water compared to what they pay for other utilities (e.g., gas, and electricity) and other communal services. The participants informed the meeting that they would not be able to pay any more for water. The idea of a stepped tariff with a lower rate for the first 5 m^3/month of consumption and higher rate for more was not favored by the participants; instead, they would try to use drinking water more efficiently.

18. The participants noted that no waterborne diseases had occurred up to the day of the meeting.

19. In the future, people expect more investment, especially to improve the sewer system and to implement similar water supply projects in other villages within the area. Also, they expect to have 24-hour water supply.

D. Odzun, Lori Region

Date	28 June 2019
Venue	Odzun, one of the bed and breakfasts
District	Lori Region
Name of Facilitator	Ruzanna Martirosyan
Participants	7 in total, 4 women and 3 men

20. Overall, the participants were very satisfied with the project and its outputs. It resulted in good water pressure, 24-hour supply, individual connections with water meters, and reconstructed pipelines. Every household can drink water, even when there is someone using it at the same time. Average payment for water per household is from AMD5,000 to AMD6,000 per month. Before the project, they had individual connections but with low pressure. If people from the same street were using water at the same time, the pressure was low. Before the project, water quality was poor.

21. The project was implemented in two stages during 2012 and 2017. No problems or issues arose during implementation regarding dust, noise, or difficulty with access to houses and shops.

22. The improved water supply positively affected the sanitation conditions of households, as new bathrooms with internal water taps were built, washing machines were purchased and installed, and new taps were placed in the kitchens. These conveniences allowed people to improve the quality of their lives. Only 40% of households improved their sewerage and/or sanitation systems, and those doing so made the improvements by themselves.

23. The water supply improvements also impacted on the incomes of the households. Because the community is a tourist center, the 24-hour water supply provided opportunities for bed and breakfast services.

24. Residents now pay more for water more than before the project. A stepped tariff with a lower charge for the first 5 m^3/month of water consumed and a higher rate for additional amounts was not supported by the participants. Rather, they said they would try to use drinking water more efficiently[2] and to reduce consumption by 30%.

25. The participants noted that there had been no incidences of waterborne diseases up to the day of the meeting.

26. Residences expected more support in the sewer sector. The main need was to construct a new sewer system. People were willing to partially pay for it.

E. Stepanavan, Lori Region

Date	28 June 2019
Venue	Stepanavan, one of the households
District	Lori Region
Name of Facilitator	Ruzanna Martirosyan
Participants	7 in total, 2 women and 5 men

27. The participants from Stepanavan City were satisfied with the project and its results. After project implementation, they now have 24-hour water supply. The project resulted in better water pressure, and the new pipelines were badly needed since before the projects they were in a poor condition. The old pipelines would break often, and after their repair the water contained sediments. Before the project, they had individual connections but low pressure. Although the quality of water and its supply had been worse than now, the taste had been better. Average household payments for water ranges from AMD3,000 to AMD6,000 a month.

28. The project works had started in 2017 and continued for 1 year. No problems or issues arose during project implementation regarding dust, noise, or difficulties of access to houses. The only problem was that the roads were not properly repaired after the project.

29. The improved water supply positively affected the sanitation conditions of households, as new bathrooms with internal water taps were built, washing machines were purchased and installed, and new taps were placed in the kitchens. These conveniences allowed people to improve the quality of their lives. Some parts of the community, however, do not have sewer or sanitation systems.

30. Residents now pay more for water more before the project. The participants stated that they would not be able to pay any more for water. Because Stepanavan is a tourist center, the participants indicated that 24-hour water supply is essential. The idea of a stepped water tariff with a lower rate for the first 5 m^3/month of water consumed and a higher rate for additional consumption was not acceptable to the participants. They would rather try to use drinking water more efficiently. Some of the participants have bed and breakfast, and this means that they would not be able to decrease the amount of water used.

31. The participants indicated that no waterborne diseases had occurred up to the day of the meeting.

32. The people expect more improvements in the future, including longer duration of water supply and investment into the sewer system. Residents could afford to invest their own funds into these improvements.

[2] This can be also a result of problems with irrigation water, because during summer people from the communities have to use drinking water also for their gardens.

F. Norabats, Ararat Region

Date	26 September 2019
Venue	Norabats community administration
District	Ararat Region
Name of Facilitator	Ruzanna Martirosyan
Participants	13 in total, 6 women and 7 men

33. Overall, the participants were satisfied with the project and its outputs, but they were not satisfied with the quality of water. The project covered reconstructing a pumping station and reservoir, improved water pressure, 24-hour water supply, and individual connections with water meters.

34. A key output was an improved and reconstructed pump station. After the Armenian Water and Sewerage Company was integrated into Veolia Djur, however, the two small pumps installed under the project were replaced with a larger one. The two small pumps are now in storage.

35. Average household payment for water is between AMD3,000 and AMD6,000 per month, which is approximately AMD1,000 person/month. Before the project, they had had individual connections, but the water pressure had been low.

36. The project was implemented in one phase in 2009. No problems and issues arose during its implementation regarding dust, noise, or difficulty with access. There were some problems with the roads, however, as these were not properly repaired after the project. Although immediately after completion water supply had been for 24 hours, at the time of the FGD it was only 16 hours. The participants indicated that they prefer not to drink from the taps because the water is cloudy. One family of six people now buys 300 liters of water (1 liter of water costs AMD10). During the meeting, representative of Veolia Djur indicated that they used to analyze the water quality twice a week and it had met the requirements.

37. The improved water supply positively affected the sanitation conditions of households, as new bathrooms with internal water taps were built, washing machines were purchased and installed, and new taps were placed in the kitchens. These conveniences allowed people to improve the quality of their lives.

38. The participants mentioned that no waterborne diseases had occurred up to the day of the meeting. There were no cases of diarrhea or other such diseases. There is a kindergarten in the same community administration building used for the FGD, and the teachers there reported that some children had nausea and dizziness, which they blame on the quality of the water.

39. In the future people expect improvements to the sewerage and/or sanitation system and in the quality of water supply.

G. Sarukhan, Gegharqunik Region

Date	27 June 2019
Venue	Sarukhan community administration
District	Gegharqunik Region
Name of Facilitator	Ruzanna Martirosyan
Participants	8 in total, no women, 8 men

40. Overall, the participants had been satisfied with the project and its outputs, but only for the first 2 years when they had had 24-hour water supply. After 2017–2018, the supply decreased to 12 hours per day, and in the summer months even less, and never exceeding 10 hours. Water pressure is improved when water is available. Average payment per household for water is from AMD3,000 to AMD7,500 a month. They pay more in winter, because they have to leave the taps open to keep the pipes from freezing.

41. Before the project, they had individual connections with low water pressure and water supply for only 2–5 hours per day. The quality of water had been better then, however, and now they can taste chlorine and plastic. The project works started in 2014 and finished in 2016. No problems or issues were encountered during implementation regarding dust, noise, or difficulties with access to houses.

42. The improved water supply positively affected the sanitation conditions of households, as new bathrooms with internal water taps were built, washing machines were purchased and installed, and new taps were placed in kitchens. These conveniences allowed people to improve the quality of their lives. The community does not have sewerage and/or sanitation systems, but some households have made such improvements themselves.

43. People now pay more for water than before the project. Although they pay a much lower price compared to what they pay for other utilities (e.g., gas and electricity) and other communal services, the participants indicated that they would not be able to pay any more for water. A general view within the communities was that water is a natural resource and the country is rich in it, so there should be no need to pay for it.

44. The idea of a stepped tariff, with a lower rate for the first 5 m^3 of water consumed monthly and a higher rate for additional consumption was not supported by the participants. They said they would try to use drinking water more efficiently in the future.

45. The participants mentioned that no waterborne diseases had occurred up to the day of the meeting.

46. In the future, people expected more support in the water sector, especially longer duration of water supply and a new sewer system, but they were unable to invest their own funds into the improvements.

H. Abovyan, Kotayk Region

Date	17 October 2019
Venue of FGD	Abovyan town, School N8
District	Kotayk Region
Name of FGD Facilitator	Ruzanna Martirosyan
Participants	6 in total, 6 women

47. Generally, participants in this region are satisfied with the project and its results and with the quality of the water. The project resulted in good flow pressure and 18-hour water supply through private connections with water meters installed. The average household's payment for water is from AMD2,500 to AMD5,000 a month. Although most of them had had private connections before the project, they also had had to gather water.

48. During the project implementation, the participants faced no problems or issues, other than maybe just some dust and the fact that 2–3 roadways had not been reconstructed after the project.

49. Water supply development positively affected the sanitation conditions of households, as new bathrooms with connected water taps were built and new taps were installed in the kitchens. These new conveniences allowed people to improve the quality of their lives.

50. People now pay more for water than before the project. Nevertheless, the quality is poorer than it had been before the project. The participants stated that they will not be able to pay more for water. The idea of a pricing system with a lower rate for the first 5 m^3/month of water consumed and a higher rate for greater volumes consumed was welcomed by the participants.

51. The participants mentioned that no waterborne diseases had occurred up to the meeting day.

52. The people expect more support to the water sector In the future, including to improve the sewerage system and implement similar water supply projects in other distant villages within the area. Also, they are expecting to have 24-hour water supply in their community.

I. Artashat, Ararat Region

Date	18 October, 2019
Venue of FGD	Artashat town, School N2
District	Ararat Region
Name of FGD Facilitator	Ruzanna Martirosyan
Participants	7 in total, all women

53. In this region, the participants are satisfied with the project overall, but they are not satisfied with the duration of water supply and the water quality. The result of the project is good flow pressure through private connections with water meters installed. Average household payment for water per person is from ADM500 to AMD600 a month. Before the project, most of them had private connections but the water pressure was very low and they had to gather water from the first floors of their buildings (2010–2011).

54. During the project implementation, participants faced no problems or issues.

55. The water supply development positively affected the sanitation conditions of households, as new bathrooms with connected water taps were built and new taps were installed in the kitchens. These

new conveniences allowed people to improve the quality of their lives. Before the project they had had a lot of problems with the water pressure and quality. The households do not have sewerage or sanitation systems in this community.

56. People now pay more for the water than before the project. The participants said that they will not be able to pay more for water because the water price for them is already very high. The idea of a pricing system with a lower rate for the first 5 m^3/month of water consumed and higher rate for more consumed cubic meter was not welcomed by the participants.

57. The participants mentioned that no waterborne diseases had occurred up to the meeting day. Prior to the project they had had such problems, though, which means that the project was important for their area.

58. In the future, people expect more support to the water sector, particularly to improve the sewerage system. Also, they are expecting to have 24-hour water supply in their community. Currently the daily supply averages about 12–14 hours, depending on the season.

J. Nerqin Sasnashen, Ararat Region (non-project)

Date	21 November 2019
Venue of FGD	Nerqin Sasnashen community administration
District	Aragatsotn Region
Name of FGD Facilitator	Ruzanna Martirosyan
Participants	8 in total, 5 women and 3 men

59. Overall, the participants are mainly satisfied with the water quality, as the community has changed and repaired the internal water supply network. The result of these changes is good flow pressure and 24-hour water supply through private connections. Sometimes the water is not very clean, so almost all use water filters.

60. The external water supply network is not in good condition and needs to be repaired. The community has a lot of water loss, so it needs to change this network.

61. Households are connected to water taps and no household water meters are installed. Households do not pay for water, because the water supply is free of charge. The sanitation conditions of households are good. Almost 80% of the community has sewerage system connections, and these also are free of charge.

62. The community uses natural water sources. The flow decreases in summer, because the households usually use the water for watering their gardens and animals.

63. Participants mentioned that they had not experienced any waterborne diseases up to the meeting day.

64. In the future, people expect more support in the water sector for sewerage and irrigation systems.

K. Irind, Aragatsotn Region (non-project)

Date	20 November 2019
Venue of FGD	Irind community administration
District	Aragatsotn Region
Name of FGD Facilitator	Ruzanna Martirosyan
Participants	7 in total, 4 women and 3 men

65. Overall, the participants are satisfied with water quality, as the community has changed and repaired the internal water supply network. The result of these changes is good flow pressure and 24-hour water supply through private connections. There are no water meters installed in households, households do not pay for water, and water supply is free of charge.

66. The sanitation conditions of households are good. Households are connected to water taps.

67. The community uses two natural water sources. It has built small reservoirs, which help it to maintain 24-hour supply. In summer, the flow decreases, because the households usually use the water for watering their gardens and animals.

68. The participants mentioned that no waterborne diseases had occurred up to the meeting day.

69. In the future, people expect more support to the water sector for sewerage and irrigation systems.

APPENDIX 6: ADB'S SUPPORT FOR PUBLIC–PRIVATE PARTNERSHIPS IN ARMENIA

1. Armenia's relatively simplified procedures for doing business have helped it attract foreign direct investment. Local and foreign investors are treated equally, capital can be expatriated, and there is no limit on foreign ownership. Between 1990 and mid-2018, there were 15 infrastructure projects with private sector participation (PSP) and investments totaling some $2.25 billion. Energy (specifically electricity) is the main sector, accounting for $836 million, or 37.1% of the total, and the largest number of projects (five). Four of the five were divestitures to privatize assets. The first major PSP project in infrastructure was divestiture of the state telecom ArmenTel's assets to Vimpelcom Armenia—Beeline in June 1995. Later, in 1998, the company was supported by European Bank for Reconstruction and Development with financing and equity investments. Public–private partnerships (PPPs) have largely been confined to the water supply sector, culminating in the national lease contract signed in November 2016 for the provision of water supply and sewerage services. One other PPP transaction involved operations of the country's nuclear power plant.

2. Until recently, there was no overarching legal framework for PPPs, and each project was implemented differently within the provisions of various public procurement laws. This changed in July 2019 with the approval of a new law on PPPs, which became effective on 1 January 2020. The law is enabling, rather than prescriptive, and establishes a framework for future PPPs. The law and its implementing rules and regulations were drafted with Asian Development Bank (ADB) assistance. Other multilateral development banks (mainly KfW, the World Bank, European Bank for Reconstruction and Development, and United States Agency for International Development) also have supported efforts to enable PSP and PPP projects. In addition to assistance in promoting the enabling environment, there has been support through transaction advisory services, project financing, and capital investments in the telecommunications, transport, energy, and water supply sectors. The transformation of the latter owes much to assistance and investment from ADB and other multilateral development banks.

3. Armenia's water sector was in a poor state after the fall of the Soviet Union. The system faced increased demand even as it suffered from worn-out infrastructure, extensive leakage and waste, and costly service provision. The government recognized that weak management and the availability of finance were major concerns, and so it partnered with the private sector to undertake reforms. Today, there is an established institutional and regulatory framework, operations are more efficient, and customers generally are satisfied with the service. With support from multilateral development banks, successful PPPs have been implemented while engaging international private operators. These PPPs have been seen as agents of change to catalyze sector reforms, and there have been significant accomplishments. The time extent of water supply improved and shortages were ended, although intermittent supply still persists in some areas. Service improvements were notable even as tariffs remained among the lowest in the region. Water services in Yerevan became fully self-financing in 2011. Capital expenditures were modest, however, and most were financed by development partners, including ADB's Water Supply and Sanitation Sector Project, approved in 2007. After the success of the first generation of PPP contracts, the government decided on a single national lease contract that combined the service areas of all utilities served under previous PPPs. The contract was signed with Veolia Djur on 21 November 2016 for 15 years. Development partners provided the funding and technical support needed to prepare and undertake tendering for the contract.

4. Overall, ADB's engagement in promoting PPPs has been relevant and effective in fostering the enabling environment. Its support through sovereign and nonsovereign lending and technical assistance helped to ensure the progression of PPPs, especially in the water sector. Its assistance in the drafting of the new PPP law and that law's implementing rules and regulations further enhanced the PPP enabling environment. ADB also has helped improve accessibility and the delivery of infrastructure and services

through projects in water supply, energy, and transport, although investment in sewerage systems has lagged behind. Advice on policy changes has been given while laws, rules, and regulations have been drafted. ADB has not been acting alone, as other multilateral agencies also have been involved. Coordination among these agencies has been harmonious.

5. ADB's support has been responsive to Armenia's needs, particularly in the development of an enabling environment for PPPs, institutional reform of the water supply sector, and advising on the contingent liabilities to government from PPPs. Both sovereign and nonsovereign lending has followed government priorities. The Armenia Resident Mission has provided active support to both PSP and PPP projects. ADB's Office of Public–Private Partnership has prioritized transactions while ADB's Central and West Asia Department has supported policy reforms. ADB's effectiveness could have been enhanced had support for the PPP regulatory environment been sequenced earlier. ADB has been successful in coordinating upstream and downstream work on PPPs, especially in the water supply sector through its capital investment funding and policy advice. A recent decision not to pursue Water Supply and Sanitation Sector Project 2, however, is likely to see other multilateral agencies stepping into the space vacated by ADB.

6. In conclusion, ADB has played a significant role in promoting an enabling environment for PPPs in Armenia. Its assistance in drafting the approved PPP law and its implementing rules and regulations is likely to be far reaching. This involvement has created a positive momentum for ADB's future intervention in the infrastructure sectors. This has not been undertaken alone, and ADB's coordination with other development partners has been a success in encouraging reforms. Nonsovereign investments in the Zvartnots airport and in hydropower plants have aided the development of PSP in the country. On the wider front, ADB should continue its engagement with the government and broaden its outlook into other sectors, and especially transport and energy, where it has a relatively successful portfolio of nonsovereign lending. It is essential to link such lending to sector reform and further improving the enabling environment for PPPs.