ARMENIA

WATER SECTOR TARIFF STUDY

February 2015

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ARMENIA
WATER SECTOR TARIFF STUDY

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Water Global Practice
South Caucasus Country Unit

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ACKNOWLEDGEMENTS

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ABBREVIATIONS AND ACRONYMS:

3RWC	Regional Water Companies of Lori, Shirak and Nor Akunq
ADB	Asian Development Bank
ADS	Armenia Development Strategy
AMD	Armenian Dram
ARM	Armenia
AST	Advanced Social Technologies
AWSC	Armenian Water and Sewerage Company
BMZ	Bundesministerium für wirtschaftliche Zusammenarbeitund Entwicklung
cap	Capita (people)
CAPEX	Capital Expenditures
CES	Consulting Engineers Salzgitter GmbH
CIS	Commonwealth of Independent States
CWS	Central Water and Sanitation
EBRD	European Bank for Reconstruction and Development
ECA	Europe and Central Asia
EUR	Euro
FBP	Family Benefit Program
FSU	Final Sampling Unit
GDP	Gross Domestic Product
GoA	Government of Armenia
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFC	International Finance Corporation
IFI	International Financial Institutions
KfW	Kreditanstalt für Wiederaufbau (Germany Financing Institution)
km	Kilometer
kWh	Kilowatt hours
m^3	Cubic meter
MVV	Management operator for the 3 regional utilities
NGO	Non-Governmental Organization
NRW	Non-Revenue Water
O&M	Operation and Maintenance
Off-grid	Not managed by the five main regional water utilities
PE	Population-Equivalent
pop	Population
PSRC	Public Sector Regulatory Commission
PSU	Primary Sampling Unit
SAUR	Management operator for AWSC
SCWE	State Committee of Water Economy

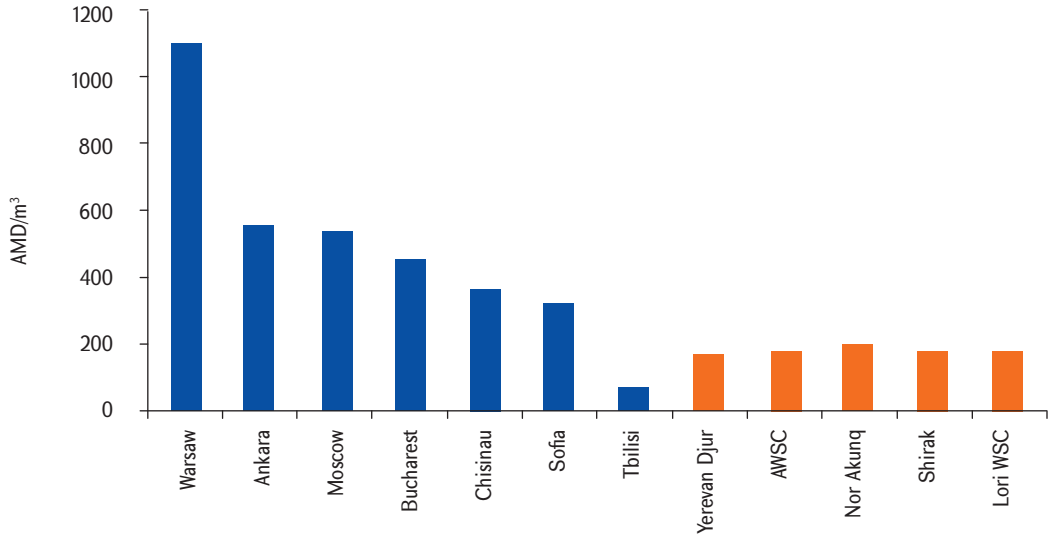
SMWP	Single Market White Paper
SSU	Secondary Sampling Unit
SWOT	Strengths, Weaknesses, Opportunities and Threats
TMP	The Total Management Plan (Developed by SAUR)
TPM	The Tariff Projection Model (Developed by DHInfrastructure and Dorsch Consultants)
USD	United States Dollar
VAT	Value Added Tax
W&WW	Water and Wastewater
WB	The World Bank
WS	Water Supply
WSC	Water and Sanitation Company
WSS	Water Supply and Sanitation
WSSP	Water Supply and Sanitation Provider
WtP	Willingness To Pay
WW	Wastewater
WWTP	Wastewater Treatment Plant
Yerevan Djur	Yerevan Water CJSC

EXECUTIVE SUMMARY

The Republic of Armenia's water and sanitation services (WSS) sector has seen impressive improvements over the last decade.[1] The Government of Armenia (GoA) has restructured, reformed and invested in the sector in ways that have improved access, continuity and quality of water and sanitation services.

Water and sanitation services are largely affordable…	WSS tariffs are some of the lowest in the region. In 2012, the average monthly household per capita expenditure on water for the poorest quintile was 2.3 percent of total household per capita consumption expenditures. This figure is far below the commonly-used thresholds for affordability in the region.[2] Figure 0.1 compares domestic and regional WSS tariffs to Armenia's.

Figure 0.1: Domestic and Regional Tariffs



Source: Tariff map, International Benchmarking Network for Water and Sanitation Utilities[3]

[1] See Box 2.3 for the current levels of access, quality and reliability of WSS services in Armenia.
[2] The World Bank uses a threshold of 4 percent.
[3] Tariff map. International Benchmarking Network for Water and Sanitation Utilities. http://www.ib-net.org/en/tariffs_map.php

… and customers appear ready to pay for necessary improvements.	A Willingness-to-Pay (WtP) survey, which was conducted as part of this study, found that most customers are generally satisfied with service. Most customers also said they are willing to pay for improvements that would improve service further. In areas outside Yerevan where the quality and reliability of service is considerably lower, 41.4 percent of those surveyed were willing to pay some amount above what they currently pay for service improvements. On average, these respondents were willing to pay a maximum of 21.4 percent above their current water expenditures. In Yerevan, where most customers receive 24 hours of continuous service, 27.1 percent were willing to pay more. On average, they were willing to pay a maximum of 12.1 percent above their current expenditures. Table 0.1 compares Yerevan and outside Yerevan respondents' maximum willingness to pay for water supply improvements.

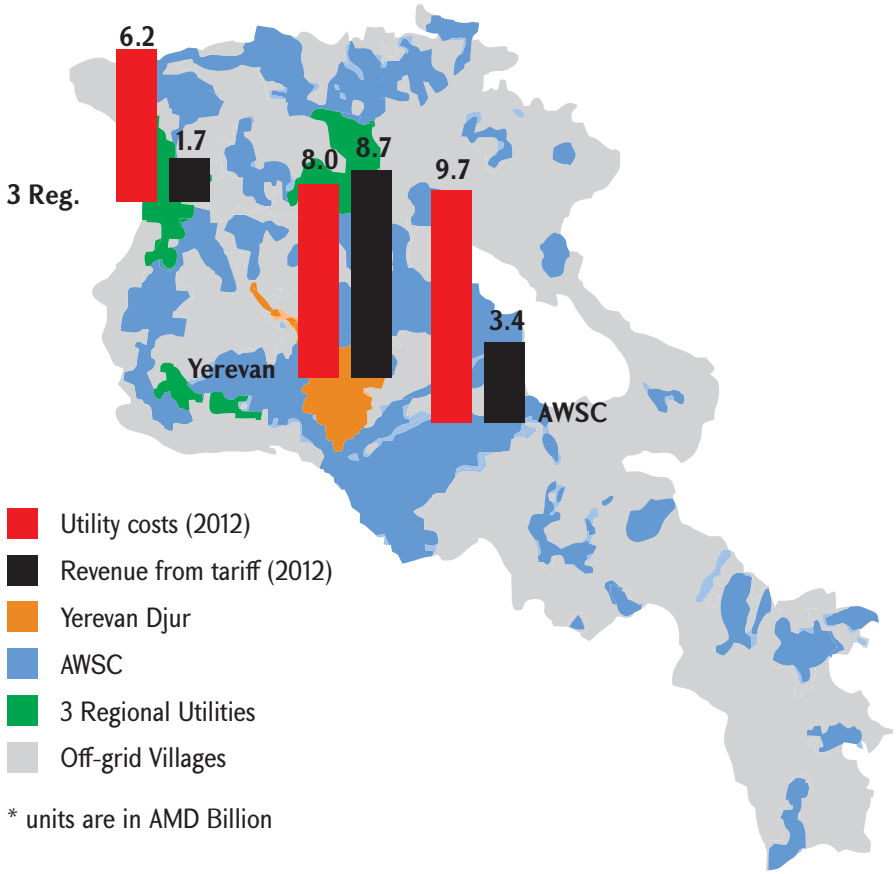
Table 0.1: Respondents' Maximum Willingness To Pay for Water Supply Improvements (AMD/ month)

	Total Sample	Yerevan	Non-Yerevan
Average maximum WtP above current expenditures	17.7%	12.1%	21.4%
Average current expenditures	2,069.24	2,455.52	1,811.72
Average maximum expenditures	2,390.45	2,724.75	2,167.58
Share of households that are willing to pay any amount above what they currently pay	35.7%	27.1%	41.4%

Source: WtP Survey Results

However, sector revenues fall well short of costs…	Tariffs are affordable, in part, because they fall short of the full cost of service. Revenue from tariffs covered only 67.3 percent of the sector's total costs in 2012. Even after government subsidies, the water sector had a shortfall of 3.38 billion AMD. Consequently, service providers are unable to carry out necessary maintenance or rehabilitate and expand network coverage. There are currently more than 800,000 people who still do not have a connection to the central water and sanitation network. Figure 0.2 shows network coverage by each service provider and compares each provider's cost and revenue in 2012.

Figure 0.2: Service Provider Operating and Capital Expenditures (OPEX & CAPEX) Versus Tariff Revenue (2012)[4]



…and costs are likely to climb.	Grace periods on several large loans in the sector expire in 2015, meaning service providers debt service costs will increase substantially. Some of these costs will need to be passed through into customer tariffs or be subsidized by the GoA.
New commercial arrangement in the sector require transition to cost-recovery tariffs.	Five water utilities currently serve 75 percent of the population of Armenia under three public-private-partnership (PPP) contracts. These contracts will end in 2016 and be retendered. Potential investors will want a clear idea of the costs of service going forward. This includes the level of subsidies that can be expected from the GoA if there are revenue shortfalls. The GoA will want to know what level of tariffs customers will be willing and able to afford. They also will want to know the expected fiscal cost associated with any necessary subsidies.
The transition will need to be phased to avoid rate shock…	The transition must take into consideration the challenges of keeping water affordable, preventing customer "rate shock," and ensuring that any fiscal outlays required are affordable. Tariffs need to be increased for financial sustainability reasons. In order to ensure affordability, such increases need to be accompanied with a better allocation of subsidies to target poorer households. The transition path of the tariff increases must also be carefully timed to limit the potential for rate shock. Figure 0.3 shows the tariff levels for four transition options. Table 0.2 shows the annual percentage change in tariff and the total subsidy cost from 2014–2019 for these transition options.

[4] Graphic produced by the consultant. Data provided by Annual Financial Statements of AWSC, Yerevan Djur, Nor Akunq, Lori and Shirak Water and Wastewater Service Providers. 2011 and 2012. Revenues are on an accruals basis.

Figure 0.3: Summary of Tariffs by Transition Option (2014–2019)

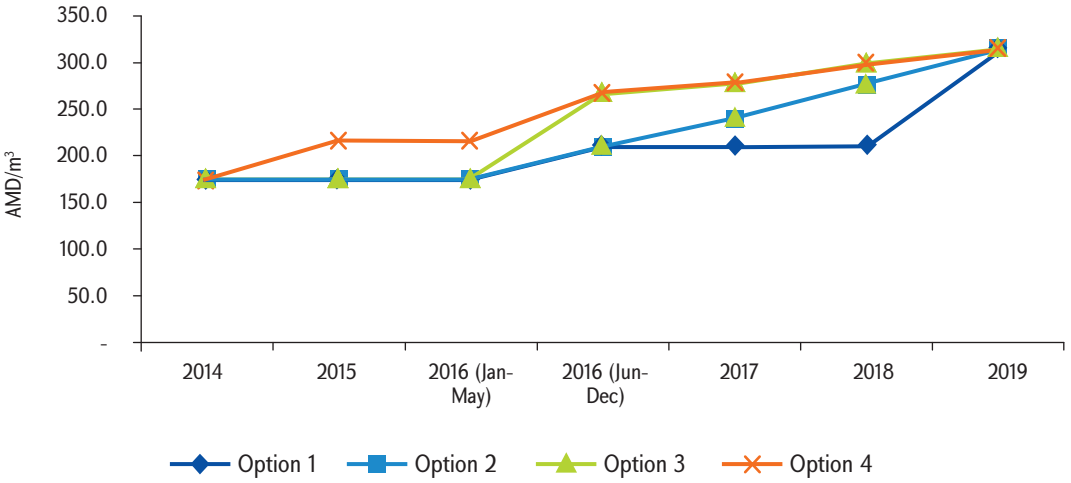


Table 0.2: Summary of Annual Rate Change by Transition Option (2014–2019)

	2015	2016 (Jan-May)	2016 (Jun-Dec)	2017	2018	2019
Option 1	0.0%	0.0%	20.5%	0.0%	0.0%	44.7%
Option 2	0.0%	0.0%	20.5%	12.8%	13.1%	13.4%
Option 3	0%	0%	48%	4%	8%	6%
Option 4	20.9%	0.0%	22.1%	3.9%	7.7%	5.5%

Note: Dark grey box represents highest rate hike in each transition program. Lighter grey box represents the option's second highest rate hike.

	Options 2 and 4 present the lowest risk of rate shock. In these options, the initial rate hikes are closest to results of the WtP survey. The survey shows that on average, respondents are willing to pay a maximum of 17.7 percent more than their current monthly water expenditures for system improvements. Option 1 also has an initial rate hike of 20.5 percent, but its subsequent rate hike of 44.7 percent is likely to result in rate shock. Option 3 has a 48 percent initial rate hike, the highest among the options presented.

…and the poorest customers protected through direct cash transfers.	There is low risk that affordability becomes an issue for customers in the lowest quintile. Armenia's existing social transfer program, the Family Benefits Program (FBP), is well suited to disperse cash transfers to poor households.[5] The program identifies beneficiaries according to a formula with thirteen means-testing variables including electricity consumption and access to gas. The FBP has already prepared a program to deliver stipends to vulnerable water customers. Table 0.3 shows a breakdown of the subsidies necessary as well as additional income from value added tax (VAT) associated with each transition option. The options 1 – 4 are ranked from the highest subsidies required to the least subsidies required. As shown in the table, options with a higher overall fiscal burden require a smaller allocation of funds to the FBP.

[5] According to a recent World Bank study, the FBP has a strong targeting performance. About 72 percent of the programs resources go to the poor. Ersado, Lire; Levin, Victoria; Armenia Social Assistance Programs and Work Disincentives. The World Bank, 2012.

Table 0.3: Subsidies Required for Each Transition Option

	Option 1	Option 2	Option 3	Option 4
Subsidies required to satisfy revenue requirements of service providers million AMD	33,307	24,283	16,423	10,472
Subsidies required for the family benefits program, million AMD	1,276	2,395	3,547	3,731
Additional expenses for budgetary organization, million AMD	1,314	1,682	2,010	2,277
State budget additional Income from VAT, million AMD	4,592	6,095	7,406	8,381
Total	**31,306**	**22,265**	**14,574**	**16,479**

Building public support will be crucial for the transition.	Successful public communication campaigns make clear three things to customers: the reasons for reform; what benefits can be expected; and how much tariffs will increase during the transition period. Survey results showed that there is much institutional distrust. There also is a collective belief that water providers should pay for improvements to WSS infrastructure. Such beliefs increase the likelihood of "rate shock" if tariffs are increased to cost recovery levels within a short period of time. Public support will take time to build and much effort to maintain. Accordingly, public communication should be sustained throughout the transition period. Demonstrating evidence of service improvements as tariffs increase will improve chances of success.

1 INTRODUCTION

The Republic of Armenia's water and sanitation services (WSS) sector has seen impressive improvements over the last decade. The Government of Armenia (GoA) has restructured, reformed and invested in the sector in ways that have improved access, continuity and quality of water and sanitation services. Challenges in the sector nevertheless remain. Table 1.1 summarizes some of the improvements that have taken place under the two largest service providers in the country, AWSC and Yerevan Djur. A table showing sector improvements for all companies may be found in Appendix I.

Table 1.1: Improvements in the WSS sector since 2000

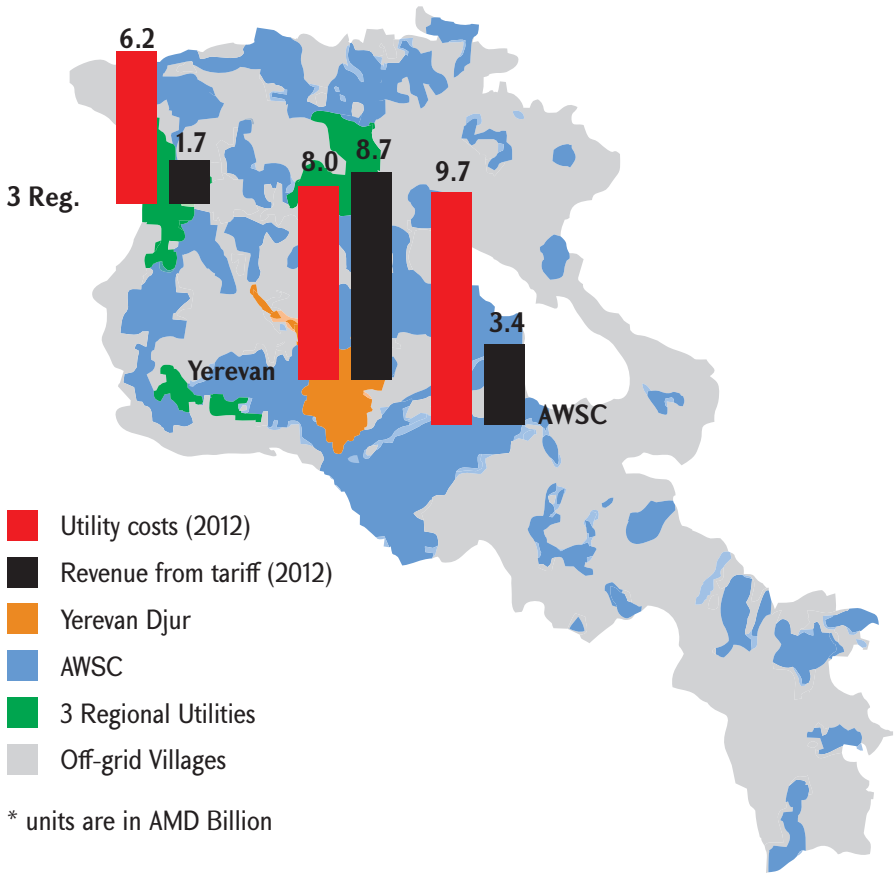
Company/indicator	Unit	Base year		
Yerevan Djur		2000	2005	2009
Water supply duration	Hours	4 – 6	18.4	20.4
Compliance with water quality requirements	%	94.5	97.2	97.8
Collection efficiency	%	21	86	97.6
Non-revenue water	%	72	79	81.1
AWSC		2004	2010	2012
Water supply duration	Hours	4 – 6	13	16
Compliance with water quality requirements	%	93.8	99.1	98
Collection efficiency	%	48	88	94.7
Non-revenue water	%	74	83.6	80.3

Challenges in the water and sanitation sector

Revenues in the sector fall well short of costs, requiring direct fiscal subsidies as well as "quasi-fiscal" subsidies, due to the deterioration of infrastructure. Under-investments on maintenance and rehabilitation have caused the deterioration.

Revenue from tariffs in Armenia covered only 67.3 percent of the sector's total costs in 2012. Even after government subsidies, the water sector had a shortfall of 3.38 billion AMD. As a result, revenues fall far short of recovering operating and maintenance costs. Revenues also do not meet the investment costs necessary for the rehabilitation and expansion of network coverage. Figure 1.1 below shows the cost of service and revenues of each utility.

Figure 1.1: Service Provider Operating and Capital Expenditures (OPEX & CAPEX) Versus Tariff Revenue (2012)[6]



Costs, meanwhile, will likely continue to climb. The grace period on several large loans—those used to finance improvements in service—will end in 2015. This will result in a higher cost of debt service for the service providers. Moreover, investment needs—for which new loans will be needed—are still substantial. More than 800,000 people in 560 villages live without access to centralized water and sanitation. Within the areas covered by centralized service there are problems with continuity of supply, pressure, and unsanitary discharge of wastewater.

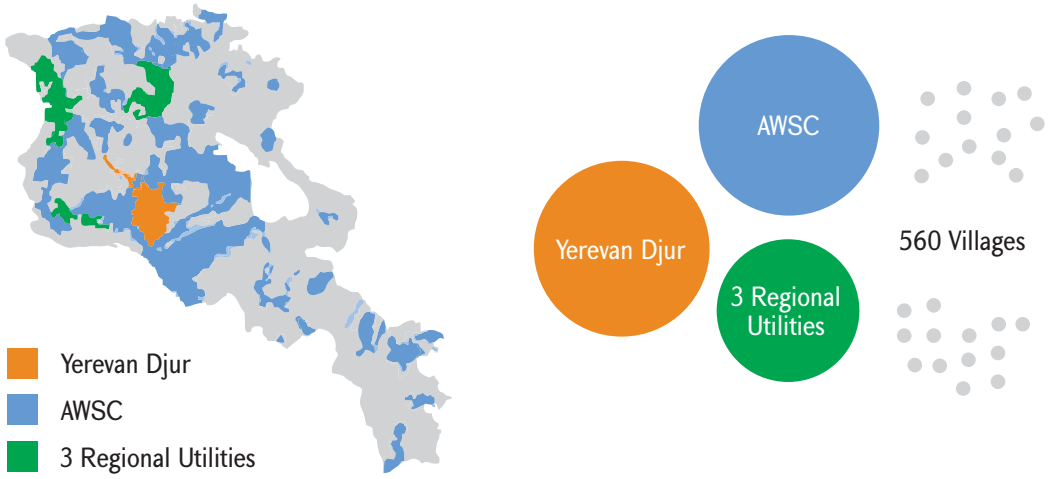
Higher costs of service will need to be passed through into customer tariffs or subsidized by the GoA. This presents the GoA with two distinct challenges: i) How to protect the poorest members of the population from tariff increases that make water and sanitation (or other basic needs) unaffordable; and ii) How to avoid the rate shock which can come with sudden, large tariff increases and make reform difficult.

Institutional changes will also present challenges. Five water utilities currently serve 75 percent of the population of Armenia under three public-private-partnership (PPP) contracts. There are 560 villages outside the areas served by PPPs. These villages have independent arrangements to obtain water supply.[7] Figure 1.2 illustrates the institutional arrangements and coverage of the service areas.

[6] Graphic produced by the consultant. Data provided by Annual Financial Statements of AWSC, Yerevan Djur, Nor Akunq, Lori and Shirak Water and Wastewater Service Providers. 2011 and 2012. Revenues are on an accruals basis.

[7] Appendix Table F.1 provides a more detailed breakdown of service coverage by service provider and marz.

Figure 1.2: Water Service and Sanitation (WSS) Service Providers



The following PPP contracts currently exist:

- Yerevan Djur, which serves 1.07 million people in Armenia's capital, is operated under a lease contract with the French company Veolia.
- Armenia Water and Sewerage Company (AWSC), which serves 640,000 people, is operated under a management contract with the French company SAUR.
- Three regional uilities (Nor Akunq, Lori, and Shirak), which serve 421,000 people, are operated under a management contract with the German company MVV.

The three PPP contracts will end in 2016 and be retendered. Before bidding, potential investors will want to have a clear idea of the costs of service going forward and what subsidies (if any) can be expected from the government to cover the gap between the cost of service and customer tariffs. The government, for its part, will want to know what level of tariffs customers will be willing and able to afford. If subsidies are required, they will want to know the anticipated fiscal burden.

Purpose of this report

The purpose of the report is to help the GoA:

- Analyze the current levels and structures of water and wastewater tariffs compared to the costs of service.
- Forecast costs under alternative scenarios, and forecast revenues under alternative tariff levels and structures.
- Recommend how Armenia can move from current tariffs to the tariffs required for full cost-recovery in the sector. This includes recommendations on:
  - A transition plan for phasing in gradually higher tariffs
  - Ways to improve the protection of the customers most vulnerable to tariff increases

The World Bank commissioned this study to inform the GoA's work in developing tariff policy and regulation in the WSS sector. This study will also inform the GoA as it prepares to procure private operators under new PPP arrangements.

Structure of the report

The remainder of the report is structured as follows:

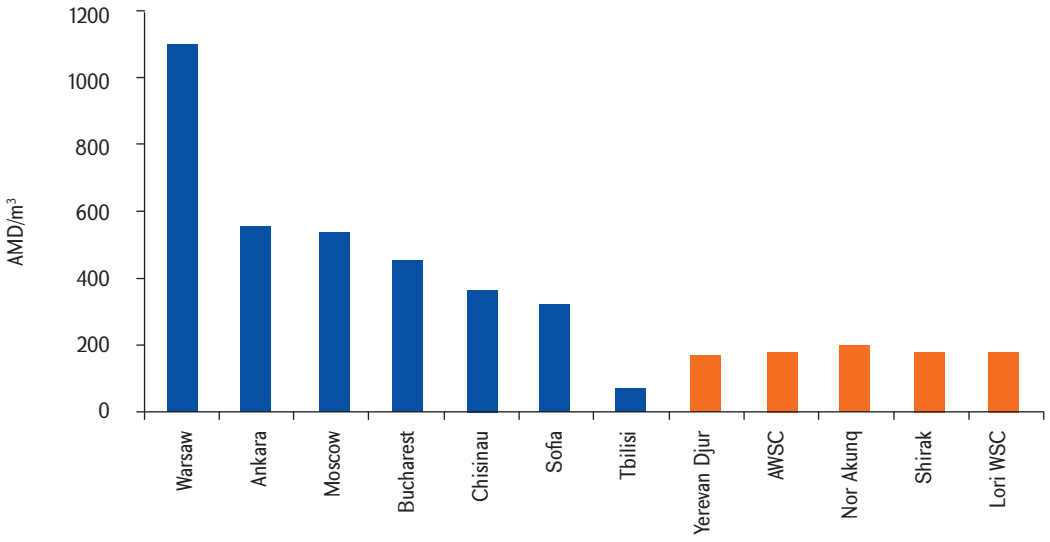
- Section 2 analyzes the current affordability of WSS in Armenia and describes results from a nationwide Willingness-to-Pay (WtP) survey.
- Section 3 analyzes the cost of WSS in Armenia. It estimates revenue requirements for the service providers, and it develops optional structures for cost-recovery level water and sanitation tariffs.
- Section 4 presents alternatives for transitioning to cost-recovery level tariffs over time, while protecting the poorest customers.

The appendices contain materials to support the tariff modeling, affordability analysis and WtP survey.

2 AFFORDABILITY AND WILLINGNESS TO PAY FOR WATER SECTOR IMPROVEMENTS

Water and sanitation sector tariffs in Armenia are lower than those in many cities of Eastern Europe and Central Asia (ECA). Armenians also spend less on water than the commonly-used thresholds of affordability in the region. Figure 2.1 compares WSS tariffs for cities in ECA to utilities in Armenia.

Figure 2.1: Domestic and Regional Water Tariffs



Source: Tariff map, International Benchmarking Network for Water and Sanitation Utilities[8]

Large increases in tariff levels could, however, make water unaffordable for households below the poverty line. Moreover, water sector reform is a highly political issue in Armenia. Social acceptability and willingness to pay for water may be as important to policy makers as affordability.

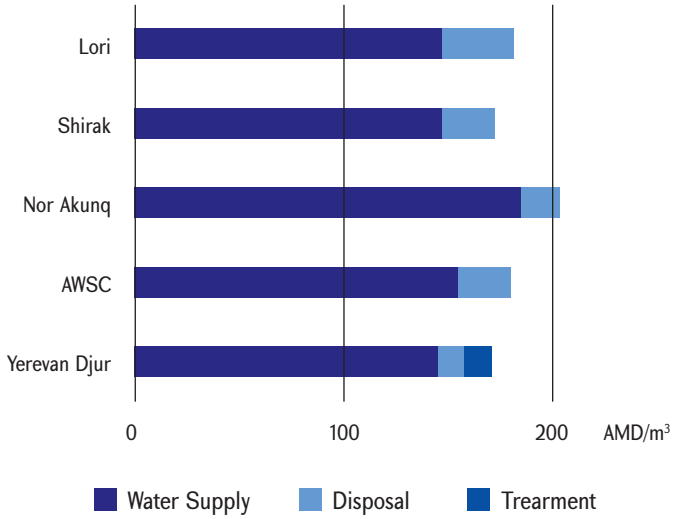
In this chapter we analyze both the affordability and social acceptability (or willingness to pay) for higher water and sanitation tariffs.

2.1 Tariffs and Subsidies for WSS

WSS tariffs in Armenia are currently uniform. Figure 2.2 shows how WSS tariffs differ by service provider.

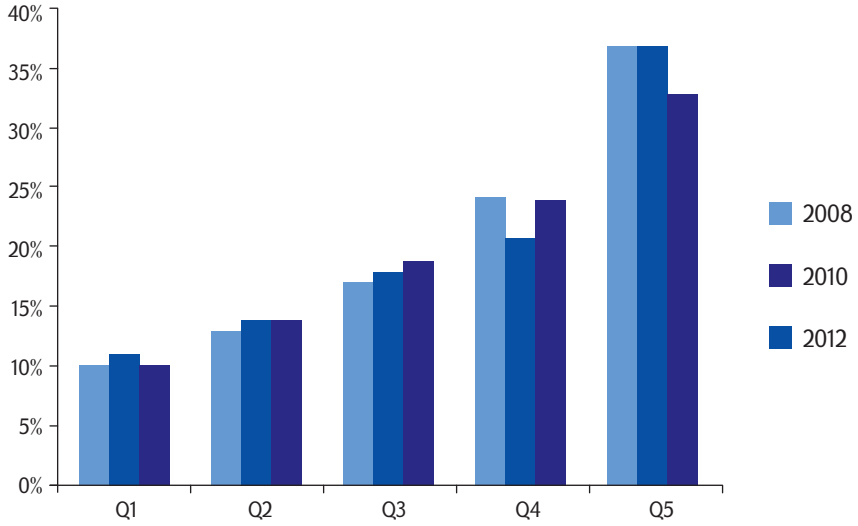
[8] Tariff map. International Benchmarking Network for Water and Sanitation Utilities. http://www.ib-net.org/en/tariffs_map.php

Figure 2.2: Current Uniform WSS Tariffs Paid by All Customer Classes



As Figure 2.3 shows, current tariffs benefit wealthier customers more than the poor, because wealthier customers typically have a higher level of consumption.

Figure 2.3: Benefit Incidence of Subsidies by Income Quintile[9]



Note: Q1 refers to the lowest quintile and Q5 the highest quintile.

The poor in Armenia receive direct cash subsidies through the Family Benefits Program (FBP). The program has high targeting performance, with 72 percent of its resources going to the poor. It consists of cash benefits paid directly to poor households as a basic lump sum that is reviewed regularly by the Government, plus a variable amount depending on family characteristics (i.e., number of children). There is currently no variable related directly to payments for water and sanitation services. However, preparations for responding to potential rate increases in the water sector are underway. Box 2.1 describes the FBP and demographics of a typical FBP beneficiary.

[9] Global Development Network, "Policy Alternatives in Subsidizing the Armenian Water Sector", 2009.

Box 2.1: The Armenian Family Benefits Program

The Family Benefits Program was created in 1999 by integrating several Soviet era categorically targeted programs into a single proxy means test program. Beneficiaries are identified according to a formula with thirteen means testing variables, including variables related to electricity consumption and access to gas. A World Bank study in 2012, evaluated Armenia's social assistance programs to determine if they were creating work disincentives. As part of the study, the profiles of FBP beneficiaries were examined. The results provide an indication of the program's targeting efficiency. A majority of beneficiaries are not of working age; about 40 percent are below the age of eighteen, while 13 percent are of pension age. FBP households tend to have more children and differentially abled persons. About 60 percent of FBP households have two or more children, and 30 percent of FBP households have at least one differentially abled person, almost two times the number of differentially abled persons in non-FBP households.

Source: Ersado, Lire; Levin, Victoria; Armenia Social Assistance Programs and Work Disincentives. The World Bank, 2012. http://www.wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2011/12/12/000333037_20111212234052/Rendered/PDF/631120ESW0P11800disclosed0120090110.pdf.

2.2 Affordability of WSS

The Armenian economy is slowly recovering from the 2008 recession, which resulted in acute increases in poverty. Poverty levels have increased most rapidly in urban areas. Levels increased in Yerevan by 5.5 percent. In all other urban areas, levels increased by an average of 4.4 percent. The poverty rate in rural communities increased by 4.5 percent. The growth of extreme poverty was least in rural communities, due to subsistence agriculture activities. Table 2.1 shows poverty rates by settlement and changes in poverty rate in Armenia from 2008–2012.

Table 2.1: Poverty Rate and Changes Over 2008–2012

Poverty rates	**2008**	**2009**	**2010**	**2011**	**2012**
Total	27.6%	34.1%	35.8%	35.0%	32.4%
Urban	27.6%	-	-	35.2%	32.5%
Yerevan	20.1%	-	-	27.5%	25.6%
Other urban	35.8%	-	-	43.6%	40.2%
Rural	27.5%	-	-	34.5%	32.1%
	2008 - 2012				
Change in the poverty rate	**Total**	**Yerevan**	**Other Urban**	**Rural**	**Urban**
Extremely poor	1.20%	1.15%	1.60%	0.93%	1.36%
Poor	4.79%	5.48%	4.41%	4.53%	4.91%

Note: Poverty rates using the 2009 methodology unavailable for 2009 – 2010[10]

Source: Social snapshot and poverty in Armenia, 2013. National Statistical Service of the Republic of Armenia, 2013. http://www.armstat.am/en/?nid=82&id=1503

The poverty rate fell 2.6 percent from 2011 to 2012. However, GDP growth in 2013 was lower in 2012 by 3.7 percent, so it is reasonable to expect an increase in reported poverty levels for 2013. Data on poverty rates

[10] See Box 2.2 for a description of the methodologies used for measuring poverty. The 2004 methodology was updated with new baseline data that reflects changing consumption and expenditure habits associated with overall improvements to Armenian living standards and economic conditions. The "Social snapshot and poverty in Armenia" report shows the 2008 national poverty rate using the new methodology but does not report data by different settlement type.

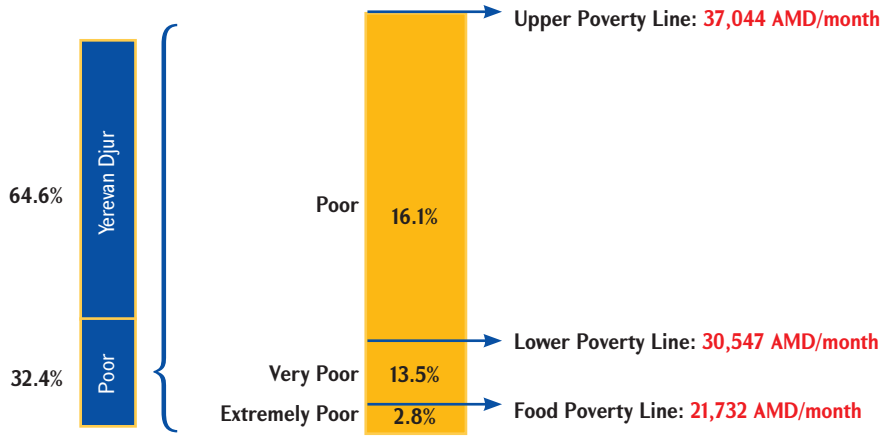
were not available for 2013. Box 2.2 summarizes the methodology used to measure poverty in Armenia.

Box 2.2: Measuring Poverty in Armenia

Poverty in Armenia has been assessed quantitatively since 1996. The methodology has been updated twice, in 2004 and 2009. In 2009, new baseline data was added that reflects changing consumption and expenditure habits associated with overall improvements to Armenian living standards and economic conditions. Poverty levels in Armenia were estimated using a quantitative indicator known as a consumption aggregate. This indicator includes the monetary value of a basket of food and non-food goods adjusted for regional and seasonal price differences.

Poverty is described by three levels in Armenia: poor, very poor, and extremely poor. Each of the three levels is demarcated by a poverty line for a more nuanced and stable picture of poverty incidence in the country. The extremely poor fall under the food poverty line (the lowest poverty line). This line is comprised of a minimum food basket based on the average caloric requirement per day (energy required for light physical activity and healthy living).[11] The estimated cost of this food basket—the food poverty line—is 21,732 AMD per month or 1.47 USD per day at the current exchange rate.[12] The lower poverty line (30,547 AMD/month), which separates the poor and very poor population includes the cost of basic non-food goods in addition to the cost of the minimum food basket. This line was estimated using the consumption basket method, which derives the share of non-food consumption by taking the grand mean of food consumption by adult equivalent of those within 2 to 10 percent of the food line.[13] The upper poverty line (37,044 AMD/month) separates the poor from the non-poor population in Armenia. This line also includes the cost of basic non-food goods in addition to the cost of the minimum food basket. The upper poverty line is estimated using the food expenditure method, which adds an estimated proportion of non-food expenditures spent by those living at the food line.

The figure below illustrates the three poverty lines derived from the 2009 methodology. The column in blue shows the percentage of poor and non-poor populations in Armenia in 2012. The percentages of poor, very poor and extremely poor populations and their respective thresholds (poverty lines) are denoted in the yellow column on the right.



Source: *Social snapshot and poverty in Armenia, 2013* National Statistical Service of the Republic of Armenia, 2013. http://www.armstat.am/en/?nid=82&id=1503

Analysis of expenditure

In 2012, the average monthly household per capita expenditure on water in Armenia was 527.2 AMD, or 1.3

[11] In Armenia the daily dietary requirement is 2,232 calories.

[12] The average exchange rate (1USD = 478.41AMD) reported for February 2015 by the Armenian Central Bank was used.

[13] The adult equivalent factor scales household consumption for a few conditions. They are: days of the month; number of adults and children; and subsequent economies of scale achieved from household composition.

percent of total monthly expenditures.[14,15] As shown in Table 2.3 individuals in the lowest quintile spent an average of 2.3 percent of monthly household per capita expenditures on water.

Table 2.2: Monthly WSS Expenditures as a Percentage of Household per Capita Expenditures (by Expenditure Quintile)

	Expenditure Quintiles				
	I	II	III	IV	V
Percentage of monthly expenditures spent on water	2.3%	1.8%	1.6%	1.4%	0.9%

Notes: I denotes the poorest quintile

Source: Household's Integrated Living Conditions Survey anonymized micro data base, National Statistical Service of the Republic of Armenia, 2012. http://www.armstat.am/en/?nid=452

Populations living in areas with the highest poverty rates spend the most on water. Populations living in urban areas other than Yerevan spend the highest percentage on WSS services (see Table 2.3).[16]

Table 2.3: Monthly WSS Expenditures as a Percentage of Household per Capita Expenditures by Settlement Type and 2012 Poverty Rates

	National average	Yerevan	Outside Yerevan	Other urban	Rural
Water expenditures as a percentage of total monthly expenditures	1.3%	1.3%	1.3%	1.4%	1.2%
Poverty rate (2012) ▪ Poor	32.4%	25.6%	-	40.2%	32.1%
▪ Extremely poor	2.8%	2.2%	-	4.4%	2.1%

Source: Household's Integrated Living Conditions Survey micro data base, National Statistical Service of the Republic of Armenia, 2012. http://www.armstat.am/en/?nid=452

Affordability as compared to typical thresholds

Expenditure on water is well below affordability thresholds typically used in Armenia and elsewhere in the world. The affordability threshold used by the World Bank in Armenia is 4 percent of average household income. In other words, if households spend more than 4 percent of their average income on WSS services, the services are considered to be unaffordable. The GoA, in contrast, adopted a more stringent threshold in the Armenian Development Strategy (ADS) for 2014-2025. The ADS applies a threshold of 2.5 percent of household expenditures to the lowest income quintile of the population.

Consumption expenditures were used as a proxy for household income in this study, because in Armenia, as in many transitioning economies, consumption relative to incomes is a more reliable and stable indicator of welfare over time.[17] Consumption expenditures are not as susceptible to short-term shocks. They are also considered to be more accurate than data on incomes, because people tend to remember their expenses while underreporting their incomes.

[14] Household per capita expenditures is defined as per capita income adjusted for household size. See Datta and Meerman, 2005)

[15] Consultant's calculation from ILCS 2012 diary data

[16] Perceived inequality between settlement types is already a potential cause of social tension, particularly in areas where coverage between companies almost intersects, for example in the Armavir region where coverage between Yerevan Djur and Nor Akunq almost intersects.

[17] Income may fluctuate seasonally or year-to-year, but consumption tends to remain more stable over time.

Section 4.2 uses the affordability thresholds to analyze tariff transition plans.

Collection ratios as an indicator of affordability

Utility collection ratios or collection efficiencies provide another perspective on the affordability of water and sanitation services. Low collection ratios may suggest that residents are having difficulty affording tariffs and paying bills. Data on collection rates in Armenia suggest that this effect is not present. In 2012, collection ratios in Armenia were, on average, 97.67 percent, and have improved steadily. The high collection rate does show that low expenditure shares on water are not due to lack of tariff collection. Table 2.4 shows the changes in collection rates by provider since 2009.

Table 2.4: Collection Rates by Provider

	2009	2010	2011	2012	2013
Yerevan Djur	-	-	98.9%	99.3%	99.3%
AWSC	83.5%	89.7%	95.4%	94.7%	94.9%
MVV	-	-	96.7%	98.0%	98.1%

Source: KfW, Draft Report on the Present State of the Water Sector, November 2013; Company annual reports (Yerevan Djur and AWSC)

2.3 Willingness To Pay for WSS

Customers do appear to be willing to pay more for better water and sanitation services in Armenia. Willingness to pay was assessed through a bidding game in which a type of contingent valuation was used to determine customers' willingness to pay more in exchange for improvements to their water and sanitation services.[18,19] In the bidding game, respondents were read a scenario which described:

- The current conditions of service in the WSS sector
- The consequences of failing to invest in, and properly maintenance the system
- Improvements that could be expected within one year of a tariff increase

They were then asked if they were willing to pay a randomly assigned percentage (20, 50 or 100 percent) above their current WSS expenditures. Depending on their answer, the enumerator would follow up with a higher or lower percentage. Finally respondents were asked the maximum amount they would pay for service improvements.

Two separate scenarios were read to each respondent, one relating to water supply and another relating to sanitation. The scenarios are described below. The scenarios were constructed based on focus group discussions as well as existing reports on the availability, quality and reliability of service. Box 2.3 describes current levels of access, quality and reliability of WSS services.

[18] Contingent valuation is a stated preference method used by economists to obtain a dollar estimate of a respondent's preference for a given good. In other words, it is a technique used to elicit a respondent's willingness-to-pay for a given good. A bidding game is one technique used to obtain a respondent's maximum willingness-to-pay. The respondent is asked a sequence of questions until the "maximum" bid is obtained.

[19] A total of 600 respondents were surveyed. See Appendix J.1 for the WtP survey sampling methodology.

Box 2.3: Current Levels of Access, Quality, and Reliability of WSS Services

The introduction of lease and management PPP arrangements in the last few years has led to improvements in quality and reliability of supply of WSS services, but problems still remain. Five utilities serve about 75 percent of the population living in Armenia, but more than 800,000 people still do not have a connection to the CWS. Sewerage is mostly discharged untreated into waterways, though sewerage from urban areas is mechanically treated. Most of Yerevan Djur customers currently receive 24 hours of continuous supply, but customers of AWSC, Nor Akunq CSJC, Shirak and Lori CJSC receive an average of 16, 22.3, 11.9 and 10 hours of water per day, respectively. Water quality is also a recurring problem, especially during the rainy season. In some settlements, water does not meet national standards. Additionally, water pressure is a problem, especially for those living in high-rise apartment buildings.

Water supply improvement scenarios

Residents in Yerevan were told to expect: strong water pressure regardless of which apartment floor they live on; 24 hours of continuous supply; and little to no service interruptions. Residents living outside Yerevan were told to expect: strong water pressure during service hours regardless of apartment floor; and eight to 12 hours of extra water service per day, if they did not already have 24 hours of continuous supply.

Sanitation improvement scenarios

Respondents who were connected to the centralized water and sanitation system (CWS) were told about a program to invest in sewerage treatment infrastructure. Residents who were not currently connected were told about a program to invest in collection, disposal and treatment infrastructure.

2.3.1 Willingness to pay for water supply improvements

The results of the WtP survey show that 35.7 percent of respondents were willing to pay more than they currently pay for better WSS services. In Yerevan, 27.1 percent of respondents were willing to pay more, while in areas outside of Yerevan, 41.6 percent of respondents were willing to pay more for improved services. On average, the maximum amount respondents were willing to pay was 17.7 percent more than their current monthly water expenditures. In Yerevan, respondents were willing to pay a maximum of 12.1 percent above their current expenditures, while respondents outside of Yerevan said they would pay 21.4 percent more.

The results by welfare group show that 39.4 of poor and 36.3 percent of non-poor respondents were willing to pay for better services.[20] On average, the maximum amount poor respondents were willing to pay above their current expenditures was 17.6 percent. Non-poor respondents were willing to pay 17.7 percent more than what they currently pay. Table 2.5 shows respondents' maximum willingness to pay for improvements by settlement type and welfare group.

Table 2.5: Maximum Willingness To Pay for Water Supply Improvements by Settlement Type and Welfare Group

	Total sample	Yerevan	Non-Yerevan	Other urban	Rural	Poor	Non-poor
Average Maximum WtP above current expenditures	17.7%	12.1%	21.4%	16.7%	32.9%	17.6%	17.7%
Average current expenditures	2,069.2	2,455.5	1,811.7	1,723.6	2,025.7	1,960.3	2,112

[20] National poverty thresholds were used to distinguish poor and non-poor customers. See Box 2.2 for a description of the methodology used to measure poverty in Armenia.

	Total sample	Yerevan	Non-Yerevan	Other urban	Rural	Poor	Non-poor
Average maximum expenditures	2,390.5	2,724.8	2,167.6	1,980.1	2,622.9	2,247.8	2,441.3
Share of households that are willing to pay any amount above what they currently pay	35.7%	27.1%	41.4%	35.3%	56.2%	39.4%	36.3%
n	600	240	400	255	105	213	325

Source: WtP Survey Results

2.3.2 Willingness to pay for sanitation improvements

The results of the WtP study show that 36.7 percent of respondents were willing to pay more than they currently pay for a connection to the CWS or for better sanitation services. In Yerevan, 27.5 percent of respondents were willing to pay more, while in areas outside Yerevan, 42.2 percent of respondents were willing to pay more for improved services. On average, respondents were willing to pay a maximum of 17.5 percent above their current monthly expenditures on waste disposal and treatment. The maximum amount respondents were willing to pay above their current expenditures was 9.6 percent in Yerevan and 22.9 percent in areas outside Yerevan.

The results by welfare group show that 40.8 of poor respondents and 36.0 percent of non-poor respondents were willing to pay for a connection to the CWS or for improvements to their sanitation service. On average, poor respondents were willing to spend up to 17.9 percent more than they currently spend. Non-poor respondents were willing to spend 18.0 percent more. Table 2.6 shows respondents' maximum willingness to pay for improvements by settlement type and welfare group.

Table 2.6: Maximum Willingness To Pay for Improvements or Connection to the Centralized Sanitation Network by Settlement Type and Welfare Group

	Total sample	Yerevan	Non-Yerevan	Other urban	Rural	Poor	Non-poor
Average maximum WtP	17.5%	9.6%	22.9%	14.9%	42.2%	17.9%	18.0%
Average current expenditures	2,069.2	2,455.5	1,811.7	1,723.6	2,025.7	1,960.3	2,112
Average expenditures (at maximum WtP)	2,385.5	2,647.3	2,211.5	1,954.0	2,835.1	2,274.3	2,448.5
Share of households that are willing to pay any amount above what they currently pay	36.7%	27.5%	42.2%	30.6%	70.5%	40.8%	36.0%
n[21]	600	240	360	255	105	213	325

Source: WtP Survey Results

[21] See Appendix J.1 for the WtP survey sampling methodology.

2.3.3 Constraints to WtP

Respondents were asked after the bidding game to identify: the constraints preventing them from paying more for WSS improvements; how they would cope with a tariff increase; and circumstances under which they would be willing to increase their maximum WtP.

Constraints on paying more for WSS improvements

Roughly 70 percent of respondents across all settlement types reported an inability to afford higher tariffs as the most significant constraint on their willingness to pay for improvements. In Yerevan, the second most reported constraint was disbelief that service providers would use higher tariffs to deliver the promised improvements as stated in the WtP scenario. In other urban areas outside of Yerevan and rural areas, respondents felt that they should not be the ones responsible for costs associated with service improvements.

Analysis by welfare group shows that 78.4 percent of poor respondents reported an inability to afford higher tariffs as the largest constraint on their willingness to pay more for water services. About 11 percent of poor respondents indicated distrust of service providers as the largest constraint on their willingness to pay a higher tariff.[22] Table 2.7 shows constraints respondents perceive as limiting their willingness to pay a higher tariff by welfare group.

Table 2.7: Constraints on Paying a Higher Tariff by Settlement Type

	Total sample	Yerevan	Non-Yerevan	Other urban	Rural	Poor	Non-poor
I don't trust that my service provider will use the higher tariffs to make the promised improvements.	15.3%	25%	8.9%	10.2%	5.7%	10.8%	17.5%
I don't trust that these improvements can realistically be achieved in my neighborhood.	2.3%	1.2%	3.1%	3.1%	2.9%	2.8%	2.5%
I do not believe that I should pay for the necessary improvements.	12.2%	11.7%	12.5%	12.2%	13.3%	8.0%	14.8%
I can't afford higher Increases to the tariff	69.5%	62.1%	74.4%	72.9%	78.1%	78.4	64.6%

Source: WtP Survey Results

Note: Light gray boxes show the most commonly reported constraint. Dark gray boxes show the second most commonly reported constraint.

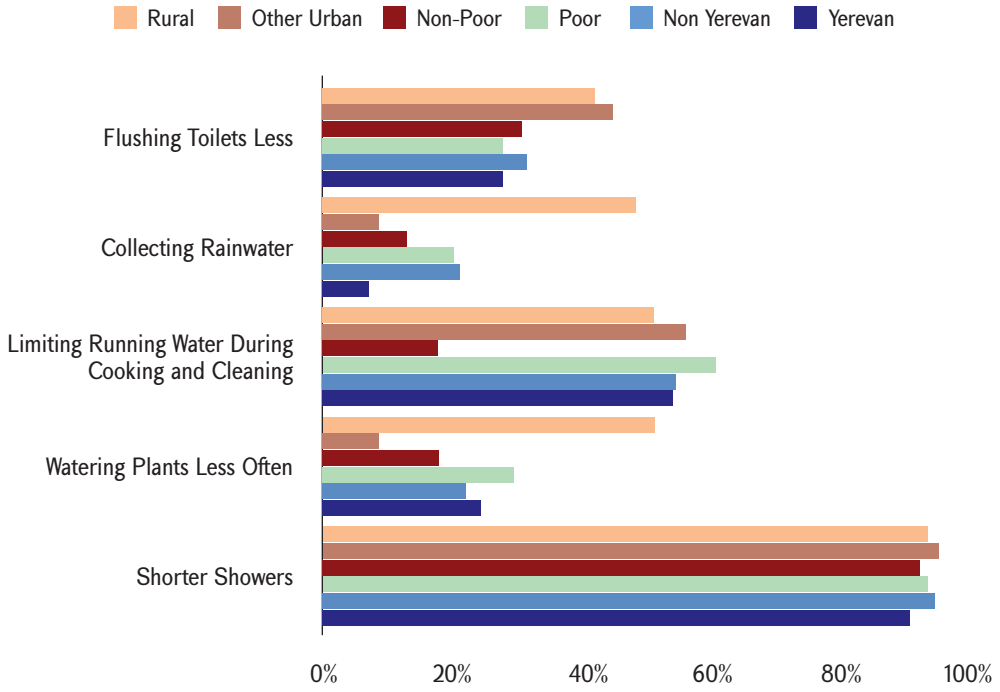
Coping strategies if tariffs are increased

Respondents were also asked to report strategies they would use to limit their consumption if tariffs were increased by 50 percent. More than 90 percent of respondents said that they would take shorter showers, and 54.7 percent of respondents said that they would limit running water during cooking or cleaning.

[22] See Appendix J.7 for respondents' attitudes towards stakeholders responsible for WSS improvements and perceptions of their ability to successfully deliver improvements

Figure 2.4 summarizes the strategies respondents are likely to use in case of a tariff increase by settlement type and welfare group.

Figure 2.4: Strategies To Cope with a Tariff Increase by Settlement Type and Welfare Group



Note: Percentage of respondents in each sub-sample that said 'Yes'.

Source: WtP Survey Results

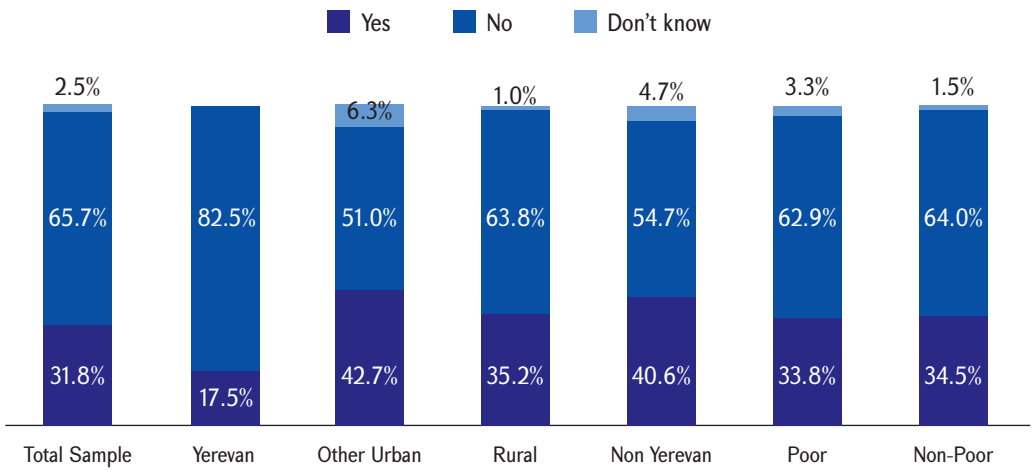
Scenarios in which respondents would support a tariff increase or surcharge

Respondents were also asked if they supported or opposed a tariff increase or surcharge under the following scenarios:

- Paying a surcharge so that network expansion may be subsidized for households with no access to the WSS network (Figure 2.5)
- Paying a higher tariff for water infrastructure rehabilitation and better quality and reliability of service (Figure 2.6)
- Paying a higher tariff to ensure their families always have access to safe and clean water (Figure 2.7)

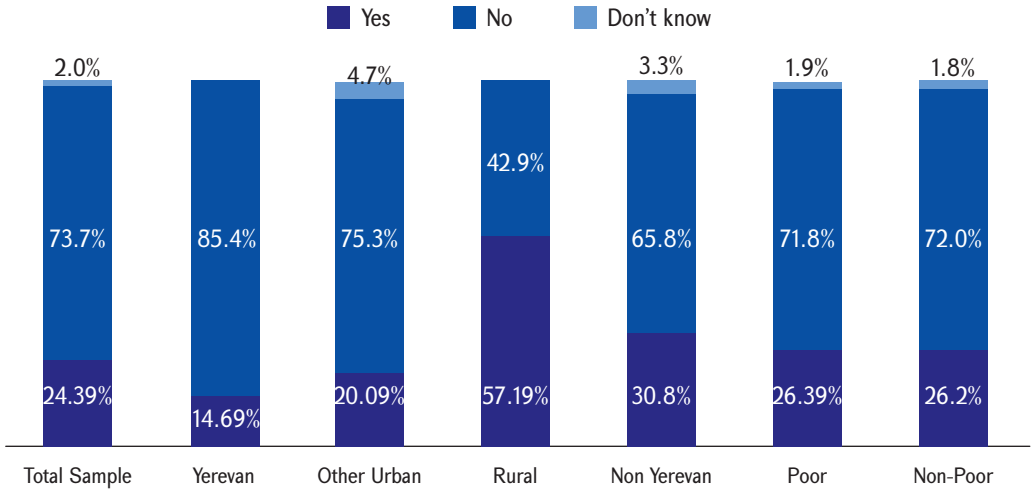
Roughly two-thirds of respondents answered "no" in opposition to each of the above scenarios. Only a majority of respondents who live in rural areas responded "yes" in support of a tariff increase or surcharge for improvements to the reliability and quality of WSS services and to ensure that their families always have access to safe and clean water. More than 80 percent of respondents from Yerevan answered "no" in opposition to each of the above scenarios. In short, most respondents in Yerevan were unwilling to pay a higher tariff or a surcharge for any of the above scenarios unlike most rural residents who were willing to paying more for two of the three presented scenarios.

Figure 2.5: Network Expansion Charge Scenario



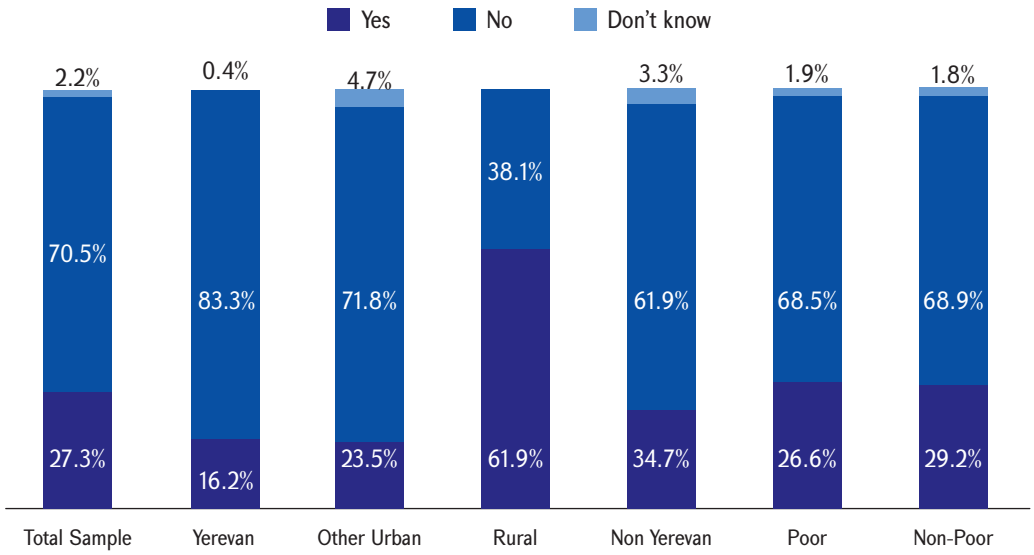
Source: WtP Survey Results

Figure 2.6: Improved Reliability and Quality of Service Scenario



Source: WtP Survey Results

Figure 2.7: Perpetual Access to Safe and Clean Water Scenario



Source: WtP Survey Results

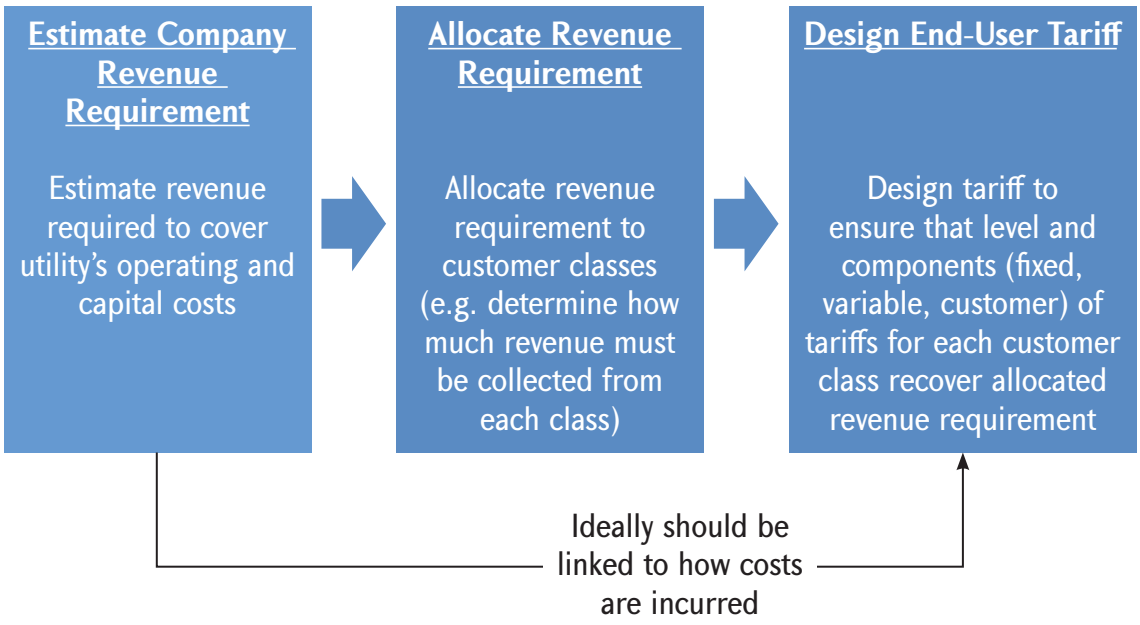
3 SETTING TARIFFS

There are three main steps to setting tariffs:

- I) Estimate the revenue requirement. The revenue requirement is the total amount of revenue a utility requires to cover all of its costs.
- II) Allocate the revenue requirement to the various classes of customers served by the utility (customer classes).
- III) Design the end-user tariffs. Tariff design is about deciding how to charge customers for the costs they impose on the system. Tariffs should be designed to allow the utility to recover its revenue requirement.

A simple explanation of this process is: costs are first aggregated into a total; portions of this total are divided and assigned to each customer class; a tariff is designed to recover the portion of costs assigned to each customer class. Figure 3.1 depicts the tariff setting process. This chapter carries out these three steps for the Armenian water sector.

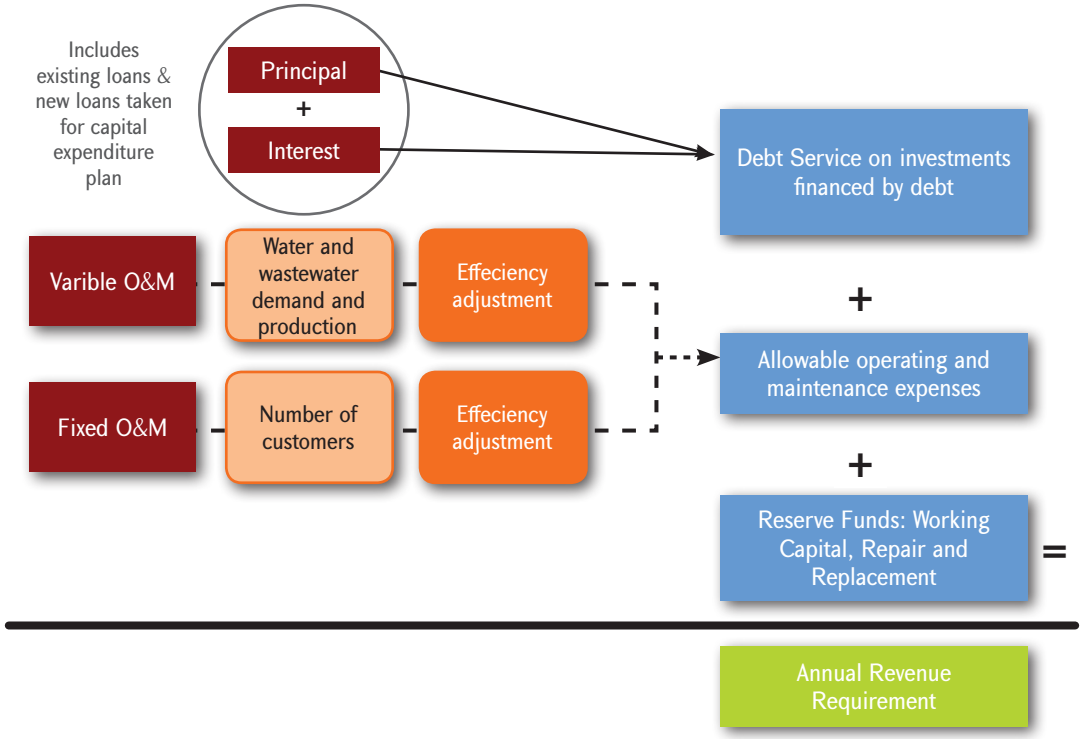
Figure 3.1: Steps Required To Set Tariffs



3.1 Estimating the Revenue Requirement

A utility's revenue requirement is the total amount of revenue required to recover its costs in any given year. Figure 3.2 shows the components that go into an estimation of the revenue requirement. This study uses the "cash needs" approach for estimating the revenue requirement (further described in Appendix A).

Figure 3.2: Overview of the Revenue Requirement Calculation



As shown in Figure 3.2, the main components of the revenue requirement are:

- Operating and maintenance (O&M) expense
- Capital expenditures (CAPEX)
- Debt service
- Reserve funds

Audited financial statements from 2009 to 2012 were used to estimate test year revenue requirement. These costs were adjusted for "known and measureable" changes. Appendix C describes the methodology for estimating the test year. Box 3.1 provides a description of the test-year approach.

Box 3.1: Selecting the Test Year

The revenue requirement is meant to be a "forward-looking" estimate of the costs for the upcoming operating years. It provides a basis for setting prices. However, it is common practice that the initial estimate for each of the items identified in the revenue requirement is made with reference to the most recent available historical costs (often referred to as the "test year"). It is necessary to bridge the gap between historical actuals and future expectations by applying a series of adjustments to better reflect actual costs. These can be organized within the following three categories:

- Normalization (removing the effects of unusual circumstances in a historical year)
- Known changes (anticipating the evolution of the business from the past to the future, such as the requirement for new security measures at water reservoirs, or increases in the electricity tariff)
- Adjustment from previous year (reconciling for previous differences between actual and target revenues)

A future test year, based on forecasts, can also be used as a starting point for a revenue requirement, or a "pro forma" test year, which is an historic test-year adjusted (as indicated in the second bullet above), for "known and measurable" changes.

Operating and maintenance expense

Operating and maintenance expenses refer to the ongoing costs of maintaining and operating utility equipment. Such expenses consist of line items typically found on a service provider's income statement. In the revenue requirement model used for this study, O&M expenses include:

- Staff costs (managerial staff costs and operational staff costs)
- Electricity costs
- Fixed costs (less staff costs)
- Variable costs (less electricity)

Table 3.3 shows these expenses for each service provider.

Table 3.1: Sector O&M Costs

Item	Units	2012 Test year			2013 Base year		
		Total	Per household connection	Per mil m^3 consumed	Total	Per household connection	Per m^3 consumed
Yerevan Djur O&M							
Electricity	(Mil AMD)	739	0.002	11.9	753	0.002	11.8
Staff costs	(Mil AMD)	2,768	0.008	44.6	2,924	0.009	45.7
Fixed costs (less staff costs)	(Mil AMD)	715	0.002	11.5	716	0.002	11.2
Variable costs (less electricity)	(Mil AMD)	1,830	0.005	29.5	1,780	0.005	27.8
Total	(Mil AMD)	**6,052**	**0.018**	**97.6**	**6,111**	**0.018**	**95.5**
AWSC O&M							
Electricity	(Mil AMD)	771	0.003	24.4	717	0.003	22.3
Staff costs	(Mil AMD)	2,163	0.008	68.5	2,283	0.008	70.9
Fixed costs (less staff costs)	(Mil AMD)	2,029	0.007	64.2	2,042	0.007	63.4
Variable costs (less electricity)	(Mil AMD)	734	0.003	23.2	811	0.003	25.2
Total	(Mil AMD)	**5,241**	**0.019**	**165.9**	**5,763**	**0.021**	**179.0**
3 Regional Utilities O & M							
Electricity	(Mil AMD)	105	0.001	11.3	123	0.001	11.9
Staff costs	(Mil AMD)	750	0.007	80.5	796	0.007	77.1
Fixed costs (less staff costs)	(Mil AMD)	96	0.001	10.3	406*	0.004	39.3
Variable costs (less electricity)	(Mil AMD)	129	0.001	13.8	130	0.001	12.6
Total	(Mil AMD)	**1,080**	**0.010**	**115.9**	**1,455**	**0.013**	**141.0**
Total sector O&M	(Mil AMD)	**12,373**	**0.017**	**120.2**	**13,329**	**0.019**	**125.1**

*the large increase in fixed costs in the 3 regional utilities comes from the increased management fee charged by MVV during 2013

Capital expenditures

Capital expenditure (CAPEX) refers to the cost of new construction or rehabilitation of assets. Capital expenditure needs for rehabilitation, system extension, and waste treatment investment have been estimated by Dorsch International Consultants for the *Armenia Water Sector Study*. These are shown in Table 3.2.

Certain investments in wastewater treatment plants were excluded from these estimates because neither the service providers nor the regulator considered that those investments, while necessary, would be realistically made during the projection period. The costs of bringing service to the 560 villages with no CWS have also been excluded.[23] The CAPEX plan also is synchronized with the funds earmarked for rehabilitation and extension of the W&WW sector in the Armenian Development Strategy. Table 3.2 shows the allocation of earmarked funds over the projection period.

Table 3.2: Overall Investment Needs in W&WW Sector in Armenia (2014-2033 – Mil AMD)

	Water supply rehabilitation	Water supply extension	Wastewater disposal	Wastewater treatment	Total
Company /Area	Million AMD	Million AMD	Million AMD	Million AMD	Million AMD
Yerevan	56,532	401	123,730	74,238	254,900
AWSC	147,021	781	35,269	44,086	227,157
3RWC	85,123	873	27,946	34,932	148,874
Sub-total	288,676	2,055	186,945	153,256	630,931
Off-grid-communities	0	77,347	0	0	77,347
Total	288,676	79,402	186,945	153,256	708,279

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Debt service

Debt service costs on existing loans are estimated using loan schedules provided by each of the service providers for all current loans in the water sector (shown in Appendix Table D.13, Appendix Table D.14 and Appendix Table D.15). This study assumes that investment needs for new CAPEX are met through concessional loans (soft loans) with the following terms:

- Year of loan start: 2016
- Loan period: 30 years
- Grace period: 5 years
- Interest rate: 4.0% p.a.
- Commission fees: 0.0%

Schedules on existing loans and the methodology for calculating debt service fees as a result of new loans are described in detail in Appendix D.2. Table 3.3 shows debt service costs for the base year.

[23] The costs and tariff implications were modeled but were not included in this study.

Table 3.3: Sector Debt Service Costs[24]

Item	Units	2012 Test year	2013 Base year
Yerevan Djur debt service			
Loss on foreign exchange (new loans)	(Mil AMD)	0	0
Loss on foreign exchange (existing loans)	(Mil AMD)	87	0
Principal (existing loans)	(Mil AMD)	0	0
Interest (existing loans)	(Mil AMD)	13	0
Principal (new loans)	(Mil AMD)		0
Interest (new loans)	(Mil AMD)		0
Total	(Mil AMD)	**100**	**0**
AWSC debt service			
Loss on foreign exchange (new loans)	(Mil AMD)	0	0
Loss on foreign exchange (existing loans)	(Mil AMD)	0	0
Principal (existing loans)	(Mil AMD)	0	0
Interest (existing loans)	(Mil AMD)	0	0
Principal (new loans)	(Mil AMD)	0	0
Interest (new loans)	(Mil AMD)	0	0
Total	(Mil AMD)	**0**	**0**
3 Regional Utilities debt service			
Loss on foreign exchange (new loans)[24]	(Mil AMD)	0	0
Loss on foreign exchange (existing loans)	(Mil AMD)	0	0
Principal (existing loans)	(Mil AMD)	0	0
Interest (existing loans)	(Mil AMD)	55	421
Principal (new loans)	(Mil AMD)	0	0
Interest (new loans)	(Mil AMD)	0	0
Total	(Mil AMD)	**55**	**421**
Total sector debt service	(Mil AMD)	**155**	**421**

Contribution to reserve funds

The estimated revenue requirements include contributions to a working capital reserve and a capital improvement reserve fund. In modeling the revenue requirement of the service providers, the study has included a capital improvement reserve and a working capital reserve.

Contributions to the working capital reserve are calculated as interest on two months of O&M expenses for each service provider (assuming a 6 percent interest rate). Contributions to the capital improvement reserve are calculated using estimates provided by the service providers and the State Water Committee for annual cash needs for asset renewal. These are summarized in Appendix Table D.11 and Appendix Table D.12.

[24] A description of how losses on foreign exchange are calculated is shown in Appendix D.

[25] American Water Works Association. Developing Rates for Small Systems. 1st ed. AWWA Manual M54. Denver, CO: American Water Works Association, 2004.

Box 3.2: Contributions to Reserve Funds

The GoA may also want to accumulate a "safety reserve" to fund future investments or to achieve other objectives. The best way to do this is through explicit contributions to a reserve fund. Examples of reserve funds include:

- **Capital improvement or "renewals" reserve**. This reserve accounts for the cash needs of the utility. It ensures that the performance of existing assets does not deteriorate during their lifetime. It is meant to cover the annual cash needs of renewing assets, which may exceed the provision of routine maintenance in a utility's operations and maintenance (O&M) costs.
- **Capital replacement reserve.** Some regulators decide to include a replacement reserve in the revenue requirement. This allows service providers to accumulate a reserve, which can cover the costs of replacing assets when they become obsolete. Capital replacement reserves are typically estimated at the rate of 1 to 2 percent of the total original cost asset value of the utility's property.
- **Contingency fund.** A contingency fund is used as "insurance" against unanticipated emergencies or failure of the utility's most vulnerable system components. Hurricanes, floods, earthquakes or other natural disasters typically cause such unanticipated emergencies. This fund is often estimated by determining the cost of replacing the most expensive facility of the utility system and reserving an amount equal to that cost. The need for this fund may be eliminated by establishing a close relationship with lending institutions and by creating an available line of credit that can be made quickly available under such circumstances.
- **Working capital reserve.** This allows utilities to recover interest on the cost of capital needed to protect the utility's cash needs against fluctuations in operating revenues and costs.[25]

Efficiency adjustments

Regulators typically allow only efficient (sometimes called "prudent") costs to be included in the tariff. Efficient costs are costs required for efficient delivery of utility services. These are often determined by the regulator through expert judgment or through comparison with costs of similar utilities. Regulators may prohibit the inclusion of certain costs in the revenue requirement because they reflect poor management. For example, the costs of technical losses (leaks) or staffing above a certain level may be excluded from the revenue requirement, because they reflect management inefficiencies.

The test year used in this study was accordingly adjusted, assuming reductions in network losses, improvements in collections, reductions in staffing and more efficient electricity consumption. Appendix C provides the methodology used for these adjustments.

3.1.1 Total revenue requirements

Table 3.4 shows test year and base year revenue requirements.

Table 3.4: Sector Test Year and Base Year Revenue Requirements

Item	Units	2012 Test year			2013 Base year		
		Total	Per household connection	Per m^3 consumed	Total	Per household connection	Per m^3 consumed
Yerevan Djur							
O & M							
Electricity	(Mil AMD)	739	0.002	11.9	753	0.002	11.8
Staff costs	(Mil AMD)	2,768	0.008	44.6	2,924	0.009	45.7
Fixed costs (less staff costs)	(Mil AMD)	715	0.002	11.5	716	0.002	11.2
Variable costs (less electricity)	(Mil AMD)	1,830	0.005	29.5	1,718	0.005	26.8
CAPEX & debt service							
Loss on foreign exchange (new loans)	(Mil AMD)	0	0.000	0.0	0	0.000	0.0
Loss on foreign exchange (existing loans)	(Mil AMD)	87	0.000	1.4	0	0.000	0.0
Principal (existing loans)	(Mil AMD)	0	0.000	0.0	0	0.000	0.0
Interest (existing loans)	(Mil AMD)	13	0.000	0.2		0.000	0.0
Principal (new loans)	(Mil AMD)	0	0.000	0.0	0	0.000	0.0
Interest (new loans)	(Mil AMD)	0	0.000	0.0	0	0.000	0.0
Revenues							
Non-tariff income	(Mil AMD)	-218	-0.001	-3.5	-218	-0.001	-3.4
Other obligations							
Capital improvement reserve	(Mil AMD)	1,200	0.004	19.3	1,202	0.004	18.8
Interest on working capital	(Mil AMD)	0	0.000	0.0	66	0.000	1.0
Tax	(Mil AMD)	736	0.002	11.9	0	0.000	0.0
Total revenue requirement	(Mil AMD)	**8,858**	**0.027**	**142.8**	**7,216**	**0.022**	**112.8**
AWSC							
O & M							
Electricity	(Mil AMD)	771	0.003	24.4	717	0.003	22.3
Staff costs	(Mil AMD)	2,163	0.008	68.5	2,283	0.008	70.9
Fixed costs (less staff costs)	(Mil AMD)	1,688	0.006	53.4	2,029	0.007	63.0
Variable costs (less electricity)	(Mil AMD)	620	0.002	19.6	734	0.003	22.8
CAPEX & debt service							
Loss on foreign exchange (new loans)	(Mil AMD)	0	0	0	0	0	0
Loss on foreign exchange (existing loans)	(Mil AMD)	0	0	0	0	0	0

Item	Units	2012 Test year			2013 Base year		
		Total	Per household connection	Per m^3 consumed	Total	Per household connection	Per m^3 consumed
Principal (existing loans)	(Mil AMD)	0	0	0	0	0	0
Interest (existing loans)	(Mil AMD)	0	0	0	0	0	0
Principal (new loans)	(Mil AMD)	0	0	0	0	0	0
Interest (new loans)	(Mil AMD)	0	0	0	0	0	0
Revenues							
Non tariff income	(Mil AMD)	-14	0.000	-0.4	-14	0.000	-0.4
Other obligations							
Capital improvement reserve	(Mil AMD)	0	0.000	0.0	1170	0.004	36.3
Interest on working capital	(Mil AMD)	0	0.000	0.0	58	0.000	1.8
Tax	(Mil AMD)	18	0.000	0.6	44	0.000	1.4
Total revenue requirement	(Mil AMD)	**6,420**	**0.023**	**203.3**	**7,396**	**0.027**	**229.7**
3 Regional Utilities							
O & M							
Electricity	(Mil AMD)	105	0.001	11.3	123	0.001	11.9
Staff costs	(Mil AMD)	750	0.007	80.5	796	0.007	77.1
Fixed costs (less staff costs)	(Mil AMD)	96	0.001	10.3	406	0.004	39.3
Variable costs (less electricity)	(Mil AMD)	129	0.001	13.8	130	0.001	12.6
CAPEX & debt service							
Loss on foreign exchange (new loans)	(Mil AMD)	0	0	0	0	0	0
Loss on foreign exchange (existing loans)	(Mil AMD)	0	0	0	0	0	0
Principal (existing loans)	(Mil AMD)	0	0	0	0	0	0
Interest (existing loans)	(Mil AMD)	55	0.001	5.9	421	0.004	40.8
Principal (new loans)	(Mil AMD)	0	0	0	0	0	0
Interest (new loans)	(Mil AMD)	0	0	0	0	0	0
Revenues							
Non tariff income	(Mil AMD)	-43	0.000	-4.6	-43	0.000	-4.2
Other obligations							
Capital improvement reserve	(Mil AMD)	0	0.000	0.0	0	0.000	0.0
Interest on working capital	(Mil AMD)	0	0.000	0.0	7	0.000	0.7
Tax	(Mil AMD)	0	0.000	0.0	0	0.000	0.0
Total revenue requirement	(Mil AMD)	**1,115**	**0.010**	**119.6**	**1,877**	**0.017**	**181.9**

3.1.2 Forecast of revenue requirements

Forecasts of the revenue requirement were developed in a tariff projection model (TPM).[26] The TPM has separate revenue requirement calculations for the service areas of Yerevan Djur, AWSC and the three regional utilities.

A forecast of the revenue requirement was developed to 2030 based on: i) water demand forecasts developed by Dorsch International Consultants for a KfW study; ii) assumptions agreed upon by the World Bank and sector stakeholder on changes to drivers of the cost of supply over time.

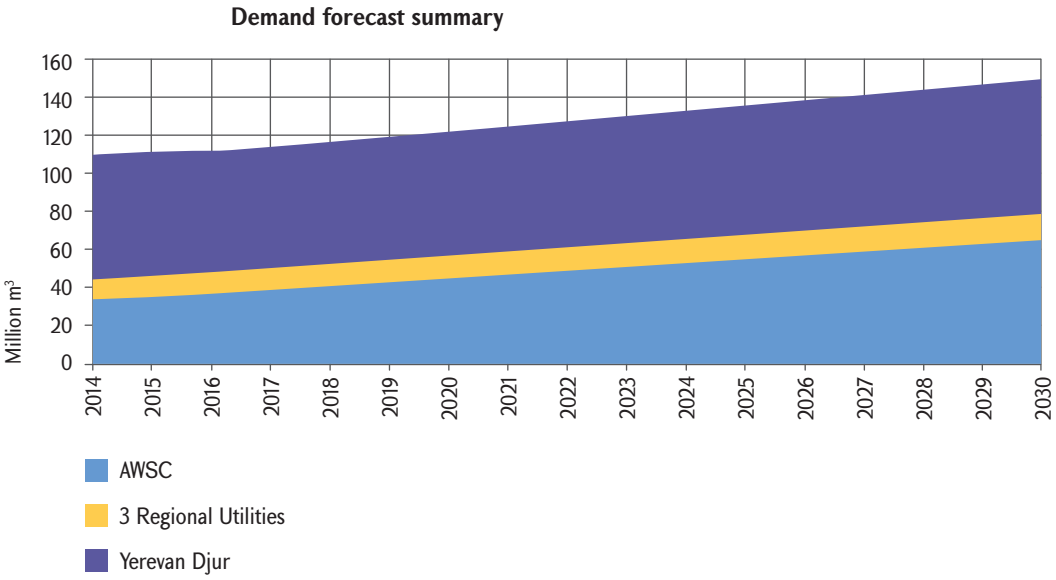
Demand

The demand projections developed by Dorsch were adjusted to account for effects of income and price elasticity. This study assumes:[27]

- An income elasticity factor of 0.3, which means that for every 10 percent increase in household income, water demand increases by 3 percent
- A price elasticity factor of -0.4, which means that for every 10 percent increase in the tariff, demand is assumed to decrease by 4 percent

Figure 3.3 shows a forecast of end-user water demand.

Figure 3.3: End-use Water Demand Forecast



Growth in demand is considerable for AWSC, while consumption for Yerevan and the three regional utilities remains close to 2014 levels. This is principally due to system expansion and the extension of service hours in the AWSC service area. For all customers, income and price elasticity are factored into the demand forecast.4.3Appendix E describes methodology for the demand forecast.

[26] The tariff projection model is an accompanying document to this report and is available upon request from the World Bank.

[27] Price elasticity data were taken from the study "Policy alternatives in subsidizing water sector in Armenia", "Advanced Social Technologies" NGO (AST), Yerevan 2012. This study is based on a survey conducted with a representative sample of 1,600 Armenian households in 2011, which included a question regarding customer's consumption response to a 50 percent and 100 percent tariff increase, respectively. The results show an average consumption reduction of 30.6 percent for the first question and 41 percent for the second question (-0.6 price elasticity for the first question and -0.4 price elasticity for the second question). The lower value was chosen because customer reactions to price changes are typically somewhat lower than the anticipated reaction expressed in WtP studies.

Supply costs

Appendices B, C, and D describe the methodology and assumptions used in modeling future revenue requirements. Table 3.5 summarizes the main assumptions.

Table 3.5: Summary of Assumptions Used in Modeling O&M Expenses

		Measured 2012	2016	2025	2030
Non-revenue water %[28]	Yerevan Djur	79.7%	71.2%	52.0%	41.4%
	AWSC	80.3%	72.0%	54.7%	43.3%
	3 Regional Utilities	79.77%	71.8%	54.0%	43.4%
Revenue collection rate %[29]	Yerevan Djur	99.3%	99.3%	99.3%	99.3%
	AWSC	94.7%	95.6%	97.5%	98.6%
	3 Regional Utilities	98.0%	98.2%	9%	99.3%
Electricity consumption (kWh/m^3 of production)[30]	Yerevan Djur	0.12	0.12	0.11	0.10
	AWSC	0.25	0.23	0.19	0.17
	3 Regional Utilities	0.10	0.09	0.07	0.07
Change in customers per permanent staff	Yerevan Djur	-	0.0%	0.0%	0.0%
	AWSC	-	0.5%	0.5%	0.5%
	3 Regional Utilities	-	0.5%	0.5%	0.5%
Change in average staff salary	Yerevan Djur	-	3.0%	3.0%	3.0%
	AWSC	-	5.0%	5.0%	3.0%
	3 Regional Utilities	-	5.0%	5.0%	5.0%

Source: Estimates based on AWSC's Total Management Plan projections and consultants calculations

Revenue requirements in Armenia's water sector are projected to increase in the short- and medium-term due primarily to:

- The end of grace periods for several loans in the sector
- The need for major rehabilitation of assets, as identified by service providers, requiring new capital expenditures

Revenue requirements are shown in real terms, exclusive of value added tax (VAT). The assumptions and methodologies used in the forecasts are summarized in in Appendix C and Appendix D.

Revenue requirement for Yerevan Djur

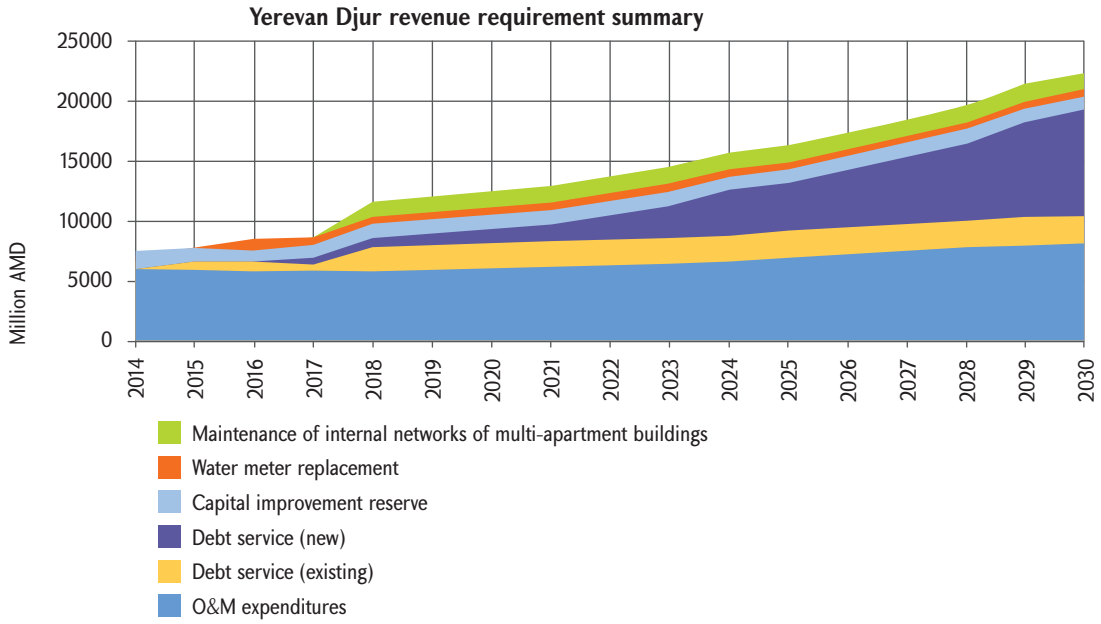
Figure 3.4 shows the revenue requirements for Yerevan Djur. Debt service costs increase from 2014 to 2025. This is due to the end of grace periods for existing loans and the addition of debt service costs for new loans taken for water supply, disposal and treatment system rehabilitation and system expansion.

[28] Any reduction in non-revenue water is assumed to reduce overall production by the same volume, with a correlated reduction in the variable costs of production. This effectively means that all non-revenue water is assumed to be attributable to technical losses. The schedule of reductions is based on the demand forecast from the study prepared by Dorsh International for KfW (Present *State of Water Sector: Water Sector Study Armenia – Sector Review and Strategy*, 2014.

[29] The revenue collection rate is assumed to affect the tariff only, but not the revenue requirement. The revenue shortfall from under-collection is assumed to be borne by paying customers. As the collection rate increases, the average tariff decreases accordingly, which affects (in a very small way) demand through the price elasticity effect.

[30] Electricity tariff estimates use figures from the ongoing 2013 Armenia Energy Sector Policy Note Update and are summarized in Appendix F.

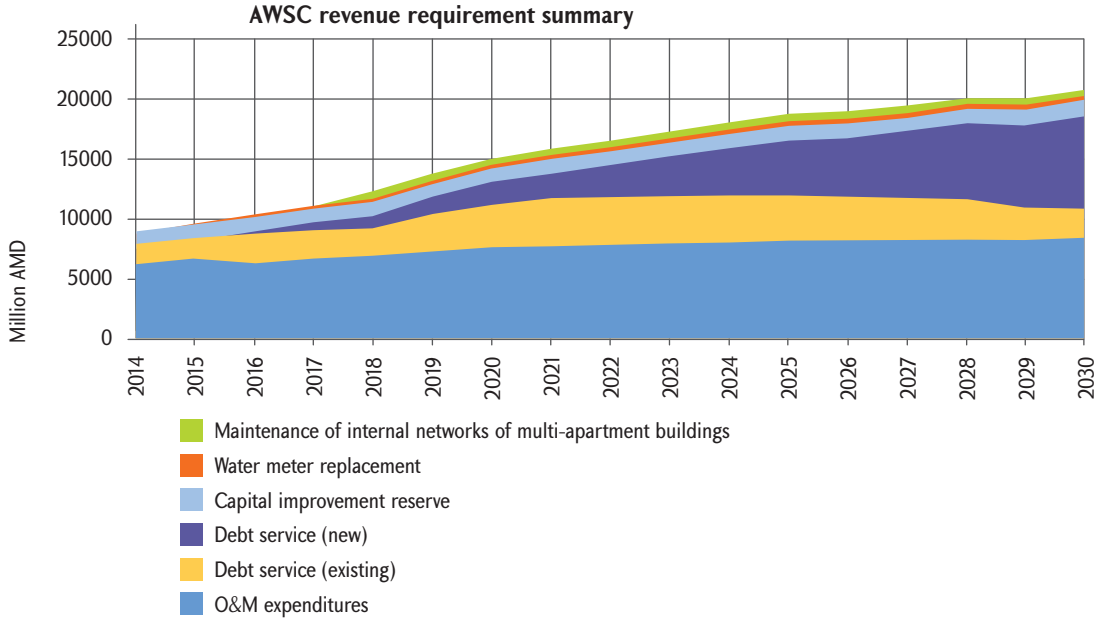
Figure 3.4: Revenue Requirements for Water and Wastewater services – Yerevan Djur



Revenue requirement for AWSC

Figure 3.5 shows revenue requirements for Armenian Water and Sewerage Company (AWSC). Similar to Yerevan Djur, there is an increase in debt service costs in 2014, which continues through 2028. This is due to the end of grace periods for existing loans in 2014 and the addition of debt service costs for new loans taken for rehabilitation and system expansion. AWSC also converts from a management to a lease contract in 2016. The management fee will be removed at that time, leading to a reduction in management costs.

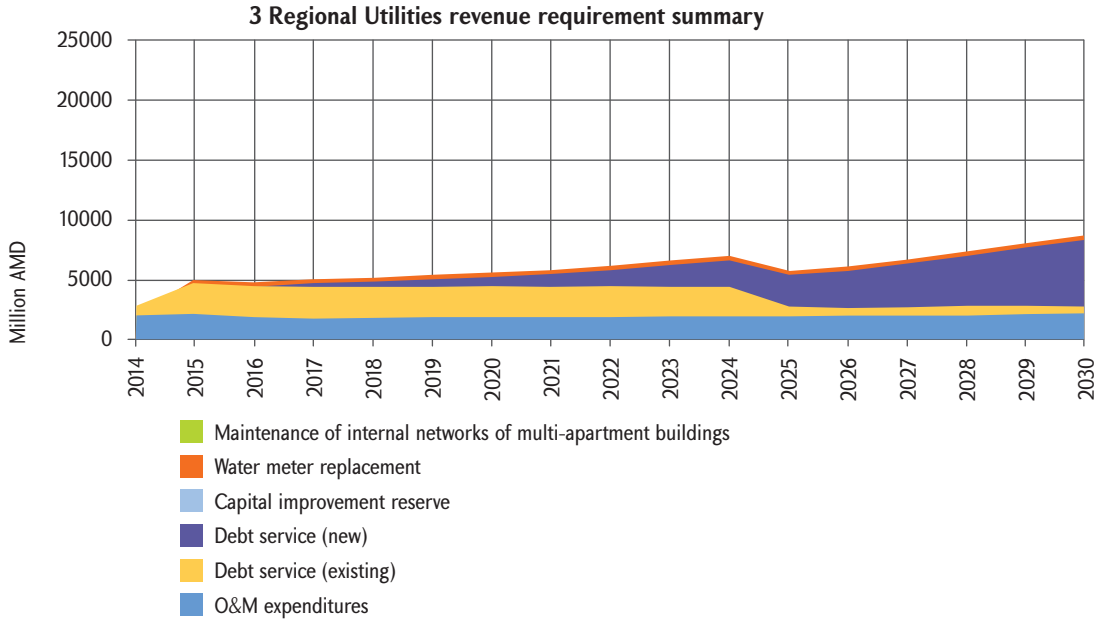
Figure 3.5: Revenue Requirements for Water and Wastewater Services – AWSC



Revenue requirement for three regional utilities

Revenue requirements for the three regional utilities are shown in Figure 3.6. As the figure shows, there is a large increase in debt service costs in 2015 which continues through 2030. This is due to the end of grace periods on existing loans in 2015 and the slow addition of debt service costs for new loans taken for rehabilitation and system expansion.

Figure 3.6: Revenue Requirements for Water and Wastewater services – Three Regional Utilities



3.1.4 Sensitivity and scenario analysis

Basic sensitivity analysis was applied to the revenue requirement by changing several key assumptions, including:

- The price elasticity of water services
- Income elasticity for water and wastewater customers
- The interest rates and grace periods of new loans taken in the sector
- The annual cash needs for renewal of assets (capital improvement reserve)
- Changes to the electricity tariff

The variable values used to calculate revenue requirements were selected through consultations with key stakeholders, including the State Water Committee and managerial staff from each of the service providers. These assumptions are described in detail in Appendix C.

Scenario analysis was used to reflect different institutional arrangements being contemplated in the sector at the time. In 2016, the lease contract for Yerevan Djur, and the management contracts for AWSC and the three regional utilities will come to an end. At the completion of this study, different options were under exploration, including changes from management to lease contracts and mergers between some or all of the

utilities. Options for how to manage and finance expansion of services to the 560 villages were also being explored. Figure 3.7 shows the two scenarios under consideration by the GoA.[31]

Figure 3.7: Institutional Arrangements Modeled in Projections

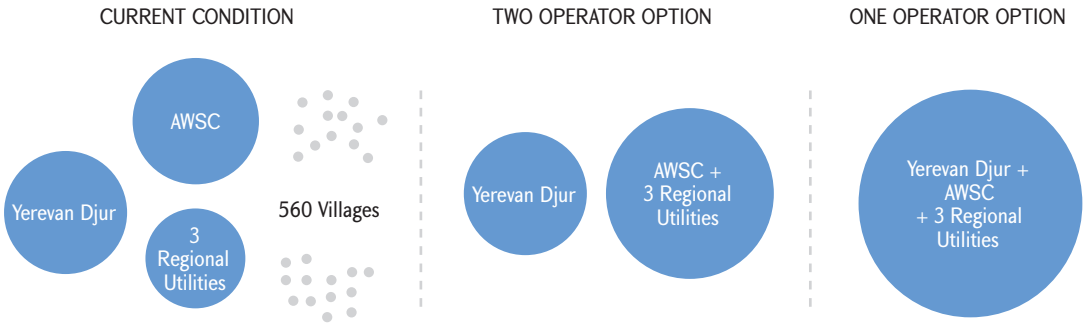


Table 3.6 shows the assumptions made under the two institutional scenarios described above. Adjustments in costs were made at the company level and then aggregated into grouped costs under the one operator and two operator scenarios. The assumptions used to model institutional scenarios were developed through input from the service providers and the State Water Committee. These are summarized in Table 3.6 and shown in detail in Appendix C.

Table 3.6: Summary of Assumptions for Institutional Changes

Scenario	Key changes	Cost implications
One operator	AWSC, MVV and Yerevan Djur merge	• 3% reduction in O&M expenses for all service providers • 60% reduction in management costs for AWSC and 3 regional utilities • Average salary growth for AWSC and 3 regional utilities increases from 2% per year to 5% per year[32]
Two operators	AWSC and 3 regional utilities merge Yerevan remains a separate operator	• Elimination of management fee (60% reduction of management costs for AWSC and 3 regional utilities) • 3% reduction in O&M expenses for AWSC and 3 regional utilities

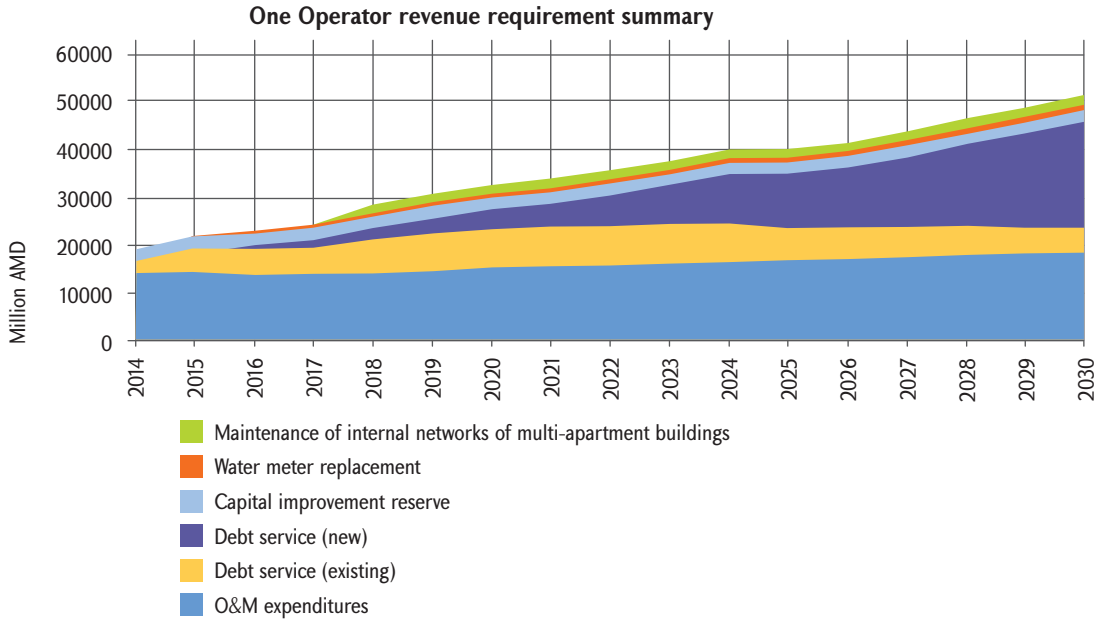
Revenue requirements for one operator

Under the combined one operator option, Yerevan Djur, the three regional utilities and AWSC merge into a single operator in 2016. Revenue requirements for one operator are shown in Figure 3.8.

[31] The strengths and weaknesses of each of these institutional options, as well as guidance on contractual arrangements, were investigated in a study funded by the Kreditanstalt für Wiederaufbau (KfW). Present State of Water Sector: Water Sector Study Armenia – Sector Review and Strategy, 2014.

[32] The average salary for Yerevan Djur is currently much higher than that for AWSC and the 3 regional utilities. Thus, it is assumed that following a merger between the five service providers, the average salaries of AWSC and the 3 regional utilities would increase.

Figure 3.8: Revenue Requirements for Water and Wastewater Services – One Operator

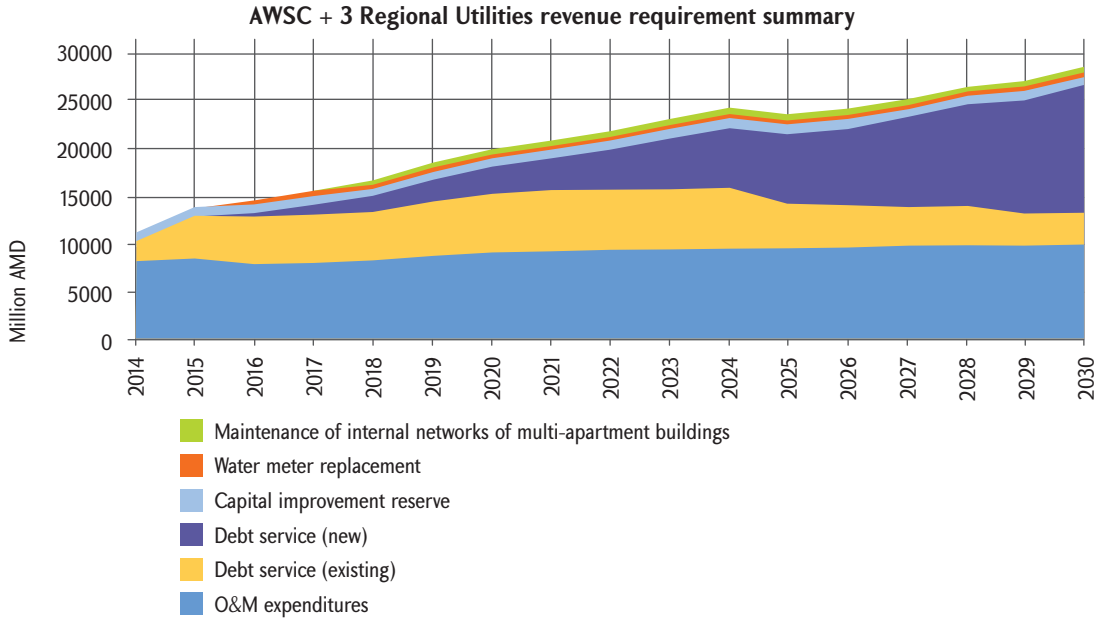


As shown in Figure 3.8, by year 2030 the costs associated with new debt service fees exceed O&M expenses. The model assumes grace periods for loans taken to implement the capital improvement plan, which offset the costs of rehabilitation to later years. Appendix D details the assumptions and methodology used to model debt servicing fees.

Revenue requirement for AWSC and the three regional utilities

Under the combined two operator option, the three regional utilities and AWSC merge into a single operator in 2016. Revenue requirements for AWSC and the three regional utilities as a single operator are shown in Figure 3.9.

Figure 3.9: Revenue Requirements for Water and Wastewater Services – AWSC + Three Regional Utilities



The increase in the revenue requirements for AWSC and the three regional utilities combined operator are largely a result of existing debt servicing fees. In 2016, these account for more than fifty percent of the total costs.

3.2 Allocating the Revenue Requirement

The steps required to allocate the revenue requirement include:

- **Assign the revenue requirement components by function or activity.** Components of the revenue requirement such as O&M, capital costs, debt services, capital improvements and depreciation expenses should be assigned to the different activities of a service provider (i.e., extraction, pumping, storage, distribution, transmission, meters and customer service activities).
- **Assign costs by causation (commodity, demand, or customer costs).** For each component of the revenue requirement and for each function or activity, allocate costs according to how they are incurred or caused. Costs are typically incurred as:
  - Commodity costs, which vary with the volume of water produced. Such commodity costs include purchased water, most energy costs and chemicals.
  - Demand or capacity costs, which vary with the rate of customer demand for water. Demand costs may include a portion of purchased water and energy costs and will include any equipment or facilities required to meet higher than average system levels of demand.
  - Customer costs. Customer costs are those costs associated with serving customers, regardless of their volume or rate of use (billing, costs associated with meters and meter reading and most costs associated with customer accounting and collections).
- **Assign costs to customer classes.** Customers are commonly categorized as residential, commercial, or industrial. Depending on the region or country, with customer classes are occasionally given for fire-protection service or lawn irrigation. To the extent possible, regulators try to group customers who have similar usage profiles and needs to impose similar costs on the system.

The following subsections describe how the study undertook each of these steps.

3.2.1 Assign revenue requirement components by function or activity

Table 3.7 shows how cost components were allocated by function or activity. As the table shows, most costs were allocated as a group to extraction, pumping and storage, transmission and distribution. The granularity of the data available from service providers did not allow for a more specific allocation.

Table 3.7: Assignment of Revenue Requirement Components by Function

Activity→ Item↓	Extraction, pumping, and storage, transmission and distribution	Meters and customer service activities
O & M		
Electricity	√	
Staff costs	√	
Fixed costs (less staff costs)		
Fixed production costs	√	
Fixed distribution costs	√	
Fixed indirect overheads	√	

Activity→ / Item↓	Extraction, pumping, and storage, transmission and distribution	Meters and customer service activities
Variable costs (less electricity)		
Variable production costs (less electricity)	√	
Variable distribution costs	√	
Variable collection costs		√
Variable indirect overheads	√	
Other variable costs	√	
CAPEX & debt service		
Loss on foreign exchange (new loans)	√	
Loss on foreign exchange (existing loans)	√	
Principal (existing loans)	√	
Interest (existing loans)	√	
Principal (new loans)	√	
Interest (new loans)	√	
Revenues		
Non-tariff income		√
Other obligations		
Capital improvement reserve	√	
Interest on working capital	√	
Tax	√	

3.2.2 Assign costs by causation

Table 3.8 shows revenue requirement allocation by causation.

Table 3.8: Assignment of Revenue Requirement Components by Causation

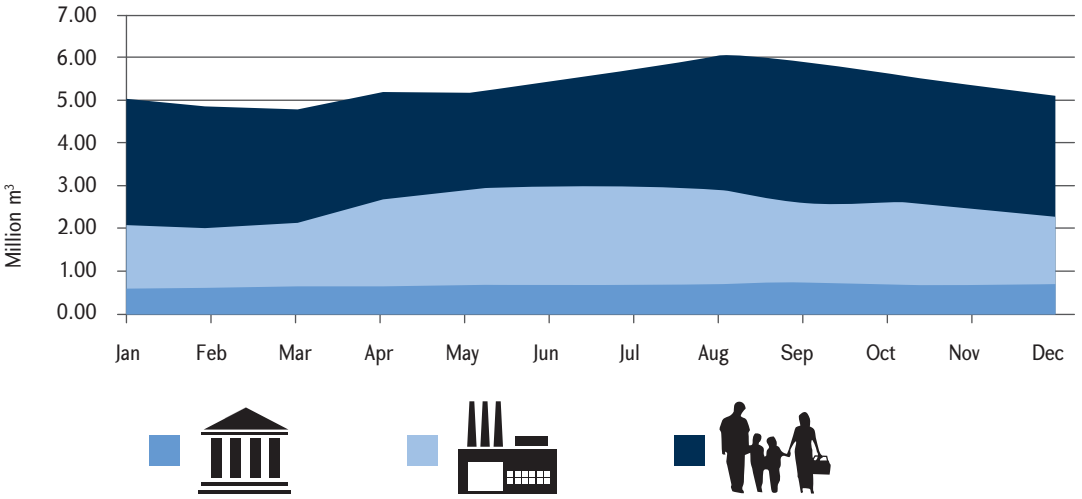
Causation→ / Item↓	Demand costs	Commodity costs	Customer costs
O & M			
Electricity		√	
Staff costs	√		
Fixed costs (less staff costs)			
Fixed production costs	√		
Fixed distribution costs		√	
Fixed indirect overheads	√		

Item↓ Causation→	Demand costs	Commodity costs	Customer costs
Variable costs (less electricity)			
Variable production costs (less electricity)	√		
Variable distribution costs		√	
Variable collection costs			√
Variable indirect overheads	√		
Other variable costs		√	
CAPEX & debt service			
Loss on foreign exchange (new loans)	√		
Loss on foreign exchange (existing loans)	√		
Principal (existing loans)	√		
Interest (existing loans)	√		
Principal (new loans)	√		
Interest (new loans)	√		
Revenues			
Non-tariff income			√
Other obligations			
Capital improvement reserve	√		
Interest on working capital	√		
Tax	√		

3.2.3 Assign costs to customer classes

Service providers in Armenia use three customer classes: residential, industrial and budgetary (government). Residential customers represent most of the load. They also have the most volatile load. Commercial customers form the second largest customer class in terms of consumption. They have a slightly less volatile load curve than residential customers. Budgetary customers are the smallest class of customers in terms of consumption. They have the most stable load curve. In 2012, residential customers consumed 64.39 million cubic meters of water. Commercial and budgetary customers consumed 30.54 and 7.84 million cubic meters of water, respectively. Peak consumption occurred during the month of August for residential customers (6.06 million cubic meters), in June and July for commercial customers (2.98 million cubic meters) and in September for budgetary customers (0.70 million cubic meters). Figure 3.10 illustrates the water sector load curves by customer class.

Figure 3.10: Monthly Consumption by Customer Class



Icons shown in figure from left to right represent budgetary customers, commercial customers and residential customers respectively.

Source: 2012 service provider annual reports and customer service records

Figure 3.11 shows how costs have been allocated and which allocators have been used. The percentages shown in the figure represent the proportion of costs imposed on the system by each customer class.

Figure 3.11: Allocation of Costs to Customer Classes[33]

Company costs Based on financial statements	Allocation method			
Customer costs	Number of customers	96%	2%	2%
Demand costs	Peak month usage	62%	8%	29%
Commodity costs	Measured consumption	61%	7%	32%

[33] Accurate record keeping and data are particularly important for allocating sector costs precisely. In particular, such data allow service providers better assess other tariff structures their impact on revenue sufficiency, stability as well as equitability amongst customer classes. For this tariff study, peak month data was used to allocate demand costs since peak period demand data was unavailable. As the Armenian water sector develops further, it would be worthwhile to put financial resources toward a system that can measure maximum day and hour demand by customer class.

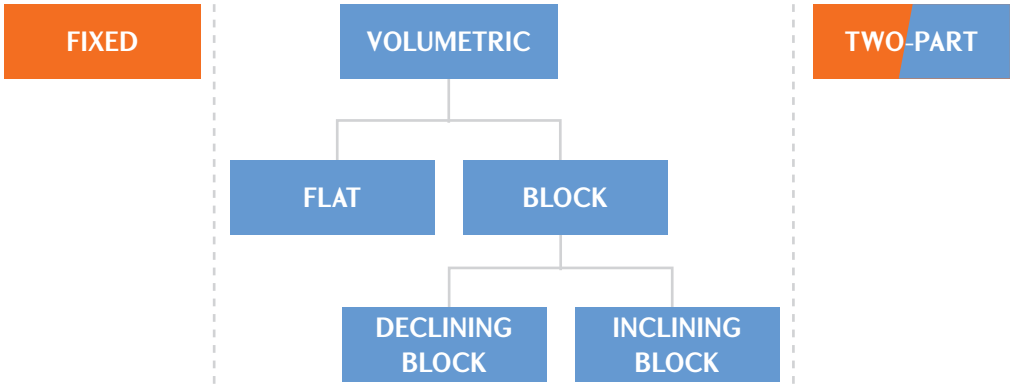
3.3 Tariff Design

The tariff is a charge or set of charges designed to collect a utility's cost of service. Tariff structures may include a volumetric component, a fixed component, or both.

- Fixed charges typically include customer charges. Customer charges are typically related to meter reading, billing costs and other customer-related costs. Fixed charges may include a minimum charge (to cover some minimum level of water consumption) or a "readiness to serve" charge, which reflects fixed capacity costs.
- Volumetric charges typically recover the costs of hourly production (commodity costs) and the costs serving maximum demand (demand or capacity charge). Volumetric tariffs can be charged via a flat fee per m^2 of water consumption, or a "declining" or "inclining" block scheme, where the fee per m^2 changes as consumption passes designated thresholds. In an inclining block scheme, the fee per m^2 increases as consumption increases. In a declining block scheme the fee per m^2 decreases as consumption increases.
- Two-part charges include a fixed component and a volumetric component. A fixed charge could be used in combination with any of the proposed volumetric tariff options.

Figure 3.7 gives an overview of common tariff options. These tariff structures may differ by customer class and by service area, or may be applied uniformly across all customer classes and service areas.

Figure 3.12: Overview of Common Tariff Options



The tariff options were evaluated in close consultation with stakeholders in workshops on June 17, 2014. Stakeholders included the State Committee of Water Economy (SWCE), the Public Sector Regulatory Commission (PSRC), the Ministry of Economy, the Ministry of Finance, the Ministry of Territorial Administration, KfW, AWSC, the World Bank, Consulting Engineers Salzgitter GmbH (CES), and the European Bank for Reconstruction and Development (EBRD).

Section 3.3.1 describes the criteria used in evaluating options for tariff design.

3.3.1 Criteria for tariff design

Stakeholders agreed on six criteria to be used in evaluating options for tariff design. The criteria are described below:

- Revenue adequacy. The primary objective in setting water tariffs is to allow water utilities to recover the costs incurred to provide water and wastewater services.

- Revenue stability. Most utilities incur expenses at a relatively fixed rate every month. Operating and maintenance and debt service expenses tend to stay constant throughout the year. Alternatively, customer demand fluctuates by month and year depending on seasonal and economic effects. The variation in customer consumption can create a discrepancy between revenues and expenses. This is an important issue to consider when setting tariffs.
- Equity. Utility companies incur varying levels of cost to serve different customer classes. Interclass tariff equity or fairness means that customers pay according to the costs incurred on their behalf.
- Simplicity. The tariff setting process can be a complex and controversial topic. Customer confusion over bills could undermine tariff reform efforts. Decision makers need to take into account how easy it will be to explain tariffs to water and wastewater customers.
- Conservation. A tariff, like any pricing structure, provides incentives to alter consumption choices. Price signals should be clear, promote efficiency and discourage wasteful use.
- Feasibility. Tariff decisions need to consider the current legal and regulatory environment. The tariff should be easy to implement. It should comply with all applicable laws.

The criteria used to evaluate tariff options in Armenia align closely with principles of regulatory design used widely throughout the world. Box 3.3 lists eight "textbook" principles of tariff design.

Box 3.3: Global Good Practice in Tariff Design

Eight principles of tariff design are often cited as the foundation of regulatory best practice on tariff structures. The principles are:[34]

1. The related, "practical" attributes of simplicity, comprehensibility, public acceptability and feasibility of application
2. Freedom from controversies over proper interpretation
3. Effectiveness in yielding total revenue requirements under the fair-return standard
4. Revenue stability from year to year
5. Stability of the tariffs themselves, with a minimum of seriously adverse, unexpected changes to existing customers
6. Fairness of the specific tariffs in the apportionment of total costs of service among the different customers
7. Avoidance of "undue discrimination" in tariff relationships
8. Efficiency of the tariff classes and tariff blocks in discouraging wasteful use of service while promoting all justified types and amounts of use:
   a. In the control of the total amounts of service supplied by the company
   b. In the control of the relative uses of alternative types of services (i.e., on-peak versus off-peak consumption)

Principles three, six and eight are typically regarded as the most important principles for economic efficiency.

[34] Bonbright, James. Principles of Public Utility Rates. Columbi*a University Press. 1961. p. 291.*

3.3.2 Selecting the best tariff design for Armenia

Table 3.9 shows the advantages and disadvantages of the tariff options discussed during the workshop. Certain tariff design options were excluded from the analysis, because they were initially dismissed by stakeholders as being unrealistic or inappropriate for the Armenian context. Declining block tariffs and "normative" tariffs (fixed charges only) were not considered, because these structures would not promote efficient water use.

Table 3.9: Advantages and Disadvantages of Alternative Tariff Structures

Tariff structure	Advantages	Disadvantages
Volumetric	▪ Most politically attractive because customers understand and accept the structure ▪ Customers pay according to what they use ▪ Does not require detailed cost allocation ▪ Encourages conservation ▪ Easy to implement with metering ▪ With Family Benefit Program (FBP), subsidies to vulnerable customers can protect affordability while encouraging conservation	▪ Revenue varies with seasonality of demand and any other demand drivers ▪ If demand forecasts are substantially lower than assumed for calculation of the revenue requirement, service providers may not recover fixed costs ▪ Higher use customers may not be paying for the full costs they impose on the system (capacity costs)
Inclining block volumetric	▪ Blocks and pricing can be structured such that the charge is set close to the marginal cost of service ▪ Customer classes that impose higher demand (capacity) costs are charged at a higher level ▪ IBTs have the strongest conservation price signal— the more customers consume, the higher their rate	▪ Difference from current structure requires greater communication outreach during reform ▪ Implementation of block tariffs would require updates to existing billing systems ▪ May not accurately reflect higher costs of serving small customers ▪ Can penalize poor households with shared connections and/or large families if they consume above the first block
Two-part (volumetric+ fixed)	▪ Fixed component creates a steady stream of revenue that helps reduce the revenue instability produced by the variable component ▪ Customer costs are assigned directly based on how they are incurred ▪ Easy to explain to customers ▪ Easy to implement as costs are known and charge is easily calculated	▪ Under the current VAT policy, service providers pay tax on volumes billed rather than volumes collected. Service providers fear that part-time residents will not pay the fixed fee, further burdening utilities ▪ Could be unfair to low-use customers because it would increase their bill above what it would have been under a variable charge-only structure ▪ Difficult to convince the public on the benefits of a "mandatory" charge

The workshop participants felt that volumetric tariffs were a strong option because: i) they are easy to implement; ii) they are easy for customers to understand (since a volumetric tariff is currently used); iii) they have strong alignment with the conservation objective; iv) when partnered with the FBP (which has a program to deliver stipends to vulnerable water customers) volumetric tariffs can ensure affordability. The government found it preferable to not change the tariff structure in conjunction with the changes in operators occurring in 2016 (due to signing of a new lease contract for a single country operator). Maintaining the same tariff structure would ensure the public would not have to adjust to two simultaneous changes in the water sector.

Stakeholders thought that inclining block tariffs held many advantages, but that the implementation could be difficult and the complexity of the system could be confusing to customers. Box 3.4 shows an example of an inclining block tariff structure for Armenia. It was also determined that creating a lifeline block for subsistence consumption was a strong but less preferred mechanism for ensuring affordability when compared with the family benefits program.

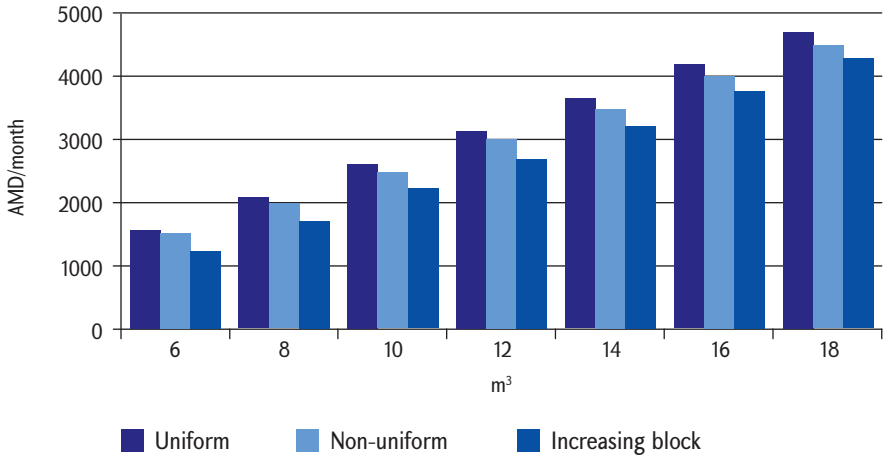
Two-part tariffs were considered a strong option for reducing stability of revenues. However, significant concern was expressed from the service providers about the current tax law and that the added tax burden (as a result of having to pay taxes on bills that were not collected) would outweigh the benefit of increased revenue stability. There was also a concern that the fixed charge may make monthly bills unaffordable for some poor customers.

Box 3.4: Example of Inclining Block Tariff Structure

Customer category	Block brackets	Factor for tariff pattern
Residential – Block 1	0 m^3 – 6 m^3	Base
Residential – Block 2	6 m^3 – 12 m^3	tariff rate for block 1 + 15%
Residential – Block 3	>12 m^3	tariff rate for block 1 + 30%
Commercial	All m^3	tariff rate for block 1 + 30%
Institutional	All m^3	tariff rate for block 1 + 30%

This proposed structure for an inclining block tariff includes three blocks for residential tariff and a single uniform charge for non-residential customers set at the third residential block level. The affordability benefits of this proposed structure are evident when comparing it to the alternative uniform and non-uniform tariff options. The figure below presents estimated customer bills for varying consumption levels under both increasing block, uniform, and non-uniform tariffs based on the estimated revenue requirement in 2016.

Comparison of Residential Bills by Consumption Volume for Cost Recovery Tariffs (2016)



Note: Tariffs are shown at full cost-recovery level under the single operator scenario.

The figure shows that residential bills would be higher under both uniform and non-uniform tariffs for a range of consumption levels. The lower residential bills under the proposed increasing block tariff are the result of setting the tariff for non-residential customers at the third block price level. One issue to consider with this outcome is that the tariff level could create affordability problems for small commercial customers. Creating blocks for non-residential customers or establishing separate small commercial and large commercial customer classes could help to solve this problem.

In addition to discussing tariff design options, stakeholders considered the distribution of costs between customer classes in uniform and differential tariffs. The advantages and disadvantages of differential tariffs are shown in Table 3.10.

Table 3.10: Advantages and Disadvantages of Uniform and Differential Tariffs

Uniform or differential?	Advantages	Disadvantages
Uniform tariff for all customer classes within service area	▪ A uniform tariff is easy for customers to understand. ▪ A uniform tariff is easy to implement and may be the only feasible option if there is no available date to establish differential rates. ▪ Setting a single tariff for all customers avoids disagreements over appropriate tariff level for each class.	▪ Under the cost allocation developed in Section 3.2, a uniform tariff would result in residential customers cross-subsidizing budgetary customers. This creates higher retail tariffs for residential customers than would occur under a differential tariff. ▪ Customer classes do not pay according to the costs they impose on the system as accurately as they would under a differential tariff.

Uniform or differential?	Advantages	Disadvantages
Different tariffs for different customer classes	▪ Lower residential tariffs would allow for easier transition to cost recovery. ▪ Remove cross subsidies between customer classes. ▪ Differentiated charges by class are easy for customers to understand. ▪ A lower residential charge makes it easy to gather public support. ▪ Existing billing systems could handle this transition.	▪ Non-residential customers may be unhappy with the level of tariffs. ▪ Differentiated tariffs require cost allocation to set class revenue.

Stakeholders generally agreed that both uniform and differential tariffs were viable options. Because the current tariff is a uniform tariff, this option would be the easiest to implement. However, the presence of an inherent subsidy between residential customers and budgetary customers under uniform tariffs made this option less attractive. This transfer is apparent in Table 3.11, which shows the average unit costs for each customer class in 2016 based on the findings of the cost allocation model. Stakeholders felt that differential tariffs, while slightly more difficult to implement, held many advantages. Most notably, the opportunity to reduce residential tariffs would likely cause less resistance from the public (excluding the commercial sector) in transitioning tariffs to cost recovery levels. It was considered a strong advantage that differential tariffs allowed for the tariff to have a more accurate representation of costs for customer classes.

Table 3.11: Average Unit Costs for Each Customer Class

	Unit Costs (AMD/m3)		
	Residential	Commercial	Budgetary
Country-wide	199	213	482
Yerevan	135	120	143
AWSC + 3 Regional Utilities	257	657	302

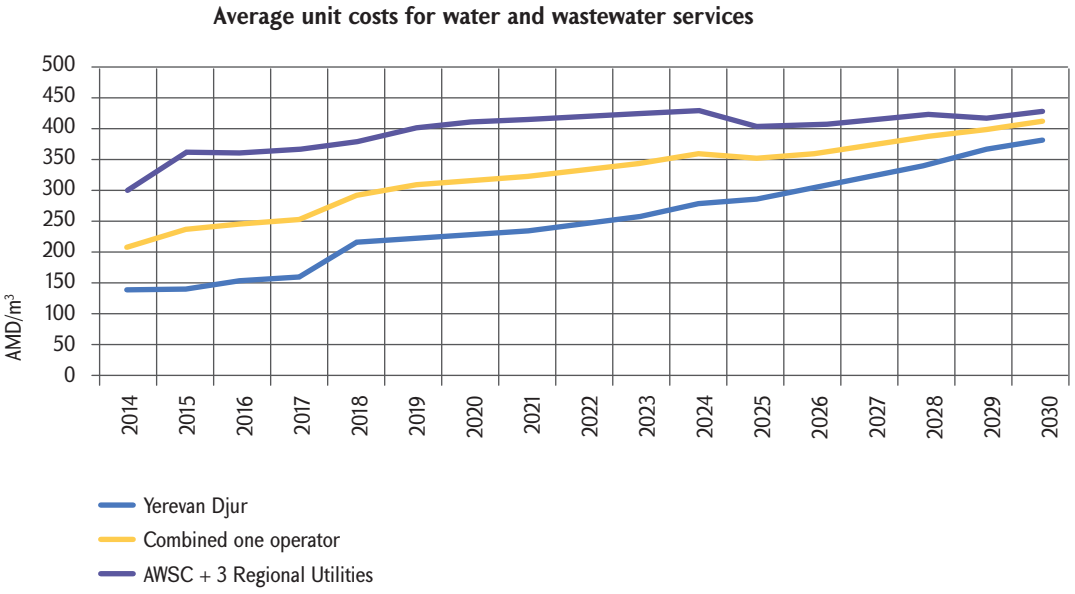
Source: Consultant's Calculation

Stakeholders also considered whether tariff levels should be the same across the country (under one operator), or whether they should differ for residents of Yerevan and residents living within the service areas of AWSC and the three regional utilities (two operators). Table 3.12 shows the advantages and disadvantages of these options while Figure 3.13 shows a comparison of unit cost projections under the two alternatives.

Table 3.12: Advantages and Disadvantages of Having Different Tariffs for One vs. Two Operators

One or two operators?	Advantages	Disadvantages
One operator	▪ A country wide tariff would allow for a lower tariff for customers outside of Yerevan, while not requiring a large increase for customers in Yerevan.	▪ The inherent transfer between customers in Yerevan and customers outside Yerevan means that there is less alignment between what customers pay and what costs they impose on the system.
Two operators	▪ Customers from each service area pay tariffs that are more closely aligned with the costs they impose on the system.	▪ Cost recovery tariffs for AWSC and the three regional utilities require an extremely rapid transition program (200 percent or greater increase) which may pose willingness to pay and affordability problems.

Figure 3.13: Comparison of Average Unit Costs for Water and Wastewater Services Excluding VAT



Stakeholders generally agreed that price increases associated with different tariffs for customers living in Yerevan and customers living in other service areas could cause serious willingness to pay problems and could threaten affordability for vulnerable customers.

4 RECOMMENDATIONS FOR REFORM

Tariff reform is necessary to increase access, quality and reliability of WSS services in Armenia, but it can disproportionately impact the poor and lead to social unrest if mitigation measures are not put in place. Successful reform efforts typically do the following:

- Provide highly targeted subsidies for vulnerable households
- Gradually phase in cost recovery tariffs
- Conduct transparent and sustained communication with the public

4.1 Subsidy Delivery

An increase in WSS tariffs will have a disproportionate impact on poor households' budgets. Roughly half (51.6 percent) of respondents surveyed believed that a program to protect vulnerable groups should be introduced if tariffs are increased.

Designing a subsidy regime requires decisions about: i) how to identify the poor; ii) how to deliver the subsidy; iii) when to deliver the subsidy; and iv) how to fund the subsidy. Options for each of these decisions are described and evaluated in the subsections below. This section describes different approaches to each step and recommends an approach for Armenia's WSS sector.

4.1.1 How to identify the poor

Poor customers are typically identified by:

- **Their water consumption.** So-called "lifeline tariffs" are tariffs which are lower for certain customers based on the amount of household consumption. These tariffs are generally applied to the initial block of consumption, called the basic need (for example, 6 m^3/month). Under inclining block tariff structures, this lower rate can either be included for all customers for their first 6 m^3 of consumption, or only be applied to those customers that use less than 6 m^3 (or the level set as subsistence consumption). A variation on the lifeline tariff is to waive or partially waive, or to provide a credit or partial credit for the fixed monthly customer charge for a targeted group of customers.
- **Assumptions about their income levels.** In some countries, customers receive compensation for the share of utility expenditures that exceed a notional "burden limit," determined as a given percentage of monthly household income. In Ukraine, for example, the Government provided discounts to households that spent more than 20 percent of monthly income on utilities). Income levels are typically determined by:
  - Household budget, income survey data, or other information collected by government (i.e., existing social support programs)
  - Other normative assumptions (i.e., type of housing)
  - Documents providing verification of income
- **Demand for subsidies.** In some countries, customers must submit an application for consideration and must provide verification of income.

As described in Section 2, poverty in Armenia has been assessed since 1996 using a consumption aggregate which includes the monetary value of a basket of food and non-food goods adjusted for regional and seasonal price differences. There are three poverty levels in Armenia: poor, very poor and extremely poor. These levels are demarcated by poverty lines and described in greater detail in section 0. Baseline line data is updated once every few years. The most recent update occurred in 2009. In 2012, 32.4 percent of households in Armenia lived below the poverty line.[35] There currently is no specific subsidy for water tariffs. However, the Family Benefit Program—the largest social transfer program in Armenia—uses a means test on income and a vulnerability scoring formula to identify and allocate social transfers to the poor. This formula allows the GoA to rank applicants, giving preference to single mothers, orphans, families with many children and the differently abled.[36]

The results of the WtP survey showed that 40.5 percent of respondents believed that tariff increases should be mitigated using the existing Family Benefit Program. As described in Section 3.3, this view is also consistent with the discussions held by government stakeholders and service providers.

4.1.2 How to deliver the subsidy

Subsidies can be delivered directly to customers through cash transfers or vouchers. They can also be delivered indirectly discounts on customers' energy bills. However, there is often a trade-off between administrative costs and targeting efficiency. Options to reach target populations most effectively often have high administrative or monitoring costs. The section below describes a few ways in which subsidies can be delivered to poor households.

- **Cash transfers** allow a government to increase consumers' purchasing power by supplementing the household income with allocations of money. The money may be intended for a particular purpose, but customers aren't required to use it in a specific way. The effectiveness of targeting the poor with cash transfer schemes depends on the institutional capacity to reach the intended beneficiaries.
- **Voucher schemes**, or near-cash transfers to households, also aim to increase consumers' purchasing power. Unlike cash, which can be used to buy anything, vouchers are designated for a specific purpose, such as the purchase of water. Voucher programs are low cost compared to universal subsidy programs. However, the administrative costs of voucher programs tend to be higher than those of cash transfer programs. The development and distribution of vouchers is inherently more complicated than the distribution of cash.
- **Indirect delivery** of the subsidy means subsidizing the water companies so that they are able to discount rates. This subsidy can be roughly targeted, such as through a lifeline tariff, or untargeted, such as when all end-user tariffs are set below cost-recovery levels.
- **Lifeline tariffs** can be used to ensure that all consumers can afford a subsistence level of water consumption. Implementation of a lifeline tariff involves a discount on the first portion of consumption, estimated at subsistence levels (approximately $6m^3$/month), while all subsequent consumption is billed at the higher rate. Another option is to charge all consumption at the highest consumption block customers enter during a billing period. This would mean that customers only benefit from the lifeline rate if they keep their consumption within the first block.

Cash transfer schemes are generally recognized as best practice if sufficient institutional capacity exists for targeting and delivery. Armenia fortunately has high institutional capacity to implement a cash transfer scheme through the FBP, which has been shown to have high targeting efficiency (see section 2.1).

[35] In 2012, households who spent less than 37044 AMD a month were considered poor.

[36] Ersado, Lire; Levin, Victoria. 2011. Armenia - Social assistance programs and work disincentives. Washington, DC: World Bank.

4.1.3 When to deliver the subsidy

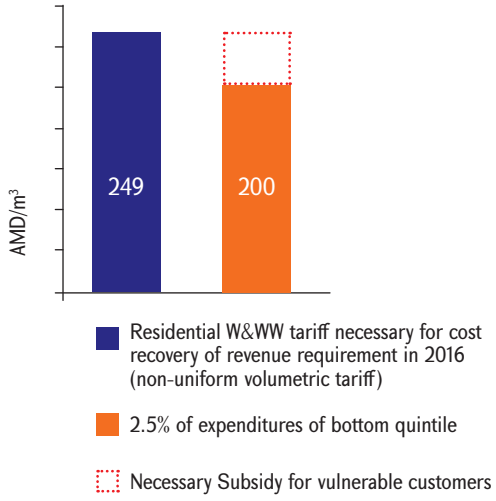
Indirect subsidies to water and sanitation utilities can be delivered in lump sums tied to budgeting cycles. Subsidies to customers through the FBP can be delivered on a monthly or bi-monthly basis directly to customers as cash transfers, using the existing system employed by the FBP program.

4.1.4 How to fund the subsidy

Subsidies may be funded by: i) direct transfer from government; ii) through cross-subsidies from other customer classes (inter-class subsidies); iii) within a customer class (intra-class subsidies). The advantage of a cross subsidy is that it avoids using government funds. The disadvantage is that it distorts prices, which affects consumption by the customer classes that fund and receive the cross subsidy. Figure 4.1 illustrates the need for funding when tariffs exceed 2.5 percent of the bottom quintile's expenditures.[37]

Existing social protection programs in Armenia are some of the best targeted programs in the ECA region.[38] The Family Benefit Program is well suited to distribute subsidies in the form of credits equal to the monthly average water consumption of poor households multiplied by the difference between the new and affordable tariff.

Figure 4.1: Necessary Subsidy for Vulnerable Customers



Source: Graphic by Consultant

4.1.5 Summary of the Options and Recommendations

Table 4.1 summarizes the advantages and disadvantages of the mitigation mechanisms described in previous sections.

[37] The 2.5 percent affordability threshold was adopted by the GoA in the Armenian Development Strategy (ADS) for 2014-2025. It is more stringent threshold than the World Bank threshold which is 4 percent of average household income.

[38] Ersado, Lire; Levin, Victoria. 2011. Armenia - Social assistance programs and work disincentives. Washington, DC: World Bank.

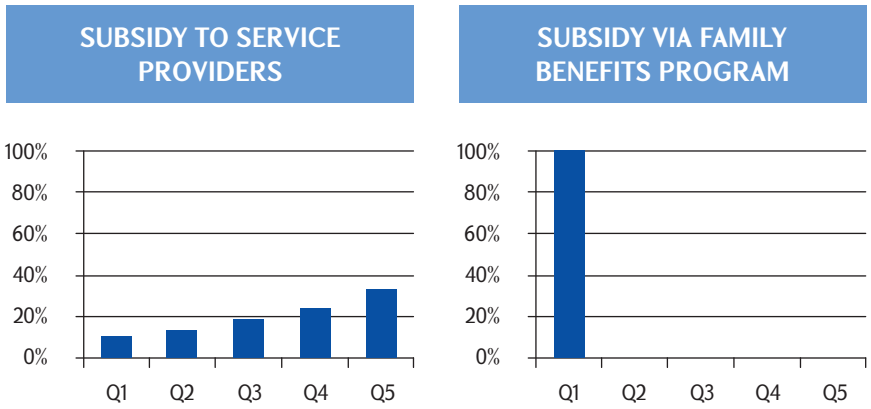
Table 4.1: Advantages and Disadvantages of Mitigation Mechanisms

Mitigation mechanism	Advantage	Disadvantage
Indirect delivery	▪ Easy to administer	▪ Weak targeting of poor households ▪ Must be accompanied with performance benchmarking to separate efficiency and subsidy considerations
Lifeline tariff	▪ Can be administered by utility; does not require separate subsidy delivery mechanism ▪ Can be funded by cross-subsidy or government	▪ Imperfect targeting: May benefit wealthy customers (who consume little water, i.e., at 2nd properties) ▪ Can penalize poor households with shared connections and/or large families
Earmarked cash subsidy (vouchers)	▪ Does not distort prices for the service	▪ May be difficult to administer (requires printing and distribution of vouchers) ▪ C ostly to monitor (would require measures to ensure that no counterfeit vouchers are made or used)

Source: Consultant

Cash transfers and voucher schemes have considerably higher targeting efficiency than indirect delivery, as is currently done in the Armenian water sector. Figure 4.2 shows a comparison of incidence of benefit and costs to the government budget of providing cash transfers to the bottom quintile versus subsidizing service providers. It is based on consumption data from 2012.

Figure 4.2: Incidence of Benefit Graph[39]



As shown in Figure 4.2, the incidence of benefit and targeting efficiency of subsidies delivered through the FBP as cash transfers to customers is much higher than would be expected with indirect transfers to service providers. When subsidies are administered directly to service providers, customers are subsidized on a per m3 basis, so customers who consume more receive a greater portion of the subsidy. According to consumption records from 2012, when subsidies are transferred directly to service providers, customers in the 5th quintile receive 330 percent of the subsidies provided to the 1st quintile.

[39] Source: Consultant's calculations

The administrative cost and burden of this subsidization option is remarkably low, because the FBP has already developed a successful program to target vulnerable water and sanitation customers and has in place a mechanism to deliver cash transfers. It takes less than two months for eligible customers who apply to the program to begin receiving benefits. For its advantages in targeting efficiency and administrative costs, it is recommended that cash transfers are used to subsidize vulnerable customers

4.2 Transition to Cost-Recovery

Increases from current tariffs to cost-recovery tariffs present three important issues for the GoA to consider:

- How to keep water affordable for as much of the population as possible
- How to prevent "rate shock," or customer discontent over sudden, substantial tariff increases. Rate shock is more than a political problem. It can create real financial problems for water service providers by decreasing collection efficiency and increasing commercial losses. Rate shock is related to customer willingness to pay but not necessarily to affordability.
- The cost of subsidies to the sector under each tariff transition program. This includes subsidies to the service providers for covering basic O&M, capital improvement reserves and debt service costs. It also includes increases in water and wastewater fees for budgetary customers and contributions to the Family Benefit Program for the protection of vulnerable families.

This section presents four potential transition programs for moving from current tariffs to cost-recovery tariffs over the period of 2014–2019. The transition options described assume the one operator scenario and a flat volumetric tariff differentiated for residential and non-residential customers. Stakeholders from the tariff workshop generally preferred this option for tariff design.

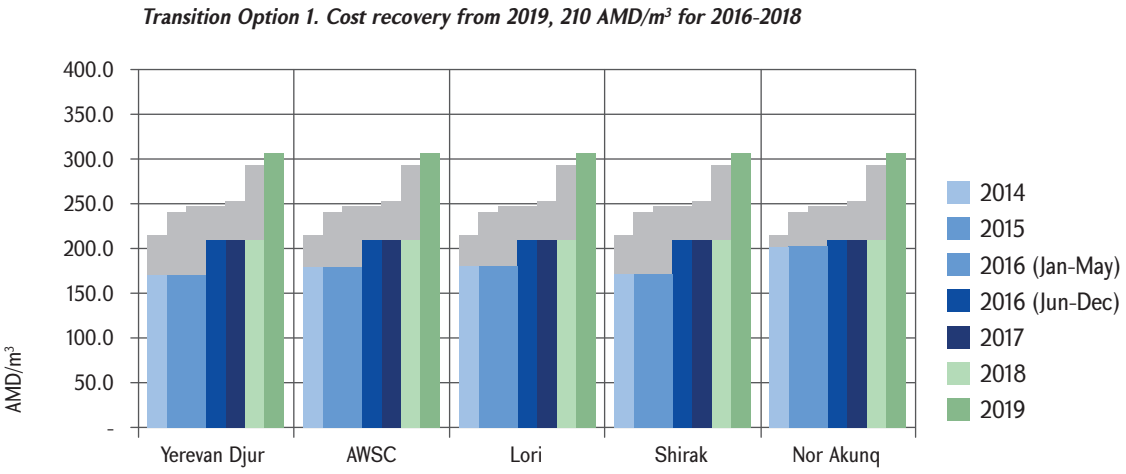
The subsidy levels required by each of the transition options are estimated by calculating: i) the difference between the revenue requirements from each year; ii) the revenue collected under a given tariff scheme; iii) the budget required for subsidies through the FBP program; iv) the increased revenue from sales after VAT; v) the increased cost of paying for water and wastewater services of budgetary customers.

4.2.1 Option 1

In transition option 1, tariffs would reach full cost recovery levels by 2019. In June of 2016, after the start of the new contract arrangement, tariffs would increase to 210 AMD/m^3 until 2018 and to full cost recovery levels in 2019.

Figure 4.3 shows how the tariff levels in transition option 1 would affect customers from each of the service areas under a differentiated tariff.

Figure 4.3: Residential Tariffs for W&WW – Transition Option 1a (Differentiated Tariff)



Note: The grey bars show cost recovery tariff levels during the respective years.

Source: Consultant's Calculations

Figure 4.4 compares the transitory tariffs to cost recovery tariff levels and affordable tariffs for customers in the lowest quintile. Table 4.2 shows the subsidy required under this transition program.

Figure 4.4: Residential Tariffs Compared to Cost Recovery Tariffs and Affordability Thresholds – Transition Option 1a

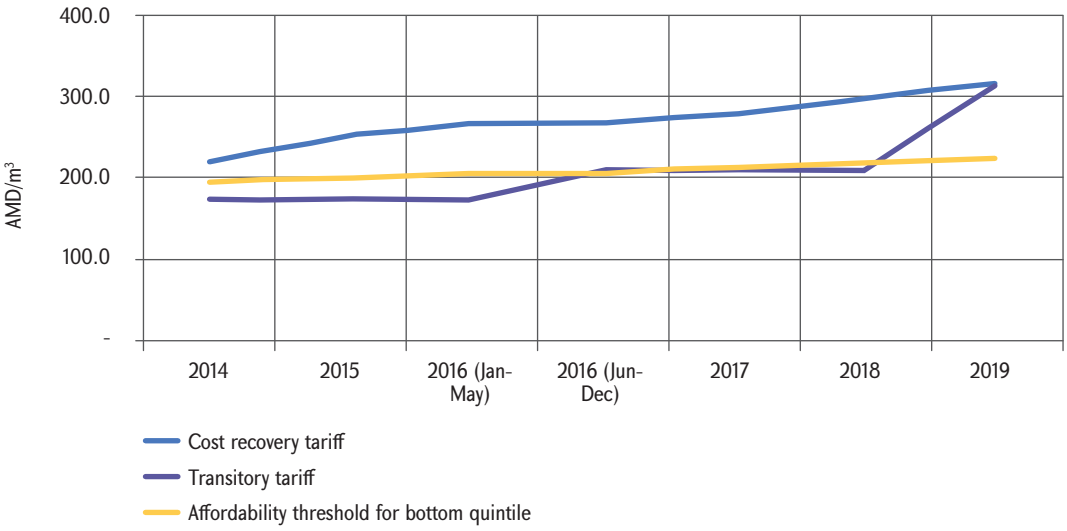


Table 4.2: Subsidies Required for W&WW – Transition Option 1a (Differentiated Tariff)

	2014	2015	2016 (Jan-May)	2016 (Jun-Dec)	2017	2018	2019	Total 2014-2019
Subsidy required (mln. AMD)	4,783	7,743	3,897	2,739	5,877	8,268	0	33,307
Subsidies required for the Family Benefits Program (mln. AMD)	0	0	0	33	0	0	1,243	1,276
Additional expenses for budgetary organization (mln. AMD)	0	0	0	143	249	252	669	1,314
State budget additional income from VAT (mln. AMD)	0	0	0	453	792	809	2,538	4,592
Total								**31,306**

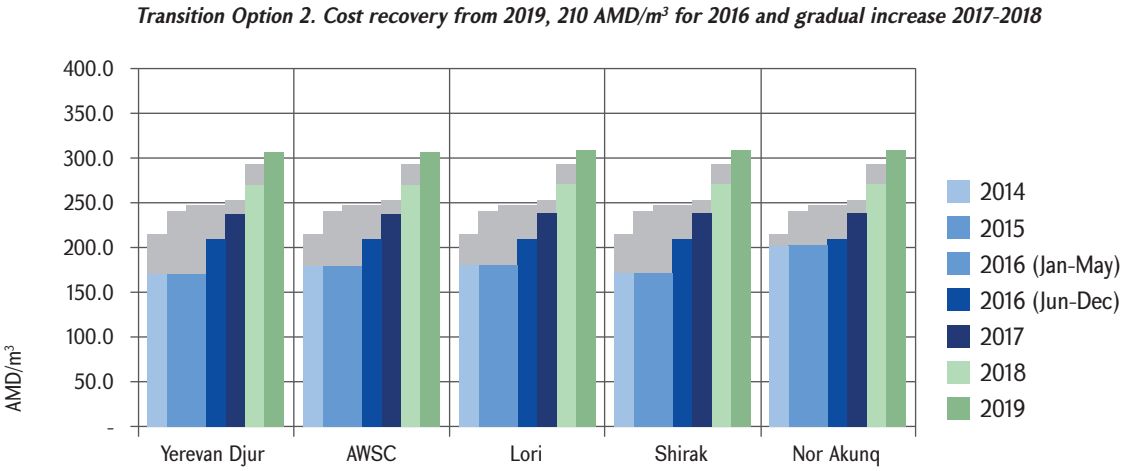
Source: Consultant's Calculations

4.2.2 Option 2

In transition option 2, tariffs would reach full cost recovery levels by 2019. In June of 2016, after the start of the new contract arrangement, tariffs would increase to 210 AMD/m³ and to cost recovery levels by 2019.

Figure 4.5 shows the tariff levels in transition option 2 as they affect customers from each of the service areas under a differentiated tariff.

Figure 4.5: Residential Tariffs for W&WW – Transition Option 2a (Differentiated Tariff)



Note: The grey bars show cost recovery tariff levels during the respective years.

Source: Consultant's calculations

Figure 4.6 compares the transitory tariffs to cost recovery tariff levels and affordable tariffs for customers in the lowest quintile. Table 4.3 shows the subsidy required under this transition program.

Figure 4.6: Residential Tariffs Compared to Cost Recovery Tariffs and Affordability Thresholds – Transition Option 2a

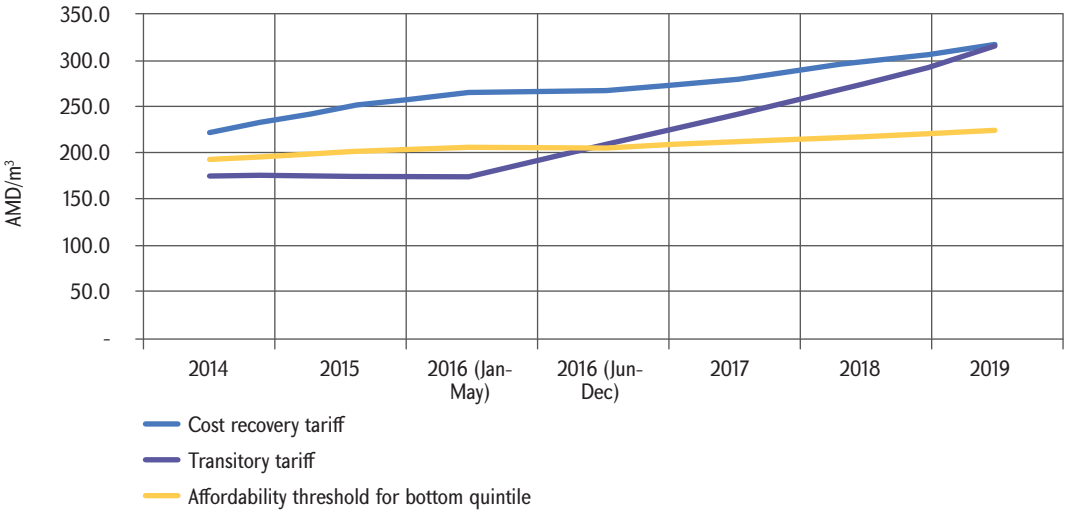


Table 4.3: Subsidies Required for W&WW – Transition Option 2a (Differentiated Tariff)

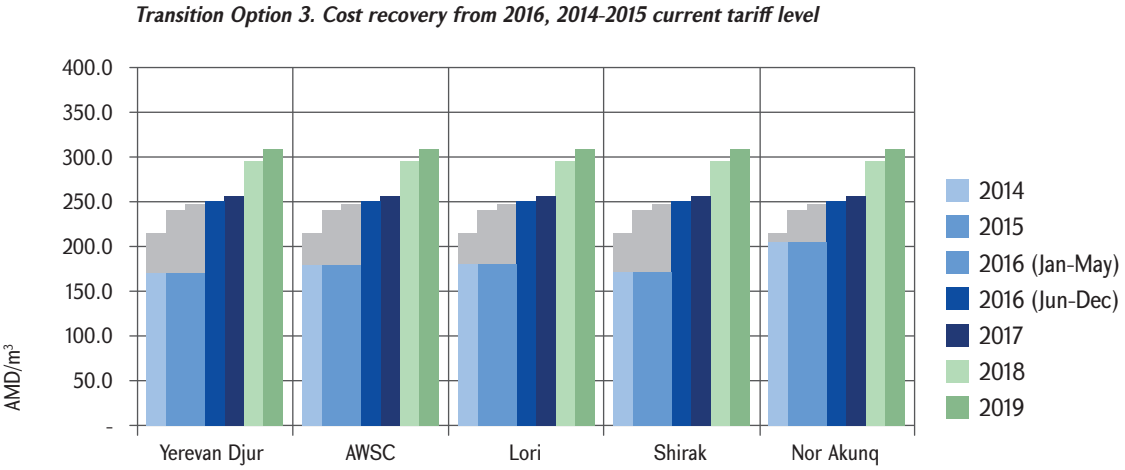
	2014	2015	2016 (Jan-May)	2016 (Jun-Dec)	2017	2018	2019	Total 2014-2019
Subsidy required (mln. AMD)	4,783	7,743	3,897	2,739	3,054	2,068	0	24,283
Subsidies required for the Family Benefits Program (mln. AMD)	0	0	0	33	365	754	1,243	2,395
Additional expenses for budgetary organization (mln. AMD)	0	0	0	143	365	505	669	1,682
State budget additional income from VAT (mln. AMD)	0	0	0	453	1,262	1,843	2,538	6,095
Total								**22,265**

Source: Consultant's calculations

4.2.3 Option 3

In transition option 3, tariffs would reach full-cost recovery levels by 2016. Figure 4.7 shows how the tariff levels in transition option 3 would affect customers from each of the service areas under a differentiated tariff.

Figure 4.7: Residential Tariffs for W&WW – Transition Option 3a (Differentiated Tariff)



Note: The grey bars show cost recovery tariff levels during the respective years.

Source: Consultant's calculations

Figure 4.8 compares the transitory tariffs to cost recovery tariff levels and affordable tariffs for customers in the lowest quintile. Table 4.4 shows the subsidy required under this transition program.

Figure 4.8: Residential Tariffs Compared to Cost Recovery Tariffs and Affordability Thresholds – Transition Option 3a

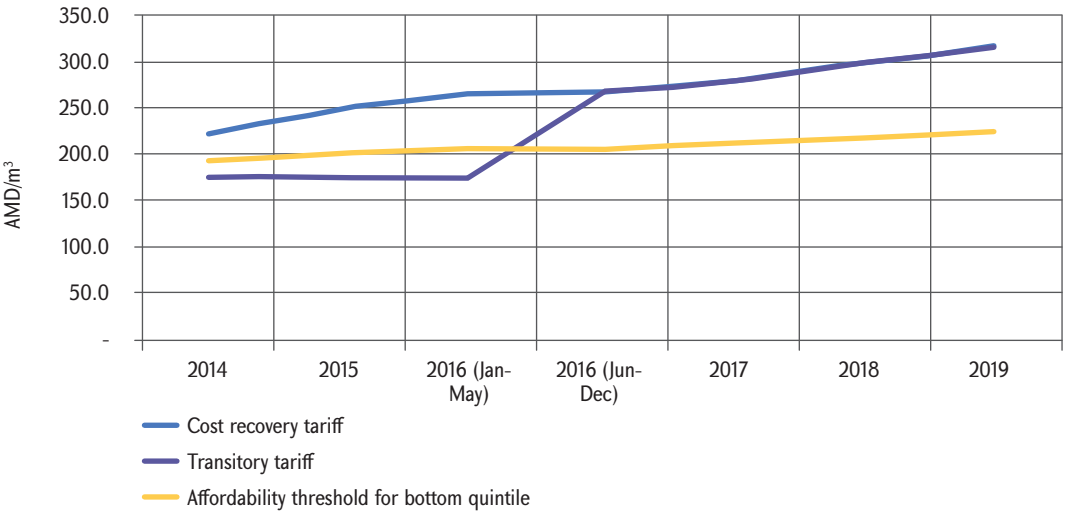


Table 4.4: Subsidies Required for W&WW – Transition Option 3a (Differentiated Tariff)

	2014	2015	2016 (Jan-May)	2016 (Jun-Dec)	2017	2018	2019	Total 2014-2019
Subsidy required (mln. AMD)	4,783	7,743	3,897	0	0	0	0	16,423
Subsidies required for the Family Benefits Program (mln. AMD)	0	0	0	427	817	1,060	1,243	3,547
Additional expenses for budgetary organization (mln. AMD)	0	0	0	258	492	590	669	2,010
State budget additional income from VAT (mln. AMD)	0	0	0	909	1,771	2,187	2,538	7,406
Total								**14,574**

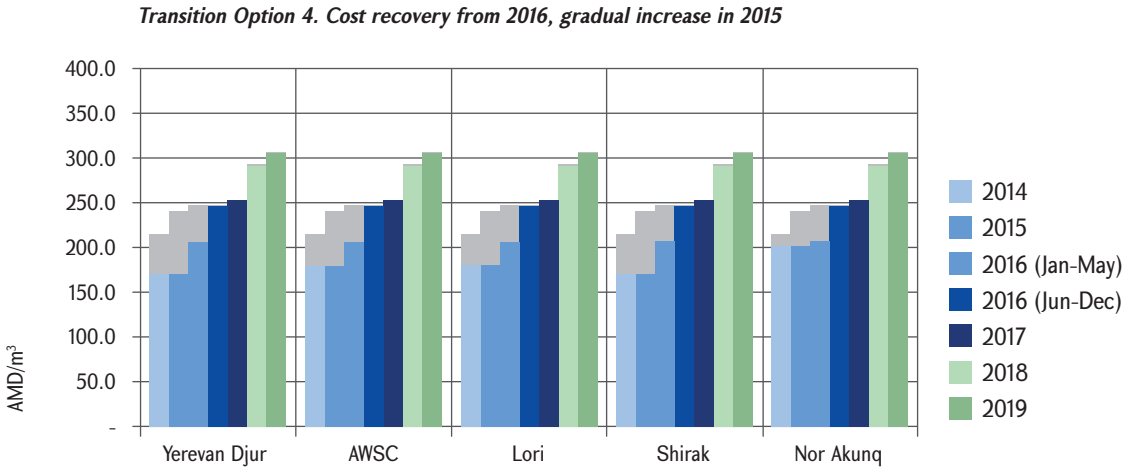
Source: Consultant's calculations

4.2.4 Option 4

In transition option 4, tariffs would reach cost recovery levels in 2016 with a gradual tariff increase starting in 2015.

Figure 4.9 shows how the tariff levels in transition option 4 would affect customers from each of the service areas under a differentiated tariff.

Figure 4.9: Residential Tariffs for W&WW – Transition Option 4a (Differentiated Tariff)



Note: The grey bars show cost recovery tariff levels during the respective years.

Source: Consultant's calculations

Figure 4.10 compares the transitory tariffs to cost recovery tariff levels and affordable tariffs for customers in the lowest quintile. Table 4.5 shows the subsidy required under this transition program.

Figure 4.10: Residential Tariffs Compared to Cost Recovery Tariffs and Affordability Thresholds – Transition Option 4a

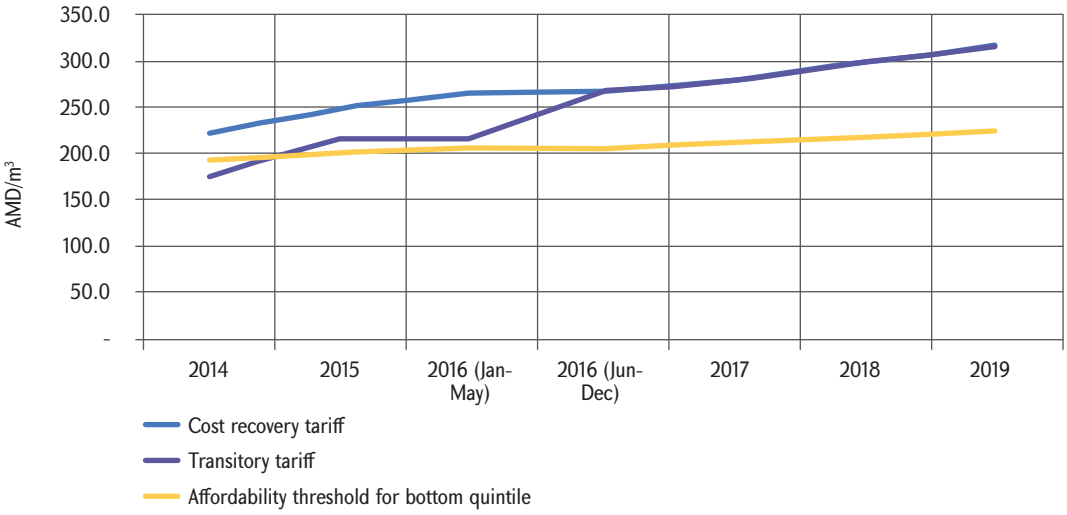


Table 4.5: Subsidies Required for W&WW – Transition Option 4a (Differentiated Tariff)

	2014	2015	2016 (Jan-May)	2016 (Jun-Dec)	2017	2018	2019	Total 2013-2019
Subsidy required (mln. AMD)	4,783	3,517	2,172	0	0	0	0	10,472
Subsidies required for the Family Benefits Program (mln. AMD)	0	156	28	427	817	1,060	1,243	3,731
Additional expenses for budgetary organization (mln. AMD)	0	188	79	258	492	590	669	2,277
State budget additional income from VAT (mln. AMD)	0	693	283	909	1,771	2,187	2,538	8,381
Total								**16,479**

Source: Consultant's calculations

4.2.5 Analysis of transition options

In all of the transition options, there is low risk that affordability would be a problem for customers in the bottom quintile due to the FBP. The potential fiscal burden from necessary subsidies is a greater

concern. Rate shock also could pose challenges for reform. The results of the WtP survey show that on average, respondents were willing to pay a maximum of only 17.7 percent more than their current monthly water expenditures for system improvements. The tariff increases proposed in the transition plans require considerably higher percentage increases. Table 4.6 shows the annual percentage rate hike for each transition option.

Table 4.6: Percentage Rate Hike From Previous Year

	2015	2016 (Jan-May)	2016 (Jun-Dec)	2017	2018	2019
Option 1	0.0%	0.0%	20.5%	0.0%	0.0%	44.7%
Option 2	0.0%	0.0%	20.5%	12.8%	13.1%	13.4%
Option 3	0%	0%	48%	4%	8%	6%
Option 4	20.9%	0.0%	22.1%	3.9%	7.7%	5.5%

Note: Dark grey box represents highest rate hike in each transition program. Lighter grey box represents the option's second highest rate hike.

Transition options 2 and 4 have the lowest risk of rate shock with the greatest annual rate hike of 20.5 and 20.9 percentage points over the span of five years. The key differences between the two options are the total subsidy cost between the years 2014–2019 and when the initial rate hike is introduced. Transition option 4 has a 16.5 billion AMD total subsidy cost, the lowest among the options. This is largely because it requires the most immediate initial rate hike. The lower the total subsidy cost, the earlier cost recover levels are reached. By comparison, transition option 2 has the second highest subsidy cost. However, the initial rate hike would not be introduced until the second half of 2016, a year later than in transition option 4. It is important to note that under all transition programs, improvements to water services are expected to happen at the same pace, according to the investment plan outlined in Appendix D. Thus, to align public support with tariff increases, there are clear advantages to spreading out tariff increases over several years. This would allow customers to see improvements in their quality of service as tariff levels increase. Again, transition options 2 and 4 present the most gradual increases among the four options.

Transition options 1 and 3 hold the highest risk for rate shock, with tariff increases of 44.7 percent in 2019 and 48 percent in 2016, respectively. Such a large sudden increase in rates has a stronger likelihood of public disapproval of tariff reform. These increases are much higher than the surveyed level of willingness to pay.

4.3 Public Communications

Regardless of the transition option chosen, a critical component of tariff reform is a well-coordinated communication campaign. It is important for customers to understand: i) what is changing and why; ii) what is the long-term plan; iii) what will be the expected benefits of the plan; iv) how much tariffs will increase in the upcoming five year period.

Survey results showed that there is much institutional distrust and a collective belief that water providers should pay for improvements to WSS infrastructure. These sentiments make the likelihood of rate shock high, especially if tariffs are increased to cost recovery levels within a short period of time.[40] Consequently,

[40] See Appendix J.7 for respondents' attitudes towards stakeholders responsible for WSS improvements and perceptions of WSS providers' ability to successfully deliver improvements.

it may be beneficial for the GoA to use direct and indirect means to involve the public in rate setting. A successful public awareness and communication campaign can: i) inform the public on true sector costs; ii) inform the public on conservation issues; iii) reduce public distrust of water service providers and the GoA. Some methods of communication include:

- **Bill inserts** are particularly useful to: i) announce tariff study events such as community meetings; ii) report findings; iii) report effective dates of tariff changes. Although inserts have a potential to reach all customers, they are often discarded as 'junk mail'.
- **Newsletters** can be used to provide more detailed information about a specific concern related to tariff reform. They can be distributed to community groups most affected by tariff changes.
- **Community group presentations** are a relatively inexpensive way to involve the public in the tariff reform process. Unlike with print materials, trained utility representatives can meet directly with members of the public.
- **24 hour information lines** with recorded messages can inform interested members of the public on the date and time of tariff study events, public hearing sessions and tariff study findings. Contact numbers of a few utility representatives that can answer the public's questions would also be pertinent.
- **Print and broadcast media relations** with local media networks can brief and provide advance notice to the public on the tariff reform process.
- **Internet sites** can be a source of information and a platform for the public to communicate with service providers. Information such as presentations, newsletters, and study findings can be easily uploaded and updated for users to access at any time. In addition, contact details and a messaging platform would allow the public to communicate with service providers directly.

It takes time to build public support for tariff reform. Public communication should be sustained throughout the transition period, and showing links between higher tariffs and noticeable service improvements will be crucial to success.

Appendix A: Approach Taken for Aggregating Costs in the Revenue Requirement

There are two general options for aggregating utilities' costs into a revenue requirement:

- The **rate-of-return** approach.[41] Under the rate-of-return approach, a utility's costs of service are assumed to include: cash operating and maintenance expenses, depreciation expenses and an allowed rate of return on invested capital (often referred to as the "rate base" or "regulated asset base"). The sum of these costs (after any required adjustments made by the regulator for imprudent expenditures) is the annual revenue requirement. The revenue requirement is typically represented arithmetically as follows: Revenue requirement = operating and maintenance expenses + depreciation + (rate base x allowed return).
- The **cash needs** approach. Under the cash needs approach, a utility's costs of service are assumed to include: operating and maintenance expenses, any debt service requirements (where debt service means principal plus interest payments required on any loan) and the direct cost of any capital expenditures not financed by debt (i.e., capital expenditure paid for by the utility from its revenues). The revenue requirement is typically represented arithmetically as follows: Revenue requirement = operating and maintenance expenses + debt service + capital improvements.

The cash needs approach explicitly acknowledges direct, annual cash requirements for capital investment. The rate-of-return approach provides a stream of cash which is only a proxy (not a direct measure) of a utility's annual cash requirements. Appendix Table A.1 shows an example comparison of the two approaches.

Appendix Table A.1: Example of Test-Year Revenue Requirements Under Different Approaches

	Cash needs	Rate-of-return
	(USD)	
Operation and maintenance expense	2,279,000	2,279,000
Debt service	950,000	
Repair and replacement reserve	410,000	*
Depreciation expense		474,000
Return (operating income)		**886,000
Total revenue requirements from rates	3,639,000	3,639,000

*Annual cash requirements for this item are met from depreciation expense and return.

**Includes principal and interest payments on debt.

Source: Adapted from American Water Works Association's "Water Rates" Manual, M1, Table 1-2. Fifth Edition.[42]

[41] The term "rate" is used in the United States and some other countries to mean the same as "tariff". The term "rate of return" refers to the returns expected by equity investors and lenders on the capital provided to utilities. The rate of return is expressed as a percentage of the utility's asset value and often reflects a weighted average of rates of return expected by equity and debt investors (often referred to as a "weighted average cost of capital"). We therefore use the terms "rate" and "tariff" interchangeably throughout this document.

[42] American Water Works Association. Principles of Water Rates, Fees, and Charges. 6th ed. AWWA Manual M1. Denver, CO: American Water Works Association, 2012.

As shown in the table and notes to the table, with the "cash needs" approach, the value represented by depreciation charges is captured through debt service costs and direct recognition of the costs of any capital improvements not financed by debt. The cash needs approach, if implemented correctly so that rates recover full operation and maintenance and capital costs, yields the same level of revenue requirement as does rate of return regulation.[43]

A number of water regulators have observed that depreciation accounting is particularly ill suited to measure the useful life of many underground water sector assets, for the following reasons:

- Underground water sector assets have longer lives than depreciation accounting recognizes. This is particularly true for irrigation and wastewater assets (some sewers and canals have been operating for hundreds of years).
- Water sector assets are more often repaired or renewed than replaced. Repair work is often necessary only in extraordinary circumstances (i.e., by natural disaster or severe weather conditions).

For the purposes of this tariff study, we use a cash needs approach for estimating the future revenue requirement as it:

- Measures the costs to a water utility of maintaining, renewing and repairing its system more directly than conventional depreciation accounting. This will be particularly important for Armenia's water utilities as they look to further rehabilitate their systems to meet service quality targets.
- Relies on water utility forecasts of maintenance, renewals, and repairs. These factors more accurately reflect the needs of the system than charges based on notional depreciation schedules.

Since the Government of Armenia also provides investment funding for capital expenditures (CAPEX), it could consider requiring a return on that investment (to be paid out as dividends). However, it should be noted that dividend payments, like debt service, mean a higher cost of service which will result in a higher tariff.

[43] In practice, many government-owned utilities typically fail to recover both full O&M and capital costs, but this failure is due to political pressures to keep rates low, or because of poor management (i.e., poor collections procedures), not because the "cash needs" approach fails to take the full costs of running and sustaining a utility into account.

Appendix B: Tariff Projection Model (TPM)

Forecasts of the revenue requirement were developed in a tariff projection model (TPM)[44] with 64 fully interlinked spreadsheets, shown in Appendix Figure B.1. The TPM is constructed with separate revenue requirement calculations for the service areas of Yerevan Djur, AWSC and the 3 regional utilities. These are then aggregated in the one and two operator options.

Appendix Figure B.1: Organization of Tariff Projection Model

[44] The model is available from the World Bank upon request.

Appendix C: Methodology for Estimation of Operation and Maintenance Costs

This appendix provides an overview of the methodology used in modelling operation and maintenance (O&M) cost estimates for each of the service providers (Sheets A1-A9, B1-B6, and C1-C7 of the TPM).[45]

Operation and maintenance expenses refer to the ongoing costs of maintaining and operating utility equipment. In the revenue requirement model, these costs are summarized as:

- Staff costs (management costs, security costs and remaining staff costs)
- Electricity costs
- Fixed costs (less staff costs)
- Variable costs (less electricity)

All costs are adjusted to account for the collection rates of each service provider by dividing the total costs by the collection rate.

C.1 Staff Costs

Staff costs have been modeled in a staff cost projection model (sheet A9 of the TPM). These costs are modelled using the following variables for each service provider:

- Number of management staff
- Number of operational staff
- Number of customers
- Customer/management staff ratio
- Customer/operational staff ratio
- Average monthly salary of managerial staff
- Average monthly salary of operational staff

Historic figures for each of these variables have been provided by service providers for 2011-2013. These are then projected for the 2014-2030 period using the assumptions shown in Appendix Table C.1.

Appendix Table C.1: Management Contract Extension, SAUR[46]

Item	2014-2015	2016-2030
Average salary growth rate for Yerevan Djur	3.0%	3.0%
Average salary growth rate for AWSC	3.0%	5.0%
Average salary growth rate for 3 utilities	3.0%	5.0%
Customer/staff ratio growth rate for Yerevan Djur	0.0%	0.0%
Customer/staff ratio growth rate for AWSC	3.0%	5.0%
Customer/staff ratio growth rate for 3 utilities	3.0%	5.0%

[45] The model is available from the World Bank upon request.
[46] Management operator for AWSC (SAUR)

In addition to the managerial and operational staff costs, management fees for AWSC and the three regional utilities have been included in projections for 2014-2015. These fee estimates are shown in Appendix Table C.2.

Appendix Table C.2: Management Contract Extension, SAUR and MVV

	2014	2015	2016
Management fee, AWSC (Euro)	927,805	927,805	405,335
Management fee, MVV (Euro)	1,053,736	854,244	191,207

After year 2016, the management costs for AWSC and MVV are reduced by 60 percent, representing the removal of the management fee. For the year of 2016, the reduction is applied only to the 7 months of 2016 that take place after the management contract is finished. The first 5 months of 2016 use the management fee shown in Appendix Table C.2.

C.2 Electricity Costs

Electricity costs for each service provider are adjusted annually based on three factors: i) the price of electricity; ii) the volume of water supplied to the network; and iii) the kWh used per m3 of water supplied to the network (energy efficiency of the system). As energy efficiency improves, electricity costs decline at a proportionate pace.

C.2.1 The price of electricity

Changes in the price of electricity are estimated using projections developed in the 2013 Armenia Energy Sector Policy Note Update. These are summarized in Appendix G.

C.2.2 The volume of water supplied to the network

Projections in the volume of water supplied to the network for each service provider use assumptions developed in the Armenia Water Sector Study.[47] These are summarized in Appendix E.1.

C.2.3 Changes in energy efficiency

Appendix Table C.3 summarizes the different energy efficiency assumptions used for each company.

Energy efficiency: Yerevan Djur

Over the course of Yerevan Djur's lease contract, the company has achieved dramatic improvements in the electricity efficiency of its water and wastewater systems. In 2009, Yerevan Djur consumed a total of 109.6 million kWh, in comparison with 240.3 million kWh in 2000.[48] For estimating the future improvement to Yerevan Djur's electricity efficiency, it is assumed that, after a measured reduction of 20 percent in 2013, kWh consumed per cubic meter of water produced remains constant. This estimation is based on the assumption that many of the major electricity efficiency improvements have already been achieved and that future improvements will not result in large changes to the overall efficiency of the system.

Energy efficiency: AWSC

Energy costs for AWSC are estimated using projections from the total management plan developed by SAUR.[49]

[47] *Present State of Water Sector: Water Sector Study Armenia – Sector Review and Strategy*, 2014.
[48] *Armenia Water Sector Note*. The World Bank, May 2011.
[49] *Total Management Plan*. SAUR, 2013.

Energy Efficiency: Three Regional Utilities

For the three regional utilities it is assumed that a reduction of 25 percent of electricity usage per cubic meter of water produced is achieved after the first 10 years of the lease contract (2016 – 2026). These changes also reflect the phasing of the capital expenditure plan. Appendix Table C.3 shows the assumed changes in electricity consumption over the course of the projection period.

Appendix Table C.3: Electricity Efficiency Three Regional Utilities

	2012	2013	2016	2030
kWh per cubic meter of water produced	0.10	0.10	0.09	0.07

C.3 Fixed O&M Costs (Less Staff Costs)

Changes in fixed operation and maintenance costs for each service provider are estimated by adjusting historic costs by the change in active subscribers.

C.3.1 Changes in active subscribers

The changes in active subscribers for each service provider are estimated using figures developed in the Armenia Water Sector Study.[50] These are shown in Appendix F.

C.3.2 Historic and test year fixed O&M costs

Historic fixed O&M costs for each service provider are determined using data from the audited financial statements of each of the five service providers. Appendix Table C.4 shows historic and test year costs for each of the service providers.

Appendix Table C.4: Fixed O&M Costs (Less Staff Costs)[51]

		Historic costs (test year)	Pro-forma test year
		2012	2013
Yerevan Djur	% change in population		0.17%
	Fixed Production Costs (Less staff costs)	421,656	422,393
	Fixed Distribution Costs (Less staff costs)	60,212	60,317
	Fixed Indirect Overheads (Less staff costs)	232,780	233,187
AWSC	% change in population		0.35%
	Fixed Production Costs (Less staff costs)	128,000	130,000
	Fixed Distribution Costs (Less staff costs)	36,771	33,350
	Fixed Indirect Overheads (Less staff costs)	720,362	994,093
Three Regional Utilities	% change in population		0.41%
	Fixed Indirect Overheads (Less staff costs)	21,637	21,726

*All fixed production and distribution costs for AWSC fall under the staff costs category in their audited financial statement. Thus these costs are discussed in section C.1.

Note: All costs are in million AMD

[50] *Present State of Water Sector: Water Sector Study Armenia – Sector Review and Strategy*, 2014.

[51] Annual Financial Statements of AWSC, Yerevan Djur, Nor Akunq, Lori and Shirak Water and Wastewater Service Providers. 2011 and 2012.

C.4 Variable O&M Costs (Less Electricity Costs)

Changes in variable operation and maintenance costs for each service provider are estimated by adjusting historic costs by the change in water production and demand. Variable production, distribution and overhead costs are adjusted via the change in water produced. Variable collection costs are adjusted via the change in water demand.

C.4.1 Changes in water demand and production

The changes in water demand and production are estimated using figures developed in the Armenia Water Sector Study.[52] These are shown in Appendix E.1

C.4.2 Changes in variable production, distribution and indirect overhead costs

Historic variable production, distribution and indirect overhead costs for each service provider are determined using data from the audited financial statements of each of the five service providers. These are then adjusted for the base year and the projection period using the changes in water production (water which is supplied to the network). Appendix Table C.5 shows historic and test year costs for each of the service providers.

Appendix Table C.5: Variable Production, Distribution and Indirect Overhead Costs (Less Electricity Costs)[53]

		Historic costs (test year)	Pro-forma test year
		2012	2013
Yerevan Djur	% Change in water production		-6.6%
	Variable Production Costs (less electricity)	1,053,867	969,058
	Variable Distribution Costs (less electricity)	191,247	178,635
	Variable Indirect Overheads (less electricity)	485,373	453,364
	Other Variable Costs (less electricity)	6,311	5,895
AWSC	% Change in water production		-8.1%
	Variable Production Costs (less electricity)	160,787	226,065
	Variable Distribution Costs (less electricity)	80,890	109,725
	Variable Indirect Overheads (less electricity)	222,739	182,996
	Other Variable Costs (less electricity)	107,950	158,150
Three regional utilities	% Change in water production		-6.2%
	Variable Production and distribution Costs (less electricity)	64,732	64,875

Note: All costs are in million AMD

[52] *Present State of Water Sector: Water Sector Study Armenia – Sector Review and Strategy*, 2014.

[53] Annual Financial Statements of AWSC, Yerevan Djur, Nor Akunq, Lori and Shirak Water and Wastewater Service Providers. 2011 and 2012.

C.4.3 Changes in variable collection costs

Historic variable collection costs for each service provider are determined using data from the audited financial statements of each of the five service providers. Appendix Table C.6 shows historic and test year costs for each of the service providers.

Appendix Table C.6: Variable Collection Costs (Less Electricity Costs)[54]

		Historic costs (test year)	Pro-forma test year
		2012	2013
Yerevan Djur	% Change in water demand		3.19%
	Variable collection costs (less electricity)	93,168	96,136
AWSC	% Change in water demand		1.94%
	Variable collection costs (less electricity)	47,540	56,664
Three regional utilities	% Change in water demand		10.71%
	Variable collection costs (less electricity)		

C.5 Additional O&M Expenses Included in Projections

In estimating revenue requirements over the 20-year projection period, there are additional expenditures which are expected to be undertaken by service providers. These are summarized as follows:

- The inclusion of the expense of rain water removal network maintenance in the Yerevan Djur service area starting in 2016
- The inclusion of increased security requirements for AWSC and the Three Regional Utilities starting in 2016
- The inclusion of servicing internal networks of multi-family apartment buildings as a responsibility of service providers, starting in 2024
- The replacement of water meters by service providers starting in 2016

Estimates for the above expenses were provided by the State Water Committee. They are shown in Appendix Table C.7.

[54] Annual Financial Statements of AWSC, Yerevan Djur, Nor Akunq, Lori and Shirak Water and Wastewater Service Providers. 2011 and 2012.

Appendix Table C.7: Annual Costs of Additional O&M Expenses (SCWE Estimates) Mil AMD

Item→ / Service provider↓	Maintenance of rainwater removal network (2016)	Increased security requirements (2016)	Replacement of water meters (2016)	Servicing of internal networks (2024)
Yerevan Djur	100		550	1325
AWSC		195	258	575
Three regional utilities		48	159	

C.6 Changes in Collection Rate

When calculating the necessary tariffs to meet cost recovery, revenue requirements are adjusted to account for collection rates of each service provider. It is assumed that, with a switch to a lease contract, the collection efficiency of the service providers would approach the level achieved in the Yerevan Djur lease contract over the period of 10 years. It is assumed that AWSC and the three regional utilities, after converting to a lease contract, achieve a collection efficiency of 99.3 percent by 2025. This is shown in Appendix Table C.8.

Appendix Table C.8: Collections Efficiency Assumptions

	Two operator option				One operator option			
	2013	2016	2025	2030	2013	2016	2025	2030
Yerevan %	99.3	99.3	99.3	99.3	99.3	99.3	99.3	99.3
AWSC %	94.9	95.6	99.3	99.3	94.9	95.6	99.3	99.3
Three regional utilities %	98.1	98.2	99.3	99.3	98.1	98.2	99.3	99.3

Appendix D: Methodology for Estimation of Capital Costs

Capital costs include the following three components:

- Debt service payments on existing loans
- Debt service payments on new loans for rehabilitation and system expansion
- Losses or gains on foreign exchange

D.1 Capital Costs of Existing Loans

Debt servicing costs on existing loans are forecasted using actual loan schedules provided by each of the service providers for all current loans in the water sector. A summary of these loans is shown in Appendix Table D.1. Detailed repayment schedules are shown in Sheet E1 of the TPM. [55]

Appendix Table D.1: Existing Loans in the Water Sector

Service Provider	Loan	Principal costs (cumulative (2013 – 2033)	Interest costs (cumulative (2013 – 2033)
Yerevan Djur	French Government - Yerevan Water and Wastewater Project	13,493,200	1,780,821
	IDA - Yerevan Water and Wastewater Project	4,488,184	944,923
	IDA - Municipal Development	11,787,466	939,966
AWSC	IDA Credit No 3893 AM (Original)	6,329,543	961,300
	IDA Credit No 3893 AM (Supplementary)	7,980,288	614,981
	IBRD Credit N 8129 ARM	4,653,130	949,701
	WSSP - ADB Credit No 2363	11,020,586	2,814,842
	ADB - Additional Loan No. 2860-ARM (SF)	9,103,957	3,277,992
	EBRD Credit No 37 030 Lake Sevan	2,922,734	410,030
	SMWP - EBRD Credit No 40718	3,594,500	540,421
MVV	KFW Loan "Nor Akunq"	623,382	4,432,936
	KfW Loan «Lori WS» CJSC - I phase No BMZ No 2001 65 266	2,355,729	422,404
	KfW Loan «Lori WS» CJSC - II phase No BMZ N:2009 66 515	6,855,660	1,335,236
	KfW Loan «Shirak WS» CJSC - I phase	2,998,201	526,362
	KfW Loan «Shirak WS» CJSC - II phase	9,467,340	1,496,083

Source: Loan repayment schedules provided by AWSC, Yerevan Djur and MVV

D.2 Capital Costs for New Loans for Rehabilitation, System Extension and Waste Treatment

Capital expenditure estimations for rehabilitation, system extension and waste treatment investment have been developed by Dorsch International Consultants for the Armenia Water Sector Study. All calculations and estimates are included in Sheets E1-E10 of the TPM. [56] The methodology is included as excerpts from the Armenia Water Sector Study.[57]

[55] The model is available from the World Bank upon request.
[56] The model is available from the World Bank upon request.
[57] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

D.2.1 General considerations (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*) [58]

The estimate of the mid- and long-term investment needs in the WS WW sector in a developing country is a complex and critical issue as the results and reliability of the estimates are substantially dependent on:

- An appropriate assessment of the technical condition and rehabilitation needs of the existing WS and WW systems in the particular urban and rural service areas;
- The target service standards for public water supply and wastewater collection systems in urban and rural service areas (which level of water supply quality and connection rate for which size / type of settlement);
- The treatment / effluent standards for wastewater and sludge treatment systems in urban and rural service areas (mechanical, chemical, biological standard for which size / type of settlement);
- An appropriate assessment of the settlement structure in the urban and rural service areas;
- An appropriate assessment of the topographic , soil, surface & groundwater conditions in the particular urban and rural water supply areas;
- An appropriate assessment of adequate unit costs for the different system components under the different conditions in the urban and rural supply areas; and
- A realistic time frame for achieving of the targeted service standards.

That means, as long as the required input data are not really known (at least to a certain degree of detail and accuracy) and the target parameters are not yet clearly defined the estimate of each Consultant will necessarily come to another result regarding the overall amount of the mid- and long-term investment needs in a country.

A schematic estimate of investment needs carried out by the Consultant of the Water Sector Study is presented in Section 4.3D.2.2. The estimates of the investment needs for the wastewater / sanitation sector in Armenia currently carried out by JINJ Consult is summarized in Section 4.3D.2.7.

D.2.2 Investment needs estimated by the Consultant of the Water Sector Study (connected customers) – (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*) [59]

Within the "Present State of Water Sector Report" the Consultant has carried out a projection of the long-term investment needs in the W&WW sector in Armenia for the period 2014 to 2033 by means of a normative approach.

The estimates are based on unit cost rates derived from projects in the region and on detailed cost estimates as provided for example by AWSC. The estimates are stated separately for the particular service areas currently managed by utilities and carried out for the following sector components:

- Rehabilitation of WS systems
- Extension of WS systems
- Water disposal facilities
- Wastewater treatment facilities

The respective unit rates applied and the resulting investment needs are summarized in the following three tables.

[58] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*
[59] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table D.2: Investment Needs for Rehabilitation of WS Systems in Utility Service Areas

Entity	Network	Rehabilitation needs		Specific cost	Total cost
	Km	%	Km	EUR/km	Mil AMD
Yerevan Djur	2,120	41%	861	120,000	56,532
AWSC	5,513	41%	2,239	120,000	147,021
Nor Akunq	307	28%	87	120,000	5,686
Lori	568	35%	199	120,000	13,055
Shirak	1,264	80%	1,011	120,000	66,382
3RWC	0	0%	0	120,000	85,123
All utilities	9,772	45%	4,396	120,000	288,676

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table D.3: Investment Needs for Extension of WS Systems in Utility Service Areas

	Period 2013-2030	Population	Mil AMD
Yerevan Djur	Additional population	6,102	
Yerevan Djur	Cost of extension		401
AWSC	Additional population	11,894	
AWSC	Cost of extension		781
Nor Akunq	Additional population	2,410	
Nor Akunq	Cost of extension		158
Lori	Additional population	4,665	
Lori	Cost of extension		306
Shirak	Additional population	6,220	
Shirak	Cost of extension		408
3RWC	Additional population	13,296	
3RWC	Cost of extension		873
All Utilities	Additional population	31,292	
All Utilities	Cost of extension		2,055
Unit rate 120 EUR/capita			

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table D.4: Investment Needs for WW Disposal and Treatment in Utility Service Areas

	Overall P.E.	P.E. connected (%)	P.E. connected (number)	Sewer network Unit cost (EUR/P.E)	WWTP unit cost (EUR/P.E)	Total cost Mil AMD
Yerevan	1,190,013	95%	1,130,512	200	120	197,968
AWSC	460,355	70%	322,248	200	250	79,355
3RWC	364,771	70%	255,340	200	250	62,878
Total	2,015,138		1,708,100			340,201
	Total investment needs					
	Water disposal Mil AMD		WW treatment Mil AMD			Total cost Mil AMD
Yerevan	123,730		74,238			197,968
AWSC	35,269		44,086			79,355
3RWC	27,946		34,932			62,878
Total						340,201

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

D.2.3 Investment needs for off-grid communities (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*)[60]

Existing water supply systems for off-grid communities are assumed to be mostly obsolete and in need of replacement. For off-grid communities it is assumed that the existing water supply systems are mostly obsolete and require complete replacement. The investment needs of the off-grid communities as shown in detail in Sheet E2 of the TPM include:

- Water source including access road 20,000 EUR
- Chlorination device: 7,500 EUR
- Transmission mains: 24,000 EUR
- Reservoirs: digressive cost function based on population figures
- Distribution network: digressive cost function based on population figures

D.2.4 Wastewater and sanitation systems (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*)[61]

The Consultant of the Water Sector Study has not estimated investment needs for wastewater collection and wastewater treatment systems in the off-grid villages, as this issue is the intrinsic subject of the ongoing "Feasibility Study on Improving and Developing Water Supply and Sanitation Systems in Rural Communities in Armenia".

D.2.5 Investment needs for new WS systems in off-grid communities (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*)[62]

The investment needs for new WS systems in off-grid communities as estimated by the Consultant of the Water Sector Study are compiled in the following table.

Appendix Table D.5: Investment Needs for New WS Systems in Off-Grid Communities

Off -grid Communities	Population	Investment needs by system components						Specific cost
		Source	Chlorine	TM	Reservoir	DN	Total	
	Number	Mil AMD	Mil AMD	Mil AMD	Mil AMD	Mil AMD	Mil AMD	AMD/cap.
Total		6206	2172	7447	4161	57362	77347	120219

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

D.2.6 Total investment needs (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*)[63]

The aggregated investment needs for the water and wastewater sector in Armenia as estimated by the Consultant of the Water Sector Study for the period 2016 to 2033 amount to AMD 708,279 million,

[60] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*
[61] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*
[62] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*
[63] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

corresponding to about EUR 1,294 million (not considering investment needs for sanitation systems in the off-grid villages).

Appendix Table D.6: Overall Investment Needs in W&WW Sector in Armenia (2014-2033 – Mil AMD)

	Water supply rehabilitation	Water supply extension	Wastewater disposal	Wastewater treatment	Total
Company/Area	Million AMD	Million AMD	Million AMD	Million AMD	Million AMD
Yerevan	56,532	401	123,730	74,238	254,900
AWSC	147,021	781	35,269	44,086	227,157
3RWC	85,123	873	27,946	34,932	148,874
Sub-total	288,676	2,055	186,945	153,256	630,931
Off-grid communities	0	77,347	0	0	77,347
Total	288,676	79,402	186,945	153,256	708,279

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table D.7: Overall Investment Needs in W&WW Sector in Armenia (2014-2033 - Mil EUR)

Utility/ Area	Water supply rehabilitation	Water supply extension	Wastewater disposal	Wastewater treatment	Total
	Million EUR	Million EUR	Million EUR	Million EUR	Million EUR
Yerevan	103.3	0.7	226.1	135.7	465.8
AWSC	268.7	1.4	64.4	80.6	415.1
3RWC	155.6	1.6	51.1	63.8	272.1
Sub-total	527.5	3.8	341.6	280.1	1,153.0
Off-grid communities	0.0	141.3	0.0	0.0	141.3
Total	527.5	145.1	341.6	280.1	1,294.3

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

The annual allocation of overall investment needs by service areas and W&WW sector components is presented in Sheet E1 of the TPM. [64]

[64] The model is available from the World Bank upon request.

D.2.7 Investment needs for the wastewater sector in Armenia as estimated by JINJ Consult (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*)[65]

JINY Consult is going to prepare an estimate of the investment needs in the WW sector in Armenia. This estimate is not carried out on "utility basis", but for the different types of urban and rural settlement areas as outlined in the following table.

According to preliminary JINJ estimates the investment needs for wastewater removal systems amount to about EUR 1300 million for cities & towns and to EUR 685 million for villages (including off-grid villages).

Appendix Table D.8: Investment Needs for Wastewater Removal Systems – JINJ Estimate

Type of settlement	Population	Average daily flow	New or rehabilitated network required	Average diameter	Average unit cost	Total investment needs
	(1000)	(m^3/day)	(km)	(mm)	(EUR / m)	(Mil EU)
Yerevan (with centralized WWS)	1000.0	320000	200	200÷1000 (av.=350)	500	100.0
Gyumri (with centralized WWS)	250.0	55000	300	200-600 (av.=300)	450	135.0
Vanadzor (with centralized WWS)	150.0	35000	230	200-600 (av.=300)	450	104.0
Towns (with centralized WWS)	440.0 (av.=10.0)	88,000 (av.=2000)	2640 (av.= 60)	150-400 (av.=250)	365	964.0
Total for cities						**1303.0**
Villages (with centralized WWS serviced by specialized Operators)	1000.0 (av.=2.00)	200,000 (av.=400)	1750 (av.= 3.5)	150-300 (av.=200)	285	500.0
Villages (with centralized WWS serviced by LSGB)	312.0 (av. 1.50)	56,200 (av.= 270)	624 (av.= 3,0)	150-300 (av.=200)	285	178.0
Villages (without centralised WWS & Individual compact treatment plants)	12.0 (av. 0.48)	1,925 (av.= 77)	45.5 (av.= 1.8)	100-150 (av.=150)	33	1.5
Villages (without centralised WWS & individual pit toilets for each household)	72.0 (av. 0.48)	11,550 (av.= 77)	180 (av.= 1.2)	100-150 (av.=125)	30	5.4
Total for villages						**685**
Grand total for cities and villages						**1988**

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

The preliminary estimated investment needs for WWTPs, as presented in the following table, amount to about EUR 370 million for cities & towns and to EUR 240 million for villages (including off-grid villages).

The overall investment needs for WW removal systems and WWTPs, as presented in the following table amount to about EUR 2600 million.

[65] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table D.9: Overall Investment Needs for WW sector in Armenia - JINJ Estimate

Type of settlement	Population	Overall investment needs		
		Total	Including	
			WW removal	WWTPs
	(1000)	(Mil EUR)	(Mil EUR)	(Mil EUR)
Yerevan (with centralized WWS)	1000.0	190.0	100.0	90.0
Gyumri (withcentralized WWS)	250.0	170.0	135.0	35.0
Vanadzor (with centralized WWS)	150.0	129.0	104.0	25.0
Towns (with centralized WWS)	440.0 (av.= 10.0)	1184.0	964.0	220.0
Total for cities		**1673.0**	**1303.0**	**370.0**
Villages (with centralized WWS serviced by specialized Operators)	1000.0 (av.= 2.0)	650.0	500.0	150.0
Villages (with centralized WWS serviced by LSGB)	312.0 (av.= 1.5)	230.0	178.0	52.0
Villages (without centralised WWS & Individual compact treatment plants)	12.0 (av.= 0.48)	9.0	1.5	7.5
Villages (without centralised WWS & individual pit toilets for each household)	72.0 (av.= 0.48)	37.9	5.4	32.5
Total for villages		**927**	**684.9**	**242.0**
Grand total for cities and villages		**2600**	**1988**	**612.0**

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

D.3 Funding of Investment Needs in the WS & WW Sector in Armenia (Excerpt From *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*) [66]

The amount of investment funds earmarked for rehabilitation and extension of the W&WW sector have a decisive impact on the level and development of the average W&WW prices which are required to achieve both the targeted water sector cost recovery and the financial sustainability of the future lease contract operator.

The future investment funds earmarked for rehabilitation and extension of the W&WW sector will have decisive impact on the development of average water and wastewater prices required to achieve the targeted sector cost recovery. Two tariff scenarios were studied:

- **Tariff Scenario A** (conservative estimate of investment funds by SCWE)
- **Tariff Scenario B** (with maximal investment funds as earmarked by ADS for the W&WW sector in Armenia)

Provisional estimates provided by SCWE suggest investment funds of approximately EUR 150 million available for the 2016-2020 period. This would average EUR 30 million per year. Approximately EUR 180 million would be available for the 2021-2025 period. This would average EUR 36 million per year. Based on these figures it is assumed that for the 2026-2033 period, EUR 36 million per year will be available.

This means that in the "Tariff Scenario A," investment funds of about EUR 618 million or AMD 338 billion are assumed to be available for investments in the W&WW sector in Armenia over the period 2016 to 2033; compared to estimated investment needs of AMD 708 billion.

[66] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

The following two tables show a provisional allocation of the earmarked investment funds for the service areas currently managed by utilities and some funds for off-grid communities (in million EUR, respectively in million AMD). In this context, the allocation of the investment funds by utility service areas does not really affect the average future water and wastewater price in the case of one nationwide operator. However, the allocation should have a logic structure and be oriented to the needs of the different service areas. The final allocation of funds will be the subject of more detailed investment studies.

Appendix Table D.10: Capital Funds Earmarked for Investments in WS & WW Sector in Armenia (SCWE Estimate - Constant Prices 2014 - Million AMD) – Tariff Scenario A

Utility / area	Period 2016 - 2020		Period 2021 - 2025		Period 2026 - 2033		Total
	Package	Mil AMD	Package	Mil AMD	Package	Mil AMD	Mil AMD
Yerevan Djur	P-1	11,492	P-3	32,834	P-4	52,534	96,860
	P-2	10,397					10,397
AWSC	P-1	21,889	P-3	27,361	P-4	43,778	93,029
	P-2	16,417					16,417
3RWC	P-1	10,945	P-3	19,153	P-4	30,645	60,742
	P-2	5,472					5,472
Off-grid communities		5,472		19,153		30,645	55,270
Total		82,084		98,501		157,602	338,188

Source: Consultant's allocation according to data provided by SCWE

Appendix Table D.11: Capital Funds Earmarked for Investments in WS & WW Sector in Armenia (SCWE estimate - Constant Prices 2014 - Million EUR) – Tariff Scenario A

Utility / area	Period 2016 - 2020		Period 2021 - 2025		Period 2026 - 2033		Total
	Package	Mil EUR	Package	Mil EUR	Package	Mil EUR	Mil EUR
Yerevan Djur	P-1	21.0	P-3	60.0	P-4	96.0	177.0
	P-2	19.0		0.0		0.0	19.0
AWSC	P-1	40.0	P-3	50.0	P-4	80.0	170.0
	P-2	30.0		0.0		0.0	30.0
3RWC	P-1	20.0	P-3	35.0	P-4	56.0	111.0
	P-2	10.0		0.0		0.0	10.0
Off-grid communities		10.0		35.0		56.0	101.0
Total		150.0		180.0		288.0	618.0

Source: Consultant's allocation according to data provided by SCWE

Sheet E4 of the TPM shows annual allocation of the investment funds for WS system rehabilitation/ extension, water disposal and WW treatment. [67]

For the service area of Yerevan Djur it is assumed that the earmarked capital funds will cover primarily the investment needs for WS system extension and rehabilitation. Residual capital funds will be used equally for investments in water disposal and WW treatment.

For the service areas of AWSC and the 3RWC it is assumed that the earmarked capital funds are allocated to WS system rehabilitation/extension and water disposal proportionally to the current investment schedules.

At this time it is not known from which sources and under which conditions the overall capital requirements of about AMD 338 billion for the period 2016 to 2033 are to be funded. The Government of Armenia has a restricted funding capability, so it is assumed that the government would want to receive as many soft loan funds from international IFIs as possible.

It is assumed that the earmarked funds are on average provided as "favorable loans" with the following average loan conditions:

- Loan disbursement of each year is treated as a separate loan
- Year of loan start: 2016
- Loan period: 30 years
- Grace period: 5 years
- Interest rate: 4.0 percent p.a.
- Commission fees: 0.0 percent

Sheets E5, E6, and E7 of the TPM show the resulting debt service schedule by year. [68]The following table shows the anticipated **amount of annual funds** for the particular utility service areas by sector components.

[67] The model is available from the World Bank upon request.
[68] The model is available from the World Bank upon request.

Appendix Table D.12: Annual Capital Funds Earmarked for WS & WW Sector in Armenia (SCWE Estimate - Constant Prices 2014 - Million AMD and Million EUR) – Tariff Scenario A

Sector component		Period 2016 - 2020		Period 2021 -2025		Period 2026 -2033	
		Average funds/year		Average funds/year		Average funds/year	
Capital funds for WS rehabilitation	Percentage	M AMD	M AMD	M AMD	M AMD	M AMD	M AMD
Yerevan	59%	3,141	5.7	3,141	5.7	3,141	5.7
AWSC	75%	7,031	12.8	5,701	10.4	7,780	14.2
3RU	86%	3,409	6.2	4,538		4,729	8.6
Off-grid communities		0	0.0	0	0.0	0	0.0
Total		13,580	24.8	13,380	24.4	15,650	28.6
Capital funds for WS extension		0	0.0	0	0.0	0	0.0
Yerevan		22	0.0	22	0.0	22	0.0
AWSC		45	0.1	45	0.1	45	0.1
3RU		52	0.1	52	0.1	52	0.1
Off-grid communities		1,348	2.5	5,363	9.8	7,304	13.3
Total		1,467	2.7	5,482	10.0	7,423	13.6
Capital funds for WW disposal		0	0.0	0	0.0	0	0.0
Yerevan	21%	1,114	2.0	3,015	5.5	4,679	8.6
AWSC	25%	2,359	4.3	1,915	3.5	2,609	4.8
3RU	14%	582	1.1	773	1.4	1,052	1.9
Off-grid communities		0	0.0	0	0.0	0	0.0
Total		4,055	7.4	5,703	10.4	8,340	15.2
Capital funds for WW treatment		0	0.0	0	0.0	0	0.0
Yerevan	21%	1,114	2.0	3,015	5.5	4,679	8.6
AWSC	0%	0	0.0	0	0.0	0	0.0
3RU	0%	0	0.0	0	0.0	0	0.0
Off-grid communities		0	0.0	0	0.0	0	0.0
Total		1,114	2.0	3,015	5.5	4,679	8.6
Total capital funds for WS & WW sectors		0	0.0	0	0.0	0	0.0
Yerevan		5,391	9.9	9,193	16.8	12,521	22.9
AWSC		9,435	17.2	7,661	14.0	10,434	19.1
3RU		4,043	7.4	5,363	9.8	7,304	13.3
Off-grid communities		1,348	2.5	5,363	9.8	7,304	13.3
Total		20,217	36.9	27,580	50.4	37,563	68.6

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table D.13, Appendix Table D.14, and Appendix Table D.15 summarize the principle and interest payments for each of the service providers.

Appendix Table D.13: Loan Repayment Schedules for Rehabilitation, System Extension and Waste Treatment -- Yerevan Djur (Million AMD)

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Loan disbursement	25,344	25,344	25,344	25,344	25,344	25,344	25,344	25,344	25,344	25,344	0	0	0	0	0	0	0	0	0	253,443
Interest	760	2,281	3,802	5,322	6,843	8,364	9,124	9,884	11,405	12,926	13,686	13,621	13,486	13,278	12,992	12,624	12168	11,685	11,108	209,180
Principal depayment	0	0	0	0	0	0	0	0	0	0	1089	2243	3466	4763	6138	7595	8051	9623	11289	134817
Commitment fee																				0
Total debt service	**760**	**2,281**	**3,802**	**5,322**	**6,843**	**8,364**	**9,124**	**9,884**	**11,405**	**12,926**	**14,775**	**15,864**	**16,952**	**18,041**	**19,130**	**20,219**	**20219**	**21,308**	**22,397**	**343,996**

Appendix Table D.14: Loan Repayment Schedules for Rehabilitation, System Extension and Waste Treatment – AWSC (Million AMD)

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Loan disbursement	22,586	22,586	22,586	22,586	22,586	22,586	22,586	22,586	22,586	22,586	0	0	0	0	0	0	0	0	0	225,858
Interest	678	2,033	3,388	4,743	6,098	7,453	8,131	8,808	10164	11,519	12,196	12,138	12,018	11,833	11,578	11,250	10,844	10,413	9,899	186,413
Principal repayment	0	0	0	0	0	0	0	0	0	0	970	1,999	3,089	4,245	5,470	6,768	7,175	8,575	10,060	120,143
Commitment fee																				0
Total debt service	678	2,033	3,388	4,743	6,098	7,453	8,131	8,808	10,164	11,519	13,167	14,137	15,107	16,078	17,048	18,018	18,018	18,989	19,959	306,556

Appendix Table D.15: Loan Repayment Schedules for Rehabilitation, System Extension and Waste Treatment – Three Regional Utilities (Million AMD)

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	Total
Loan disbursement	14,802.3	14,802.3	14,802.3	14,802.3	14802.3	14,802.3	14,802.3	14,802.3	14,802.3	14,802.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	148,022.5
Interest	444.1	1,332.2	2,220.3	3,108.5	3,996.6	4,884.7	5,328.8	5,772.9	6,661.0	7,549.1	7,993.2	7,955.1	7,876.5	7,755.0	7,588.1	7,373.0	7,106.8	6,824.7	6,487.5	122,170.9
Principal repayment	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	635.9	1,310.0	2,024.6	2,782.0	3,584.9	4,435.9	4,702.1	5,620.1	6,593.3	78,739.3
Commitment fee																				0.0
Total Debt Service	444	1,332	2,220	3,108	3,997	4,885	5,329	5,773	6,661	7,549	8,629	9,265	9,901	1,0537	1,1173	1,1809	1,1809	1,2445	1,3081	200,910

E.4 Losses and Gains from Foreign Exchange

Losses and gains on foreign exchange are estimated using the new and existing loan repayment schedules described in Appendix D.1 and Appendix D.2. The foreign exchange rate projections from the AWSC Total Management Plan shown in Appendix Table D.16 were applied. To determine the distribution of new loans between Euros and USD, the distribution between Euros and USD of all existing loans in the sector is used. Sheet E1 of the TPM shows losses and gains on foreign exchange for existing loans. [69]

Appendix Table D.16: Exchange Rate Forecasts [70]

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Euro €1.00 to AMD	545	547	550	552	555	558	560	563	566	568	571	574	576	579	582	584	587	590	593	596	598
USD $1.00 to AMD	410	412	414	416	418	420	422	424	426	428	430	432	434	436	438	440	442	444	446	449	451

[69] The model is available from the World Bank upon request.

[70] *Total Management Plan.* SAUR, 2013.

Appendix E: Water Demand and Production and Wastewater generation.

Water demand and production and wastewater generation forecast have been developed by Dorsch International Consultants for the Armenia Water Sector Study. The methodology is included as an excerpt from the Financial and Human Resource Impact Report. [71]

E.1 Projection of Water Demand (Excerpt From the *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*) [72]

Calculation and projection of overall water demand development is based on data and projections provided by the utilities. Only for Yerevan service area, where the forecast ends with 2016, it is assumed that the population demand will increase by 0.5% p.a., whereas the demand of all other consumer categories will remain about constant. The original demand projection is then adjusted to account for "income elasticity" and "price elasticity" which become relevant with a significant increase of W&WW prices.

Appendix Table E.1 shows the projection of the original water demand for service areas currently managed by utilities (on an annual basis over the period 2012-2033).

For off-grid communities, water metering does not exist. The water demand forecast is based on a current normative water consumption of 250 l/cap/d. The assumption was made that the average water demand will drop to a level of 150 l/cap/d by the year 2033 (see Appendix Table E.2).

For the elaboration of the TPM, the Consultant has modified the original demand projection by considering both the effects of "income elasticity" and "price elasticity" for the service areas managed by utilities.

Regarding "price elasticity," data are provided by the study "Policy alternatives in subsidizing water sector in Armenia", Advanced Social Technologies" NGO (AST), Yerevan 2012. This study is based on a survey conducted with a representative sample of 1,600 Armenian households in 2011. The study included a question regarding customer's consumption response to a 50 percent and 100 percent tariff increase. The results show an average consumption reduction of 30.6 percent for the first question and 41 percent for the second question (-0.6 price elasticity for the first question and -0.4 price elasticity for the second question).

Base on the results of this study the Consultant has applied:

- An "income elasticity factor" of 0.3, which means that the domestic water demand is assumed to increase by 3 percent if the available household income increases by 10 percent.
- A "price elasticity factor" of - 0.4, which means that the domestic water demand is assumed to decrease by 4 percent if the W&WW price increases by 10 percent. A factor of -0.4 is chosen, because the actual reaction on price changes is usually somewhat lower than the anticipated reaction expressed in willingness to pay studies.

Appendix Table E.1 shows the annual modified water demand projection for each utility.

[71] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*
[72] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table E.1: Projection of Water Demand by Utilities – Considering Price and Income Elasticity

Entity	Item	2014	2016	2020	2025	2033
		Mil m^3	Mil m^3	Mil m^3	Mil m^3	Mil m3
Yerewan Djur	Population	40.6	41.1	42.8	45.5	50.5
	Organisations	0.0	0.0	0.0	0.0	0.0
	Other demand	25.4	24.6	24.6	24.6	24.6
	Sub-Total	66.0	65.7	67.4	70.1	75.1
AWSC	Population	22.0	25.2	33.6	44.3	58.6
	Organisations	2.5	2.6	2.7	2.8	2.9
	Other demand	9.0	9.2	10.4	10.9	12.5
	Sub-Total	33.6	37.0	46.7	57.9	74.1
3 RU	Population	8.6	9.0	9.7	10.8	12.9
	Organisations	1.2	1.2	1.3	1.5	1.7
	Other demand	0.8	0.8	0.9	0.9	1.1
	Sub-Total	10.6	11.0	11.9	13.2	15.7
All utilities	Population	71.2	75.3	86.1	100.6	122.0
	Organisations	3.7	3.8	4.0	4.3	4.6
	Other demand	35.2	34.6	35.8	36.4	38.2
	Total	110.2	113.7	126.0	141.3	164.8

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*

Appendix Table E.2: Provisional Projection of Water Demand of Off-grid Communities

Entity	Unit	2014	2016	2020	2025	2033
Total off-grid	Households	172,230	172,523	172,554	172,513	170,836
Communities	Population	594,641	595,685	595,785	595,660	589,882
Overall Demand	Mil m3	51.8	49.5	44.7	38.7	32.9

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*

The water demand in the utilities' service areas is expected to increase while water demand in rural areas is expected to decrease. This is due to the reduction of the specific per capita consumption, which is expected to start when pricing of water will enhance rational use.

E.1.1 Projection of water production (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*)[73]

The original projection of long-term water production as described in detail in the Study Report "Present State of Water Sector" assumes that with full rehabilitation of the existing water supply systems the high portion of NRW (currently about 75 percent) can be reduced to 35 percent by the year 2033.

Appendix Table E.3 gives a detailed projection of water production using the estimate of full rehabilitation funds required in Appendix D.2.[74]

[73] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

[74] The model is available from the World Bank upon request.

Appendix Table E.3: Projection of Water Production With Actual Investment Funds for Rehabilitation (Based on 35% NRW Target in 2033)

Entity	Unit	2014	2016	2020	2025	2033
Yerevan Djur						
Water sales	Mil m^3	66.0	63.6	65.3	67.9	72.8
NRW	(%)	75%	71%	63%	52%	35%
NRW	Mil m^3	202.6	157.0	109.6	73.6	39.2
Production	Mil m^3	268.6	220.7	174.8	141.5	112.0
AWSC						
Water sales	Mil m^3	33.6	35.8	45.0	55.8	71.5
NRW	(%)	76%	72%	63%	52%	35%
NRW	Mil m^3	106.2	90.4	76.8	61.1	38.5
Production	Mil m^3	139.8	126.2	121.9	117.0	109.9
3 Regional Utilities						
Water sales	Mil m^3	10.6	10.6	11.4	12.7	15.1
NRW	(%)	75%	71%	63%	52%	35%
NRW	Mil m^3	45.2	32.9	21.9	14.8	8.1
Production	Mil m^3	55.8	43.4	33.4	27.5	23.2
All Utilities						
Water sales	Mil m^3	110.2	109.9	121.8	136.5	159.4
NRW	Mil m^3	354.0	280.4	208.3	149.5	85.8
Production	Mil m^3	464.2	390.3	330.1	286.0	245.2

The provisional projection of water production in off-grid communities is presented in Sheet C2 of the TPM and summarized in the following table.[75]

Appendix Table E.4: Provisional Projection of Water Production for Off-grid Communities

Entity	Unit	2014	2016	2020	2025	2033
		Mil m^3	Mil m^3	Mil m^3	Mil m^3	Mil m^3
Total off-grid communities	Water sales	52	50	45	39	33
	NRW	90	86	77	67	57
Total	Production	207	198	179	155	132

Source: *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*

NRW reductions at the utility level and better demand management in off-grid communities will likely lead to a significant decrease in water production for those communities.

E.1.2 Projection of wastewater generation (excerpt from *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014*)[76]

It is assumed that 80 percent of water supplied is returned as wastewater both in the service areas managed by utilities and in rural areas. Sheet C4 of the TPM shows projected annual wastewater generation by utility service area.[77]

[75] The model is available from the World Bank upon request.
[76] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*
[77] The model is available from the World Bank upon request.

Appendix F: Population Projections

Population projections are estimated using figures developed in the "Armenia Water Sector Note." These are summarized in Appendix Table F.1 and Appendix Table F.2. The water sector note discusses both the methodology used in the population forecast and the applied assumptions.[78]

Appendix Table F.1: Population Growth Rates[79]

Year	Population (million)	Growth rate (% p.a.)
2010	2.963	0.17%
2015	2.989	0.01%
2020	2.991	-0.01%
2025	2.989	-0.13%
2030	2.970	-0.20%
2035	2.940	-0.27%
2040	2.901	-0.36%
2045	2.849	-0.47%
2050	2.782	

[78] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*
[79] *Financial and Human Resource Impact Report: Water Sector Study Armenia, 2014.*

Appendix Table F.2: Current Population Figures[80]

Type	Utility/Province	2012
Utility	Yerevan Water	1,075,000
	Armenian Water	642,341
	Nor Akunq	67,545
	Lori	152,079
	Shirak	202,257
	Subtotal Utilities	2,139,222
	Unconnected population within utilities' service areas[81]	64,200
Off-grid	Aragatsotn	71,470
	Ararat	30,209
	Armavir	116,507
	Gegharkunik	112,698
	Lori	69,343
	Kotayk	51,453
	Shirak	37,215
	Syunik	47,772
	Vayots dzor	28,365
	Tavush	78,356
	Subtotal Off-Grids	643,388
GRAND TOTAL		2,846,810

[80] *Present State of Water Sector: Water Sector Study Armenia – Sector Review and Strategy*, 2014.
[81] Estimates based on connection rates

Appendix G: Electricity Tariff Projections

The expected price of electricity for each year during the projection period is determined using estimates from the 2013 World Bank Energy Sector Policy Note. Appendix Table G.1 shows the electricity tariff estimates.

Appendix Table G.1: Electricity Tariff Forecast, AMD/kWh[82]

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
General service primary (6(10) kV)																				
Average variable charge (AMD/kWh)	21	23	23	21	21	24	24	24	24	23	24	26	38	38	39	39	38	38	38	38
% change		9.5	3.4	-7.8	-2.7	15.1	-1.0	0.3	-0.2	-3.1	6.1	6.4	44.7	0.9	1.6	0.5	-2.2	0.0	0.0	0.0

82 *Republic of Armenia Energy Sector Policy Note Update. World Bank. 2013*

Appendix H: Cost Allocation by Customer Classes

To ensure equitable allocation of costs across customer classes, the forecast revenue requirement for each year is apportioned by three allocators: (i) water consumption; (ii) number of customers; (iii) peak month consumption. Allocators are shown in column (a). The percentages in columns (c), (d), (e) and (f) we derived using the 2012 annual reports and data provided by service providers. Costs for each line item were assigned an allocator. For example, electricity costs (640 Mil AMD) were allocated by the percentage of total water consumption by each customer class as described below:

Total Electricity Costs = 640 Mil AMD

*Residential Electricity Costs = 383 (629*60.9%).*

Appendix Table H.1: Cost Allocation by Customer Classes, Yerevan Djur (2016)

	Fixed vs. Variable	Allocator	Total (2012)	Residential	Budgetary	Commercial and Industrial	Bulk
		(a)	(b)	(c)	(d)	(e)	(f)
Allocation							
Proportion of annual water consumption		*Water consumption*	*62.24*	*60.9%*	*6.7%*	*32.4%*	*4.5%*
Proportion to total customers		*Number of customers*	*335,488*	*95.6%*	*4.1%*	*0.3%*	*0.0%*
Proportion of each customer class to peak month/pipe size		*Peak month*	*5.79*	*60%*	*6%*	*33%*	*5%*
O & M			(2016)				
Electricity	Variable	Water consumption	640	390	43	207	29
Staff costs	Fixed	Peak month	2,675	1,616	172	888	125
Fixed production costs	Fixed	Peak month	424	256	27	141	20
Fixed distribution costs	Fixed	Peak month	50	30	3	17	2
Fixed indirect overheads	Fixed	Peak month	195	118	13	65	9
Variable Production Costs (less electricity)	Variable	Water consumption	762	464	51	247	34
Variable distribution costs	Variable	Water consumption	115	70	8	37	5
Variable collection costs	Variable	Water consumption	80	49	5	26	4
Variable indirect overheads	Variable	Water consumption	292	178	20	95	13
Other variable costs	Variable	Water consumption	4	2	0	1	0
Maintenance of rain water removal network	Variable	Number of customers	0		-	-	-

	Fixed vs. Variable	Allocator	Total (2012)	Residential	Budgetary	Commercial and Industrial	Bulk
		(a)	(b)	(c)	(d)	(e)	(f)
Water meter replacement	Meter	Number of customers	550	526	23	1	0
Servicing of internal networks	Variable	Apartment customers	0	-	-	-	-
Debt Service							
Loss on foreign exchange (new loans)	Fixed	Peak month	2	1	0	1	0
Loss on foreign exchange (existing loans)	Fixed	Peak month	8	5	0	3	0
Principal (existing loans)	Fixed	Peak month	422	255	27	140	20
Interest (existing loans)	Fixed	Peak month	118	71	8	39	5
Principal (new loans)	Fixed	Peak month	0	-	-	-	-
Interest (new loans)	Fixed	Peak month	63	38	4	21	
Revenues				-	-	-	-
Non-tariff income	Fixed	Number of customers	-182	(174)	(7)	(0)	(0)
Other obligations							
Maintenance cost (increase for existing assets)	Fixed	Peak month	0	-	-	-	-
Maintenance cost (for additional investments)	Fixed	Peak month	0	0	0	0	0
Depreciation (existing assets)	Fixed	Peak month	1,005	607	64	334	47
Depreciation for additional Investment	Fixed	Peak month	0	-	-	-	-
Interest on working capital	Fixed	Peak month	62	38	4	21	3
Lease fee	Fixed	Peak month	0	-	-	-	-
Tax	Fixed	Peak month	0	-	-	-	-
Profit	Fixed	Peak month	0	-	-	-	-
Revenue requirement			7,286	4,540	465	2,281	319
Adjustment for collection rate			55	34	4	17	2
Total revenue requirement			**7,341**	**4,574**	**468**	**2,298**	**321**
Total fixed			4,879.8	2,882.9	317.3	1679.7	235.8
Total variable			1,907.02	1,161.47	128.34	617.21	85.58
Total consumption (adjusted)		Water consumption	553.85	529.69	22.75	1.41	
Tariff (water supply)			66.41	40	4	21	3

Source: Consultant's calculations

Appendix I: Improvements in the Armenian Water Sector 2000 - 2012

This section describes improvements in the WSS sector from 2012-2012.

Appendix Table I.1: Improvements in the WSS sector since 2000

Company/indicator	Unit	Base year			
Yerevan Djur		**2000**	**2005**	**2009**	**2012**
Water supply duration	Hours	4 – 6	18.4	20.4	20.6 (2011)
Compliance with water quality requirements	%	94.5	97.2	97.8	-
Collection efficiency	%	21	86	97.6	99.3
Non-revenue water	%	72	79	81.1	80
AWSC		**2004**	**2010**	**2012**	
Water supply duration	Hours	4 – 6	13	16	
Compliance with water quality requirements	%	93.8	99.1	98	
Collection efficiency	%	48	88	94.7	
Non-revenue water	%	74	83.6	80.3	
Shirak		**2005**	**2009**	**2012**	
Water supply duration	Hours	4.7	10.9	11.9	
Compliance with water quality requirements	%	98.1	99.6		
Collection efficiency	%	49	78	97	
Non-revenue water	%	85	77		
Lori		**2005**	**2009**	**2012**	
Water supply duration	Hours	4	9.5	10	
Compliance with water quality requirements	%	88	92		
Collection efficiency	%	58	80	97	
Non-revenue water	%	77	71		
Nor Akunq		**2005**	**2009**	**2012**	
Water supply duration	Hours	4	22.3	22.3	
Compliance with water quality requirements	%	100	100		
Collection efficiency	%	47	97	100	
Non-revenue water	%	87	70		

Source: Present State of Water Sector: Water Sector Study Armenia – Sector Review and Strategy. KfW, 2014. Armenia Water Sector Note. The World Bank, May 2011.

Appendix J: Results of the Willingness-to-Pay Survey

This appendix summarizes the key findings from the willingness-to-pay survey. The sections in this appendix are as follows:

- J.1 describes the survey methodology
- J.2 describes the availability and continuity of WSS services in Armenia
- J.3 describes respondents' satisfaction with WSS services
- J.4 describes respondents' current sanitation conditions
- J.5 describes respondents' CWS expenditures
- J.6 describes respondents' attitudes and perceptions of current tariffs
- J.7 describes respondents' attitudes towards stakeholders responsible for WSS improvements and perceptions of their ability to successfully deliver improvements
- J.8 describes respondents' attitudes towards social protection mechanisms
- J.9 show the demographics of the respondents surveyed

J.1 Survey Methodology

The willingness-to-pay survey supports the Armenia Tariff Study by providing a quantitative measure of Armenians' willingness to pay for improvements to water and sanitation services. It also gauges the social acceptability of tariff reform. Enumerators interviewed and acquired 600 completed surveys from respondents living in 4 marzes: Yerevan, Shirak, Ararat and Kotyak. Though small, the survey is representative of the four marzes. Yerevan and outside-Yerevan (Shirak, Ararat and Kotyak) consist of approximately 75 percent of the population in Armenia. Furthermore, the marzes selected represent the diverse conditions of water supply and sanitation services in Armenia. The survey results have a sampling error of 5.7 percent. Appendix Figure J.1 provides a geographical representation of the four marzes that covered in this survey.

Appendix Figure J.1: Marzes Included in the WtP Survey

Marz	Population Size	WSS Company
Yerevan	1.06 million	Yerevan Djur
Ararat	260.3 thousand	AWSC
Kotayq	254.9 thousand	AWSC
Shirak	251.9 thousand	MVV

J.1.1 Sampling design

Nearly half of Armenia's population lives in Yerevan. The marz has roughly 52 percent of active subscribers who receive WSS in the country. In marzes outside of Yerevan, four companies, the larger AWSC and smaller consortium made up of the three smaller utilities, Lori, Shirak and Nor Anunk, serve approximately 175 thousand households. AWSC serves approximately 32 percent of the subscribers in the country while the three utilities collectively serve approximately 16 percent of subscribers.

To select respondents, the proportional to size sampling approach was used with data from customer records provided by the water companies. Samples were divided as follows: roughly 50 percent were customers from Yerevan served by Yerevan Djur; 50 percent were customers from outside of Yerevan, namely, from AWSC (31.9 percent); 16 percent were customers of a consortium of the three smaller utilities. To reflect these proportions, 313 respondents were selected from all 12 administrative districts in Yerevan, 191 from Ararat and Kotyak and 96 from Shriak. For the marzes outside Yerevan, communities were selected by using probability proportionate to size sampling so that smaller communities had an equal opportunity to be selected relative to larger communities. Within each administrative district of Yerevan, about 26 households were selected. From the 10 communities selected in Ararat and Kotyak, about 20 households were selected from each of the 10 communities chosen. In Shirak, about 20 households were selected from each of the 5 communities chosen. Appendix Table J.1 presents a quantitative breakdown of the sampling approach. Appendix Figure J.2 illustrates the sampling approach.

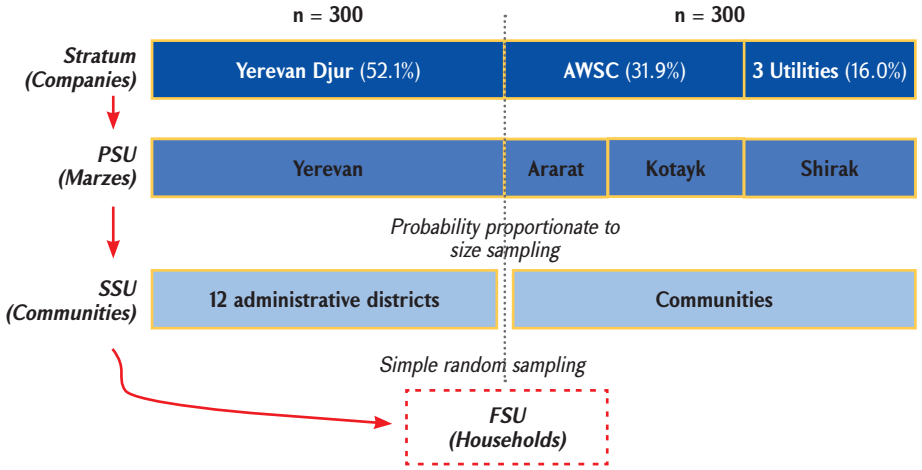
Appendix Table J.1: Breakdown of Sampling Units in Sampled Population

	Strata			
	Yerevan Djur	AWSC	Consortium of Lori, Shirak and Nor Anunk companies	Total
Number of active subscribers	285,917	175,092	87,516	548,525
Proportion of active households	52.1%	31.9%	16.0%	100%
Number of subscribers in the sample	313	191	96	600
Proportion of sample from each strata	52.1%	31.9%	16%	100%
Number of SSUs (communities/ administrative districts)	12	10	5	28
Average number of FSUs	26	20	20	22

Note: Secondary Sampling Unit (SSU); Final Sampling Unit (FSU)

Source: Local Consultant's Calculations

Appendix Figure J.2: Proportionate to Size Sampling Approach



Note: Population [N] = 548,525 (represents total number of active subscribers for WSS in Armenia; Sample [n] = 600 (2*300); PSU: Primary Sampling Unit; SSU: Secondary Sampling Unit; FSU: Final Sampling Unit

The results of the survey were analyzed by the following sub-samples: Yerevan; outside Yerevan; rural, urban areas outside of Yerevan; and poor and non-poor groups.

J.2 Availability and Continuity of WSS Services

Respondents were asked a series of questions on their centralized water service (CWS). The questions related to continuity of supply including the number of days in a week and hours out of 24 hours they received water service from the CWS. Respondents were also asked if they used alternative sources of water in addition to water from the CWS to meet their household's water needs.

J.2.1 Continuity of supply

In Yerevan, other urban and rural areas, 98.3, 96.9 and 85.7 percent of respondents receive water every day of the week, respectively. Appendix Table J.2 shows by the number of days the proportion of respondents who receive water from the CWS by sub-samples.

Appendix Table J.2: Availability of Water by Number of Days in the Week

No. of Days	1	2	3	4	5	6	7
Total sample *n=600*	0.5%	-	0.8%	2.3%	0.3%	0.5%	95.5%
Yerevan *n=240*	0.8%	-	-	0.4%	0.4%	-	9%
Outside Yerevan *n=360*	0.3%	-	1.4%	3.6%	0.3%	0.8%	93.6%
Other Urban *n=255*	0.4%	-	0.4%	0.8%	0.4%	1.2%	96.9%
Rural *n=105*	-	-	3.8%	10.5%	-	-	85.7%

Source: WtP Survey Results

Only 47.3 percent of respondents indicated that they receive 24 hours of continuous water supply. Respondents who live in Yerevan receive, on average, 21.1 hours of water each day, the highest amongst the marzes sampled. On average, respondents from outside Yerevan receive 14.2 hours of water each day, while those in other urban and rural areas receive 14.5 and 13.4 hours of service, respectively. In other urban areas outside of Yerevan, respondents experience disparate hours of service—20 percent of respondents report receiving only one to four hours of water service each day while 36.4 percent report that they receive more than twenty hours of service daily. Appendix Table J.3 outlines the hours of service received in each settlement type.

Appendix Table J.3: Hours of Service in a Day by Settlement Type

	1 – 4	5 – 9	10 – 14	15 – 19	20+
	No. of hours out of 24				
Yerevan	0.0%	4.2%	9.2%	14.2%	72.5%
Outside-Yerevan	16.8%	21.6%	11.2%	14.0%	36.4%
Other Urban	20.0%	13.9%	9.9%	18.7%	37.3%
Rural	8.6%	40.0%	14.3%	2.9%	34.3%

Source: WtP Survey Results

In contrast, respondents who live in rural areas receive, on average, 13.4 hours of water supply each day. Only 34.3 percent have 24 hours of continuous water supply. 50.5 percent receiving only up to 10 hours of water a day. Appendix Table J.4 shows the proportion of respondents by number of hours of water received during the day.

Appendix Table J.4: Hours of Water Received Through the CWS for Rural Customers

Hours	1-4	5-9	10-14	15-19	20+
Percentage of Rural Respondents	8.6%	40.0%	14.3%	2.9%	34.3%

Note: n = 255

Source: WtP survey results

J.2.2 Some use of water sources other than CWS to meet household needs

Most respondents are connected to the CWS, but about 5 percent of those surveyed rely on other water sources to meet household water needs. They obtain water from other sources because they perceive water from the CWS to be of poorer quality, and/or because they do not receive sufficient amounts from the centralized network. Appendix Table J.5 shows the percentage of household water needs met by the CWS for respondents who reported that they use other sources to meet household water needs.

Appendix Table J.5: Percentage of Household Water Needs Met by the CWS

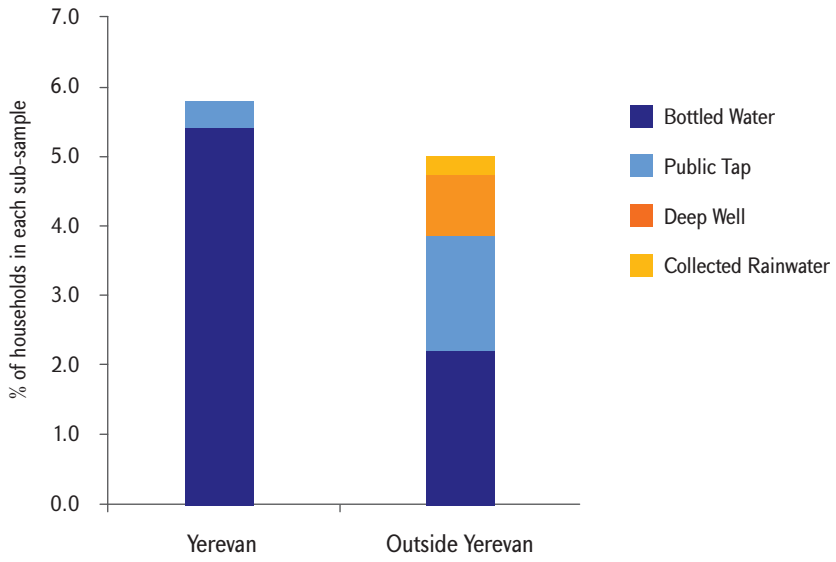
Water from CWS	Frequency	Percentage
Up to 20%	1	3.40%
21-40%	1	3.40%
41-60%	1	3.40%
61-80%	6	20.7%
81-100%	20	69.0%
Total	29	100.0%

Note: Table only includes respondents who reported use of other sources of water besides the CWS (n = 29 out of 600 total surveyed respondents)

Source: WtP Survey Results

By settlement type, only 1.6 percent of respondents who live in other urban areas outside of Yerevan areas supplement household needs with other sources of water. In Yerevan, 5.8 percent do so, while 10.5 percent of those who live in rural areas supplement with other sources. In Yerevan, respondents purchase bottled water, while outside of Yerevan, respondents use a variety of sources in addition to bottled water, including public taps and deep wells. Appendix Figure J.3 shows the alternative sources of water used by respondents in Yerevan and areas outside of Yerevan.

Appendix Figure J.3: Percentage of Households Sampled Using Alternative Sources of Water



Source: WtP Survey results

J.3 Satisfaction with WSS Services

Sixty-four percent of respondents surveyed were satisfied with their current WSS services, of which 47.2 percent were completely satisfied. There is a positive and direct correlation between respondents' satisfaction with WSS services and the number of days in a week of WSS service as well as the number of hours of service received out of 24 hours.[83]

Appendix Table J.6: Satisfaction with WSS Services by Settlement Type

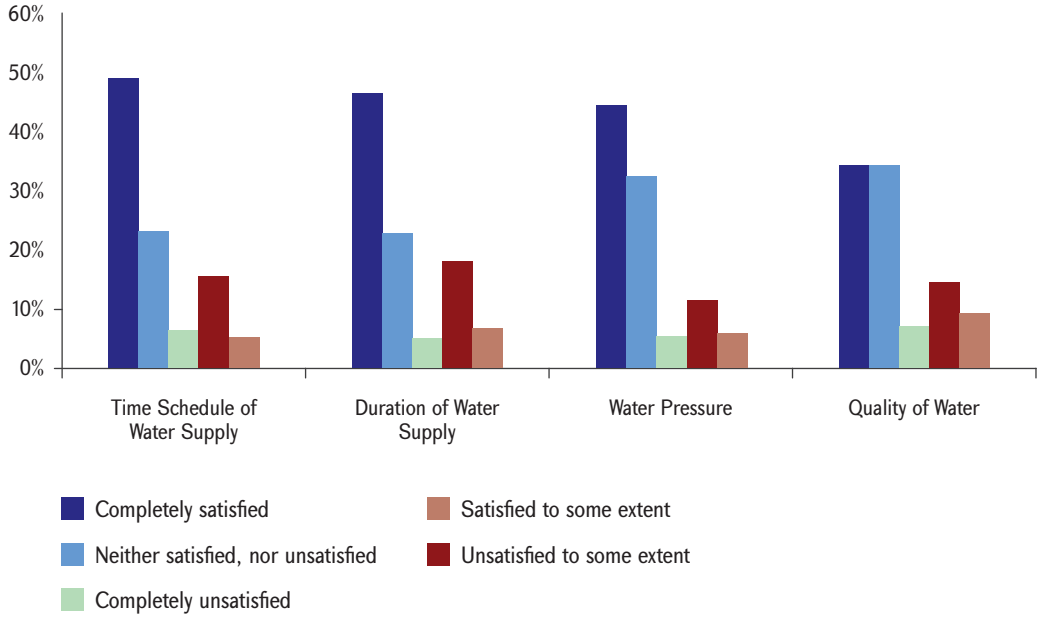
	Yerevan	Non Yerevan	Other Urban	Rural	Total
	% of all households surveyed				
Completely satisfied	21.7	35.8	38.4	29.5	30.2
Satisfied to some extent	46.2	25.6	30.2	14.3	33.8
Neither satisfied, nor unsatisfied		12.8	10.2	19.0	11.0
Unsatisfied to some extent	1	15.8	10.6	28.6	16.8
Completely unsatisfied	5.4	10.0	10.6	8.6	8.2

[83] The results were significant at 0.05 and 0.01 levels respectively

In Yerevan, where almost all respondents receive water all seven days of the week, and 72.5 percent receive more than 20 hours of supply a day, 46.2 percent of respondents were satisfied to some extent and 21.7 percent were completely satisfied with their WSS services. In urban areas outside of Yerevan, where WSS services are more variable, 30.2 percent of respondents were satisfied to some extent with their WSS services, while 38.4 percent were completely satisfied. In rural areas, where WSS services are the poorest, and respondents receive on average, 13.4 hours of water a day, 14.3 percent reported that they were satisfied to some extent, while 29.5 percent were completely satisfied. Appendix Table J.6 further describes respondents' level of satisfaction with WSS services by settlement type.

Respondents were also asked about their satisfaction with attributes of water supply including: continuity of water supply; the time schedule for delivery; pressure; and qualities such as smell, taste, cleanliness and clarity. Overall, about 70 percent of respondents were satisfied or completely satisfied with all attributes of CWS services. Appendix Figure J.4 shows the proportion of respondents who were satisfied or dissatisfied with attributes of CWS service.

Appendix Figure J.4: Level of Satisfaction with Water Supply and Quality Attributes

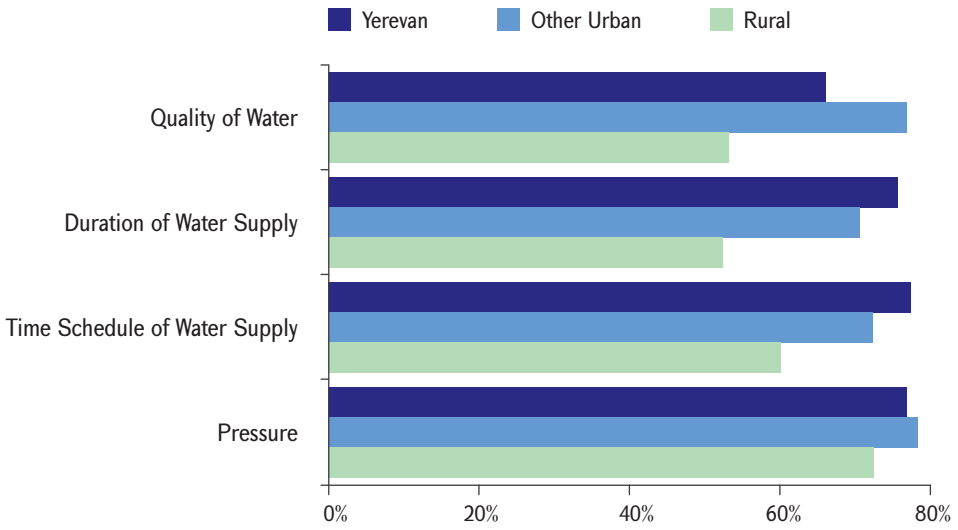


Note: Quality of water refers to attributes such as smell, taste, cleanliness and clarity

Source: WtP Survey Results

Respondents in Yerevan and urban areas outside of Yerevan were more satisfied with the duration of water supply and quality (smell, taste, cleanliness and clarity) attributes of CWS than rural respondents. In rural areas, 52.4 percent of respondents were satisfied with the quality of CWS while 66.2 percent of respondents in Yerevan and 76.9 percent of respondents residing in urban areas outside of Yerevan were satisfied or completely satisfied. Appendix Figure J.5 shows the most common problems associated with households' CWS by settlement type.

Appendix Figure J.5: Satisfaction with Attributes of CWS Services by Settlement Type



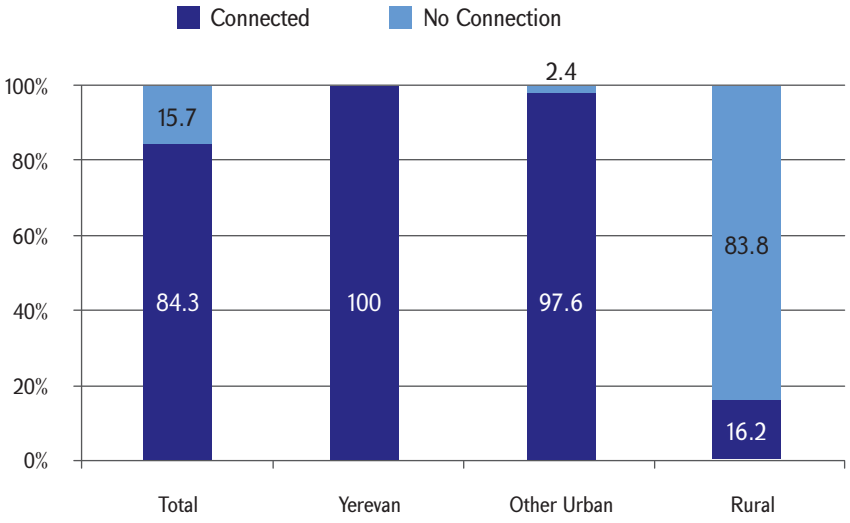
Note: Quality of water refers to attributes such as smell, taste, cleanliness and clarity

Source: WtP Survey Results

J.4 Current Sanitation Conditions

Results of the survey indicate that 84.3 percent of respondents are connected to the centralized sewerage system. Every respondent in Yerevan and 97.6 percent of respondents in urban areas outside of Yerevan reported that they are connected to the centralized sewerage system. By contrast, 16.2 percent of rural respondents reported that they are connected to the centralized sewerage system. Appendix Figure J.6 shows the proportion of respondents who are connected, by settlement type.

Appendix Figure J.6: Proportion of Respondents Connected to the Centralized Sewerage System by Settlement Type



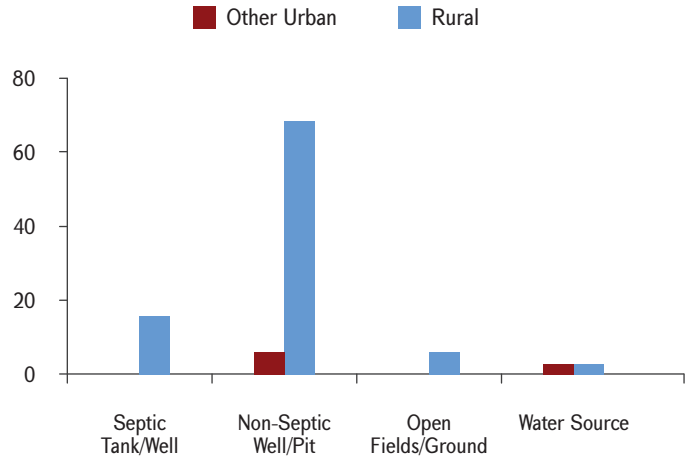
Source: WtP Survey Results

J.4.1 Households not connected to the centralized sewerage system

Households who are not connected to the centralized sewerage system in other urban and rural areas have the following toilet facilities: pit latrines with slab (covering); pit latrines with no slab; or open pits. Eighty-six percent of unconnected households use pit latrines with no slab or open pits.

Sewerage of unconnected households is disposed in different ways. In rural and urban areas outside of Yerevan, sewerage empties into non-septic wells or pits. Appendix Figure J.7 shows the various types of waste disposal and treatment methods used by respondents not connected to the centralized sewerage system.

Appendix Figure J.7: Other Waste Disposal and Treatment Methods by Settlement Type



Note: All respondents in Yerevan are connected to the centralized sewerage system

Source: WtP Survey Results

J.4.2 Satisfaction with sanitation facilities and services

Eighty-three percent of respondents surveyed were completely satisfied with their sanitation system. In Yerevan, where all respondents are connected to the centralized sewerage system, 97.1 percent of respondents were completely satisfied with the system. In other urban areas, 93.7 percent of respondents were completely satisfied. In contrast, only 24.8 percent of respondents from rural areas were completely satisfied with their sanitation system. Respondents who were less than completely satisfied with their sanitation system reported inconvenience and smell as the two most important problems related to household sanitation systems.

J.5 CWS Expenditures

On average, respondents spent 2069.24 AMD on CWS each month. Respondents who live in Yerevan spent on average 2455.52 AMD—29.8 percent and 17.5 percent more than those who lived in other urban areas and rural areas, respectively.

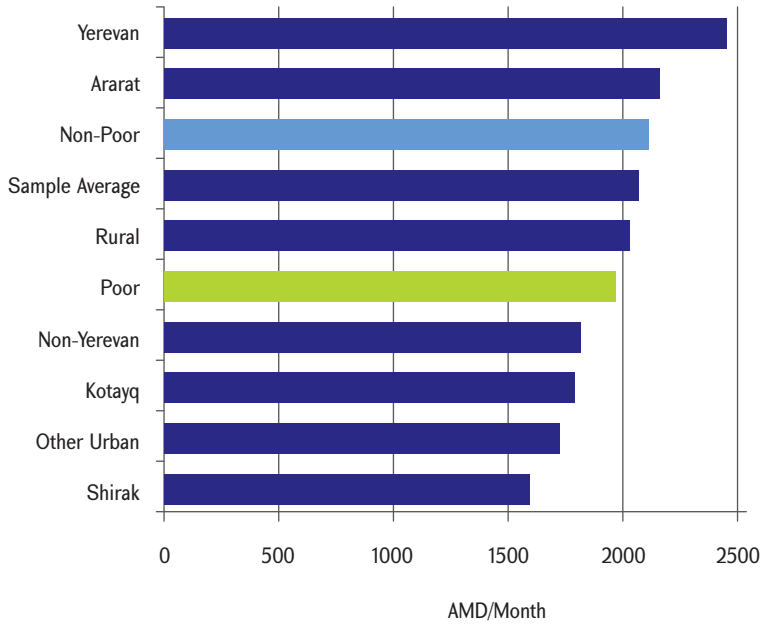
Expenditures on alternative water sources

Respondents who used alternative sources spent on average 7214.3 AMD per month on household water needs, more than three times the average monthly water expenditures of all study respondents. On average, respondents bought 34.5 liters of bottled water and reported spending 5014.2 AMD per month on bottled water in addition to, or as an alternative to consuming water from the CWS.

CWS expenditures of poor households

On average, the poor households surveyed spent 7.2 percent less on CWS services each month than non-poor households. In Shirak, the marz with the highest poverty rate in Armenia, respondents spent on average 1589.74 AMD each month on CWS services. Appendix Figure J.8 ranks households' average monthly water expenditures by settlement type, marz and poor and non-poor groups.

Appendix Figure J.8: Average Monthly Household CWS Expenditures by Subsample



Source: WtP Survey Results

Sanitation expenditures for households that are not connected to the CWS

The cost of building a standalone toilet can be high or come at no monetary cost to a household. On average, respondents who were not connected to the CWS spent 44,702 AMD, while the median amount reported was 20,000 AMD. In man-hours, a standalone toilet took about 55 hours to build. A few respondents also reported costs associated with maintaining their toilets. The average amount spent was 14,674 AMD while the median amount spent was 8000 AMD.

J.6 Attitudes and Perceptions of Current Tariffs

To better understand respondents' attitudes and perceptions of current tariffs, enumerators asked respondents whether they agreed or disagreed with five statements. The statements were related to issues of fairness and transparency of current tariffs.

Appendix Table J.7 summarizes respondents' attitudes and perceptions of tariffs by settlement type.

Appendix Table J.7: Respondents' Attitudes and Perceptions of Tariffs by Settlement Type

I believe the current price of water tariffs is fair.

	Total Sample	Yerevan	Outside Yerevan	Other Urban	Rural
	%				
Completely agree	12.0	10.0	13.3	9.8	21.9
Agree to some extent	22.5	28.8	1	18.4	18.1
Neither agree nor disagree	17.0	13.3	19.4	18.4	21.9
Disagree to some extent	29.5	34.2	26.4	26.3	26.7
Completely disagree	18.7	13.3	22.2	26.7	11.4

I understand how water and wastewater tariffs are set.

	Total Sample	Yerevan	Outside Yerevan	Other Urban	Rural
Completely agree	1.2	2.1	0.6	0.4	1.0
Agree to some extent	6.0	5.8	6.1	5.1	8.6
Neither agree nor disagree	3.2	4.2	2.5	2.0	3.8
Disagree to some extent	32.2	40.0	26.9	26.3	28.6
Completely disagree	57.2	47.5	63.6	66.3	57.1

I would like to have a better understanding of exactly how tariffs are set.

	Total Sample	Yerevan	Outside Yerevan	Other Urban	Rural
Completely agree	25.3	11.7	34.4	35.7	31.4
Agree to some extent	36.3	35	37.2	34.9	42.9
Neither agree nor disagree	13.8	15.4	12.8	14.5	8.6
Disagree to some extent	12.8	24.2	5.3	3.1	10.5
Completely disagree	11.3	13.3	10.0	11.8	5.7

If I understood exactly how tariffs were determined, I would be more likely to support the current tariff.

	Total Sample	Yerevan	Outside Yerevan	Other Urban	Rural
Completely agree	7.8	6.7	8.6	9	7.6
Agree to some extent	28.0	33.3	24.4	23.5	26.7
Neither agree nor disagree	42.7	26.7	53.3	51.8	57.1
Disagree to some extent	10.2	1	4.7	4.7	4.8
Completely disagree	9.8	14.6	6.7	8.6	1.9

If I understood exactly how tariffs were determined, I would be more likely to support changes in the current tariff.

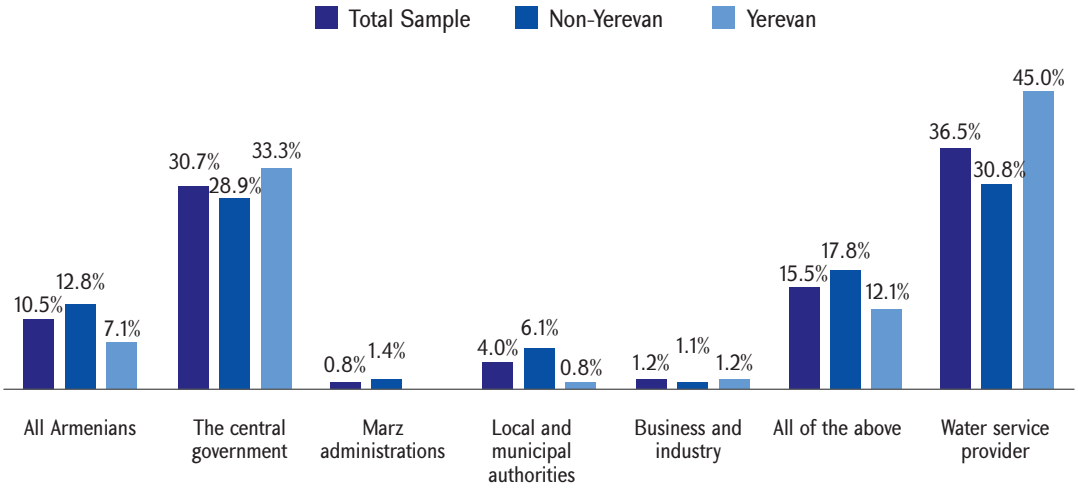
	Total Sample	Yerevan	Outside Yerevan	Other Urban	Rural
Completely agree	4.0	2.9	4.7	3.1	8.6
Agree to some extent	21.5	20.8	21.9	22.4	21
Neither agree nor disagree	43.2	26.2	54.4	52.2	60
Disagree to some extent	12.7	24.2	5.0	5.5	3.8
Completely disagree	16.3	24.2	11.1	14.5	2.9

Source: WtP Survey Results

J.7 Attitudes Towards Stakeholders Responsible for WSS Improvements and Perceptions of Their Ability to Successfully Deliver Improvements

Respondents were asked to indicate which stakeholder they thought should be most responsible for paying for sector improvements. As shown in Appendix Figure J.9, 36.5 percent of respondents thought that service providers should be most responsible. The central government and "all of the above" were ranked second and third respectively.

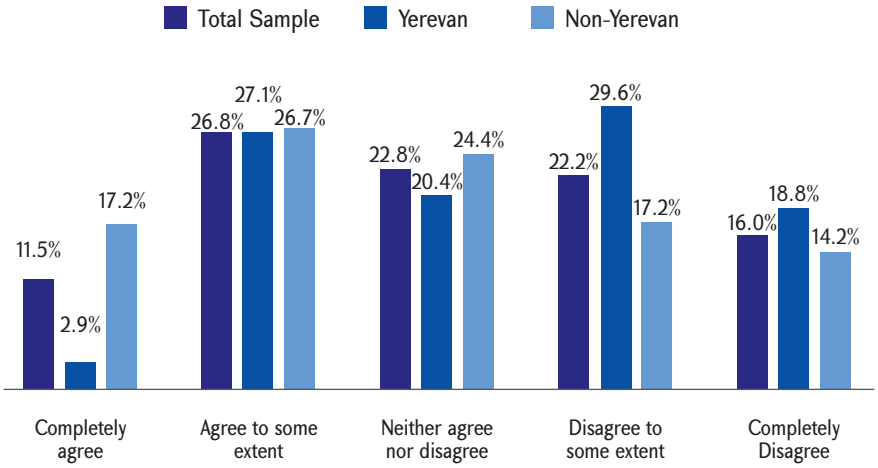
Appendix Figure J.9: Stakeholders Responsible for WSS Improvements



Source: WtP Survey Results

Responses were largely mixed when respondents were asked to rate their confidence in service providers' ability to deliver sector improvements. In Yerevan, where quality and reliability of service is the highest, only 2.9 percent of respondents were very confident that service providers could deliver on the improvements described in the WtP scenarios. In contrast, respondents outside Yerevan were more optimistic, 17.2 percent were very confident that improvements could be delivered.

Appendix Figure J.10: Confidence in Service Providers' Ability To Deliver Sector Improvements



Note: Respondents were asked the following question: "To what extent do you agree with this statement?: I have complete confidence in my water and sanitation company's ability to carry out the improvements to the water and sanitation system as promised in the scenarios just described to me."

Source: WtP Survey Results

J.8 Attitudes Toward Social Protection Mechanisms

The results of the survey show that there is strong support for measures that protect the poor from tariff increases.

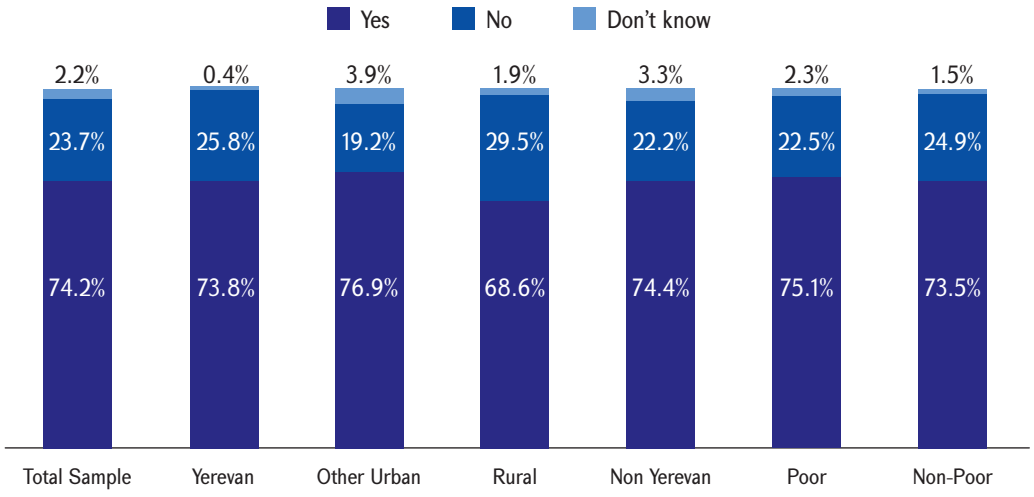
As shown in Appendix Table J.8, more than 90 percent of respondents believe that additional measures must be taken to protect the poor if tariffs are increased. Respondents were also strongly in favor of introducing a lifeline tariff for households that consume less than 25 liters per person per day as shown in Appendix Figure J.11.

Appendix Table J.8: Attitudes Toward Social Protection Measures for Vulnerable Households

	Total sample	Yerevan	Other urban	Rural	Non-Yerevan
No. The Family Benefits Program already provides sufficiently for vulnerable families.	6.3	5	4.7	13.3	7.2
Yes. Water and wastewater services should be supplemented under the family benefit program.	40.5	37.1	38.8	52.4	42.8
Yes, a separate program should provide assistance for water and Wastewater tariff increases	51.8	57.5	54.9	31.4	48.1

Source: WtP Survey Results

Appendix Figure J.11: Support for Lifeline Tariffs



Source: WTP Survey Results

L.9 Survey Demographics

Appendix Table J.9: Respondents' Sex

	Male		Female		Total
	Frequency	%	Frequency	%	
Total sample	173	28.8	427	71.2	600
Yerevan	65	27.1	175	72.9	240
Outside Yerevan	108	30	252	70	360
Other urban	53	20.8	202	79.2	255
Rural	55	52.4	50	47.6	105

Source: WtP Survey Results

Appendix Table J.10: Respondents' Age

	Frequency	Mean	Median	Mode
Total sample	600	50.50	51.50	55.00
Yerevan	240	51.32	52.00	50.00
Outside Yerevan	360	49.9	51.00	55.00
Other urban	255	50.05	51.00	55.00
Rural	105	49.69	52.00	52.00

Source: WtP Survey Results

Appendix Table J.11: Respondents' Education Level

	Frequency	Percentage
Completed or incomplete higher or postgraduate	192	32.0
Completed or incomplete secondary vocational	113	18.8
Completed or incomplete primary vocational	33	5.5
Completed or incomplete secondary	228	38.0
Completed or incomplete basic (8-9 grades)	24	4.0
Elementary	6	1.0
No elementary	4	0.7
Total	600	100.0

Source: WtP Survey Results

Appendix Table J.12: Sample Household Size

	Average Household Size Statistics				
	Total	Present members	Present children (<16)	Present working adults (16 - 65)	Present elders (> 65)
Total sample	4.02	3.66	0.79	2.42	0.45
Yerevan	3.81	3.81	0.68	2.37	0.55
Outside Yerevan	4.15	4.15	0.86	2.45	0.39
Other urban	3.84	3.84	0.76	2.18	0.40
Rural	4.90	4.90	1.10	3.10	0.00

Source: WtP Survey Results

Appendix Table J.13: Samples' Type of Housing

Housing Type								
	Total		Yerevan		Other urban		Rural	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Apartment in multistory apartment building (including room(s) in dormitories)	411	68.5	199	82.9	211	82.7	1	1.0
Single-family house	185	30.8	41	17.1	43	16.9	101	96.2
Wagon/shed or other temporary Dwelling	4	0.7			1	0.4	3	2.9

Source: WtP Survey Results

Appendix Table J.14: Distribution of Respondents by Apartment Floor

Apartment Floor		
	Frequency	Percent
1	65	10.8
2	70	11.7
3	89	14.8
4	61	10.2
5	44	7.3
6	12	2.0
7	16	2.7
8	21	3.5
9	18	3.0
10	1	0.2
11	4	0.7
12	3	0.5
13	1	0.2
14	3	0.5
15	2	0.3
16	1	0.2
Total	411	68.5
Missing	189	31.5
Grand total	600	100.0

Source: WtP Survey Results

Appendix K: Survey Instrument

Armenia Water Services Household Survey

Data will only be used for statistical analysis and are not subject to publication.

Questionnaire Number

Marz ☐ *1 = Yerevan; 2 = Shirak; 3 = Kotayk; 4 = Ararat*

Settlement name _____

Settlement Type ☐ *1 = Yerevan; 2 = Other Urban; 3 = Rural*

Customer code ☐☐☐☐☐☐ Code

Sampling unit ☐ 1. Main sampling 2. Additional sampling

Date of interview ☐☐ *day* ☐☐ *month* 2014 *year*

Interviewer _____ *Name, surname* ☐☐ *Code*

Supervisor - - - - - - - - - - - - - - *Name, surname* - - - - - - - - - - *Signature*

Instructions for the interviewer

When someone answers the door please read out the following text:

Good morning/afternoon/evening. My name is _____ and I am carrying out research on a study of Armenia's Water Sector for the World Bank. We would like to better understand the public support for improving water and wastewater services and are interested in your experiences towards the services you currently receive. While the city authority and water company are aware of this research, the research itself is independent of them. Therefore, your answers will be held entirely confidential. Would you be willing to share 20 minutes of your time to assist us with our data collection?

Thank you. Before we start, I need to ask you a few questions to determine if you will be able to answer all the questions in the survey:

1. *Have you lived in this dwelling for longer than 6 months?*
2. *Is your house connected to the central water supply system (water supply pipeline inside the dwelling/building or in the yard or land next to the dwelling)?*
3. *If yes, is this connection functional (you have water through it)?*

If 'no' to any question, please move to the next apartment/house on your list.

For conducting this survey, it will be best for us if we can speak to the member of your household who is the most informed about water supply and sewage issues and can provide the most complete answers to the questions on behalf of the household. Would this be you? If not can we please speak with this person?

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Section A: Demographics and Type of Housing

A.1. INTERVIEWER TO FILL: Sex of respondent (Male = 1, Female = 2)	
A.2. How old are you?	
A.3. What is your education level?	

(1) Completed or incomplete Higher or Postgraduate	**(2) Completed or incomplete basic (8-9 grades)**
(3) Completed or incomplete Secondary vocational	**(4) Elementary**
(5) Completed or incomplete Primary vocational	**(6) No elementary**
(7) Completed or incomplete Secondary	

A.4. How many members live in this household? *INTERVIEWER: (READ) BY HOUSEHOLD WE MEAN PEOPLE WHO USUALLY LIVE TOGETHER, HAVE A SHARED ECONOMY AND COMMON BUDGET.*	
A.5. How many members (mentioned by you in the previous question) have been absent for more than 3 months in the last 12 months?	
A.6. Currently how many members are present in your household?	

A.7. How many of them are in the age group of:

A.7_1	**0-15 years old**	
A.7_2	**16 – 64 years old**	
A.7_3	**65 + years old**	

A.8. INTERVIEWER TO FILL: **Type of housing in which the respondent lives:**

Apartment in multistory apartment building (including room(s) in dormitories)	**(1) →GO TO A.9**	
Single-family house	**(2) →SKIP TO B.1**	
Wagon/shed or other temporary dwelling	**(3) →SKIP TO B.1**	
Other_____(mention)	**(4) →SKIP TO B.1**	

A.9. INTERVIEWER TO FILL: **Floor on which respondent lives: (to be filled out by interviewer in case of multistory apartment building in A.10.)**

List floor number	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Section B: Water Supply

B.1. Usually how many days a week do you receive water from the system? (number of days: 0-7)		
	Number of Days	
B.2. Out of 24 hours in a day, how many hours do you actually receive water?		
	Number of Hours	
B.3. Do you usually use sources other than the centralized water supply system for the needs of your household (drinking, cooking, hygiene, washing)?		
Yes		
No	**(1) →GO TO SECTION C**	
B.4. Do you use the following sources? (1) Yes, (2) No *INTERVIEWER: OBTAIN RESPONSE FOR EACH OPTION*		
B.4_1	Public tap (water fountain)	
B.4_2	Well or deep/artesian well	
B.4_3	Natural spring	
B.4_4	Collected rainwater	
B.4_5	Water purchased from vehicles with tanks	
B.4_6	Purchased bottled water	
B.4_7	Open body of water (lake, river etc.)	
B.4_8	Irrigation system water	
B.5. Why do you use other sources for your household needs (drinking, cooking, hygiene, washing)? *INTERVIEWER: OBTAIN RESPONSE FOR EACH OPTION* **(1) Yes, (2) No**		
B.5_1	The quantity of water supplied by the centralized system is not enough	
B.5_2	Quality of tap water supplied by the centralized system is poor	
B.5_3	The water supplied by the centralized system is too expensive	
B.5_4	Other_____(mention)	
B.6. What share of your household drinking water needs is covered by the water received from the centralized water supply system in your dwelling/building or the yard/adjacent land?		
Up to 20%		
21- 40%		

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

	41-60%
	61-80%
	81-100%

B.7. Please tell me whether your household purchases water from the following sources, and if so, how many liters per week do you purchase, how much do you pay per liter? *INTERVIEWER: IF "NO" SKIP TO NEXT ROW*

Column Number					
		(1) Yes **(2) No**	**Quantity in liters**	**Price per liter**	**Total price** (=Col.2xCol.3)
B.7_1	Bottled water				
B.7_2	Water purchased from vehicles with tanks				
B.7_3	Other_____ (mention)				
B.7_4	Total per week *INTERVIEWER: CALCULATE SUM OF THE ROWS B.7_1 – B.7_3 FOR COLUMNS 2 AND 4*		=		=
B.7_5	Total per month *INTERVIEWER: MULTIPLY COLUMN 2 AND 4 IN ROW B.7_4 BY 4 FOR MONTHLY AMOUNT*		=		=

B.8. Please evaluate how much water in general your household consumes for domestic needs (drinking, cooking, showering and other uses) from all sources except centralized water supply and purchased water?

INTERVIEWER: OBTAIN ANSWER IN ONE OPTION BY WHICH THE RESPONDENT IS ABLE TO EVALUATE, IF THE H/H DO NOT CONSUME DRINKING WATER FROM OTHER SOURCES WRITE "0" IN B.8_1 AND CONTINUE		**Water consumption in liters**
B.8_1	Daily	
B.8_2	Weekly	
B.8_3	Monthly	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Section C. Fees and satisfaction with water supply services

C.1. Do you have a water meter?	
No	
No, but prepared to install	
Not yet, but expected to be installed under the Family Benefits Program	
Yes →***if selected SKIP to C.3***	

C.2. Which of the following describes how your water bill is determined? *INTERVIEWER: READ RESPONSE OPTIONS*	
Number of people in my home	
Number of people in my entire community (for community taps)	
The size of the pipe bringing water to my home	

C.3. Are you generally satisfied with the operation of your centralized water supply system?	
Completely satisfied	
Satisfied to some extent	
Neither satisfied, nor unsatisfied	
Unsatisfied to some extent	
Completely unsatisfied	

C.4. Are you generally satisfied with the current conditions of the following characteristics of your household's centralized water supply?

C.4_1	Time schedule of water supply (the days of the week and the time of day that you have water supply)		***Completely Satisfied (1)***
C.4_2	Duration of water supply (number of hours in 24 hours you have water)		***Satisfied to some extent (2)***
C.4_3	Water pressure in the system		***Neither satisfied, nor unsatisfied(3)***
C.4_4	Quality of water (taste, smell, cleanliness, clarity)		***Unsatisfied to some extent (4)***
			Completely unsatisfied (5)

C.5. Please rate the following in terms of greatest to least importance to you. (1 = most important, 4 = least important) INTERVIEWER: READ RESPONSE OPTIONS		
C.5_1	Continuous supply (i.e., water comes out of the tap every time you turn it on)	
C.5_2	Strong pressure (i.e., tap, shower will have higher pressure)	
C.5_3	Quality (smell, taste, color) (i.e., safe and good to drink straight from the tap)	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

C.5_4	Other_____(mention)	

C.6. What is your average mothly bill for water and sanitation (in drams)?		
	Drams	

C.7. Please let me know the extent to which you agree or disagree with the following statements.			
C.7_1	I believe the current price of water tariffs is fair.		***Completely agree (1)***
C.7_2	I understand how water and wastewater tariffs are set.		***Agree to some extent (2)***
C.7_3	I would like to have a better understanding of exactly how tariffs are set.		***Neither agree nor disagree (3)***
C.7_4	If I understood exactly how tariffs were determined, I would be more likely to support the current tariff.		***Disagree to some extent (4)***
C.7_5	If I understood exactly how tariffs were determined, I would be more likely to support changes in the current Tariff		***Completely Disagree (5)***

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Section D: Willingness to Pay for Water Services

INTERVIEWER: FOLLOW THE INSTRUCTIONS TO FILL THE BELOW TABLE

D.1. Centralized water expenditures *INTERVIEWER: COPY FROM C.6*	
D.2. Purchased water expenditures *INTERVIEWER: COPY FROM B.7_5; column 4*	
D.3. Total water expenditures *INTERVIEWER:* ***Calculate the sum of above 2 rows***	

INTERVIEWER: READ THE TEXT, "IN THIS SECTION I WILL READ OUT A SCENARIO ABOUT YOUR WATER SUPPLY SYSTEM TO YOU. PLEASE PAY ATTENTION AS THEY REFER TO SPECIFIC PLANS FOR WATER SECTOR IMPROVEMENTS."

INTERVIEWER: IF D.2.≠0 READ THE TEXT BELOW

CURRENTLY YOUR HOUSEHOLD PAYS ____ AMD (INTERVIEWER: READ FROM D.3.) **PER MONTH FOR WATER (INCLUDING WATER FROM CENTRALIZED SYSTEM AND PURCHASED WATER), OF WHICH YOUR H/H CURRENTLY PAYS ____ AMD** (INTERVIEWER: READ FROM D.1.) **PER MONTH FOR CENTRALIZED SYSTEM WATER.** *INTERVIEWER : NOW READ THE WATER SUPPLY SCENARIO.*

INTERVIEWER: IF D.2.=0 READ THE BELOW TEXT

CURRENTLY YOUR HOUSEHOLD PAYS ..... AMD *(INTERVIEWER: READ FROM D.1.)* ***PER MONTH FOR CENTRALIZED SYSTEM WATER.*** *INTERVIEWER: NOW READ THE WATER SUPPLY SCENARIO.*

D.4. To prevent rapid deterioration of the central water supply system and services and/or for implementation of the improvements proposed in the scenario, for the same amount of water consumed from the centralized system would you be willing to pay 20% more per month? (*INTERVIEWER: Calculate D.1+20%, copy it to the box and continue***), which comprises AMD? You can assume that the improvements would be implemented within 1-2 years of the change in price.**	**1. Yes** **2. No→ D.6.**	

D.5. If yes, then would you be willing to pay 40% more per month? (*INTERVIEWER: Calculate D.1+40%, copy it to the box and continue*), **i.e. AMD?**	**1. Yes→D.7.** **2. No→ D.7.**	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

D.6. If no, then would you be willing to pay 10% more per a month (*INTERVIEWER: Calculate D.1+10%, copy it to the box and continue***), i.e. _____ AMD?**	**1. Yes** **2. No**
D.7. What is the maximum amount that you would be willing to pay monthly for the mentioned purposes AMD?	

D.8. Which is the strongest constraint that is preventing you from being more willing to pay a higher tariff price than you have indicated? *INTERVIEWER:* READ RESPONSE OPTIONS. *CHOOSE CLOSEST AND ONLY ONE.*

I don't trust that my service provider will use the higher tariffs to make the promised improvements.	
I don't trust that these improvements can realistically be achieved in my neighborhood.	
I do not believe that I should pay for the necessary improvements.	
I can't afford higher increases to the tariff.	
Other (write below)	

D.9. If the price per cubic meter of water increased by 50% would you decrease the total amount of water you use? If yes, by how much?

No	**(1)**	**→ SKIP TO E.1.**
Yes, by up to 20%		
Yes, by 20-40%		
Yes by more than 40%		

D.10. How would you most likely reduce your consumption? (1) Yes; (2) No

INTERVIEWER: OBTAIN ANSWERS FROM ALL OPTIONS.

Shorter showers/less baths	
Water my plants less often	
Limit running water during cooking and cleaning	
Collect rainwater	
Flush toilets less	
Other_____ (mention)	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Section E: Sewerage

INTERVIEWER: (READ TO RESPONDENT)

"THIS SECTION REFERS TO THE WASTEWATER DISPOSAL SYSTEM OF YOUR HOUSEHOLD. THE DWELLING OF YOUR HOUSEHOLD COULD BE CONNECTED TO THE CENTRALIZED SEWAGE SYSTEM. IN THIS CASE YOU HAVE TO PAY BILLS FOR WASTEWATER DISPOSAL AND TREATMENT. OTHERWISE, IF THE DWELLING OF YOUR HOUSEHOLD IS NOT CONNECTED TO THE CENTRALIZED SEWAGE SYSTEM, WE ASK YOU TO MENTION HOW YOU ORGANIZE YOUR WASTEWATER DISPOSAL."

E.1. Is your dwelling connected to the central water disposal/sewer system?		
Yes		☐
No		
E.2. Which kind of toilet facility do members of your household primarily use? *INTERVIEWER: READ OUT OPTIONS, CHOOSE ONLY ONE.*		
Flush/pour flush	Bucket	☐
Pit latrine with slab	No facilities or bush or field → SKIP TO E.5.	
Pit latrine without slab/open pit	Other_____(mention)	
Composting toilet		
E.3. Where do the contents of this toilet empty to?		
Centralized sewage system	Open fields/ground	☐
Septic tank/well	Water: river, drainage channel, lake, etc.	
Non-septic well/pit	Other_____(mention)	
E.4. Do you share the toilet facility with other households?		
Yes		☐
No		
E.5. How satisfied are you with your current system for sewage disposal?		
Completely satisfied	**(1) → SKIP TO E.7.**	☐
Satisfied to some extent	**(2)**	
Neither satisfied, nor unsatisfied	**(3)**	
Unsatisfied to some extent	**(4)**	
Completely unsatisfied	**(5)**	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

E.6. Please rate the following problems with your sanitation facility from greatest to least importance to you. (1 = most important, 4 = least important) INTERVIEWER: OBTAIN RESPONSE FOR EACH OPTION.		
E.6_1	Smell	
E.6_2	Inconvenience	
E.6_3	Environmental impact	
E.6_4	Other _____ (mention)	

INTERVIEWER: ASK THE QUESTIONS E.7-E.9 ONLY IF E.3. ≠1.

E.7. How much did your toilet cost in cash or labor?			
E.7_1	In cash	*(Estimate in drams)*	
E.7_2	In labor (if respondent or family member built the facility)	*(Estimate in hours)*	
E.8. Have you needed to maintain this toilet since its construction?			
	Yes		
	No → **SKIP TO SECTION F**		
E.9. How much did the maintenance cost you during the last 12 months?			
		In drams	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Section F: Willingness to Pay for Sanitation Services

INTERVIEWER: FOLLOW THE INSTRUCTIONS TO FILL THE BELOW TABLE.

F.1. Water and wastewater expenditures *INTERVIEWER: COPY FROM C.6.*	
F.2. Scenario number (1=connected to the sewage system, 2=not connected to the sewage System *INTERVIEWER: COPY FROM E.1.*	

INTERVIEWER: READ ALOUD "IN THIS SECTION I WILL READ A SCENARIO ABOUT YOUR SANITATION SYSTEM TO YOU. PLEASE PAY ATTENTION AS THEY REFER TO SPECIFIC PLANS FOR WATER SECTOR IMPROVEMENTS."

CURRENTLY YOUR HOUSEHOLD PAYS ..... AMD (INTERVIEWER: READ FROM F.1.) **PER MONTH FOR CENTRALIZED SYSTEM WATER SUPPLY (AND SANITATION).**

INTERVIEWER:NOW, READ THE SANITATION SCENARIO AND THEN READ THE FOLLOWING TEXT IN F.3.

F.3. To prevent rapid deterioration of the central water supply (and sanitation) system and services and/or for implementation of the improvements proposed in the scenario would you be willing to pay 15% more per month in addition to the costs of improving water supply (*INTERVIEWER: Calculate F.1+15%, copy it to the box and continue***) *only for improvements in sanitation*, which comprises AMD? You can assume that the improvements would be implemented within 1-2 years of the change in price.**	**1. Yes** **2. No→ F.5.**	
F.4. If yes, then would you be willing to pay 40% more per month (*INTERVIEWER: Calculate F.1+40%, copy it to the box and continue***), i.e. AMD?**	**1. Yes→ F.6.** **2. No→ F.6.**	
F.5. If no, then would you be willing to pay 10% more per a month (*INTERVIEWER: Calculate F.1+10%, copy it to the box and continue***), i.e. AMD?**	**1. Yes** **2. No**	
F.6. What is the maximum amount that you would be willing to pay monthly for the mentioned purposes AMD?		

F.7. Which constraint is preventing you from paying a higher tariff for the improvements described? *INTERVIEWER:* READ RESPONSE OPTIONS *CHOOSE CLOSEST AND ONLY ONE.*	
I don't trust that my service provider will use the higher tariffs to make the promised improvements.	
I don't trust that these improvements can realistically be achieved in my neighborhood.	
I do not believe that I should pay for the necessary improvements.	
I can't afford higher increases to the tariff.	
Other (write below)	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Section G: Beliefs, Attitudes and Debriefing Questions

G.1. To what extent do you agree with this statement?: I have complete confidence in my water and sanitation company's ability to carry out the improvements to the water and sanitation system as promised in the scenarios just described to me.	
Strongly agree	
Somewhat agree	
Neither agree nor disagree	
Somewhat disagree	
Strongly disagree	
G.2. If our water infrastructure system needs to be repaired and upgraded to bring clean water to ALL Armenian households, who do you think should be responsible for paying for these improvements?	
All Armenians (by paying a little more each month)	
The central government	
Marz administrations (marzpetarans)	
Local and municipal authorities	
Business and industry	
All of the above	
Water supply company/public service provider	
Other_____(mention)	
G.3. If there are problems with Armenia's water infrastructure system, who do you hold MOST responsible for fixing these problems?	
Water and waste water public service providers (e.g. Yerevan Djur)	
The central government	
Marz administrations (marzpetarans)	
Local and municipal authorities	
Other_____(mention)	
G.4. How much do you trust them to address the problems facing Armenia's water infrastructure system? *(1 = trust a great deal, 5 = do not trust at all)*	
G.4_1 Water and waste water public service providers (e.g. Yerevan Djur)	
G.4_2 The central government	
G.4_3 Marz administrations (marzpetarans)	
G.4_4 Local and municipal authorities	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

G.5. Do you think it is necessary to improve the level of social protection for vulnerable families under the Family Benefit Program if water and wastewater tariffs are increased?		
	No. The Family Benefits Program already provides sufficiently for vulnerable families.	
	Yes. Water and wastewater services should be supplemented under the family benefit program.	
	Yes. A separate program should provide assistance for water and wastewater tariff increases.	

G.6. Did you know that for every 100 liters of water that enters Armenia's water system, an average of 50 liters are lost due to outdated and damaged infrastructure? **There are also over 100,000 families in Armenia who currently do not have access to affordable, clean water.** ***INTERVIEWER: READ OPTIONS TO RESPONDENT AND ASK IF THEY OPPOSE OR SUPPORT EACH OPTION***		
		(1) Yes (2) No
G.6_1	Keep water tariffs the same, with the understanding that without investment, water and wastewater infrastructure will deteriorate in the next 10 years, leading to more frequent interruptions, fewer service hours, and poorer pressure and quality.	
G.6_2	Introduce a water network expansion charge, where you pay a little extra each month to invest in providing public access for families that currently do not have access to affordable clean water.	
G.6_3	Increase water rates to rehabilitate water infrastructure, improving service hours, pressure and water quality.	
G.6_4	Increased water rates to ensure that my family always has access to safe Clean water	
G.6_5	Introducing a lifeline tariff, where households that use less than 25 liters per person per a day pay less for water, to ensure all households can afford Water	

Codes for alternative answers (entered in the relevant cells):
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99 = the respondent refuses to answer the question

Section H. Characteristics of household and living standards

H.1. Which of the following best describes your home?	
Owned by member or members of the household	
Rented from an individual	
Rented from community or the state	
Other_____(mention)	
H.2. How much did your household spend last month?	
In drams	
H.3. Of this, approximately how much did your household spend on:	
	Armenian drams
H.3_1 Food	
H.3_2 Utilities (water, electricity, gas, heat)	
H.3_3 Communications (phone, internet, cable TV)	
H.3_4 Transport (including also petroleum for own vehicle)	
H.3_5 Educational needs	
H.3_6 Healthcare needs	
H.3_7 Durable consumer goods (car, television…)	
H.3_8 Clothing	
H.3_9 Entertainment	
H.3_10 Other	

Codes for alternative answers (entered in the relevant cells):
96 = not applicable to the respondent
98 = "no opinion" or "don't know
99 = the respondent refuses to answer the question

Willingness to Pay Scenarios

Water Supply

Did you know that the price paid for water only covers a small portion of the overall costs of supplying your home with water? Much of the infrastructure is badly in need of repair, and water losses are some of the highest in the world. An average of less than 50 liters for every 100 liters of water put into the water system actually makes it to your home. Without investment, it is likely that the quality of water service will deteriorate in the coming ten years, leading to fewer service hours, poorer water quality and weaker pressure.

Suppose a program was being considered to invest in repairing and upgrading water infrastructure in Armenia. The improvements would provide:

For respondents in Yerevan:	For respondents outside of Yerevan:
Perfect water quality (the same as you would get in bottled water), reliably strong pressure, regardless of which floor you live on and consistent 24 hour service, with close to no service interruptions	8-12 extra hours of service (for customers who do not already have 24 hour service), perfect water quality (the same as you would get in bottled water) and reliably strong pressure during service hours, regardless of which floor you live on

Considering that in total you currently pay _____ per month for water (including water from centralized system and purchased water), of which you currently pay _____ per month for water from the centralized system, would you be willing to pay _____ more per a month for these improvements for the same amount of water consumed? You can assume that the improvements would be implemented within one year of the change in price.

Sanitation

Respondents with connection

For respondents in Yerevan:	For respondents outside of Yerevan:
Did you know that sewage from your home is currently discharged directly into watercourses and in some cases in recreational areas of central Yerevan?	Did you know that sewage from your home is currently discharged directly into watercourses?

Also, due to damaged pipes, during heavy rains there is a risk of cross contamination between the sewage network and the water supply network. Suppose a program was being considered to invest in sewage treatment infrastructure. The program would create a more hygienic environment for your family and community, ensure safe and clean drinking water, and prevent contamination of rivers and groundwater. Considering that you currently pay _____ per month for water and sanitation, would you be willing to pay _____ more per month for these improvements? This would be *in addition* to the costs of improving water supply. You can assume that the improvements would be implemented within one year of the change in price.

(3) Respondents without connection but that can be connected to the centralized sanitation network

A program is being considered to bring wastewater collection services to your neighborhood and home. The program would provide a connection at your home to dispose of all wastewater and sewage through a public waste water system. These systems have been used successfully in other communities in Armenia to remove waste in a hygienic way without odor. The objective of the program is to prevent you from having to construct and maintain pit latrines in your yard and to create a more hygienic environment for your family and community. It would also prevent contamination of rivers and groundwater. Considering that you currently pay _____ per month for water and sanitation, would you be willing to pay _____ more per month for these improvements? This would be *in addition* to the costs of improving water supply. You can assume that the improvements would be implemented within one year of the change in price.