EAP Task Force

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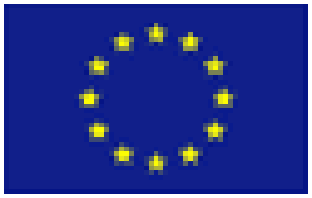
National Policy Dialogue on Financing Strategy for Rural Water Supply and Sanitation in Armenia

Final report

OECD



A project for the State Committee for Water System in Armenia, managed by the OECD/EAP Task Force Secretariat and funded by the European Commission under the EU Water Initiative

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This report is also available in Russian under the title:

Национальный диалог по финансовой стратегии для водоснабжения и водоотведения в селах Армении

FOREWORD

In 1993, the Task Force for the Implementation of the Environmental Action Programme for Central and Eastern Europe (EAP Task Force) was created to support the integration of the environment into the broader process of economic and political reform in transition economies. Its secretariat was established in the OECD's Environment Directorate. With the enlargement of the European Union, and since the 1998 Aarhus conference, the EAP Task Force's work has been focused on the countries of Eastern Europe, Caucasus, and Central Asia (EECCA).

Under the aegis of the EAP Task Force and in cooperation with the Danish government, the OECD has developed a methodology to inform policy dialogue on strategic financial planning in the water supply and sanitation sector. In EECCA countries, considerable investments are required to improve the quality of the service and the environmental performance of the sector, while sufficient financing shall be ensured to properly operate and maintain existing Water Supply and Sanitation (WSS) infrastructure; clear priorities and targets need to be set to guide both countries' own action programmes and multi-stakeholder partnerships. The methodology entails setting specific, measurable, realistic and time-bound policy targets in the sector, measuring the financial costs (investment and operation and maintenance) associated with these targets, assessing the financial resources available to cover these costs, and developing scenarios to close the potential cash flow gap (adjusting targets and/or time schedule, or raising additional revenues).

This publication presents key findings and recommendations of a Financing strategy (FS) case study in Armenia, sponsored by the European Commission (EC) and the Organisation for Economic Co-operation and Development/Environmental Action Programme Task Force (OECD/EAP Task Force).

The objective of the study was to help local stakeholders develop a Financing Strategy for Rural Water Supply and Sanitation in Armenia through a National Policy Dialogue (NPD) on this subject. The key challenges were to set up realistic targets for rural WSS based on a minimal water supply standard consistent with, but more ambitious than the Millennium Development Goal (MDG) on water supply, and develop a policy package that covers both improvement of the rural WSS infrastructure (more reliable supply, renovation of networks, extensions of WSS systems) and the financing thereof (introducing user charges in rural settlements where these do not currently exist, allocating sufficient budgetary resources, acquiring international loans and grants, creating financial facilities for people who cannot afford to pay, etc.).

The study has built upon another OECD/EAP Task Force project, funded by the UK DFID, aimed at developing methodological guidelines for Financing Strategies for rural Water Supply and Sanitation, and the methodological dimension is also reflected in the publication.

Alexandre Martoussevitch (OECD) managed the project funded by the EC (DG ENV). EC hired a consultant, the Institute for Applied Environmental Economics (TME, the Netherlands) to implement the project. Dr. Jochem Jantzen (TME) was head of the project team. Valuable comments on the final report were provided by Peter Borkey (OECD).

The project has entailed a close cooperation with the State Committee of Water System (SCWS) in Armenia. Many officers and experts contributed to the project, and we thank all of them, and specifically Gagik Khachatryan, Mger Mkrtumyan and Liana Karapetyan (SCWS).

Lessons learnt from this project, on policy and method, are relevant to most EECCA countries and beyond.

The views expressed in this report are those of the authors and do not necessarily reflect those of the OECD, its member states, the EC, or the Armenian government.

CONTENTS

LIST OF ACRONYMS AND ABBREVIATIONS

ADB	Asian Development Bank
AMD	Armenian dram (national currency). It is assumed that 1 EUR = 450 AMD
AP	Action Plan
ATP	Ability to pay
AWSC	Armenian Water and Sewage Company, or Armvodocanal
Capex	Capital expenditure
COWI	Danish consultancy that developed the Feasible model
DEFRA	Department of Environment, Food, and Rural Affairs of the United Kingdom
DEPA	Danish Environmental Protection Agency
DFID	Department for International Development of the UK
EAP TF	Environmental Action Programme Task Force
EC	European Commission
EECCA	The EECCA is an abbreviation for Eastern Europe, Caucasus, and Central Asia; and it includes the following 12 countries: Armenia, Azerbaijan, Belarus, Georgia, Kazakhstan, Kyrgyzstan, Republic of Moldova, Russian Federation, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.
EU	European Union
EUWI	European Union Water Initiative
Feasible	Model for assessing expenditures, financing of environmental policy, developed by COWI
FS	Financing Strategy
GDP	Gross Domestic Product
IBT	Increasing block tariff
IFIs	International Financial Institutions
IWRM	Integrated Water Resources Management
JICA	The Japan International Co-operation Agency.
KfW	Kreditanstalt für Wiederaufbau (Credit Establishment for Reconstruction, German bank)
Lcd	Litre per capita per day
MDGs	Millennium Development Goals
MOSES	Model On Sustainable Environmental Scenarios (developed by TME to assess costs and investments of environmental policies)
MTEF	Medium-Term Expenditure Framework
MWSS	Minimal Water Supply Standards
NPD	National Policy Dialogue
NPV	Net Present Value
OECD	Organisation for Economic Co-operation and Development
O&M	Operation and Maintenance
PRSP	Poverty Reduction Strategy Paper
PWS	Piped Water Supply
RA	Republic of Armenia
RWSS	Rural Water Supply and Sanitation
SC	Steering Committee
SCWS	State Committee of Water System of the Republic of Armenia
SMART targets	Specific, Measurable, Achievable, Realistic, and Time-bound targets for (environmental) policies
SoCU	Statement of Common Understanding

SWIFT	A model (still under development) for developing FS for WSS in Africa, for the World Bank. The model is being developed by PEMconsult
TME	Instituut voor Toegepaste Milieu Economie (Institute for Applied Environmental Economics), the Netherlands
UK	United Kingdom
UN	United Nations
UWW	Urban Waste Water Directive
WB	World Bank
WFD	Water Framework Directive
WHO	World Health Organisation
WSC	Water supply company
WSS	Water Supply and Sanitation
WTP	Willingness to pay

SUMMARY

Objective

The objective of this study sponsored by the European Commission (EC) and the OECD/EAP Task Force was to help develop a Financing Strategy (FS) for rural Water Supply and Sanitation (WSS) in Armenia through a National Policy Dialogue (NPD) on this subject.

The Government of Armenia (GoA) is aiming at achieving by 2015 WSS sector development targets based on realistic minimal water supply standards (MWSS) consistent with, but more ambitious than the official definitions of the United Nations (UN) Millennium Development Goals (MDGs) on WSS. Therefore, the key challenge of the study was to support the GoA in the development of such standards and to explore their financial feasibility for rural WSS.

National Policy Dialogue on Financing Strategy for Rural WSS

The National Policy Dialogue on Financing Strategy for Rural Water Supply and Sanitation was organised by a Steering Committee (SC) involving all key Armenian and international stakeholders and chaired by the State Committee of Water System (SCWS). Regular and extended (multi-stakeholder) SC meetings provided a platform for the dialogue, while the OECD/EAP Task Force Secretariat and the consultant (TME) selected by the EC provided analytical input and facilitated the dialogue (see Annex 2 of this report for more details on the NPD in Armenia and lessons learnt from it).

Key issues which were discussed in the dialogue were: alternative options/definitions of the MWSS and sector development targets consistent with them, scenarios to achieve the targets and their financial implications[1], as well as packages of financial and institutional policy measures attached to the scenarios.

The key findings and recommendations of the case study, which were discussed in the framework of the National Policy Dialogue on Financing Strategy for rural WSS in Armenia, are presented below.

Key findings

With about 30% of the rural population without improved access to safe drinking water; the present status of rural WSS in Armenia is quite poor, even though it is improving slowly. The sector is also seriously under-financed, which is due to weak institutional set up, low to no tariffs (only 25% of population living in villages outside service areas of water utilities pay for water) accompanied by poor tariff collection, and – until recently – low priority of rural WSS for the government.

However, the study suggests that ambitious WSS targets could realistically be achieved. The minimum water supply and sanitation standards (MWSS) agreed upon by stakeholders in the dialogue process, defined as

- at least 50 litres per capita per day (lcd)
- at a distance from dwelling to tap of no more than 100 metres,
- regularity of at least eight hours per day (for piped water supply), and
- acceptable water quality;

would be technically and financially feasible for rural Armenia.

[1] Simulations of scenarios and options for policy variables were made by the Consultant using the FEASIBLE computer tool, following the financing strategy methodology developed by the OECD/EAP Task Force in co-operation with Denmark. Survey results and simulations with FEASIBLE are the source of all data, figures, and charts in this summary.

The implementation of the Policy scenario, which represents a combination of the MWSS with more ambitious targets, anticipating, on average, **75**% on-plot supply (in-house and yard tap) in rural settlements by 2015, would require investments amounting to some **34.9 billion dram** (€77.5 million) over 2007-2015.

Although the financial challenges in the rural WSS in Armenia are great, and presently financial resources are short, **the Policy scenario would be financially feasible, given that:**

User charges for piped water supply are introduced in all villages and gradually increased keeping them below the affordability limit of 3% of household income, so that by 2015 rural households will pay AMD 26,500 per annum, on average (compared to AMD 12,000 in the base year), and collection efficiency is improved drastically; and

The strategy is integrated into the budgetary process, foremost into the Medium-Term Expenditure Framework (MTEF) at the Ministry of Finance (MoF), and over 2008-2015 the government will allocate for rural WSS at least 0.3% and up to 0.46% of the public budget.

However, the study suggests that **financing is not the major constraint.** It concludes that with the present institutional set up in rural settlements outside service areas of water supply companies it is not possible to implement the FS for rural WSS. Such settlements, especially those with no nearby water source, have to take care of all aspects (technical, financial, etc.) of the water supply system, while their financial (fiscal) and human resource capacity is often far from sufficient to address the challenge.

Key institutional reforms to be implemented jointly by the central and local governments include: strengthening management and financial capacity of local jurisdictions, establishing larger water utilities or companies by expanding their service areas to cover most rural settlements, adopting the MWSS and setting an agency responsible for the financing strategy implementation, and co-ordination of varios investment programmes for rural WSS, often implemented with support from donors.

Present situation in rural WSS in Armenia and baseline scenario

Surveys of rural WSS undertaken by the Japan International Co-operation Agency (JICA) and the OECD[2] describe the WSS in rural Armenia (where about 1.07 million inhabitants lives) as follows. All rural settlements can be roughly classified into three categories:

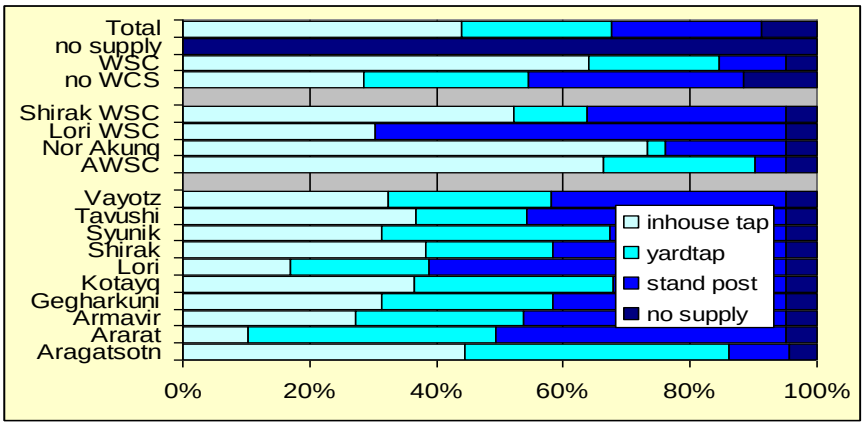
- Rural settlements served by one of the existing water supply companies (WSCs) serving in total about 45% of the rural population;
- Rural settlements without the services of a water company, but with a centralised (piped) water supply managed by rural communes (about 50% of rural population);
- Rural settlements that lack centralised (piped) water supply (about 40 000 inhabitants).

According to the recent surveys, the quality of the supply has been improving: the on-plot supply (in-house and yard taps) in rural Armenia had increased from 45% in 2000/2001 to about 68% in 2006. In figure A, for all *Marzes* (regions) and water companies serving rural Armenia, the estimated share of different water supply methods (in-house tap; yard tap; standpipes; others) is shown.

In settlements served by water supply companies (WSCs), over 80% of all households have on-plot supply; in rural settlements without WSC service, the on-plot supply is estimated at about 55%. However, for approximately one third of the rural population in Armenia, water still needs to be collected from stand-posts (often located far from dwelling) or from springs, rivers, own wells, etc.

[2] It should be noted that no data on WSS in some 600 villages existed when the project started. So, data collection through questionnaires and field interviews was one of the first challenges faced by this study. Coincidently and fortunately, the Japan International Co-operation Agency (JICA) undertook an intensive data collection thus contributing a lot to establishing a data-base for decision making within the GoA and also to this study, and that valuable contribution is fully acknowledged.

Figure A: Rural population, by type of connection to water supply, 2006



According to European standards, water supply per capita per day should be around 110-170 litres per capita per day. However, in rural Armenia, the average water production is **400** lcd. This indicates a highly oversized existing infrastructure for drinking water, losses and inefficient uses of drinking water.

Some 50% of existing systems should be renovated given that the average age of the infrastructure is about 35 years. Total needed investments for renovation and optimisation of the current infrastructure to reduce water consumption closer to EC figures, are estimated at **34.9 billion** dram (**≈** € 77.5mln).

The unit costs (in Armenian drams (AMD) per m3) of water supply vary substantially across rural settlements: the ratio of the highest costs to the lowest costs amounts to 10-20. While the analysis suggests that in rural settlements not served by water companies there is a complete disconnection between unit costs and the finance available. In rural settlements not served by WSCs, the population with access to piped water supply (PWS) either pays low tariffs or do not pay at all (some 55% of the population in such settlements). While the collection of tariffs set by water companies is generally poor, varying from as low as 15% to reasonably good 85%, depending on rural settlement.

Lack of stable sources of financing for WSS in many rural settlements explains large variations in expenditures for rural WSS across *marzes* (regions) in Armenia – the ratio of the highest expenditures (in AMD per capita per annum) in marz Ararat to the lowest one in marz Tavushi is as big as 13.

In the baseline scenario, which anticipate the extrapolation of recent trends ("business as usual" or "no new policy" scenario) annual expenditures over 2008–2015 (excluding renovations) are estimated at AMD 2.5 billion, of which 1.1 billion is for operational and maintenance costs, and 1.4 billion for reinvestments. If renovations are included, annual expenditures are AMD 2 billion higher.

The revenues projected based on present figures and recent trends (user charges, loans, budget contribution), including the foreseen increase in revenues from user charges (due to better collection), are too little to cover all projected expenditures in the scenario. The total financing gap over 2007-2015 would amount to some **AMD 19 billion** and can be explained by the following existing constraints (and gaps) of a legal, institutional, and organisational nature:

- Low collection efficiency in rural settlements served by water companies (at present, 15-85%);
- Low user charge rates and low collection efficiency, or no regular charges for water supply in the settlements with piped water supplies not served by WSCs (at present, in 80% of surveyed rural settlements, the population **does not pay at all** for water supplies);
- Very weak fiscal position of all rural settlements (low to no public revenues, and lack of fiscal transfers from upper levels of the budgetary system).

The level of financing for rural WSS provided from loans and central budget contributions in 2007 and planned for 2008 amounts to some 0.33% of total public expenditures. The problem was, however, that when the study was completed, no public allocations for rural WSS was envisaged for 2009 on. The analysis suggests that the financing gap in the baseline could be closed, if over 2008-2015 the central budget would continue to allocate for rural WSS from 0.3% to 0.46% of the central budget (the estimate for the central budget in 2009 is AMD 607 billion (€1.35 billion)). - This is a realistic option, as can be seen looking at the 2007/2008 figures.

Policy targets

Several options for/definitions of the MWSS as a country-specific interpretation of the Millennium Development Goals (MDGs) on WSS were suggested and simulated by the Consultant and then discussed with stakeholders. They anticipated different types of access, distance to water tap and quantity of water supply (in lcd). Through the National policy dialogue, a preferred, technically and financially feasible definition of the MWSS, was agreed upon as follows:

- at least 50 lcd, at a distance from the tap to the dwelling of no more than 100 metres,
- with the regularity (for piped water supply) of at least eight hours per day, and
- acceptable water quality (biological, chemical, etc.).

These service levels are significantly more ambitious than the minimum required to achieve the millennium development goals. The GoA also intends to achieve these MWSS for the entire population, which is again significantly more ambitious than the MDG target, which only aims at halving the proportion of people without sustainable access to an improved water source.

Three sets of targets and respective development scenarios have been simulated for rural WSS:

- The **Minimal Water Supply Standards (MWSS) scenario**, which aims at guaranteeing at least the basic water supply to all rural populations, as defined in the MWSS;
- The **Policy scenario**, which represents a combination of the MWSS, with more ambitious targets for rural water supply as set in the Poverty Reduction Strategy Paper (PRSP), anticipating, on average, **75**% on-plot supply (in-house and yard tap) in rural settlements (the latter target was somewhat eased by assuming piped water supply for only eight hours per day, rather than the overly-ambitious 24-hour supply target set in the Armenian PRSP);
- The "**Maximal" scenario**, which describes an optimal supply (**95**% of rural population will have in-house taps and receive **150** lcd).

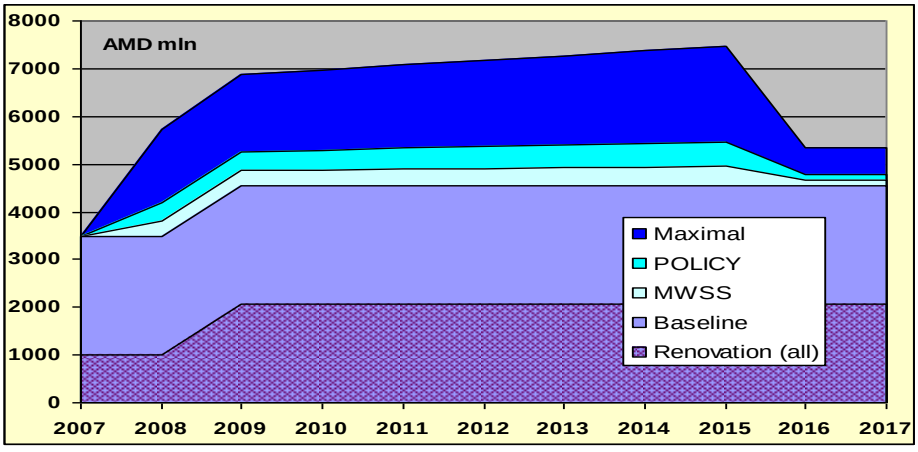
The investment needs for each of the simulated scenarios are shown in Table A from which one can see that investments for extensions of the water supply network are relatively small compared to the other categories (their share in total investments is: 8% (for MWSS), 16% (for Policy) and 37% (for Maximal scenario). The lion's share of investments in RWSS (AMD 16.5 billion) should be allocated to **renovation and optimisation** of the present water supply networks which is a common part of all the scenarios in question. Re-investments to compensate for depreciation also require large funds, between AMD 12.4 billion (in the Baseline scenario) and AMD 14 billion (in the Maximal scenario).

Table A: Total investments over 2007–2015 for renovations, re-investment and extensions, in different scenarios, in million AMD

Investment category	All	Baseline	MWSS	Policy	Maximal
renovations	renovations total	renovations 2007-2015	renovations 2007-2015	renovations 2007-2015	renovations 2007-2015
WSCs	20 949	9 670	9 670	9 670	9 670
no WSCs	14 707	6 789	6 789	6 789	6 789
Total	*35 656*	*16 459*	*16 459*	*16 459*	*16 459*
re investments		re investments	re investments	re investments	re investments
WSCs		7 291	7 418	7 575	8 205
no WSCs		5 118	5 207	5 318	5 760
Total		*12 409*	*12 625*	*12 893*	*13 965*
extensions			extensions	extensions	extensions
WSCs			216	558	4 194
no WSCs			1 170	3 042	10 926
no Supply			1 080	1 926	2 664
Total			*2 466*	*5 526*	*17 784*
Total by category					
WSCs	20 949	16 961	17 304	17 803	22 070
no WSCs	14 707	11 907	13 166	15 149	23 475
no Supply			1 080	1 926	2 664
Total general	***35 656***	***28 869***	***31 550***	***34 878***	***48 209***

Figure B, below, shows the differences in expenditures between the scenarios. From the figure one can see that the cost differences between the baseline and the MWSS and Policy scenario are minimal. Only in the Maximal scenario there is a large costs difference (65%). But after 2015 the cost difference between the scenarios is much lower, as all planned investments would be completed.

Figure B: Annual total expenditures (for operation and maintenance, re-investment, renovations, and extensions) in different scenarios



Affordability of scenarios

In analysing the affordability of these scenarios, the required expenditures are compared to the available income. This is done by comparing the water bill with household income (see Table B), and by comparing subsidies and loans allocated for rural WSS to total central government expenditures. In the affordability assessment, it was assumed that the water bill should not be larger than 3% of household

income – a threshold agreed with stakeholders. User charges under different scenarios (average value over the period, in AMD per household per year) were assessed as follows: AMD 12 000 in the baseline; AMD 23 000 for MWSS, assuming a consumption of 120 m3 per household (150 lcd) and the tariff rate at AMD 100 per cubic metre; and AMD 26 500 for Policy scenario, assuming the same level of water consumption, but higher tariffs (gradually increasing to AMD 220 per m3 in 2015).

The analysis shows that the two policy scenarios are affordable for most rural households. Problems may occur only for the poorest rural population (potentially some 35 000 households, i.e. some 10% of the total) in the Policy scenario. By these households could be compensated, for instance, through the general income support system already in place in Armenia, which appears to be quite effective and well targeted to the poor, and by applying other income policy instruments.

Table B: Estimated share of the water bill in rural household income, per income quintile, base year 2006 versus MWSS and Policy scenarios, with assumed optimistic (10% growth/year) and pessimistic growth (6% growth/year) of the real income of rural households in Armenia

	Share of water bill in household income				
Income quintile	**Base year 2006**	**MWSS 2015 optimistic**	**Policy 2015 optimistic**	**MWSS 2015 pessimistic**	**Policy 2015 pessimistic**
20% poorest	2,1%	1.8%	2.1%	2.6%	3.0%
2nd 20% population	1,7%	1.4%	1.6%	2.1%	2.4%
3rd 20% population	1,5%	1.2%	1.4%	1.8%	2.1%
4th 20% population	1,3%	0.9%	1.1%	1.4%	1.6%
20% richest	1,1%	1.1%	1.3%	1.5%	1.8%
Average	1,5%	1.3%	1.5%	1.9%	2.2%

* household expenditure were used as a proxy for household income

Source: based on Armstat, 2008 (rural income distribution per adult equivalent) and own assessment, 2008

Equally, the two scenarios in question (MWSS and Policy) are affordable for the public budget, as the needed international loans and allocations from the budget will vary from 0.33% to 0.2% of the central budget, and such a level of financing was already achieved in 2007-2008. The analysis has also revealed that the Maximal scenario would be too ambitious, non-affordable for rural households.

The analysis establishes that there is no serious affordability constraint for financing the two scenarios (MWSS and Policy). However, the existing large variation in the unit cost of water production makes it hard to address the affordability of water supply in smaller settlements. Larger water companies or public utilities serving many settlements of different size and applying a uniform tariff across the territory that they serve would be able to (a) enjoy economies of scale and (b) apply cross subsidisation between areas with different production costs, thus improving affordability for the poor, and (c) will in general have better access to the finance and skilled labour needed to properly operate and maintain the WSS systems. The scale of operations would also create other advantages (better technical skills, monitoring, administration, fee collection capacity) compared to small water utilities each serving only one rural municipality.

Financing of the scenarios

Though, presently, total annual expenditures are not enough to finance even the baseline expenditure. The following policy measures would, nevertheless, help close the gap:

- user charges should be increased gradually (to AMD 23 000 for MWSS scenario, and to AMD 26 500 for Policy scenario, compared to AMD 12 000 in the base year), keeping them below the affordability limit of 3% of household income.;

- collection efficiency shall be improved drastically – up to 100% of the billing;

- the loans committed from the Kreditanstalt für Wiederaufbau (KfW) and the Asian Development Bank (ADB) will be fully utilised s between 2008 and 2013 making about AMD 4 billion available for rural water supply in Armenia.

If such a high collection efficiency is not achieved, the losses in revenues should be compensated either from the public budget, or by setting higher tariff rates (i.e. at the expense of those households who timely and fully pay for water supply which is not a preferable option, of course).

Conclusions

The overall conclusion is that, although the financial challenges in the rural WSS are great, and presently financial resources are short, there is sufficient potential in Armenia to implement one of the two development policy scenarios (MWSS or POLICY), without much "pain" for the poorest part of the population or a too heavy burden on the public budget. With the safeguarded loans and budget for rural WSS, already a large part of the estimated financial gap can be covered. The affordability analysis shows that even under less favourable economic developments, the Policy scenario would be affordable.

Therefore, overall, the implementation of the financing strategy based on the Policy scenario would be more of an institutional and organisational challenge than a financial challenge.

Institutional changes required for the implementation of the Financing Strategy (FS)

It is clear that with the present institutional set up in rural settlements without WSC services it is not possible to implement the FS for rural WSS. Such settlements, especially those with no nearby water source, have to take care of all aspects (technical, financial, etc.) of the water supply system, while their financial (fiscal) and human resource capacity is often far from sufficient to address the challenge.

Therefore, institutional reform seems inevitable, including establishing larger water utilities or companies or expanding service areas of existing water utilities to cover such rural settlements. It will require some legislative actions to clearly define: the responsibilities of municipalities (for supplying drinking water to the population); and the rights of consumers (to have reliable supply of quality drinking water against timely payments); the role and legal position of public companies, etc. Obviously, these legal issues need to be addressed in a broader perspective (defining the role of municipalities in providing water supply to their population; establishing a sustainable framework for municipal finance).

Next steps towards the implementation of the FS

For the implementation of the financing strategy at the national level, the following actions should be considered:

- Establish government capacity to:
  - Collect and regularly update rural WSS data (financial, technical, etc.);
  - Co-ordinate various ongoing investment programmes (implemented with support from donors and International Financial Institutions (IFIs) and integrate them into a comprehensive WSS sector development programme);
  - Plan individual projects ;
  - Prioritise projects (based on transparent procedures) to be co-financed from the public budget,
  - Monitor progress in the WSS programme, ie project implementation and reporting (to the Government of Armenia, civil society and, where appropriate, IFIs);
- Adopt MWSS;

- Ensure integration of the FS into the PRSP, Medium-Term Expenditure Framework (MTEF), and annual budgets;
- Attract and safeguard financial resources (international and bilateral loans and grants, budget contributions) for the FS;
- Discuss the institutional future of rural WSS with all stakeholders (rural municipalities should be consulted on their preferences before final judgements on institutional structure are taken at national level) and undertake needed institutional reforms.
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1. INTRODUCTION

1.1. Rural Water Supply and Sanitation

Rural Water Supply and Sanitation (WSS) in many regions of the world is not as well developed as urban WSS. In many developing countries, this results in a far from optimal supply of water for large parts of the population. The situation for sanitation in rural areas is often even worse. The problematic situation with WSS is well recognised by the international community, by including targets for WSS in the Millennium Development Goals (MDGs) (see UN, 2000 and UN, 2007).

Whereas in many countries Financing Strategies (FS) have been developed for urban settlements, supported by tools like the Feasible model (see EAP TF/COWI, 2004 and, for example, OECD, 2004), there is a lack of knowledge and documented experience on the development of FS for rural WSS.

As an FS for rural WSS includes other issues and priorities than in urban areas, the Environmental Action Programme Task Force (EAP TF) of the OECD has initiated the development and application of tools for rural WSS. This has been done by developing a rural module in the Feasible model, as the costs functions for rural WSS differ from urban WSS, but also the ability to finance a strategy is different in rural areas. This new module on rural WSS was tested in this project.

This project was initiated by the OECD/EAP Task Force and was funded by the Department for International Development of the UK (DFID) and the EUWI. The project was executed in parallel with a project to develop guidelines for Financing Strategies for rural Water Supply and Sanitation. The State Committee of Water Systems (SCWS), the beneficiary of this project, agreed on the implementation in rural Armenia of this project aiming at developing an FS for rural WSS (supplementary to an earlier FS for urban WSS in Armenia). The project was executed in the period from January 2006 to March 2008.

1.2 Financing Strategy

Setting up an FS for rural WSS is a complex and diversified task. Various issues must be taken into account:

- Macro-economic issues like GDP, and economic growth;
- Rural income levels and distribution;
- Public budget (as share of GDP and recent performance);
- Current supply of WSS services and the technical solutions to improve the supply;
- Current expenditures, management, and payment for these services;
- Financing of infrastructural projects, and the involvement of national and international donors and IFIs;
- Implementation and financing gap;
- Organisation and implementation of WSS policies.

A Financing Strategy for rural WSS basically entails the following steps:

- Analyse the current situation of rural WSS and develop a baseline scenario:
  - Technical infrastructure and quality of the service;
  - Current expenditures and financing thereof by user charges, budget subsidies, loans, and grants;
  - Assess the difference between expenditures and available finance and develop a policy package to bridge the baseline financing gap;
  - Assess the affordability of the WSS for the rural population;
  - Assess legal and institutional situation.
- Design, analyse, and decide on policy (development) scenarios for rural WSS:
  - Set targets for extension of service and quality of WSS services;
  - Assess expenditure needs and available finance;
  - Assess affordability, adapt targets, and/or finance, if needed;
  - Assess needed legal and institutional changes;
- Implementation:
  - Establishing or nominating an implementing agency;
  - Adopting an action plan;
  - Adopting MWSS;
  - Integrating the FS into the PRSP, MTEF, and annual budgets.

The analysis of the current situation is included in a "baseline scenario" (or "no new policy" scenario). A baseline scenario simulates the current infrastructural, financial, and social situations extrapolated to the future. It assumes (in most cases) the same level of WSS services and structure of finance (unless clear investment and operational decisions on, for example, water tariffs are already planned).

In a baseline scenario, the current annual expenditures are estimated and compared with the revenues of user charges, (budget) subsidies, and loans/grants. If the revenues of user charges, budget, loans, and grants are smaller than the expenditures, a financing gap exists and a policy package to bridge the gap should be developed.

The aim of "policy scenarios" is to simulate development targets and policies. Targets are formulated (for example, based on MDGs), and expenditures are estimated, in combination with the assessment of (needed) additional financial sources (increasing revenues of user charges, loans, etc.). In principle, many scenarios can be simulated, so a choice has to be made between more or less realistic scenarios. This then should finally result in the formulation of a consistent policy package for a Financial Strategy for water supply and sanitation in rural settlements.

As developing an FS requires a lot of data, data processing, and estimations, it is inevitable that a tool should be used to structure at least most of the quantitative data on which the strategy will be based. In this project, the rural module of Feasible has been used, a model that enables simulations for rural WSS financing strategies.

More detailed information on key issues of rural WSS and the role of Financing Strategies can be found in Annex 1, while an FS methodology for rural WSS is presented in the methodological Guidelines (OECD/EAP Task Force, 2008, forthcoming).

1.3 Role of National Policy Dialogue in developing a Financing Strategy for rural WSS

In developing the FS for rural WSS in Armenia, the beneficiary was the State Committee for Water Systems, which involved the main stakeholders in the dialogue: water companies, ministries, committees, and other government agencies with ties to water policy (Ministry of Finance, Ministry of Environment, Ministry of Labour and Social Affairs, Ministry of Health, National Statistical Service, etc.), International Financial Institutions (KfW, ADB, World bank, EBRD), the National Statistical Service, NGOs, international organisations (OECD, EUWI, DFID, JICA, USAID, UN, etc.). A Steering Committee was set up to involve the main stakeholders in the policy dialogue and provide a platform for the dialogue.

In the first stage of the project, attention was paid to collecting information on rural water supply and sanitation in Armenia, to assess key problems and challenges facing the sector and the magnitude of the problem. In parallel, discussions with the Steering Committee served to agree on the issues to be studied (as the main objective was already set: develop a Financing Strategy on Water Supply and Sanitation for rural Armenia). *Inter alia*, it was decided that Armenia-specific sector development targets, more ambitious than official UN definitions of MDGs on WSS, would be based on a Minimal Water Supply Standard (MWSS), while the Consultant was invited to suggest feasible options for the definition of MWSS.

The Steering Committee also served as an important source of information (directly or indirectly) to the project team. Several informal meetings were organised for additional information collection.

After initial collection of relevant information, a baseline scenario was developed to describe a "business as usual" (or "no new policy") case for rural WSS (≈ extrapolation of the present situation). This was discussed in the Steering Committee and served as a basis for developing policy scenarios.

Options for policy targets were identified and simulated with the Feasible model, in order to show the consequences of certain policy choices (in terms of needed additional expenditure and finance).

During this stage, specific questionnaires were also developed by the project team, both for water companies and rural settlements without WSC services, in order to collect additional and more recent information.

As a result of the discussions within the framework of the National Policy Dialogue (NPD), two main scenarios were agreed on ("Minimal Water Supply Standards" and "Poverty Reduction Strategy & MWSS") for further analysis. The results of this analysis are submitted in this final report.

1.4 Report structure

This report has the following structure:

- A description of the current situation of rural water supply and sanitation, resulting in the definition of the baseline scenario;
- A description and presentation of the policy scenarios;

- A discussion on the affordability of the policies simulated;
- A discussion on institutional issues, linked with the implementation of the Financing Strategy;
- Conclusions and discussion.

The report includes the following annexes:

Annex 1: Key issues of rural WSS and the role of Financing Strategy;

Annex 2: National Policy Dialogue on Financing Strategy for rural WSS in Armenia;

Annex 3: Data collection, analysis, and delineation for scenario simulations with the Feasible model;

Annex 4: Survey in 150 rural settlements without services of water companies;

Annex 5: Example simulations;

Annex 6: Comparison of final with preliminary results;

Annex 7: Numeric data behind the graphs in the report.

1.5 Acknowledgements

The results of this project could not have been achieved without the assistance, guidance, and provision of information by many stakeholders in the drinking water sector. First of all, we are grateful to the Chairman of the Steering Committee, Mr Gagik Khachatryan, First Deputy Chairman of the SCWS and the Secretariat of the Steering Committee managed by Mrs Liana Karapetyan, who have paved the way for the implementation of this project.

We also would like to express our thanks for the active co-operation of the four water companies that serve rural settlements, the Ministry of Health, the Ministry of Social Affairs, the Ministry of Finance and Economy, the National Statistical Service, and representatives of Armenian NGOs. Important input was also obtained from the rural settlements themselves, by responding to the survey of the project team.

Moreover, valuable input to the project was provided by the JICA (sharing the results of a survey on rural WSS) and other international organisations (US AID, KfW, UNDP).

Finally, we would like to thank the EU and the DFID for their financial support of this project, and the OECD/EAP Task Force Secretariat, for their continuous guidance on the project.

2. PRESENT SITUATION AND CHALLENGES FOR RURAL WATER SUPPLY IN ARMENIA, DEFINING THE BASELINE

2.1 Introduction

Currently, rural water supply in Armenia can be characterised as a sector in transition. In the recent past, five water companies (as joint stock companies) have been created, both serving (most) urban settlements, and part of the rural population. In settlements without the services of these water companies, in most cases the water supply infrastructure is operated locally (municipality), and in some cases no centralised (piped) water supply is available.

The institutional changes already set in motion, need to be continued by creating a proper legal framework for the operation of (municipal) water supply and sewerage networks.

Of the rural population (of about 1.1 million inhabitants), only a part has access to on-plot water supply (in-house tap or yard tap). In the Poverty Reduction Strategy Paper (PRSP), the targeted improvement of rural **on-plot** water supply is set at 70% for 2015 (it was approximately 45% in 2000).

The current financial situation of rural water supply is far from sustainable. The established water companies have increased the collection of user charges in the last few years, but are unable to finance the needed renovations to the network, let alone an extension of the networks. In rural settlements without water company services, the situation is worse: in only 20% of these settlements, user charges are collected.

In this chapter, the current situation for rural WSS in Armenia is the starting point for the simulation of the baseline scenario, including its financial dimension.

In the baseline scenario the following assumptions have been applied:

- The level of water supply services will be kept at the current level;
- For the financing part of the scenario, policies under implementation (concerning collection of user charges, support from public budget, and loans) are simulated.

The baseline scenario thus shows whether the expenditures that are needed to operate the current infrastructure are covered by sufficient resources from user charges, public budget, and loans.

In the current situation, on the one hand, the present infrastructure is oversized in many villages. It also needs a lot of renovation. On the other hand, many other villages lack piped water supply (PWS). To assess the effects thereof on expenditures, the baseline simulations are threefold:

- A simulation with the oversized infrastructure;
- A simulation with an infrastructure based on EU design parameters;
- A simulation of the needed renovations.

2.2 Present state of the rural WSS infrastructure in Armenia

The present state of rural WSS in Armenia will be briefly discussed in this section. Three main elements will be discussed: institutional, technical (infrastructure), and financial aspects. The following description is mainly based on interviews with and surveys amongst water companies, and surveys on settlements without WSC services. More detailed information can be found in Annexes 3 and 4.

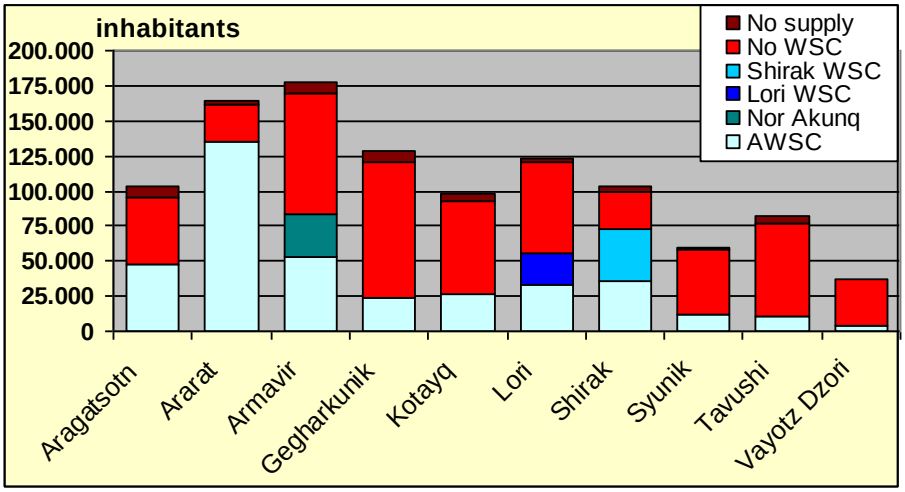
2.2.1 Institutional

In Armenia, four water companies are active in rural settlements:

- Armenian Water and Sewage Company (AWSC or Armvodocanal), which serves about 380 000 rural inhabitants in all 10 *Marzes*;
- Nor Akunq, which serves about 30 000 rural inhabitants in all Armavir *Marzes*;
- Lori Water and Sewage Company (Lori WSC), which serves about 20 000 rural inhabitants in all Lori *Marzes*;
- Shirak Water and Sewage Company (Shirak WSC), which serves about 35 000 rural inhabitants in all Shirak *Marzes*. (Note: Yerevan WSC also serves several small settlements in the **pre-urban** area of Yerevan City, but they were not included in the scope of the project)

In Figure 2.1, the way in which the water supply sector is organised in rural settlements in Armenia is shown graphically.

Figure 2.1: Rural water supply per *Marz* in Armenia, inhabitants per type of connection



In total, the four WSCs serve roughly 45% of all rural inhabitants. The remaining 55% of rural inhabitants is either served by locally operated water supply services or has no central water supply in place (4% of rural population).

The graph shows large regional differences: in Ararat, the vast majority of the population is served by a WSC, in some *Marzes* (Aragatsotn, Armavir, Lori, Shirak) about 50% of population is served by WSCs. In the other five *Marzes*, the vast majority of water supply is organised locally.

In order to implement a Financing Strategy for rural water supply, it will be necessary to strengthen the current institutional set up of the (rural) water sector:

- The current water companies have to renew their contracts and operational licences in the near future;
- The locally operated water supply networks will need to be embedded legally, in order to be included in the financing strategy;
- In settlements without central water supply, water supply services (and the legal structure) need to be set up.

As institutional changes are needed, the possibilities for the future need to be investigated. The pros and cons of possible organisational/institutional structures need to be made clear. In which direction the sectoral institutional set up needs to develop is subject to further discussion.

2.2.2 Water supply infrastructure

The current infrastructure for rural water supply is relatively old (the average age of the rural networks can be estimated at about 35 years[3]). Although the quality of the service is not always sufficient, Table 2.1 shows that, on average, per rural inhabitant, 400 litres of water per capita per day is produced[4] or in total 150 million m3 per year. On average, the WSCs produce twice as much water per capita as the water services in settlements not served by WSCs.

Table 2.1: Population served by central system

Region	connected population	water production, baseline current		water production, baseline adapted	
		lcd	mln m3/y	lcd	mln m3/y
Aragatsotn	46 098	253	4.3	117	2.0
Ararat	26 024	125	1.2	77	0.7
Armavir	81 356	256	7.6	88	2.6
Gegharkunik	92 272	294	9.9	93	3.1
Kotayq	63 400	275	6.4	102	2.4
Lori	61 984	152	3.4	74	1.7
Shirak	24 962	294	2.7	97	0.9
Syunik	43 239	274	4.3	99	1.6
Tavush	61 955	296	6.7	94	2.1
Vayots Dzor	32 248	474	5.6	94	1.1
AWSC	362 566	658	87.1	132	17.5
Nor Akunq	29 485	29	0.3	127	1.4
Lori WSC	21 044	416	3.2	75	0.6
Shirak WSC	34 797	516	6.6	108	1.4
No supply	**(40 624)**				
no WSC	574 162	248	52.0	87	18.2
WSC	447 892	594	97.1	127	20.8
Total	981 430	400	149.2	92	38.9

Source: analysis TME-survey, statistical information (population) and Feasible output (water production baseline adapted for western European standards)

On the right hand side of the table an estimate is also given of water supply, if western European standards for water demand were to be applied in rural Armenia. This would lead to a three times lower demand (and thus production) as in the current situation.

Apart from the quantity of water available in rural settlements, the quality[5] also needs some discussion. As stated in the introduction, the PRSP target for rural water supply is 70% on-plot connection by 2015, whereas in 2000 about 45% of the rural population had on-plot supply.

[3] Based on the analysis of the results of the 2007 survey on rural water supply and sanitation.
[4] This does not necessarily mean that 400 lcd is also consumed, due to losses in the network, public use, and use for irrigation.
[5] In terms of distance between supply and user.

Figure 2.2: Type of connection of rural population to water supply, 2006

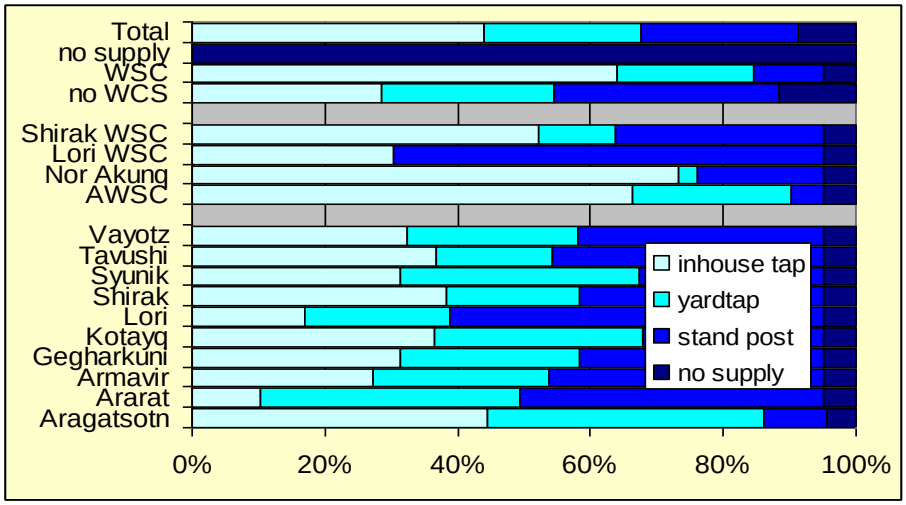
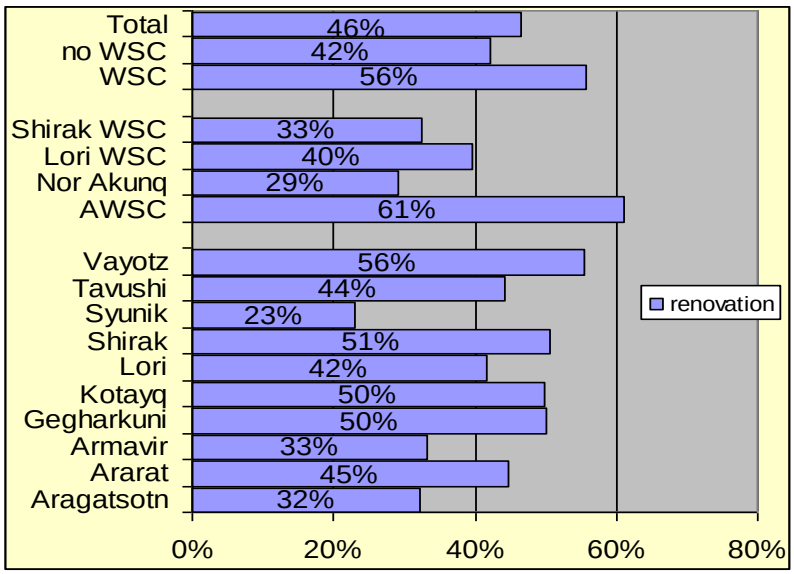


Figure 2.2 shows the current (2006) situation of rural water supply, which is based in surveys and interviews by the team. Overall, the on-plot supply has improved during the last few years. It is now assessed that about 68% of the rural population has on-plot supply (upper bar in the graph). In settlements served by WSCs, on-plot supply is over 80%; in rural settlements without a WSC service, on-plot supply is estimated at about 55%. Still, for about one third of the rural population in Armenia, water needs to be collected at community taps (often far from the house) or from springs, own wells, etc.

The state of the current water supply infrastructure can also be characterised by the need for renovation. All water companies were asked to specify the need for renovation of their infrastructure. The survey of the JICA on water supply in settlements without WSC services also provides some information on this.

In Figure 2.3, an indication is given of the needed renovation of the water supply infrastructure, for the water companies, and for settlements without WSC services.

Figure 2.3: Needed renovation of water supply infrastructure of WSCs and of settlements without WSC service (*in percent of the replacement value of present fixed assets)*



It can be seen that, on average, almost 50% of the water supply infrastructure needs to be renovated. For rural settlements served by WSCs, the need for renovation varies from about 30% to over 60% (AWSC) In rural settlements without WSC services, the average need for renovation is estimated at 42%, but as Figure 2.3 shows, there is a large variation between regions.

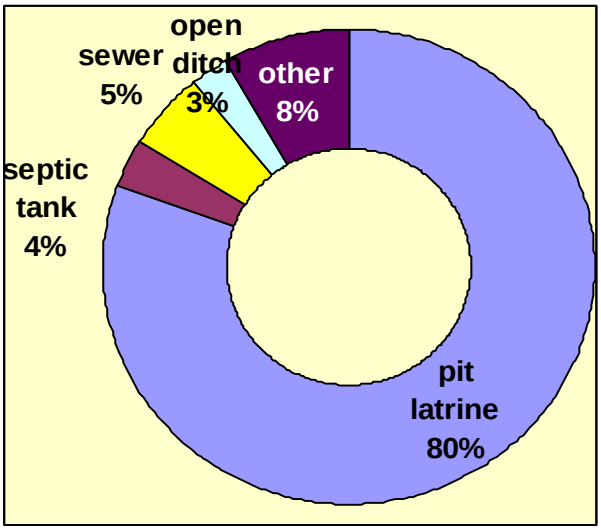
The renovation needs reveal that the current technical state of the water supply infrastructure is far from optimal. It thus can be anticipated that, apart from achieving policy targets, large investments will be needed for renovation.

2.2.3 Sanitation infrastructure

For sanitation, the situation is less detailed (than for rural water supply), as no reliable statistics exist on the sanitation situation in rural areas. According to the statistical yearbook, some 3% of the rural population had access to sewerage in 2004 (ARMSTAT, 2005). Other (indirect) information on sanitation is the type of toilets households use: according to the Census in 2000 (Armstat, 2000, census data on type of toilet), 21% of the rural population used flush toilets (which also may indicate use of a somewhat more advanced system than just a pit latrine, for example septic tank or sewerage), the others a non-flushing toilet.

The following graph – based on results of the survey carried out in 150 rural settlements (see Annex 4) – confirms this.

Figure 2.4: Type of connection of rural population to sanitation, 2006



According to the results of this survey, most rural households use pit latrines for sanitation. Sometimes (4% of cases) septic tanks are used, whereas 5% of the rural population has access to sewerage.

2.2.4 Expenditures and revenues

Currently, no statistical information is available on the expenditures and financial status of (rural) water supply in Armenia. Surveys amongst water companies and settlements without WSC services give some basic information on the current financial status of rural water supply.

Table 2.2: Estimated expenditures and financing thereof, of rural water supply by water companies and settlements without WSCs, 2006, in mln AMD/y

	Estimated expenditures	Financed by user charges	Financed by budget	Expenditures per capita AMD/y
water companies	1 627	980	647	3 632
no WSC	345	65	175	601
Total	1 972	1 045	822	1 929

Source: survey by project team

The present total expenditures for rural water supply are estimated at almost AMD 2 billion (≈ € 4.4 mln)[6]. Although the rural population in settlements without WSC services (574 000) is larger than the rural population served by WSCs (447 000), the estimated present expenditures for water supply are **five times lower** in settlements not served by WSCs.

This becomes even clearer, when the expenditures per capita are compared: on average, the present per capita expenditures in settlements served by WSCs are estimated at AMD 3 600 per year (≈ € 8 per year), in settlements without WSC services present, per capita expenditures are estimated at AMD 600 per year (≈ € 1.34 per year).

Slightly more than half of the expenditures is financed by the revenues of user charges; the rest is financed by budget contributions. For a small part of expenditures of settlements without WSC services (AMD 105 million) it is not clear how they are financed. For WSCs, the expenditures are estimated by summing user charges revenues and budget contributions.

It can be concluded that the present level of expenditures for rural water supply is (very) low. If expenditures would be estimated on the basis of water production and average tariff (assume AMD 100 per m3), annual per capita expenditures would be estimated at AMD 21 000 in case of WSC services (365 days * 594 lcd * 0,1 AMD/litre), AMD 9 000 in case of no WSC services (365 days * 248 lcd * 0,1 AMD/litre). This would be six to 15 times more than recorded present expenditures.

Expenditures for sanitation are mainly private. Pit latrines are typically constructed by the inhabitants themselves, bringing costs down to (construction) materials and own labour input. Public expenditures may be limited to operation and partial maintenance of sewerage and septic tanks at public buildings (schools, public buildings, hospitals). The current level of expenditures is not known, but it is clear that the level of public expenditures is minimal.

2.3 Baseline scenario

A baseline scenario can best be described as a "no new policy" or "business as usual" scenario in which the existing situation concerning rural water supply and sanitation is represented and extrapolated into the future. Only improvements which: (a) are being implemented, or (b) have been planned for the near future should be taken into account, if sufficient funds for the ongoing or future improvements are firmly committed. It serves as a **reference scenario** for the development of a financing strategy for rural WSS.

The key issues a baseline scenario should address are:

- Is the current trend sustainable?
- Where does it lead?

[6] The exchange rate applied in this report is AMD 450 per €.

- What are the key risks associated with the current trend?
- What are the priorities for policy-making (regions and territories, user groups, etc.).

A baseline scenario thus already supports the policy dialogue and helps identify the key variables that will be used to design development scenarios. In the baseline, current levels of WSS services will be kept similar to the base year, user charges (if existent) will remain constant (unless decisions have already been taken on changing water tariffs) as will donations from local or central budget. In case grants or loans are already committed, these also should be taken on board in the analysis.

By comparing the annual expenditures needed to keep the existing infrastructure running with the projected revenues from charges, grants, loans, and budgets, the baseline scenario gives an indication whether the current financing of expenditures is sufficient. If this is the case, this results in either a break-even situation (expenditures are just covered by revenues) or a financing surplus (revenues cover more than expenditures, leaving room for some additional expenditure). If revenues fail to cover all expenses, there exists a "financing gap".

Moreover, the affordability (in terms of the share in incomes of the water bill, for rural households and the public budget and for the economy as a whole) is addressed for the baseline scenario. For practical reasons this assessment is combined with the affordability issues of policy scenarios and addressed in a separate chapter.

The simulation of a baseline involves the following steps:

- Assessing the current technical WSS infrastructure and performance (which has already been discussed in the previous sections);
- Assessing the infrastructural costs: capital costs, operation and maintenance, renovations of the different elements of the WSS infrastructure (water intake, transmission, distribution, sewerage, sewerage treatment) (see the following sections and also Annex 3);
- Assessing the available finance from different sources: user charges, public budgets, loans, and grants;
- Assessing the financing gap and developing a policy package to bridge the gap;
- Assessing affordability (see Chapter 4).

The description of the current situation is the starting point for defining the baseline scenario. As already shown, the current situation has, *inter alia*, the following features:

- An oversized water supply network in some villages on the one hand, and a lack of piped systems in many other villages, on the other;
- Large need for renovation;
- Limited financial resources.

As the baseline scenario is the backbone for policy scenarios for the future development of WSS in rural Armenia, the baseline needs to be defined in such a way that it enables development of a proper rural water supply and sanitation infrastructure.

For this reason the following distinction is made:

- A baseline simulation based on the current levels of water supply (assuming an oversized network);

- A baseline scenario based on the defaults in the Feasible model (western European standards for water supply demand[7]).

By comparing the results of these two simulations, an assessment can be made of the differences in operational costs, and (re) investments between these two scenarios. It will also show to what extent the current capacity of the water supply infrastructure needs to be reduced to comply with EU standards and the consequences thereof for costs and investments/renovations.

2.4 Baseline expenditures

2.4.1 Annual expenditures for water supply

In the baseline simulations, the expenditures for water supply have been estimated by using international price levels (except for labour, where the costs have been assessed at about one-third of the international defaults). Initially, two simulations were made for the expenditures:

- Baseline assuming the present (excessive) capacity (150 mln m3/year);
- Baseline with the capacity of present rural WSS infrastructure adapted for EU water demand standards (38 mln m3/year).

The results of this assessment are shown in the next table.

Table 2.3: Estimated total expenditures, operation and maintenance costs, and re-investments expenditures, baseline scenario for rural Armenia, in million AMD per year[8]

Region	Baseline capacity			Present capacity		
	Operation & maintenance	Re-investment	Total expenditure	Operation & maintenance	Re-investment	Total expenditure
Aragatsotn	52	66	117	42	52	94
Ararat	18	20	37	15	17	32
Armavir	71	63	134	44	44	88
Gegharkunik	93	113	206	65	80	144
Kotayq	128	164	292	92	117	208
Lori	102	131	232	80	103	183
Shirak	40	49	88	27	32	59
Syunik	124	156	280	81	102	183
Tavush	106	131	237	68	86	154
Vayots Dzor	65	83	148	36	47	83
AWSC	785	1 007	1 791	486	619	1 105
Nor Akunq	22	24	45	27	28	54
Lori WSC	27	34	60	15	19	35
Shirak WSC	41	52	92	26	33	59
No WSC	797	975	1 772	550	680	1 229
WSC	873	1 116	1 989	554	699	1 253
Total[9]	**1 671**	**2 091**	**3 762**	**1 103**	**1 379**	**2 482**

Source: assessment TME with Feasible, 2008.

[7] 150 lcd for in-house taps, 100 lcd for yard taps, and 40 lcd for standpipes.

[8] The original calculations are made in Euros. The exchange rate applied is AMD 450 per euro.

[9] Total may deviate from the calculated sum due to rounding.

To operate and (minimally) maintain the present infrastructure, the simulation shows that, annually, AMD 1.67 billion is needed, or about AMD 1 500 per inhabitant per year. For the re-investments (which are needed to maintain the value of the infrastructure at the current value), slightly more than AMD 2 billion per year would be needed.

Therefore, if the present state of the infrastructure is taken as the starting point, annual needed expenditures can be assessed at AMD 3.7 billion (≈ € 8 mln). This is almost two times higher than the actually recorded present expenditures of AMD 2 billion (see table 2.4, column "present expenditures").

Table 2.4: Estimated expenditures and financing thereof, of rural water supply by water companies and settlements without WSCs, 2006, in mln AMD/y

	Present expenditures	Expenditures estimated with Feasible	Feasible estimates/present expenditures, %%
Water companies	1 627	1 989	122%
No WSC	345	1 772	514%
Total	**1 972**	**3 762**	**191%**

Source: team surveys and Feasible model

Table 2.4 shows that the estimated needed expenditures for WSCs are more or less in line with the currently recorded expenditures (though some 22% higher). However, for settlements without WSC services, present expenditures are a factor five lower than the estimated expenditures by Feasible. This last result indicates a considerable lack of funds, making even operation and maintenance difficult, of the WSS infrastructure in settlements without WSC services.

If the water supply infrastructure in the baseline is modelled with EU standards for water demand, the estimated operational and (re-)investment costs are about 35% lower. The EU standards for water demand are taken as the starting point for the policy scenarios to be discussed in the next chapter. If planned renovations are also taken into account, the additional expenditures for the years 2006–2008 can be roughly assessed as follows:

Table 2.5: Estimated expenditures between 2006–2008 for renovations of the existing infrastructure, baseline scenario for rural Armenia, in million AMD per year

Region	2006	2007	2008
AWSC	760	760	760
Nor Akunq	160	160	160
Lori WSC	310	310	310
Shirak WSC	340	340	340
Total	**1 570**	**1 570**	**1 570**

Source: own assessment, based on available loans and grants, 2008

The estimate of expenditures for renovations is limited to the settlements serviced by water companies. These companies have acquired (international) loans, which are used for renovating and upgrading the existing infrastructure. The amounts in the above table have been estimated by means of the needed renovation (which is specified by the water companies), and the available budgets for rural WSS from loans.

2.4.2 Investments and renovations, water supply

In the previous section, renovations were only partially assessed, and over a limited period. To make an assessment of further renovations requires an assessment of the total value of the water supply infrastructure and assumptions on the pace of renovations.

Table 2.6: Current and baseline investment stock replacement value, total needed renovation and annual renovation (8%), (AMD x million)

	Current investment stock	Baseline investment stock	Renovation total	Renovation & renewal total	Annual renovation
WSCs	44 640	27 972	16 161	20 949	1 293
No WSCs	38 988	27 180	11 347	14 707	908
Total	**83 628**	**55 152**	**27 508**	**35 656**	**2 201**

Source: simulations with Feasible, assumption on pace of renovation

The current investment stock for rural water supply in Armenia has a replacement value of AMD 84 billion (≈ € 186 million). As the current infrastructure is oversized, the needed renovation should be assessed on the basis of the baseline investment stock[10], but the optimisation will also lead to expenditures.

The value of the (optimised) baseline investment stock is estimated at AMD 55 billion (≈ € 123 million), one third lower than the current investment stock.

If the baseline infrastructure is the basis for estimating the needed renovations (50%), the investment for renovations can be assessed at AMD 27.5 billion (≈ € 62 million). But as the infrastructure is presently oversized, optimisation will also lead to additional capital costs, pushing up the total costs of renovation by possibly 30% (to AMD 35 billion [≈ € 79 million]).

The annual renovation needs can be estimated by assuming a time period to complete the needed renovations. In this assessment, a time period of 16 years has been assumed (based on AMD 35 billion total renovation investment). This results in 6.4% renovations or AMD 2.2 billion annually (≈ € 5 million or AMD 2 050 per inhabitant, which is less than € 5 per rural inhabitant per year).

2.4.3 Expenditures for sanitation

As sanitation is mainly organised privately, in the baseline, the costs can largely be ignored. For the households, costs of pit latrines may vary largely, from no to little costs, if the latrine is constructed by the household itself. The costs may vary widely, depending on whether cement is used or not, if wood is available, etc. In the Feasible model, the costs of a pit latrine for the average household (3.5 inhabitants) are estimated at between AMD 80 000 and AMD 180 000 (€ 180-€ 400, [about € 50–100 per inhabitant]).

For the public sector, costs are limited to connection to a pit latrine, septic tank, or sewerage, but as indicated before, no information is available.

2.5 Financing

For financing of the operation, maintenance, and renovations of the rural water supply infrastructure, four different types of revenues can be distinguished:

- User charges;

[10] This assumes that the future water supply infrastructure in rural Armenia will be adapted to the EU standards for water supply.

- Budget subsidies;
- Loans;
- Grants.

In the baseline, the first three of these have been assessed.

2.5.1 Revenues from user charges

Revenues from user charges for water services constitute an important part of total revenues. Total revenues from user charges can be estimated by the following formula:

(total amount billed) x (collection rate)

The "Total amount billed" can be estimated from:

("water use" (in m3)) x ("water tariff" (in monetary units per m3)),
or by
("number of clients") x ("standard water fee per client[11]),
or a combination of both.

The annual revenues from user charges have been estimated for water companies and settlements with (own) piped supply.

Two estimates have been made:

- One for the base year (2006);
- One for the target year (2012 for WSCs, 2015 for settlements without WSC service), for which it is assumed that the collection rate can be increased to the level of consumers that have on-plot water supply.

For each of the water companies and the group of settlements with own municipal water utilities, a short explanation is given on the estimated revenues.

Armavodakanal (AWSC)

Current revenues of the water charges are estimated as follows:

- Total revenues from water charges are estimated roughly for the whole company at AMD 2 000 million;
- The share of rural clients in total is assessed at roughly 111 300 of a total number of clients of 262 100 (42%);
- Rural revenues are assessed at AMD 849 million.

For the future, revenues can be assessed as:

- 120 m3 water sold per household (average of 3.5 people per household) per year;
- Water supply tariff will be AMD 100 per m3;
- There will be 111 300 clients;

[11] This should be calculated for each group of customers and then summed up.

- Collection rate increases to 95% (in 2012);
- Total potential revenue will be AMD 1275 million.

Nor Akunq

Current revenues of the water charges are estimated as follows:

- Total revenues from water charges are estimated roughly at AMD 171 million (2006);
- The share of rural clients in total is assessed at roughly 5 280 of a total number of clients of about 60 000 (9%);
- Rural revenues have been assessed at 9% of AMD 171 million (= AMD 15 million).

For the future, revenues can be assessed as:

- 120 m3 water sold per household per year;
- Water tariff will be AMD 121 per m3;
- There will be 5 280 rural clients;
- Collection rate increases to 80%;
- Total realistic potential revenue will be AMD 62 million.

Lori WSC

Current revenues of the water charges are estimated as follows:

- Total revenues from water charges are estimated at roughly AMD 247 million (2006);
- The share of rural clients in total is assessed at roughly 7 500 of a total number of clients of about 38 000 (20%);
- Rural revenues are assessed at 20% of AMD 247 million (= AMD 49 million).

For the future, revenues can be assessed as:

- 120 m3 water sold per households per year;
- Water tariff will be AMD 92 per m3;
- There will be about 7 500 rural clients;
- Collection rate increases to 68% (2012);
- Total realistic potential revenue will be AMD 56 million.

Shirak WSC

Current revenues of the water charges are estimated as follows:

- Total revenues from water charges are estimated at roughly AMD 430 million (2006);

- The share of rural clients is 15.5%;
- Rural revenues are assessed at 15.5% of AMD 430 million (= AMD 67 million).

For the future, revenues can be assessed as:

- 120 m3 water sold per households per year;
- Water tariff will be AMD 100 per m3;
- There will be about 9 800 rural clients;
- Collection rate increases to 67% (2012);
- Total realistic potential revenue will be AMD 79 million

For future revenues, it is assumed that the collection rate (64% in 2006) will increase to 92% in 2009, leading to increased revenues of rural water supply, to AMD 96 million.

Settlements without water company services

About 50% of the rural population has access to piped water, served by public (also called collective or centralised) water supply systems, but not by water companies. Basically, respective rural municipalities operate and maintain the existing water infrastructure.

Current revenues of user charges are derived from the results of the survey (see Annex 1):

- Revenues of user rural charges are estimated at AMD 48 million in 2006 for eight of the 10 *Marzes*, by analysing the results of the team survey (Annex 1);
- Taking into account the two missing *Marzes*, revenues will be 20 to 25% higher;
- Total revenues of user charges in settlements without WSC services can be estimated at AMD 65 mln (2006; for 2007 a 10% increase will be assumed).

For the future, revenues can be assessed as:

- 120 m3 water sold per household per year;
- Water tariff will be AMD 100 per m3;
- There will be about 150 000 potential clients;
- The collection rate will increase to 62% (2012);
- Total realistic potential revenue will be AMD 1 116 million.

The results of this assessment are shown in the next table.

Table 2.7: Estimated revenues of water charges in rural settlements in Armenia, base year and maximal realistic potential (see explanation in text) in the baseline (in mln AMD per year)

	AWSC	Nor Akunq	Lori WSC	Shirak WSC	Rest of settlements	Total
User charge revenues, 2006	849	15	49	67	65	1 045
Number of rural customers	111 300	5 280	7 500	9 800	150 000	
% of customers with on-plot supply	95%	80%	68%	67%	62%	
Projected water use per year per household (m3)	120	120	120	120	120	
Price (AMD/cubic metre)	100	121	92	100	100	
Charge revenues, potential 2012/2015	1 270	60	55	80	1 110	2 575

Source: own assessment, 2006-2007

The assessment shows that the total revenues in the base year are estimated at about AMD 1 billion. The assumption concerning increased collection – but also the projected water use per customer in 2012/2015 – leads to total potential revenues of about AMD 2.5 billion per year in 2015.

2.5.2 Revenues from budget contribution and loans

For budget contributions and loans, assumptions are made on the "rural" share of total subsidies and loans allocated for rural WSS. The following table gives an overview of the basic elements of the assessment.

Table 2.8: Estimated contributions from budget and loans to water companies in Armenia, for WSS in Armenia, total and estimated rural share, in the baseline (in AMD x 1 million)

	AWSC	Nor Akunq	Lori WSC	Shirak WSC	Total
Budget subsidies 2006	1 500	116	-	-	1 616
Budget subsidies 2007	1 200	70	-	-	1 270
Loans/grants 2005 – 2008 (€ x mln)	13.4	13.2	11.4	14.6	52.6
Loans/grants 2005 – 2008 (AMD mln)[12]	6 033	5 940	5 130	6 570	23 673
Estimated share of rural WSS	42%	9%	20%	15.5%	

Source: SCWS, water companies, and own assessment, 2006/2007

In the next table the contribution from the public (central) budget and loans for rural WSS in Armenia is assessed, based on the assumption that in the year 2005, 10% of the loans is used, whereas for 2006, 2007, and 2008 it is assumed that, each year, 30% of the loans will be disbursed.

For the municipalities without a water company, subsidies from (local) budgets have been estimated at AMD 175 million annually (see Annex 1).

[12] To assess the value of the loans in local currency, an exchange rate of 450 AMD per € is applied.

Table 2.9: Estimated contributions from central and local budgets and loans to water companies in Armenia, for rural WSS in Armenia, 2006-2008, in the baseline (in AMD x 1 million)

	AWSC	Nor Akunq[13]	Lori WSC	Shirak WSC	No WSC	Total
Budget contributions 2006	637	10	-	-	175	822
Loans 2006	760	160	308	339		1 568
Budget contributions 2007	510	6	-	-	175	690
Loans 2007	760	160	308	339		1 568
Budget contributions 2008	-	-	-	-	175	175
Loans 2008	760	160	308	339		1 568

Source: SCWS, water companies, and own assessment, 2006

The table shows that, in the period 2006–2008, considerable additional finance is available for rural WSS, due to budget contributions and loans. However, it also shows that contributions of the central budget are phased out by 2008, and after 2008 no loan agreements are in place in the baseline. So from 2009 onwards, there will be a considerable drop in financial resources, if no additional financing sources become available.

2.5.3 Total financial resources for rural water supply

Finally, all identified financial sources in the baseline are summarised in the following table, showing the projected development for each of them.

Table 2.10: Estimated financing sources for rural WSS in Armenia, 2006-2015, in the baseline (in AMD x 1 million)

Financing source	2006	2007	2008	2010	2012	2015
User charge revenues	1 045	1 131	1 343	1 768	2 192	2 583
Budget	822	690	175	175	175	175
Loans	1 568	1 568	1 568	0	0	0
Total Financial sources	3 434	3 389	3 086	1 943	2 367	2 758

Source: own assessment, 2006

It can be seen, in Table 2.10, that the financial resources in the baseline scenario are relatively "abundant" in the first three years of the period till 2015. Afterwards, the loss of financing from budget and loans is only partially compensated by the projected increase in revenues from water user charges.

2.6 Financing gap/surplus

In the baseline scenario the (needed) expenditures are compared with the available financial resources. If these resources are higher than expenditures, there is a financing surplus; in the case where financing resources do not cover all expenditures, there is a financing gap.

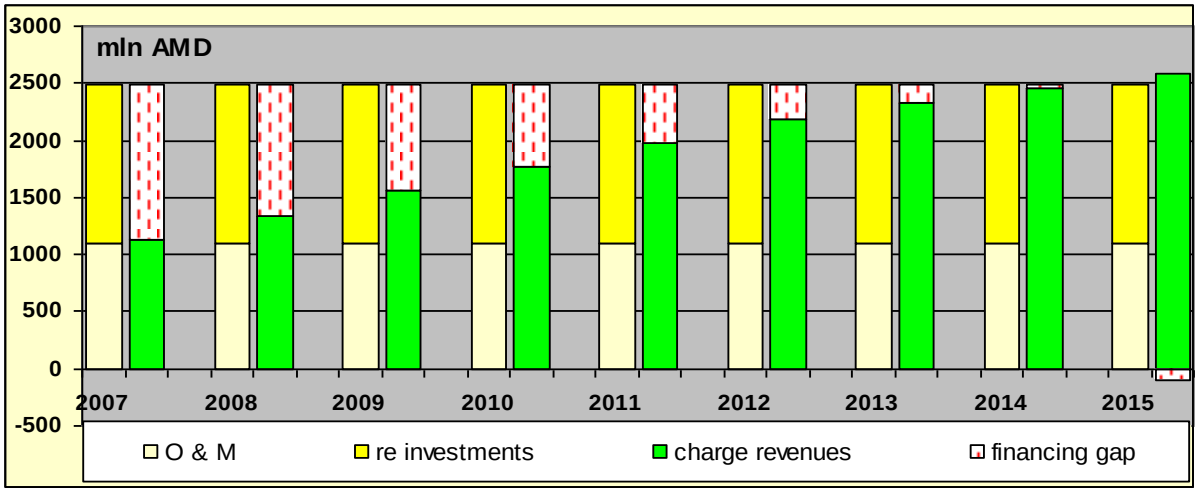
In case of a financing gap, some of the needed expenditures cannot be covered, leading to lower service levels, bad maintenance, and lack of reinvestments, resulting in a deterioration of the water infrastructure.

In the next two figures, the way in which the financing gap can be analysed is illustrated.

[13] The actual amount available for 2007 is € 0.5 mln (which is less than what has been projected in the baseline).

Figure 2.5 shows, on the one hand, the needed expenditures for operation and maintenance, and on the other hand, the revenues from user charges. In the figure, the renovation of infrastructure is excluded, as well as budget subsidies and loans.

Figure 2.5: Estimated financing gap for rural WSS in Armenia, without renovations, budget contributions, and loans, 2006 – 2015, in the baseline (in AMD x 1 million)

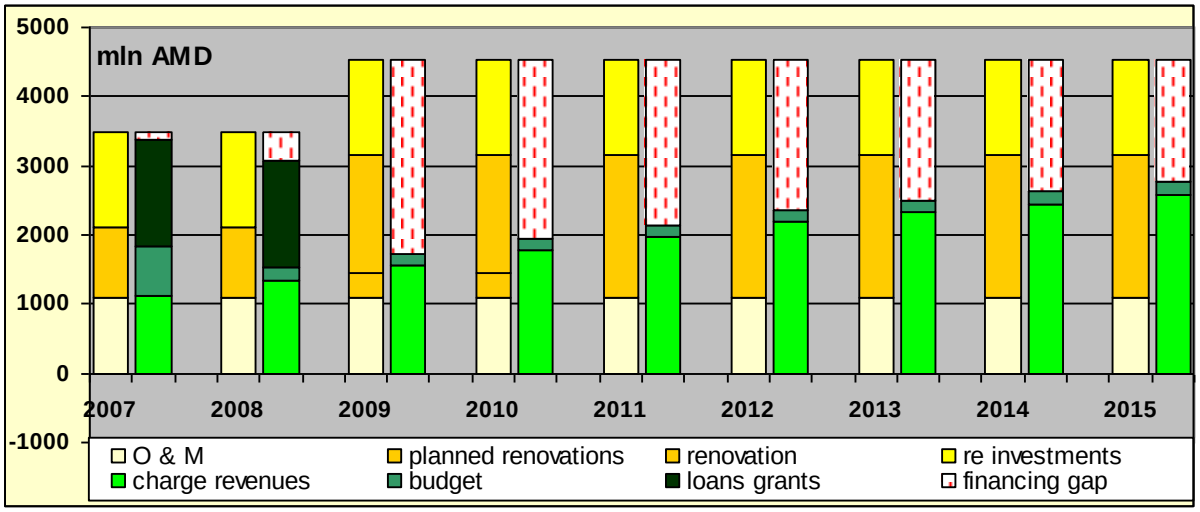


Source: own assessment, 2008

The figure clearly shows a large financing gap. Although user charge revenues are enough to cover operation and maintenance costs, funds for reinvestments are almost non-existent in the first years of the period 2006–2015. The situation improves, as a result of the assumed increase of revenues from user charges, and by 2015, it is projected that revenues from user charges will be enough to cover the operation and maintenance costs, as well as to set aside for re-investments.

In the next figure, the renovations of infrastructure and the additional financial resources from budget and loans are also included. For the renovations, in 2007 and 2008 the planned renovations are taken into account. Then, from 2009 onwards, it is assumed that of the total needed renovations of the WSS networks, 8% will be renovated each year (which means that in 12.5 years time the rural WSS infrastructure will be totally renovated).

Figure 2.6: Estimated financing gap for rural WSS in Armenia, including renovations, loans, and budget subsidies, in the baseline (in AMD x 1 million)



Source: own assessment, 2008

Figure 2.6 reveals that, although expenditures in 2006–2008 are about 50% higher due to renovations, the financing gap in the first two years is close to zero. However, as a result of a lack of financial resources from 2008 onwards, expenditures cannot be kept at the level of 2006–2008.

Therefore, the initial assessment of the financing gap in the baseline reveals that too few funds are available to finance all necessary expenditures from 2008 onwards. Estimated expenditures needed are AMD 39 billion (≈ € 87 million), whereas financing would be limited to AMD 22.5 billion (≈ € 50 million) in the period 2007–2015. The financing gap can thus be estimated at, in total, AMD 16.5 billion (≈ € 37 million, concentrated between 2009–2015).

Closing the baseline annual financing gap

As can be seen from the chart, in 2009-2015 the revenues from user charges will be enough to fully cover operation and maintenance costs, while there will be a lack of financing for re-investment (to compensate for depreciation of fixed assets and maintain their value at a constant level) and for renovations (to upgrade the level of services).

With more or less fixed revenues from user charges (tariffs do not change, but collection increases), the only way to finance needed re-investments and renovations is to allocate more funds from the central public budget and/or attract more international loans and grants.

The annual financing gap could be closed if, over 2009-2015, allocation from the public budget, together with new grants and loans, amounted to AMD 16.5 billion (maximally AMD 2.8 billion in 2009; AMD 1.8 billion in 2015). This would comprise some 0.46-0.3% per cent of estimated public revenues (2009). This corresponds to the level of the central budget contributions and loans allocated for rural WSS in 2007-2008 (they amounted to AMD 3.65 billion, or on average 0.33% of the central budget for 2007-2008[14]).

Therefore, the needed additional finance for RWSS from budget, loans, and grants would not differ much from the already committed budget contributions and loans (for 2007 and 2008).

[14] According to the MTEF of the Ministry of Finance and Economy, budget expenditures are (estimated at) AMD 524 billion in 2007, AMD 589 billion in 2008, and AMD 607 billion in 2009.

2.7 Key problems and challenges facing rural WSS in Armenia

From the baseline assessment the following, interlinked, conclusions can be drawn concerning the rural Water Supply and Sanitation:

- The institutional set up needs further development;
- The WSS infrastructure needs renovation and improved maintenance;
- There is a lack of revenues for financing the needed actions.

Institutional

For rural WSS in Armenia, WSS institutions need to be developed further:

- Only 1/3 of rural settlements is served by professional water companies;
- Two thirds of rural settlements lack an institutionalised set up in the WSS sector.

Although it can be imagined that local/municipal water utilities could deal with rural WSS, this does not solve the existing problems (a single municipal water utility would lack the basic skills and [financial, administrative, and technical] knowledge to further develop WSS infrastructure), simply because the scale of the settlements (on average some 1 100 inhabitants per community) is too small.

However, this does not necessarily mean that all settlements should be served by water companies; it can also be imagined that municipalities associate, in order to have access to better skilled labour and specialised personnel, when needed.

An important prerequisite for institutional reform is the development of a proper legal framework for water supply and sanitation. This would, for example:

- Establish the right to water supply for the population;
- Establish the obligation of municipalities to supply water to those who demand it and are willing to pay;
- Establish a legal framework for public companies;
- Establish a legal framework for association of municipalities.

WSS infrastructure

The existing rural WSS infrastructure is far from optimal:

- Renovation of about 50% of the existing network is needed;
- About 40 000 rural inhabitants currently have no access to piped water supply;
- The level of on-plot service should still be increased considerably to meet the MDGs on WSS in rural Armenia.

Centralised sanitation (sewerage and sewage treatment) lacks almost everywhere (although this is not necessarily a problem in rural areas).

These problems are interlinked with the lack of funds.

Lack of revenues

The baseline analysis shows that even to sustain the WSS infrastructure at the existing level will be a challenge with the financial funds now available. This can be explained by the fact that water tariffs are relatively low, and the additional problem that many users do not pay for the water services. This seems to be a vicious circle in that users complain about the level of service and are therefore not (very) willing to pay, while municipalities/owners lack revenues from user charges just to sustain the level of service, never mind improve it.

Funding from the public budget is also a problem. Operational subsidies to water utilities from the central budget are to be phased out[15], while contributions from international loans (and the required Armenian contribution from the central budget to the capital investment projects financed from the loans) are scheduled till only 2010, making it uncertain for water companies how to finance, in the (near) future, needed investments in WSS infrastructure.

On the one hand, in communities with their own water utilities, contributions from the local budget are minimal or absent as local communities hardly have any financial means at all. Moreover, the revenues of user charges in these settlements are minimal compared to settlements served by WSCs.

On the other hand, the level of financing from the public budget and/or international loans and grants – allocated specifically for re-investments and renovations – needed to close the baseline annual financing gap looks quite realistic. Hence, more ambitious targets than just maintaining the present situation could and should be considered.

[15] Although in the poverty reduction strategy paper it is stated that budget contributions are needed for (re) investments.

3. POLICY SCENARIOS

3.1 Introduction

A policy scenario normally deals with changing policies towards a higher level of WSS services. The issues addressed in a policy scenario can be technical (for example increasing water quantity, increasing the connection rate of population to the water network) but also financial (for example assessing the level of user charges required to achieve certain technical targets).

3.1.1 Developing a policy scenario

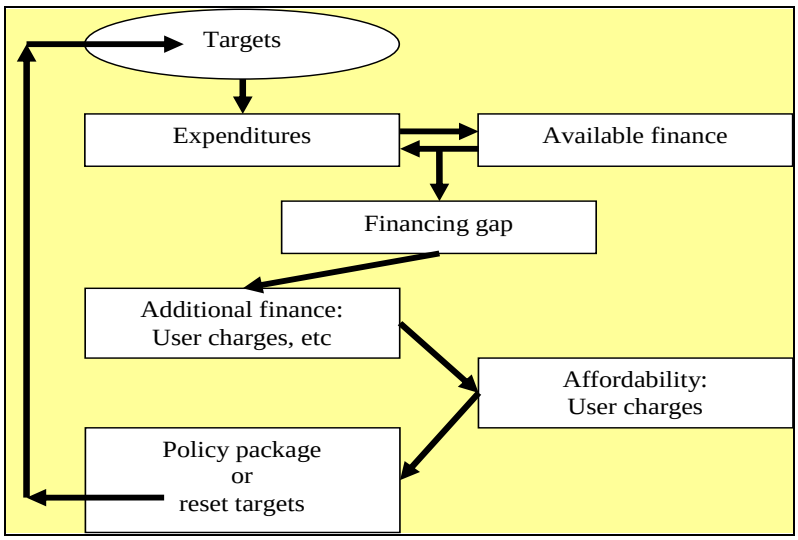
For the development of a policy scenario, the results of the baseline scenario form an important input. In this study, the baseline scenario for rural WSS in Armenia reveals that there is a large need for renovation of the existing network, about 40 000 rural inhabitants do not have access to piped water and the population currently served by standpipes often lives more distant than 100 metres from the standpipe. The baseline for rural WSS in Armenia also shows that revenues of user charges (even if increasing) are hardly sufficient to cover the needed expenditures. This is especially true for the settlements that are currently not served by WSCs.

One or more policy scenarios are needed to address the above issues, which do not only study the needed improvement of the water supply infrastructure, but also at the way this can be financed.

The development of a policy package can, in general, be characterised as an iterative process of:

- Setting targets for the improvement of the WSS infrastructure;
- Simulating the resulting expenditures: investments for extension/improvement of the system, renovations, additional operational and maintenance expenditures;
- Assessing the projected availability of finance;
- Comparing expenditures with the available finance to assess if there is a financing gap;
- Assessing additional needs for finance and the potential sources thereof;
- Assessing the affordability of the policy package for the affected population;

Figure 3.1: Cycle for developing policy scenarios for water supply



In the case where the policy package is not affordable and the financing gap cannot be closed, set less ambitious targets, and follow the cycle in Figure 3.1 until a balanced package is developed.

Next to the "technical" approach, which is necessary in any comprehensive Financing Strategy, other issues related to the implementation of policies also have to be taken into account.

This includes:

- Business model;
- Decisions on support from public budget for (rural) WSS;
- User charges and collection rate;
- Levels where main decisions need to be taken (national, regional, water company or utility, municipality, household).

3.1.2 Organisation of the chapter

This chapter starts with a discussion on developing policy targets. The concept of "**Minimal Water Supply Standards**" (MWSS) is presented, suggesting different options of how the Minimal Water Supply Standard could be defined in case of rural WSS, and providing (mostly qualitative) assessment of the options. The internationally-agreed (UN) definitions of Millennium Development Goals (MDGs) on WSS are considered, followed by a brief discussion on the targets for rural water supply in Armenia as defined in the Poverty Reduction Strategy Paper. Finally, options of how the MWSS concept can be integrated with other policy targets are discussed.

The rest of the chapter addresses the simulations carried out on expenditures, financing, and the financing gap. Three policy scenarios are presented, analysed, and discussed, in comparison with the baseline and current situation.

3.2 Setting policy scenario targets

There are various ways of setting policy targets. In this section, the options that have played a role in developing targets for the FS for rural WSS in Armenia will be discussed:

- Minimal Water Supply Standards;
- Millennium Development Goals, targets on WSS (MDG7, target 10);
- Targets on WSS set in the Poverty Reduction Strategy Paper.

3.2.1 Minimal Water Supply Standards

The State Committee for Water Systems of Armenia, has developed a concept for "Minimal Water Supply Standards" (MWSS) (SCWS, 2006), which could serve as a guarantee to the population of Armenia for sufficient water supply of acceptable quality.

The closest concept to that of the Minimal Water Supply Standards comes from the guidelines for water supply of the WHO (WHO, 2006), which will be discussed hereafter.

Key elements of the Minimal Water Supply Standards

The "minimal water supply standards" that might eventually be introduced in Armenia would have the following key elements (see the SCWS's "Proposal on provision of rural communities with minimal water supply service"):

1. Water quantity – volume, in litres per capita per day (lcd);

2. Distance – distance to the water source, availability of in-house or yard tap, or water delivered from distant sources by tanker-trucks;

3. (Tap) water quality – chemical and biological contamination, taste, colour, odour, etc.;

4. Service quality – pressure, duration of water supply/water supply schedule.

Moreover, MWSS could also be interpreted as a **right of the consumer** to water supply of at least a minimal standard.

WHO guidelines for water supply

The WHO guidelines on drinking water supply give a general, and internationally accepted, guidance for drinking water supply. In the WHO guidelines, a four-tier classification system of drinking water supply is used (WHO, 2004, p. 91). Basic parameters in these guidelines are:

- Distance to the water supply, or time needed to collect water;
- Amount of water that can be collected.

This results in an overall assessment of the public health risk from poor hygiene and potentially needed policy interventions and actions.

Table 3.1 gives an overview of this four-tier system.

Table 3.1: Classification of water supply by service level and quantity of water collected

Service level	Distance/time	Likely volumes of water collected	Public health risk from poor hygiene	Intervention priority and actions
No access	More than 1 km / more than 30 min round-trip	Very low - 5 litres per capita per day	**Very high** Hygiene practice compromised. Basic consumption may be compromised.	**Very high** Provision of basic level of service. Hygiene education
Basic access	Within 1 km / within 30 min round-trip	Average approximately 20 litres per capita per day	**High** Hygiene may be compromised. Laundry may occur off-plot	**High** Hygiene education. Provision of improved level of service
Intermediate access	Water provided on-plot through at least one tap (yard tap)	Average approximately 50 litres per capita per day	**Low** Hygiene may not be compromised. Laundry may occur on-plot	**Low** Hygiene promotion still yields health gains. Encourage optimal access
Optimal access	Supply of water through multiple taps within the house	Average 100-200 litres per capita per day	**Very Low** Hygiene may not be compromised. Laundry may occur on-plot	**Very low** Hygiene promotion still yields health gains

Source: Howard & Bartram (2003), referred to in WHO (2006)

The table shows, that only the service levels, classified as "Intermediate access" and "Optimal access" are regarded as having a (very) low risk from poor hygiene. This can be classified as "Safe water supply" according to the WHO.

The service level "No access" establishes a very high risk for public health, thus being classified as "None safe water supply". "Basic access", which is the minimal basis for achieving the MDG targets for WSS, is, according to the above classification, also classified as non-safe.

However, there is certainly a grey area between "basic assess" (20 lcd/max; 1 km), and "Intermediate (on-plot) access" (50 lcd; on-plot). For example, a standpipe within 100–200metres, would not require much time (5–15 minutes) to collect water, and can supply high quality water.

Water quantity

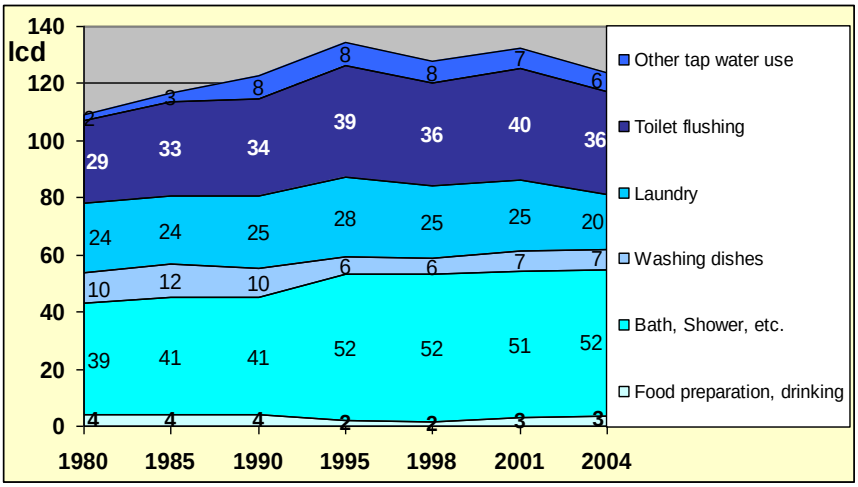
Guidance on what minimal water supply means in terms of **quantity** (measured in lcd) can be obtained from looking at standards or practices in other countries, as well as at relevant recommendations of the World Health Organisation (50 lcd) (see previous paragraph).

Practical experience shows that domestic water use varies to a large extent, giving little guidance on minimal quantities:

- In Canada, the domestic water use was 638 litres per person per day in 1999 (NRCan, 2007);
- In rural settlements in China, domestic water use (in 1993) varied from less than 50 lcd (*e.g.* Anhui, Shaanxi, Gansu) to over 110 lcd (*e.g.* Beijing, Shanghai, Xizang), in many regions between 50-90 lcd (Sichuan, Yunnan, etc.) (FAO, 2007);
- In Brazil, in a rural settlement in Minas Gerais, the average water use of households with an individual water source is on average 25 lcd. Households that have to collect water from a distance only use as little as 9 lcd (Fundação Oswaldo Cruz, 2007).

Analysing the domestic water consumption pattern can give more guidance on identifying minimal water supply. An example of water supply practice in Holland is given in Figure 3.1.

Figure 3.1: Domestic water use per capita per day in the Netherlands



Source: MNP, 2005

This graph shows the development of water supply in the Netherlands during the period 1980–2004.

One can see that the use of drinking water varies between 105 litres per capita per day (lcd) to almost 140 lcd in 1995. After 1995 a slight decrease in water use can be observed, due to technical innovations (less water use for flushing toilets, less use in washing machines).

Critical water use (for drinking and food preparation) is only 3–4 litres per day, or some 3% of total domestic water use. This, combined with water for washing dishes and laundry, would total about 30 litres per day.

Most water in the Netherlands is used for personal hygiene (bath, shower): about 50 lcd. Whereas in Holland, almost all houses are equipped with a bathroom/shower with hot water supply, such a service level is seldom in place in rural Armenia. This obviously leads to a lower average demand in rural Armenia. Anecdotal data from rural households – which have to boil water for bathing – suggest that, typically, 20-30 litres per day is quite enough for personal hygiene.

Based on this assumption one would conclude that, on average, 50-60 lcd would be the minimal amount of water needed to meet the minimal needs of a human being (water for drinking, cooking, washing dishes, laundry, and personal hygiene).

Distance

Following the WHO guidelines, a distance of near zero would be preferable. MDG targets refer to a maximum of one kilometre. It can be argued that access to a public tap within 100 metres can also be considered to be a reasonable solution[16].

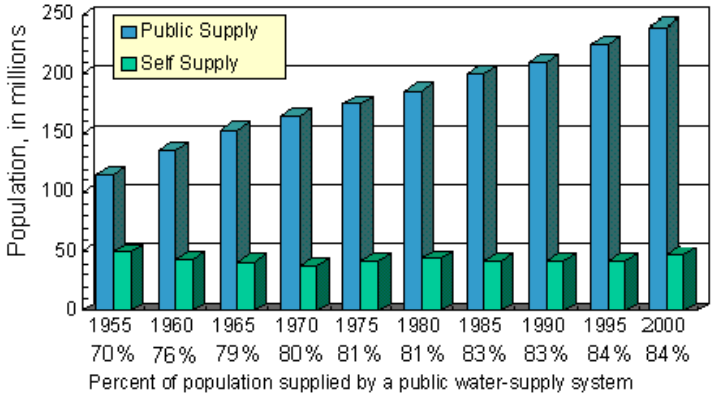
[16] SNiP (Industrial standards used in the former Soviet Union) effective in EECCA countries requires that standpipes should be no further than 100 metres from dwellings. Also, the draft law on drinking water states (in article 17.3.a) "ensuring of provision of running water of defined quality to all residents within the territory of the community (with a maximum 100 metre radius) through the available municipal water supply system".

For at least 5% of the rural population living in the fringe area[17] such public supply near the home will not be possible at reasonable costs. As the census reveals, in such cases water is taken in from streams/rivers, wells, or individual tanks.

In practice, this implies that the rural population, which cannot be served by a central system (estimated to be at least 5%), should have another form of minimal water supply that takes into consideration distance. Options would be:

- Own "protected" source[18];
- Bring in water with water trucks, although the UN classifies this as "non improved". It may well be an improvement, if the water that is brought to remote places is of good quality (checked by a water company) and is sold at reasonable costs (this may well be below the actual costs of bringing the water to remote places, and this would therefore imply that subsidies are needed to connect this part of the population).

Figure 3.2: Public and self-supplied populations in the United States, 1955 - 2000



Source: USGS

That "self supply" is not uncommon, even in one of the most developed countries in the world, is shown by Figure 3.2. It shows that, in the United States, about 15% of the population is still "self supplied".

The conclusion for distance is the following:

Each rural inhabitant should have access to safe water (from at least a standpipe) in a distance not further than 100 metres from the house.

If it is technically or economically impossible to construct a branch of the public water system near the house, public authorities should either allow "own supply" (from "protected water source"), but regularly check water quality and advise users on best practices (at no or little cost to the user), or they should bring in water to remote consumers by water trucks (again, at a reasonable price to the consumer). They could possibly also help construct individual water tanks to bridge the days without supply.

[17] Outside the core and outside the (potential) service area of public water supply.

[18] One of the most important issues about the protection of a water source is to prevent storage and spilling of pollutants in the vicinity of the source, or that animals can enter the "protection zone" of the source.

Water quality

Ensuring drinking water quality in most cases requires the intervention of professionals. Assessing quality is already a professional job (using testing equipment in laboratories), producing high quality drinking water (with no risk to connected clients) involves some form of treatment (in many cases chlorination) and high skilled labour to operate equipment.

So ensuring water quality requires an institutional set up and equipment, with sufficient access for rural water producers (the water companies, but also individual villages or even individual houses) to highly qualified workers.

At present, these pre-requisites are generally not in place in rural areas. How this should be organised, especially for settlements without water companies and for individuals who have their own water source, is at this moment unclear. A solution could be to establish inter-municipal water bodies, which could perform certain tasks of water suppliers (quality checks, planning, administration, etc.), or professional water companies throughout the country, as these companies could ensure water quality, professional treatment, etc.

Water service quality

Apart from quantity, distance, and (biochemical) quality of drinking water supply, the water service in rural areas should also be regular. In the Poverty Reduction Strategy Paper, 24 hours per day service is targeted for rural piped water supply by 2012. **This will hardly be feasible**, as in the current situation regularity of water service in rural areas is one of the most-mentioned problems[19]. A more practical approach may be to assume at least eight hours water supply per day (which is also proposed in comments by the KfW).

For the households not connected to piped water, the situation may vary. On the one hand, households with their own water source may have regular supply throughout the year. On the other hand, for households without own supply (for example, when the water is brought in by water tankers) service may be irregular (*e.g*. once a week).

To a certain extent, regularity can be dealt with by storing water (for central or decentralised supply, in reservoirs established at homes of the households). In cases of supply by a non-piped system, individual storage facilities could be considered to be the responsibility of the public authorities (so as to guarantee regularity).

Defining MWSS

In the previous sections, proposals have been developed to materialise the MWSS concept. But still a few questions need to be answered before a final proposal can be developed:

- Do MWSS apply to the **whole country** (so should be applied in each and every settlement) or are MWSS to be specified **for each settlement** (as may be read from Chapter 4, Article 17.4 and 17.5 of the Draft law on drinking water)?

- By which **date** the MWSS should be implemented in all settlements in (rural) Armenia?

[19] According to the results of the JICA questionnaire, 56% of rural settlements declare that water supply is "not sufficient in a period of a year", another 22% declares that water supply is "not sufficient throughout the year". According to the team survey amongst settlements without WSC service, average supply is 15 hours per day and 6.5 days a week (see Annex 4).

- Should the MWSS regulate mainstream water supply or should it rather regulate the **"exemptions**"?[20]

The draft law anticipates that MWSS will be location-specific (although also the "authorised State bodies on water systems management and health, within the scope of their responsibilities", would have a say according to the draft law). This would be an inefficient solution[21], and would leave much uncertainty for the consumers. It is therefore advised to make **a uniform MWSS** applicable to the whole territory of Armenia.

A clear **timetable** for the implementation or the achievement of the MWSS should be set, comparable with the timetable for the implementation of the rural water supply targets in the Poverty Reduction Strategy Paper.

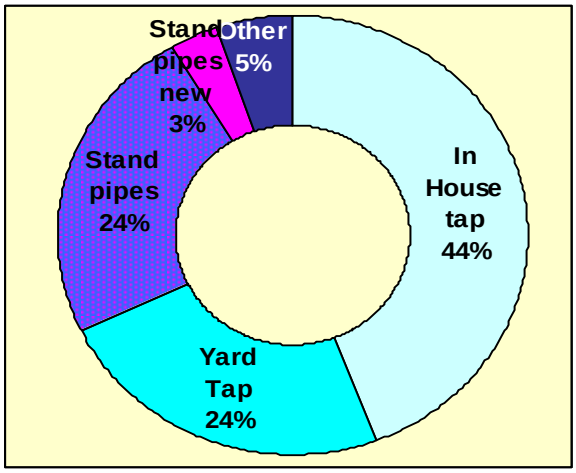
The question of whether the MWSS should regulate the mainstream of drinking water supply or should just regulate the exemptions also needs an answer.

In most developed countries, water utilities are obliged to deliver water to whomever asks for it, in quantities demanded by consumers (assuming that the consumer is willing and able to pay). In practice this means that water companies or utilities have to build and maintain facilities that can meet the demands of their customers (which is logical in a market economy). In cases where this is not possible (*e.g.* too high costs to supply water to remote customers: the "exemptions"), procedures regulate such exemptions.

In Armenia, rural water supply is often already above the proposed minimal quantities (of 50-60 lcd), and on-plot. This implies that MWSS for these consumers should not be the future target, as this would decrease their current service level. This would obviously **limit the targeted rural population** to be supplied with MWSS, to the group of inhabitants (and settlements) where the above outlined MWSS are currently not met.

Figure 3.3 gives an example of how MWSS could be implemented for rural water supply.

Figure 3.3: Indication of rural water supply in Armenia, according to MWSS, 2015, by type of connection



[20] According to the comments of the KfW, the MWSS should rather regulate exemptions than the mainstream, ensuring availability of the minimal water supply to those who do not have it at present.

[21] For each community with own central water supply, discussions and decisions can be foreseen, taking a lot of time and money, but probably resulting in more or less the same standards. Moreover, if at the central (or even world) level, decisions have already been made on what is desirable or not, sustained by professional evidence, it is difficult to imagine how such information can be challenged by less specialised/qualified people in rural areas of Armenia.

Assuming that, for the groups "in-house" and "yard tap", the requirements of MWSS are already met, MWSS would mainly address the rural population and settlements served by standpipes or without access to central drinking water supply, partly by extending the central supply and partly by ensuring that individual water sources are "protected".

Taking into consideration the foregoing analysis, the following definition of a unified MWSS is used in the further analysis:

- All rural inhabitants should have regular access to quality drinking water via centralised water supply systems, or from individual sources (protected wells, springs, boreholes, and surface water or water tankers);
- The minimal amount of water should be 50 lcd;
- The distance between the tap/individual source and the consumer's dwelling should not exceed 100 metres;
- Regularity (in case of piped water supply): eight hours per day as a minimum;
- The MWSS should be achieved by 2015.

3.2.2 Millennium Development Goals for water supply and sanitation

Millennium Development Goals, or MDGs, adopted by the general assembly of the UN of 8 September 2000, aim at reducing poverty and inequality. MDGs are formulated for eight goals including poverty reduction, education, child care, health, etc., as well as for environmental sustainability (Goal 7), and more specifically for water supply and sanitation (Target 10, Indicators 30 ad 31). Goals and targets are time-bound and refer to 1990 as a base year[22] and 2015 (in general) as the target year.

The official UN definitions for the MDGs for WSS are presented in Table 3.2:

Table 3.2: Millennium Development Goals, targets for Water Supply and Sanitation

Goals and Targets (from the Millennium Declaration)	**Indicators for monitoring progress**
Goal 7: Ensure environmental sustainability	
Target 10: Halve, by 2015, the proportion of people without sustainable access to safe drinking water and basic sanitation	30. Proportion of population with sustainable access to an improved water source, urban and rural 31. Proportion of population with access to improved sanitation, urban and rural

Source: UN, 2007, Official Millennium Development Goals website (www.un.org/millenniumgoals/)

To understand these definitions well, one needs to understand what is meant by "sustainable access" to "an improved water source" and "improved sanitation". According to the UN definition, the following should be understood:

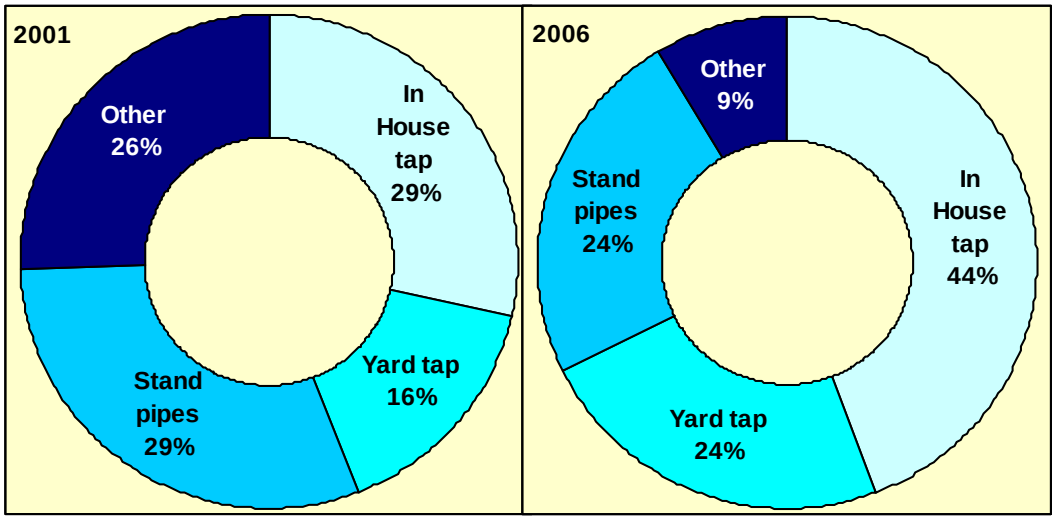
- **Water Supply**. "Improved" technologies include: house connection, public standpipe, borehole, protected dug well, protected spring, rainwater collection. "Not improved" technologies are: unprotected well, unprotected spring, vendor-provided water, bottled water (based on concerns about the quantity of supplied water, not concerns over the water quality), and tanker truck-provided water. It is assumed that if the user has access to an "improved source" then such a source should be likely to provide 20 litres per capita per day at a distance of no further than 1 000 metres; and

[22] However, the official MDG Target 10, does not mention a base year specifically, so presumably reference may also be made to another year than 1990 for Target 10.

- **Sanitation**. "Improved" technologies include: connection to a public sewer, connection to a septic system, pour-flush latrine, simple pit latrine, ventilated improved pit latrine. The excreta disposal system is considered adequate if it is private or shared (but not public) and if it separates human excreta from human contact in a hygienic manner. "Not improved" are: service or bucket latrines (where excreta are manually removed), public latrines, latrines with an open pit.

If the definition of the UN is followed for Armenia it implies that, in 2001, at least 74%[23] of the rural population already enjoyed water supply services with "improved" technologies, and, in 2006, already 90% enjoyed them (sum of "in dwelling", "in building", and "public taps") (see Figure 3.4).

Figure 3.4: Rural water supply in Armenia, 2001/2006, by type of connection



Source: Based on Armstat, 2001 and analysis of JICA and TME surveys

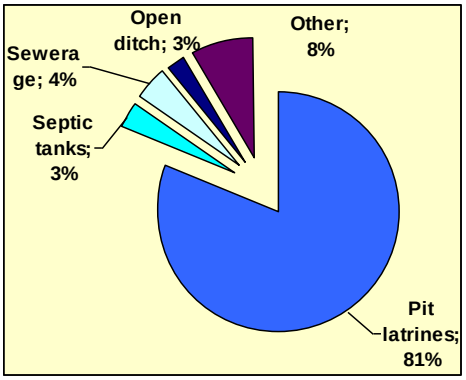
Given the large quantities of water available for the rural population (see Chapter 2), it can be assumed that the vast majority of the remaining 26-9% of the rural population also enjoyed "improved supply".

Assuming a near zero implementation gap of the MDG for WSS, adaptation of the MDG for WSS would have very little practical impact.

For sanitation, the situation is less clear as no reliable statistics exist on the sanitation situation in rural areas. According to the statistical yearbook only 3% of the rural population had access to sewerage in 2004 (ARMSTAT, 2005). This is in accordance with the results from the surveys performed during this study amongst water companies (0.25% of the population in the sample connected to sewerage) and settlements without WSC services (4.5% of the population in the sample connected to sewerage).

[23] Figures for 1990 are not available; the earliest figures relate to 1995. In 1995, 73% of the rural population had access to drinking water supply, with a daily supply of 117 lcd. After 1995, access increased to 75%, but supply reduced to 34 lcd (ARMSTAT, `Housing conditions of population", Statistical Yearbook Armenia, 2001).

Figure 3.5: Water sanitation in rural Armenia, settlements without WSCs, 2007



Source: Based on analysis of TME surveys

Figure 3.5 shows that most of the rural population use individual pit latrines. If this is close to the reality of the fact then almost all rural inhabitants already have improved sanitation, and therefore implementation of the strict definition of MDGs for rural Armenia would have little implication.

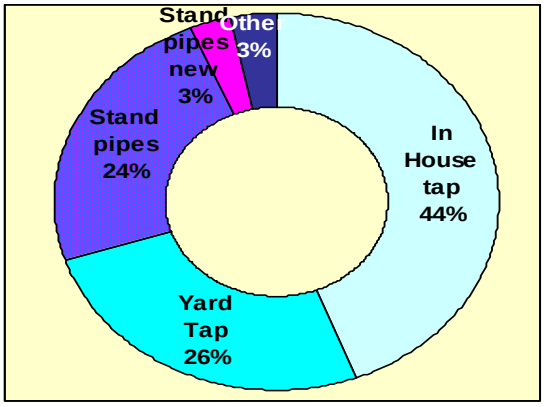
3.2.3 MDG for WSS in Armenia according to the Poverty Reduction Strategy Paper

In Armenia, the MDGs have been made operational in the Poverty Reduction Strategy Paper (PRSP), which addresses many aspects of poverty reduction, including targets for rural water supply:

"the access to safe supply in rural settlements" should increase from 45% of the population in 2001 to 70% by 2012 (and 2015) (page 35, PRSP).

In the PRSP "safe supply" assumes on-plot supply[24] by a centralised (piped) system. In addition, the PRSP states that by 2015 the supply should be **24** hours per day. Obviously, this is much more ambitious than the UN definition of the water supply MDGs discussed above.

Figure 3.6: Indication of rural water supply in Armenia, according to the PRSP, 2015, by type of connection



Source: Poverty Reduction Strategy Paper

The PRSP refers to the situation in 2001 as a reference year rather than 1990. This is done for the practical reason that most EECCA countries lack data for 1990[25].

[24] The PRSP states, in point 368, "A centralised water supply is available to 71% of households, including 87% in urban and 45% in rural areas". This coincides with on-plot supply in Figure 3.4 (2001).

Figure 3.6 gives an indication of rural water supply after the targets on WSS set in the PRSP are achieved. On-plot supply will increase from 45% (in 2001) to 70% (in 2015). Also, part of own supply will be replaced by public taps (standpipes). Compared to the types of connection in the baseline (Figure 3.4, 2006), there will only be a small shift (as in the baseline in 2006, 68% of the rural population is already connected to on-plot supply).

3.2.4 Combining MDGs for water supply with MWSS

In the previous sections, operational definitions of the MDGs and MWSS have been developed. These definitions are based on the information that is currently available, using guidance from the WHO and international experience, on the one hand, and specific information available for Armenia on the other.

When comparing the MDGs for WS in Armenia (the official definition and the interpretation suggested in the PRSP), with the MWSS, the following can be said:

- In comparison with the official definition of MDGs for rural WS for Armenia, the MWSS would be more ambitious in every sense;

- When compared to the MDGs for rural water supply, **as defined in the PRSP**, MWSS are more demanding than the MDGs for WS, as the MWSS assume that 100% of the rural population should be supplied with water (of which a part with minimal quantities and distances);

- However, the MWSS are also less demanding in that the MDGs, as defined in the PRSP, require that the on-plot water supply should have increased to 70% by 2015, whereas this is not regulated by the MWSS. Moreover, for piped systems the PRSP targets 24-hour water supply, while the MWSS assumes only eight hours' supply per day.

The practical implications of a combined policy package to achieve both MDGs and MWSS can be as follows:

- To assure meeting the MWSS, households with no public supply should get close (within 100 metres) access to water. This can be achieved by various means:
  - Establishing stand-posts nearby (within 100 metres);
  - Shift individual water sources from "unprotected" to "protected" ones[26];
  - Individual water reservoirs to be supplied by publicly controlled and financed tanker-trucks;
  - Connection to piped water, in-house or by yard tap;
- To assure meeting the objectives on WSS set in the PRSP, the share of households with on-plot supply should increase slightly.

In the "extreme" situation, the MWSS and PRSP do not coincide:

[25] Because there is a lack of statistical data for the reference year 1990, because of the practical assessment that over 10 years the situation probably did not improve (rather worsened), or because the official MDGs for WSS do not explicitly refer to 1990 as the base year.

[26] In practice this may often mean that the current situation is legalised and surveyed/monitored by public (water) authorities.

- PRSP may target the already publicly-served population (replacing standpipes by on-plot supply);
- MWSS target (mainly) the population without public water supply (assuming that the publicly served rural population has access to at least 50 lcd). Thus implementing the MWSS would help achieve more social equity.

Assessing the current situation vis-à-vis the proposed MWSS, is outside the scope of the current project, as it would require a very detailed data collection activity[27]. However, if a MWSS is adopted, it would be expedient to adjust the PRSP accordingly.

3.2.5 Water supply

On the basis of the considerations discussed, policy packages can be developed for rural WS. The following table gives an overview of the possibilities.

Table 3.3: Possible policy packages that can be simulated on rural WSS

Policy package	Description
MDGs for rural WS as defined in the PRSP	Increase – by 2015 – on-plot WS to 70% of the rural population
MWSS	Regular supply – by 2015 – for currently not publicly supplied rural consumers and settlements (about 25%) with at least 50 lcd and at a maximal distance of 100 metres
Combined MDGs (PRSP definition) with MWSS	Increase – by 2015 – on-plot WS to 70% of the rural population **and** regular supply – by 2015 – for currently non publicly supplied rural consumers and settlements (about 25%) with at least 50 lcd and at a maximal distance of 100 metres, for at least eight hours per day.

For the final model simulations, the following scenarios have been chosen:

- MWSS, which can be seen as a minimal policy scenario;
- Combined PRSP and MWSS targets approach. As in 2006 already 68% of the rural population had on-plot supply, in the simulations a target of 75% has been assumed. Two alternatives have been simulated:
  - Policy 1: which assumes that, in each settlement, on-plot supply (if needed) is increased in an average way (for all settlements the same targets, unless in the current situation the 75% "on-plot supply" target is already achieved);
  - Policy2: this assumes that the gap between current and targeted on-plot supply is filled by first addressing larger settlements (as it is expected that this will reduce costs).
- Maximal: this scenario simulation has been added to get an indication of maximal possible improvements. In this approach it is assumed that all rural populations will be served by central supply and will have in-house taps (except for the 5% of rural population that lives outside the core of the villages).

[27] This is also recognised by experts from the KfW, in a letter to the SCWS in which the initial steps in this project are addressed: "For making justified decisions regarding quantitative and qualitative indicators (*i.e*. quantity, technology, regularity, quality, etc.), as well as before assigning any authority with the responsibility for enforcement, the Government of Armenia will need a comprehensive study. The study should cover all settlements and consider, *inter alia*, availability of water sources and possibility to deliver water at reasonable costs (particularly taking into account affordability issue). However, for the purpose of the FS for rural WSS, supply of piped water (approx. 50 lcd, eight hours per day from stand-pipes located within 100 metres from dwelling), which is appropriately treated in order to ensure safety for the health (according to the national standard) could be defined as a "minimum water supply standard".

3.2.6 Rural Sanitation

Neither the Poverty Reduction Strategy Paper, nor the Note on MWSS mention rural water sanitation as a priority. Moreover, comparing the current situation with the UN MDG targets for sanitation leads to the conclusion that little (urgent) action is needed in rural Armenia.

As the water supply system develops, more rural households will install bathing facilities and flushing toilets. On the one hand, this may increase the production of wastewater and thus the need for more advanced sanitation solutions (septic tanks and simple sewage systems). On the other hand, the description of the current situation shows that, currently, quantitative rural water supply is almost four times higher than strictly needed for drinking water supply, according to western European standards. From this point of view, it is likely that the amount of wastewater produced by the rural population would decrease in the coming years, which would indicate that no action is needed in the short term.

Though some improvement can be imagined, for example a shift from (simple) pit latrines to simple septic tanks, another option would be to gradually start treating wastewater by reed bed filters, which can be built individually or collectively at (very) little cost[28].

An issue that could be addressed in the FS for rural WSS would be the upgrading of the sanitation infrastructure for public buildings (administration, schools, hospitals, etc., totalling some 2 000 buildings).

3.2.7 Modelling rural WSS

When modelling rural settlements in Feasible, several "off model" issues have been encountered:

- In Armenia, about 40-45% of the population is served through long water main transmission pipes, connecting rural settlements to distant water sources. This option is not present, thus cannot be modelled exactly in Feasible. It is assumed that the costs of such central supply is comparable with the costs of individual water intakes for rural settlements;

- The average amount of water supplied to rural inhabitants is in the range of 400 lcd, which is considerably higher than default values in Feasible (and these defaults refer to satisfactory supply in European countries). This indicates oversized networks in (rural) Armenia (or water uses other than household purposes, like irrigation), but also that if the currently supplied amount of water would be modelled in Feasible, the costs of operation and capital replacement (or re investment) would be overestimated;

- Regularity: in Feasible it is assumed that the less hours per day supply is available, the higher the costs to supply a certain, fixed amount (say 50 lcd). Therefore, increasing regularity in combination with a fixed amount of water (lcd) leads to lower total expenditures[29]. For modelling reasons we have applied modest water uses per capita in the policy scenario simulations (50 lcd for standpipes, 100 lcd for yard taps, and 150 lcd for in-house supply).

3.3 Results of simulations, water production/demand

The policy scenarios aim at increasing the quality of water supply. A first result is the availability (production and/or demand) of water in the different simulations.

[28] For as little as € 15 (AMD 7000) per capita, a simple reed bed filter can be built (TME, 2007d), but there is a wide range of costs (depending on the type of pollution to be treated, the way in which the reed bed is constructed, and the possibility of using local materials and labour).

[29] To supply a certain quantity of water in less hours per day means that the capacity needs to be larger (larger diameters of pipes).

Table 3.4: Per capita water production/demand in the different scenarios (in lcd)

	Current oversized	Base line	Minimal Water Supply Standards	Policy 1	Policy 2	Maximal
Aragatsotn	253	117	117	117	117	150
Ararat	125	77	77	94	94	150
Armavir	256	88	88	101	103	150
Gerharkunik	294	93	93	101	102	150
Kotayq	275	102	102	104	104	150
Lori	152	74	74	103	105	150
Shirak	294	97	97	108	105	150
Syunik	274	99	99	101	99	150
Tavush	296	94	94	106	103	150
Vayots Dzor	474	94	94	103	104	150
No supply (at present)			40	89	95	150
AWSC	658	132	132	132	132	150
Armavir, Nor Akunq	29	127	127	127	127	150
Lori WSC	416	75	75	115	112	150
Shirak WSC	516	108	108	109	110	150
Total	400	92	94	107	107	150

Source: Feasible simulations, 2008

In the MWSS approach, the amount of water available only increases for inhabitants that are currently not served by central supply. In the policy scenarios, water availability increases as more inhabitants get on-plot supply (with 100-150 lcd instead of 50 lcd for standpipes). In the maximal scenario, water supply increases to 150 lcd, which is still almost three times lower than in the current situation with an oversized water supply infrastructure.

3.4 Results: annual expenditures

The scenarios were simulated using the Feasible model and estimates for total expenditures for the various scenarios are presented in the next table.

Table 3.5: Annual operational and maintenance and re-investment expenditures (excluding renovations and extensions), after achieving scenario targets (2016), AMD million

	Present oversized	Baseline	MWSS	Policy[30]	Maximal
Aragatsotn	117	94	96	96	122
Ararat	37	32	35	41	61
Armavir	134	88	96	113	171
Gerharkunik	206	144	154	167	231
Kotayq	292	208	215	216	257
Lori	232	183	189	220	262
Shirak	88	59	62	66	78
Syunik	280	183	188	188	233
Tavush	237	154	161	170	206
Vayots Dzor	148	83	87	92	109
No supply	0	0	50	91	122
AWSC	1 791	1 105	1 105	1 105	1 238
Armavir, Nor Akunq	45	54	58	58	65
Lori, Lori WSC	60	35	37	50	61
Shirak, WSC	92	59	63	63	79
Total	3 762	2 482	2 595	2 735	3 294

Source: Feasible simulations, 2008

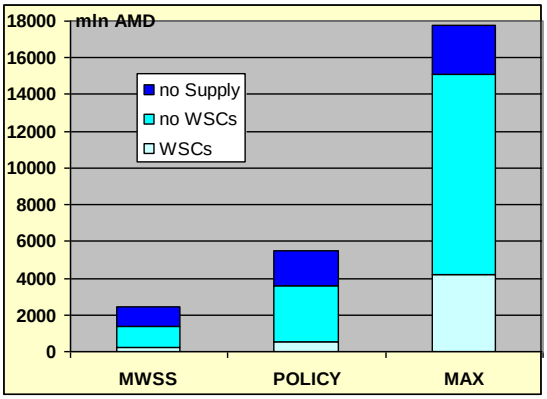
This table shows that there is no large difference in costs to operate and maintain the water supply system in the various scenarios. It even appears that, theoretically, all scenarios would be less costly than maintaining the present oversized infrastructure, even in the "maximal" approach. This urges investments in water supply system optimisation.

3.5 Renovations and investments

The baseline assessment already showed that renovating the current infrastructure (and at the same time optimising it) would incur large investments - in total about AMD 35 billion (≈ € 79mln) - as about 50% of the infrastructure would need renovations and optimisation. Assuming that renovation is completed in 16 years, each year 6% of the needed renovations will need to be completed at a cost of AMD 2.2 billion (≈ € 5mln). This is about AMD 2000 (≈ € 5) per year per person served, which is quite affordable for rural Armenia.

[30] Although two "Policy scenarios" have been simulated, only the results of the first are shown, as the overall results between the two scenarios are minor.

Figure 3.7: Needed additional investments to achieve targeted water supply in the different scenarios, 2008-2015 in mln AMD



The additional investments to upgrade and extend the water supply infrastructure to the targeted levels in the different scenarios are shown in Figure 3.7.

Total investments in extensions to achieve policy targets are smaller than the funds needed for renovations of the existing infrastructure.

To achieve MWSS, AMD 2.5 billion (≈ € 5.2 mln) needs to be invested in WSS infrastructure extensions. If the investment is implemented in the period 2008–2015 (eight years), the annual investments will be AMD 310 million. Not surprisingly, 90% of these investments shall be concentrated in settlements without WSC services, about 50% would be made in settlements without central water supply, and the other 50% in settlements with central water supply. In the latter case, the MWSS investments would mainly relate to creating easier access to standpipes and increasing the number of standpipes in these settlements. In settlements with WSC services, few investments in extensions need to be made to achieve MWSS service levels.

To achieve the targets of the Policy scenario, AMD 5.5 billion (≈ € 12 mln) needs to be invested. Therefore, annually, AMD 690 mln must be invested in extensions in the period 2008–2015. As Figure 3.7 shows, in this scenario also, most investments (90%) are to be made in settlements without WSC service (and 1/3 in settlements with currently no water supply).

Therefore, with regard to the two main policy scenarios, the conclusion may be that the focus of overall investments will be on renovations rather than on WSS infrastructure extensions needed for achieving the target of MWSS and/or Policy. For MWSS, the total investment expenditures for extensions (of AMD 2.5 billion) are only a small fraction (< 10%) of the need for renovations. For the policy scenarios, investments in extensions (AMD 5.5 billion) are five times lower than needed investments for renovation. Only when policy would aim at maximal supply (which is currently not realistic for the medium term), total needed investments in extensions would be comparable (though still 1/3 lower) with the investments for renovation.

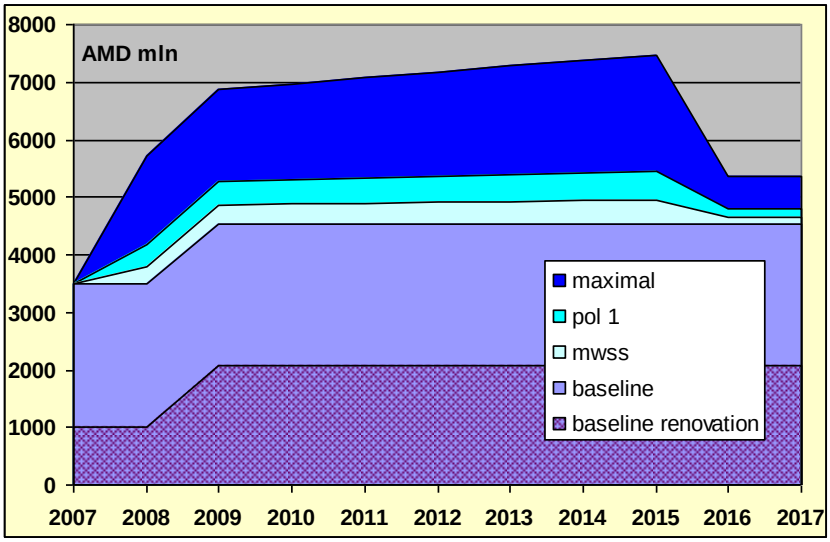
3.6 Sanitation expenditures

As mentioned in Section 3.3.2, no targets for rural sanitation are set in the FS for rural WSS. However, it is also mentioned that it would be good to improve at least the sanitation in public buildings. It can be estimated that such improvements would cost several million euros (2 000 systems at costs of between € 1 000 [AMD 450 000] and € 10 000 [AMD 4.5 million] per system). This would result in a total investment of about € 10 million or AMD 4.5 billion (assuming € 5 000 per system for 2 000 systems).

3.7 Overview expenditures

Figure 3.8 gives an overview of the total expenditures, as discussed in the previous paragraphs.

Figure 3.8: Annual expenditures in the various scenarios and needed expenditures for renovation or the existing rural water supply network (in AMD million)



It can be seen that the largest challenge is the renovation of the rural water supply network at a higher rate than is currently the case. For the MWSS and the Policy scenario, the additional annual expenditures in extensions are relatively limited.

3.8 Financing

The amount of finance available in the baseline scenario has been estimated at about AMD 3.4 billion in 2007, dropping to AMD 1.9 billion in 2010, and then slowly increasing to AMD 2.7 billion in 2015. The user charge revenues increases from AMD 1.1 billion in 2007 to 2.5 billion in 2015.

For the policy scenarios discussed, additional sources of finance are considered:

- User charges: compared to the baseline, there is a slight increase in the share of population with access to water supply, as well as on-plot supply. Therefore, compared to the baseline simulation (92 lcd), more water will be sold (MWSS 94 lcd; Policy 107 lcd; Maximal 150 lcd on average) and thus increase the total revenues of user charges;

- A principle agreement exists on a loan from the Asian Development Bank (ADB), which will partly be used for rural water supply;

- In supplement to the loan, the Armenian government will finance part of the investment.

The total agreement of the ADB loan involves US$ 45 million (US$ 15 million for 2008/2009, US$ 30 million for 2010-2013; 80% financed by ADB, 20% by the Armenian government). About US$ 28 million of the US$ 45 million will be spent on rural water supply. The assumptions made about how this money will be spent during this period are shown in the following table.

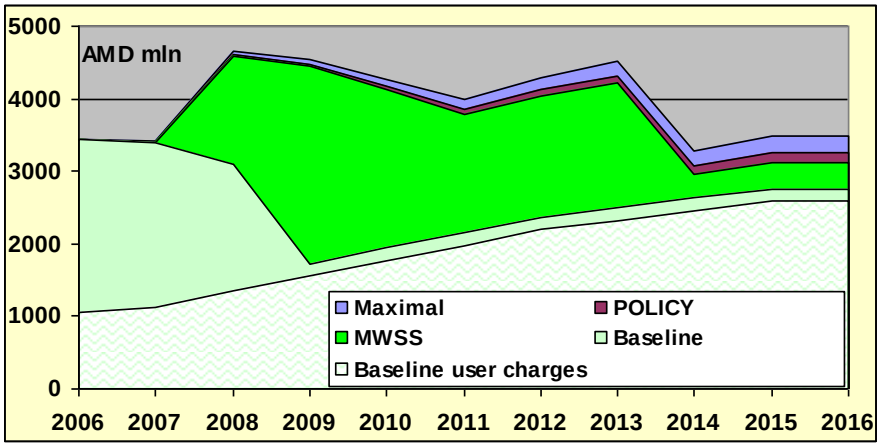
Table 3.6: Assessment of ADB loan and budget contributions for rural water supply 2008-2015[31].

		2008	2009	2010	2011	2012	2013	Total
Total	**In million US$**	**2.80**	**6.53**	**4.67**	**4.67**	**4.67**	**4.67**	**28.00**
ADB	In million US$	2.24	5.23	3.73	3.73	3.73	3.73	22.40
Armenian central gov	In million US$	0.56	1.31	0.93	0.93	0.93	0.93	5.60
Total	**In AMD million**	**860**	**2 006**	**1 433**	**1 433**	**1 433**	**1 433**	**8 596**
ADB	In AMD million	688	1 605	1 146	1 146	1 146	1 146	6 877
Armenian central gov	In AMD million	172	401	287	287	287	287	1 719

Source: SCWS, October 2007

As well as this loan, the KfW has also provided a grant, for three years (2008–2010), of in total € 3.9 million (≈ AMD 585 per year). This grant falls outside the scope of the FS, as it is meant for financially supporting "management contracts".

Figure 3.9: Assessment of available finance in the various scenarios



An overview of the total available finance in the different scenarios is given in Figure 3.9.

User charges will, in all scenarios, become a more important source during the period 2008–2015. The drop in finance in the baseline (due to finalisation of the KfW loans) is more than compensated by the newly acquired financial resources form the ADB loan and central budget contributions (linked with the ADB loan). Therefore, between 2008 and 2013, about AMD 4 billion in total will be available for rural WS.

3.9 Financing Gap

In this section, for the three scenarios simulated, an assessment will be presented on the balance between expenditures and available finance.

The baseline results can serve as a point of reference. In total, for the period 2007–2015, expenditures are estimated at AMD 39 billion (≈ € 87 mln) and available finance at AMD 22.5 billion (≈ € 50 mln). The financing gap, in total, is AMD 16.5 billion (or on average AMD 1.8 billion per year/€ 4 mln per year). The lack of finance in the baseline is mainly linked to the inability to finance expenditures for renovations and re-investments, especially after the projects by the four WSCs will be finalised.

[31] 1 US$ = 307 AMD.

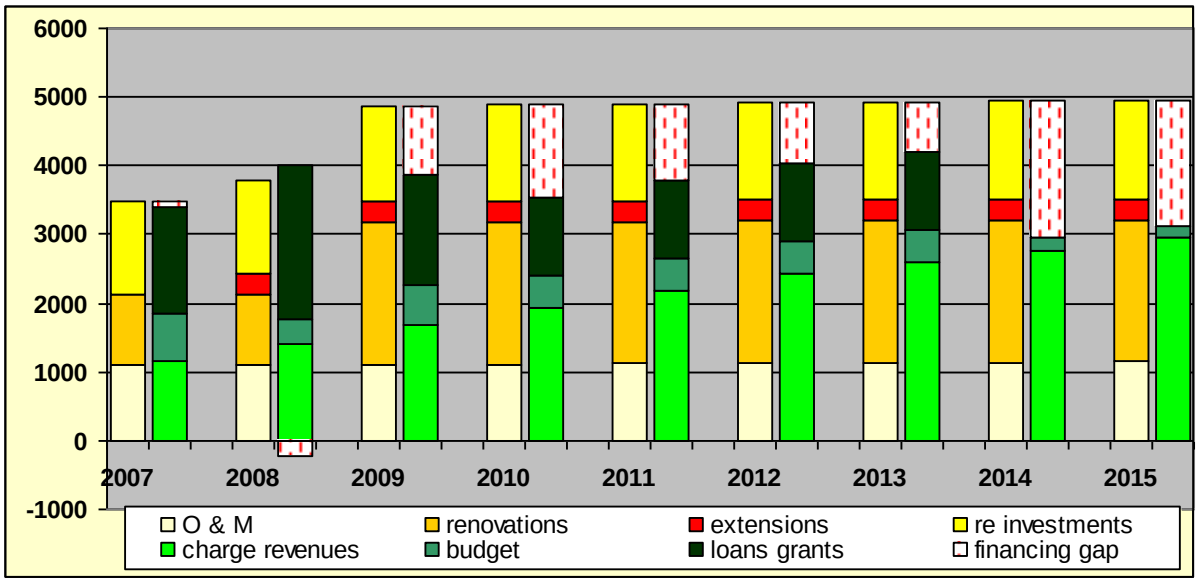
In Chapter 2, it is argued that closing the financing gap in the baseline with additional allocations from the central budget, and with loans and grants, looks realistic and would not require more than 0.3–0.44% of the estimated central public budget (2009).

In fact, some of the needed additional finance has already been arranged for the period (see Table 3.6). In total AMD 8.6 billion in additional finance (ADB and central government) will become available between 2008 and 2013. This already covers slightly more than half of the needed additional funds in the baseline.

3.9.1 MWSS scenario

In the MWSS scenario, the financing gap is reduced, compared to the baseline. This is mainly due to the additional loan and budget contributions.

Figure 3.10: Estimated financing gap for rural WSS in Armenia, including renovations, loans and budget subsidies, in the Minimal Water Supply Standards scenario (in AMD x 1 million)



Source: own assessment, 2008

Figure 3.10 shows that until 2008, sufficient finance was available. Until 2013 most key expenditures (except for part of the re-investments) can be financed. In total, expenditures are estimated at AMD 42 billion (≈ € 93 mln), against AMD 33 billion (≈ € 73 mln) available finance. So the financing gap is limited to AMD 9 billion (≈ € 20 mln), or 21% of total expenditures.

The figure also shows that from the expenditures to be financed, the expenditure for "extensions" needed to implement the MWSS policy, are relatively small compared to other expenditure categories.

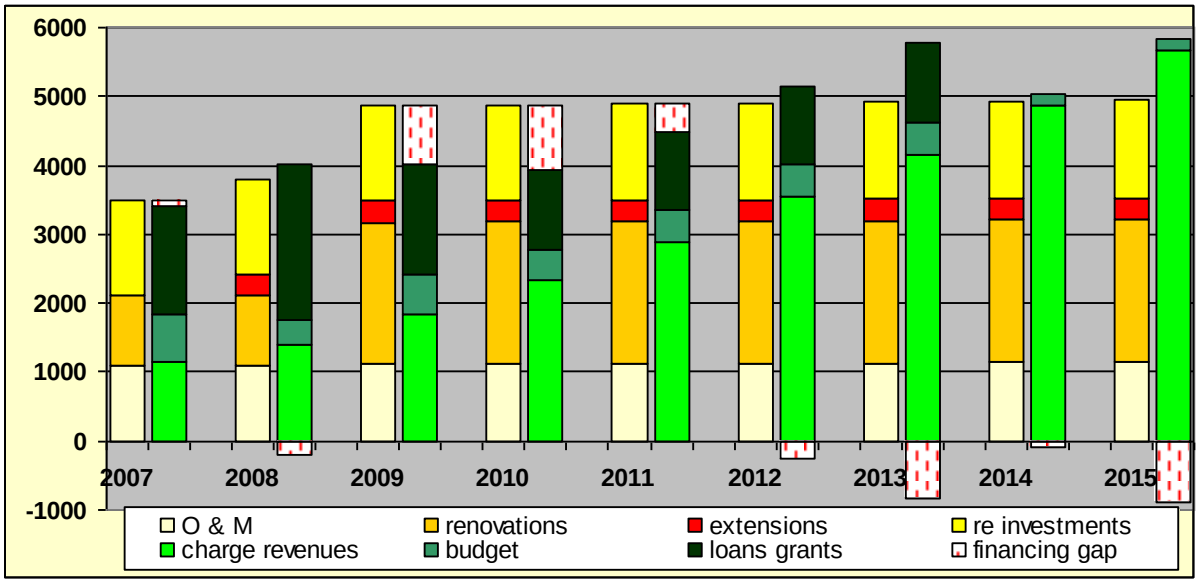
If the MWSS scenario is implemented, the question arises as to if a financing gap will really exist as outlined. The expenditure category "re-investment" (to compensate for the depreciation of the fixed assets) is rather "indicative or administrative" than a hard inevitable expenditure category. However, in the longer term, lack of re-investment will result in growing accumulated depreciation of fixed assets, thus gradually deteriorating the infrastructure.

The pace of renovation can also be differentiated (at the moment, it is assumed that in 16 years the infrastructure will be totally renovated, but of course this can be phased, if needed, to adapt to the available finance).

In 2015, the main source of finance will be user charges (AMD 2.9 billion), this being almost enough to finance operational and maintenance costs, renovations, and the relatively small expenditures for extension of the service to MWSS level.

If, between 2008–2015, revenue from user charges were increased to cover the financing gap, water tariffs (rates) should be increased by 9.8 % annually, and collection efficiency improved drastically (up to 100% of billing). In 2015 this would result in 92% higher user charges, as shown in Figure 3.11.

Figure 3.11: Balanced financing gap for rural WSS in Armenia, by increasing the user charges (92% higher 2015), in the MWSS scenario (in AMD x 1 million)



Source: own assessment, 2008

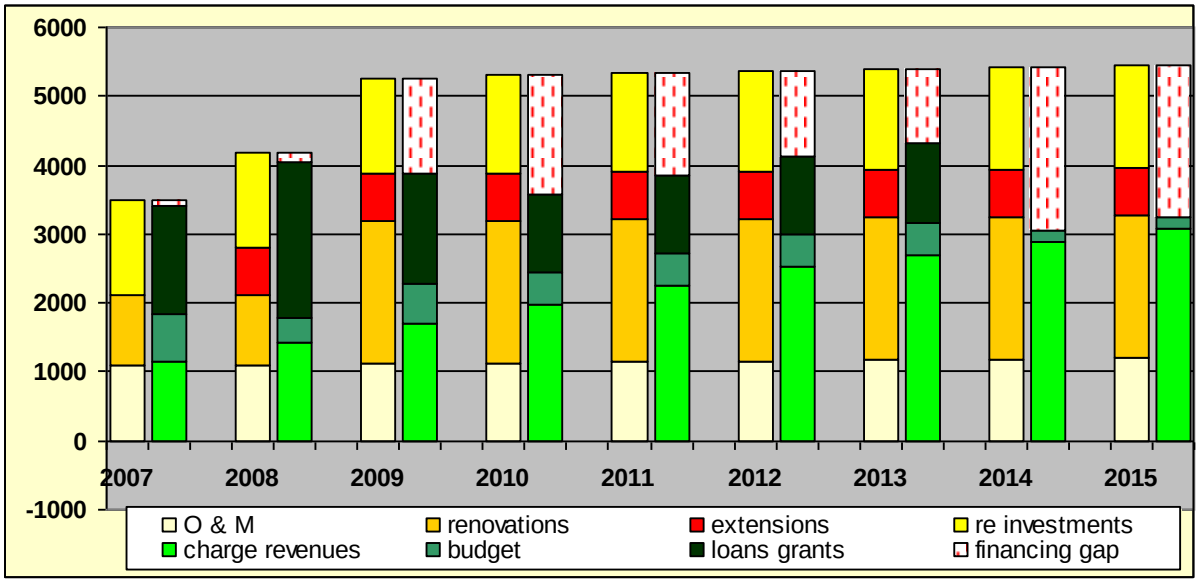
Such kinds of policy to bridge the financing gap, would lead to water tariffs, in 2015, that would be sufficient to cover all expenses linked with water supply after 2015. As a result of the increase in tariffs, an average household would pay AMD 23 000 per year in 2015 (≈ € 51 per year).

Of course, other financial resources can also be used to bridge the financing gap, *e.g.* budget contributions for investments, additional loans. This would (at least at the short term), lessen the financial burden to rural households.

3.9.2 Policy scenario

In the Policy scenario, the financing gap is reduced, compared to the baseline. This is, as in the MWSS scenario, mainly due to the additional loans, grants, and budget contributions. It is only very partially due to the increase in user charges revenues (which will be somewhat higher as the level of services increases).

Figure 3.12: Estimated financing gap for rural WSS in Armenia, including renovations, loans and budget subsidies, in the Policy scenario (in AMD x 1 million)



Source: own assessment, 2008

Figure 3.12 shows that until 2008, sufficient finance was available. Until 2013 most key expenditures (except for part of the re-investments) can be financed. In total, expenditures are estimated at AMD 45 billion (≈ € 100 mln), against AMD 33.5 billion (≈ € 74 mln) of available finance. Therefore, the financing gap is limited to AMD 11.5 billion (≈ € 25 mln), or 26% of total expenditures.

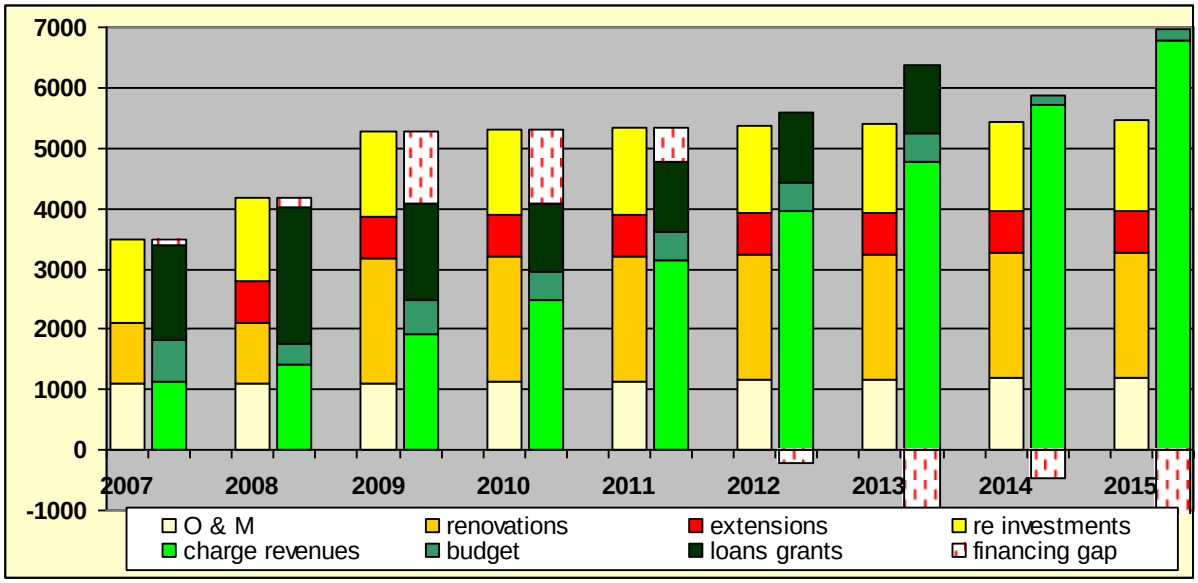
The figure also shows that from the expenditures to be financed, the "extensions" as a result of the MWSS policy, are still relatively small compared to other expenditure categories (although not as small as in the MWSS scenario, but still amounts to only 1/3 of the needed expenditures for renovations).

Also in the Policy scenario, the question arises as to if there really will be a financing gap. As was already said above, the re-investment expenditure category is rather "administrative or indicative" than a hard inevitable expenditure category. Total re-investment expenditures are estimated at AMD 13 billion, which is roughly 30% higher than the estimated financing gap. For renovations, total expenditures are estimated at AMD 16.5 billion, but this number can partially be adapted to the actual availability of finance. Therefore, by phasing re-investments and renovations, the financing gap of AMD 10 billion can be decreased or even balanced.

In 2015, the main source of finance would be user charges (AMD 3 billion), almost being enough to finance operational and maintenance costs and renovations. However, the relative small expenditures for extension of the service to Policy level (75% on-plot supply) could, in 2015, not be financed without adaptation of the budgets for renovation or re-investment.

An option to balance the estimated financing gap is to increase water tariffs and collection efficiency (up to 100% of billing). If, for example, the cumulative financing gap for the period 2008–2015 should be brought down to zero, in total AMD 11.7 billion (€26 million) additional user charges should be collected. An annual increase of 12% per year of user charges (which would lead to a 120% higher water price in 2015 compared to 2007) complemented by the improved collection efficiency would generate enough revenues. This is shown in Figure 3.13.

Figure 3.13: Balanced financing gap for rural WSS in Armenia, by increasing the user charges (120% higher in 2015), in the Policy scenario (in AMD x 1 million)



Source: own assessment, 2008

The 120% increase of tariffs would lead to almost six times higher revenues of the user charges (instead of three times with stable tariffs). The annual water bill in 2015 would be on average 120 m3 * AMD 220 per m3 = AMD 26 500 per household (≈ € 59 per year).

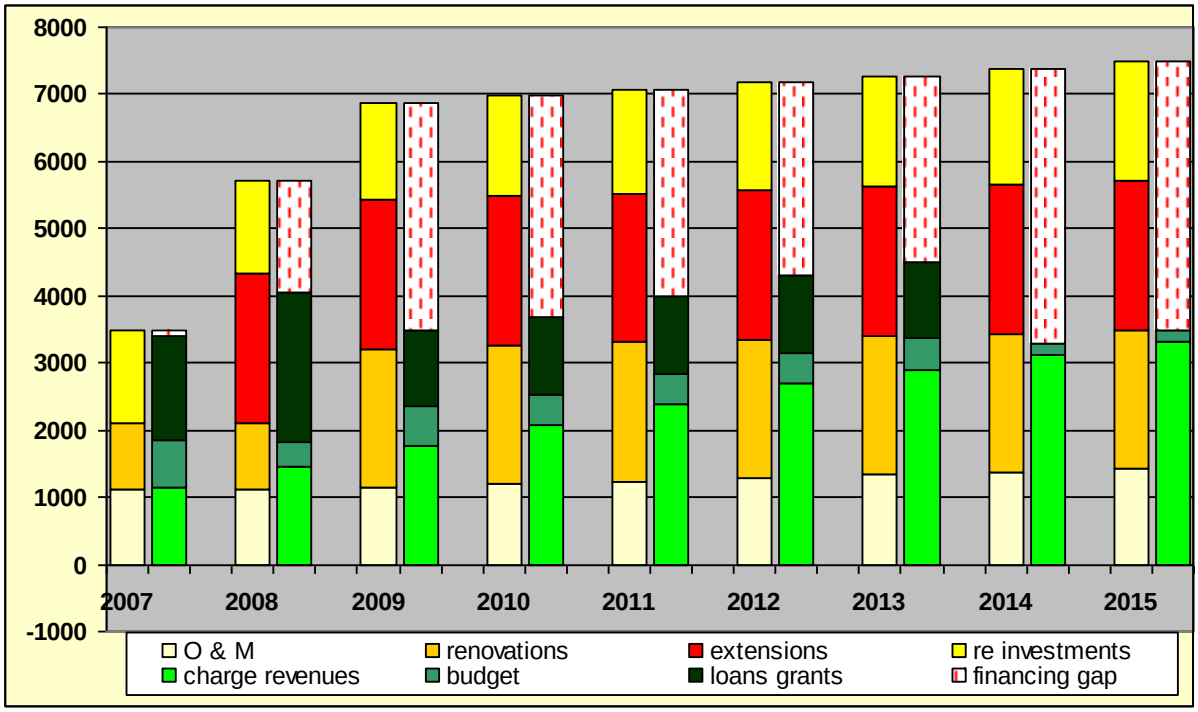
In 2015, revenues of user charges would be enough to cover all simulated expenditures. In fact, there would be a financing surplus of AMD 1.5 billion. After 2015, this surplus will even increase, as extensions of the supply system will be completed, and also renovations will be in process (to be finished around 2023, at the assumed pace).

3.9.3 Maximal scenario

The Maximal scenario serves as a "landmark" scenario. It shows the kind of investments and expenditures needed and the (im)balance with revenues from available financial sources.

Figure 3.14 shows the estimated expenditures needed to achieve (almost) 100% of in-house tap water supply in rural Armenia by 2015. Revenues, as in MWSS and Policy, are also shown.

Figure 3.14: Estimated financing gap for rural WSS in Armenia, including renovations, loans and budget subsidies, in the Maximal scenario (in AMD x 1 million)



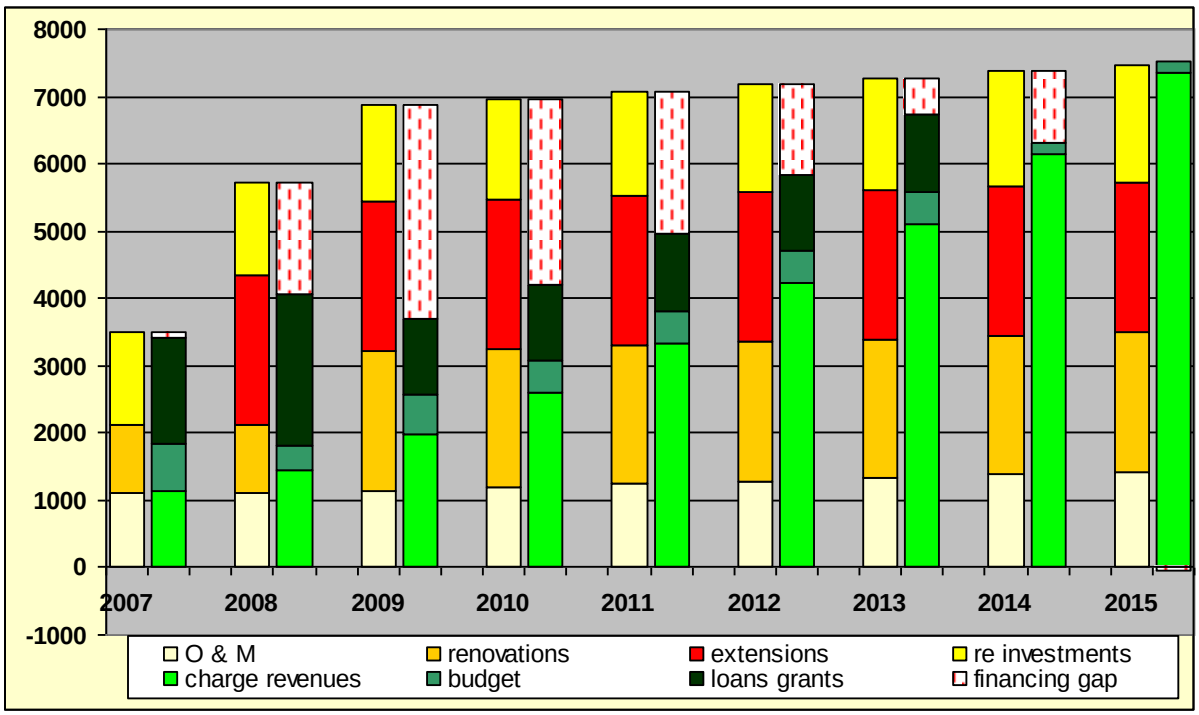
Source: own assessment, 2008

This figure shows that the available financial resources cover roughly 50% of needed expenditures (after 2009). It is therefore clear that, without additional financial resources, a maximal policy scenario is not feasible. Total expenditures are estimated at AMD 60 billion (≈ € 135 mln) for the period. The total financing gap can be estimated at 40%, or AMD 25 billion (≈ € 56 mln); AMD 3 billion on average per year.

In the seven years between 2008 and 2015, it will not be possible to totally balance the financing gap by increasing user charges. An increase of, annually, 20% (complemented by the collection efficiency at 100% of billing) would be needed, leading to a water price level of 360% of the 2007 level.

If the same user charge policy would be followed as with the Policy scenario (price increase 12% per year in the period 2008–2015), the result would be a reduction of the financing gap by AMD 12.6 billion (≈ 28 million), leaving the gap at AMD 12.5 billion (≈ € 28 million). This is illustrated in Figure 3.15.

Figure 3.15: Partially balanced financing gap for rural WSS in Armenia, by increasing the user charges (increase of 120% in 2015), in the Maximal scenario (in AMD x 1 million)



Source: own assessment, 2008

In 2015 there will be a small financing surplus (of about AMD 40 mln [≈ € 0.9 mln]). After 2015 the financing surplus will increase, as the investment into extensions will be completed (AMD 2.2 billion per year). Therefore, preconditions for the implementation of the Maximal scenario will be in place from only 2015 onwards.

3.10 Conclusions

Two policy scenarios ("Minimal Water Supply Standards" and "Poverty Reduction Strategy") and a "Maximal" scenario have been assessed in this chapter. Both technical and financial economic results have been obtained. From the techno-economic analysis the following conclusions can be drawn:

- Water supply infrastructure: compared to the baseline, in the MWSS scenario only a little more water (2%) will be demanded (and thus produced). In the Policy scenario, demand will increase by about 15%. In the "Maximal" scenario, the increase will be 60%. However, even in the "Maximal" scenario, the total amount of water demanded will be considerably less than the amount presently supplied (≈ 400 lcd). Therefore, it is clear that one of the main challenges for both baseline and policy scenarios is to downscale and optimise the present, oversized supply infrastructure;

- Total annual operational and re-investment expenditures in the policy scenarios do not differ much from the baseline: in the baseline these expenditures are estimated at AMD 2.5 billion (≈ € 5.5 million), in the MWSS scenario at AMD 2.6 billion, and in the Policy scenario at AMD 2.7 billion. Only in the "Maximal" scenario, there would be a more significant increase in these expenditures (to AMD 3.3 billion ≈ € 7.3 million). Compared to what it would costs to operate and maintain the present oversized WSS infrastructure (annual expenditures estimated at AMD 3.8 billion ≈ € 8.4 million), the scenarios simulated would even lead to cost savings;

- The analysis of needed investments in the various scenarios shows that the additional investments needed to extend the service level of rural WSS is relatively small compared to the investments needed to renovate/optimise the WSS infrastructure (which is foreseen in all simulated scenarios and are estimated at AMD 35 billion [≈ € 78 mln]). Investments needed for extensions would be AMD 2.5 billion (≈ € 5.5 mln) in the MWSS scenario and AMD 5.5 billion (≈ € 12 mln) in the Policy scenario. Only for the Maximal scenario would investments in extensions come near the investments for renovations: AMD 17.7 billion (≈ € 40 mln). Therefore, the biggest financial challenge in all scenarios (apart from Maximal) will be to attract enough funds for the needed renovations to the existing water supply systems;

- The investments for extensions of the WSS infrastructure are mostly concentrated in settlements without WSC services. WSCs would have to do little to comply with the MWSS and Policy targets (only about 10% of total investments in extensions would be implemented by the WSCs). The group of settlements without piped water supply (presently about 40 000 inhabitants) would require between 30-50% of the total investment budget;

- Additional finance needed to implement the FS is already partially available (ADB, central budget). Therefore, compared to the baseline, financing is already improved in the MWSS and Policy scenarios;

- The financing gap in the MWSS and Policy scenarios is – due to the additional finance available – smaller than in the baseline, respectively AMD 7 billion and AMD 10 billion, compared to AMD 16.25 billion in the baseline. Simulations show that a gradual increase of water tariffs by 92% for MWSS, and 100% for Policy (over the period 2008–2015) would, in principle, generate sufficient additional financial revenues to close the financing gap. As a result, the average water bill for households would increase from AMD 12 000 per year (≈ € 27 per household) to about AMD 23 000 and AMD 26 500, respectively, per household.

The general conclusion is therefore that the two policy scenarios are, in principle, financially feasible, though attention must still be paid to the (household) affordability of the scenarios (next chapter), to assess if and what kind of social support may be needed when implementing the FS.

4. AFFORDABILITY

4.1 Introduction

There are several ways of looking at the economic and financial affordability of a Financing Strategy. Most common is to look at household affordability, but one may also look at the budget, or the economy as a whole. In this chapter the affordability of the baseline and the policy scenarios will be discussed and assessed for rural Armenia.

4.2 Affordability of the baseline scenario

4.2.1 Rural household affordability

To assess the affordability of an FS for rural WSS for households, the costs of water services to consumers should be compared with specific household incomes. Special attention should be given to lower income groups. Although no hard guidelines exist on how much the water bill should maximally be, in comparison with household income, often percentages of between 3%-5% are taken. In this affordability analysis, it is assumed that 3% should be the maximum.

In the baseline for rural WSS, it is estimated that total revenues of user charges will increase from AMD 1 billion in 2006, to AMD 2.5 billion in 2015. In the current situation, it is not easy to determine how much a household actually pays for water. As shown in Chapter 2, water companies do collect most revenues, but still have collection problems, whereas in 80% of the settlements without WSCs no payment mechanism exists for water. Therefore, there may be a large variety in the actual household payments for water (ranging from zero to AMD 35 000 per year).

The expectation is, however, that water companies will be increasingly able to collect user charges, and also, in the settlements without WSCs, an increase in collection is assumed.

Assuming a paid use of water per household of 120 m3 per year, at a tariff of AMD 100 per m3, the annual water bill may currently be as high as AMD 12 000 per household (some € 26 per year). By comparing this with the rural income distribution a judgement can be made as to what extent the policy is affordable. This is outlined in Table 4.1.

Table 4.1: Estimated rural income distribution per income quintile and share of water charge in total household incomes (for households that pay), 2006 and 2015, in the baseline, optimistic (10%/y) and pessimistic (6%/y) assumptions on growth of rural household income in Armenia

Consumption quintile	Household income 2006 AMD/year	Share of water charge in household income	Household income 2015, (optimistic) AMD/year	Share of water charge in household income	Household income 2015, (pessimist) AMD/year	Share of water charge in household income
20% poorest	581 418	2,1%	1 454 067	0,8%	996 064	1,2%
2nd 20% population	691 286	1,7%	1 857 750	0,6%	1 243 391	1,0%
3rd 20% population	808 477	1,5%	2 169 853	0,6%	1 456 285	0,8%
4th 20% population	930 820	1,3%	2 843 956	0,4%	1 830 153	0,7%
20% richest	1081 382	1,1%	2 346 489	0,5%	1 690 990	0,7%
Average	818 677	1,5%	2 003 208	0,6%	1 382 185	0,9%

Source: based on Armstat, 2008 (rural income distribution per adult equivalent) and own assessment, 2008

In this assessment it can be seen that, in 2006, paying a water bill of AMD 12 000 per year per household did not pose a problem, in general, for the rural population of Armenia. In all income quintiles, the bill does not exceed 3% of income.

However, making people pay for water in the near future may pose a problem. In many cases, households pay little or nothing for water supply (with an average supply of 400 lcd). For these households (at least 50% of the current rural population) starting to pay for water may be difficult in some cases.

Within the group of poorest rural households, there will not always be the ability to pay regularly for water, as they have, (i) little financial income (average "money income" in 2004 was € 1000 [AMD 450 000]), and (ii) the income is earned irregularly (most income is generated from farm production) (see Annex 1). Also, within this group representing the poorest 20% of population, the incomes may differ considerably, so for maybe half of this group (the poorest 10%) the "3% of income limit" may still be surpassed. Therefore, at least for this group, some sort of financial support will be necessary.

An indication of the amount of support this group would need, is that roughly 35 000 households, on average will be able to pay only 50% of the bill (of 12 000 AMD per year). Potentially the subsidy would therefore have to be AMD 6 000 * 35 000 households = AMD 210 million. However, as in 2007 the collection of user charges is limited to AMD 1 billion (of a potential of AMD 2.5 billion), maximally 40% of the AMD 210 million would be needed, *i.e*. AMD 84 million.

Obviously, however, with optimistic economic development in the coming decade, the group of rural inhabitants not able to pay the (full) price for water will diminish. Even with a more pessimistic view on rural economic growth, the average water bill would represent only 1.2% of income for the poorest 20% of household. A higher economic growth (10%) would diminish the pressure of the water bill on rural household income even further to 0.6% for the average, and to 0.9% for the poorest 20% of population.

It can therefore be concluded that no structural or long-term income support (or other measures [see next paragraph]) will be needed for a large part of the rural population to enhance their ability to pay their water bills.

4.2.2 Affordability for the budget and the economy as a whole

For the affordability of a water policy (in the baseline), there are no hard guidelines on how much of the public budget (local, regional, and/or national) should or could be spent on water services.

In Armenia, the ability (or willingness) to pay for WSS services is lacking for a large part of the rural population. Funds from the public budget will be needed to cover the financing gap. By comparing what is needed for WSS with the total budget and specific parts of the budget (or investment in infrastructure), an idea can be obtained of the affordability for the budget.

In the baseline scenario, for Armenia, the maximal financing gap (in 2009) is estimated at AMD 2.8 billion (≈ € 6 million), in the case where all assumed renovations and re-investments are implemented. Compared to the estimate of 607 billion AMD for the 2009 central budget expenditures (MoFE, 2007), the financing gap for rural WSS would only constitute 0.46 % of the total estimated central public budget for 2009. In 2007-2008, the budget contributions and (international) loans allocated for rural WSS accounted for just 0.33% of the central budget (as planned and approved by the Parliament).

It is clear that only firm commitments and medium-term budget planning can solve the question of "budget affordability".

In Armenia, the Poverty Reduction Strategy Paper states that water infrastructure investments should be financed by the public budget. This would imply that at least AMD 2 billion, annually, needs to be set aside to cover needed renovations for rural water supply. If the re-investments would also have to be financed from the public budget, rural WSS would require AMD 3 billion allocated from the public budget in 2009 to 1.7 billion AMD in 2015.

4.3 Affordability of policy scenarios

In the policy scenarios (MWSS and Policy) it has been assumed that, apart from the additional finance available through the ADB loan and central budget contributions, the financing gap will be closed by increasing the water tariffs gradually between 2008 and 2015. The increase in water tariffs needed in the two scenarios is calculated by comparing the needed additional finance with additional revenues from user charges.

This results in the following assumptions on water tariffs:

- In the MWSS scenario, the annual average water bill per household is assumed to increase from AMD 12 000 per year (2008) to AMD 23 000 in 2015 (an increase of 92% compared to the baseline);

- In the Policy scenario, an annual average water bill per household is assumed to increase from AMD 12 000 per year to AMD 26 500 (an increase of 120% compared to the baseline).

Table 4.2 shows the results of the affordability analysis for the policy scenarios in 2015, for both an optimistic income growth and for a pessimistic growth.

Table 4.2: Estimated rural income distribution per income quintile and share of water charge in total household incomes (for households that pay), 2015, MWSS and Policy scenario, optimistic (10%/y) and pessimistic (6%/y) assumptions on growth of rural household income, Armenia

Consumption quintile	*Optimistic* Household income 2015, AMD/year	Share of water charge in-household income MWSS	Share of water charge in-household income Policy	*Pessimistic* Household income 2015, AMD/year	Share of water charge in-household income MWSS	Share of water charge in-household income Policy
20% poorest	1 454 067	1.8%	2.1%	996 064	2.6%	3.0%
2nd 20% population	1 857 750	1.4%	1.6%	1 243 391	2.1%	2.4%
3rd 20% population	2 169 853	1.2%	1.4%	1 456 285	1.8%	2.1%
4th 20% population	2 843 956	0.9%	1.1%	1 830 153	1.4%	1.6%
20% richest	2 346 489	1.1%	1.3%	1 690 990	1.5%	1.8%
Average	2 003 208	1.3%	1.5%	1 382 185	1.9%	2.2%

Source: based on Armstat, 2008 (rural income distribution per adult equivalent) and own assessment, 2008

The results show, that the affordability threshold of 3% of household income is not surpassed for any of the income groups in any of the two economic forecasts. For the 20% poorest households, with an optimistic growth assumption, the share of the water bill in total household income would decrease from 2.1% in 2006 (baseline) to 1.8% for MWSS, and remain stable at 2.1% for the Policy scenario. Under these optimistic growth assumptions, the MWSS and Policy scenarios do not pose additional affordability problems compared to the baseline.

In a pessimistic approach, with lower growth rates, the share of the water bill in household income (20% poorest) will increase to 2.4% in MWSS, or to 3% in Policy, in the period of 2008–2015. In the Policy scenario the threshold is just reached.

It thus can be anticipated that, under less optimistic economic assumptions, a part of the poorest 20% of the rural population would still need a more structural type of social support to keep the water bill affordable.

The additional budget contributions and loans available in the policy scenarios from 2008–2013 are estimated at, in total, AMD 8.6 billion (≈ € 19 million). In 2008 this equals 0.15% of the central budget

(estimated at AMD 524 billion), and in 2009, 0.33% of the budget (estimated at AMD 607 billion). After 2009, this share will decrease from about 0.23% (2010) to 0.20% (2013) (assuming a gradual growth of the central budget in line with the real GDP growth).

There is therefore little difference between the "budget" affordability of the policy scenarios, compared to the baseline.

4.4 Policies to make the water bill affordable

There is a wide range of policies possible to keep or make the water bill affordable for households. Here some of the most obvious policy options are illustrated, as it is important to understand the relation between tariff policy, affordability constraints, and the dynamics of both the economy and the water services.

Set water tariffs at a level affordable for all income groups

The most general policy is to keep (uniform) water prices at a level that is affordable for all. This general pricing approach limits the ability of water utilities to raise enough revenues through user charges, as the total revenues depend on the prices and quantities.

As the water fee is fixed, and the water supply quantity is also rather stable (and the policy may encourage a more economic use of water), total revenues are also fixed to a certain amount, not necessarily enough for all needed expenditures. In this case, larger subsidies from the budget are needed.

As a result of this policy, not only the poorer inhabitants are subsidised, but also the richer households, which in principle would be able to pay a higher water tariff.

In the baseline scenario, the water tariffs used in the assessment (between AMD 92 and AMD 121 per m3) are not enough to cover even operation and maintenance (O&M) costs, indicating that the current price of water in the longer term is not sustainable to cover all costs of operation, maintenance, renovation, and re-investments.

Subsidise poorest households individually

Another approach is to set tariffs at a higher level, aiming at more revenues, and to assess what would be the "damage" for the poorest inhabitants. The "damage" might be best defined as the difference between the ability to pay for water services (with, for example, a limit of 3% of income) and the actual water bill. In the previous sections it is argued that only a relatively small part of the rural population (currently about 10%) would need some sort of financial support for the water supply.

One drawback of such a policy to make higher bills affordable for all, is that individual subsidies have to be given. On the one hand, this is always difficult, because it is not easy for a municipal or regional institution to set up a consistent and reliable cadastre of the poorer population (as income in rural areas, especially, is very difficult to determine, calculate, or estimate, and control).

On the other hand, it can be argued that, in many countries, some sort of social register is kept for granting certain income support to the poor. If fraud in such a system can be kept under control (at an acceptable minimum level) it is a good solution, as it takes into account social considerations, and provides additional revenues from user charges where needed..

In Armenia a household income support system is already in place and works rather effectively. Over the last 3-4 years it has become better targeted to poor households and could be instrumental in addressing the WSS services affordability issue (see report on Task 3 in (OECD/EAP Task Force, 2007) for more details).

Increasing block tariff system

An increasing block tariff (IBT) could also be introduced to overcome the limitations of revenue raising due to poverty. A two- (or more) tier system is simple:

- For the first, say, 10 cubic metres per month the household/connection pays a low water price (or no fee at all);
- For additional water use the customers have to pay a higher water price.

The result will always be that the consumers that consume less will, on average, pay less per cubic metre than consumers with a larger water demand. It thus enables water utilities to supply poorer customers at lower tariff rates and richer customers at somewhat higher tariff rates.

A **necessary precondition** for such a policy is that water is metered in a reliable way (which is often not the case in Armenia [for details see Annexes 2-5 to the report] [OECD/EAP Task Force, 2007]). It can also be argued that an increasing block system subsidises smaller "richer" families.

4.5 Conclusions

The affordability analysis shows that applying a 3% threshold to the water bill as a share of household income, does not lead to any major affordability problems for rural households in the baseline. Even for the 20% poorest population, the share of the water bill in income is only 2.1% (in 2006), well below the threshold of 3%. Still, it can be anticipated that some part of the poorest population will need some sort of limited social support (for example, only partly pay the bill, or income subsidies, in the range of AMD 6 000 [€ 13] per household per year).

In the baseline scenario, due to the assumed fixed level of user charges, the social support would be focussed on the coming few years, as due to economic development, the share of the water bill in income would decrease, thus enabling more people to pay their bills without support.

In the policy scenarios, which assume increasing water tariffs, it can be anticipated that for a relatively small group of poor inhabitants, affordability issues may play a more structural role in the period 2008–2015, as under less optimistic economic circumstances the share of the water bill in household income would be stable or even increase (to 3% in the Policy scenario).

The affordability of the baseline, the MWSS, and the Policy scenarios have also been assessed for the central budget by comparing the budget contributions, loans, and grants with the central budget projections. This assessment shows that only a slight increase of budget allocation and loans would be needed to close the financing gap. In the baseline, the ratio of budget contributions and loans allocated for rural WSS, compared to total budget expenditures shows a share of 0.33%. In the Policy scenarios, this would be the same, *i.e*. 0.33%, in 2009, and would then decrease to 0.2% in 2013. As only the loans and budget contributions already committed are included in the policy scenarios, no affordability problems are foreseen for the central budget.

The affordability assessment confirms that, overall, the implementation of the financing strategy based on the Policy scenario would be more an institutional and organisational challenge than a financial challenge**.**

5. INSTITUTIONAL

5.1 Introduction

Presently, the water companies serve mostly urban settlements in Armenia. For rural water supply, the water sector is divided as follows: part of the settlements (with about 50% of rural population) is served by water companies; in the other settlements, piped water supply is arranged locally (if a network is available) or is absent (for about 40 000 inhabitant). In settlements without WSCs, the services are incorporated in the municipal services (as a department).

Settlements served by WSCs are, in most cases, supplied through a regional network of transmission mains connected to a few water sources. This nationwide network also serves most urban settlements in Armenia.

The other rural settlements manage their own water supply by using a water source near the settlement (about 80% of them have their own water sources; the rest share water sources with one or more other settlements).

In the present situation there are not only large technical differences between the settlements with and without WSCs, there are also financial and organisational differences. WSCs increasingly manage to collect user charges (as is shown in Chapter 2), whereas in settlements without WSCs the available funds from revenues are very small and local budgets are generally very weak.

From our previous analysis we have concluded that the implementation of the financing strategy based on the MWSS or Policy scenarios would be more an institutional and organisational challenge than a financial challenge.

In this chapter some considerations are presented concerning further development of the institutional setup of the water supply and sanitation in rural Armenia.

5.2 Responsibilities, legal framework, regulations, and ownership

This study does not address the question of to what extent the present legal framework needs to be changed to enable implementation of the suggested organisational models. Certain issues will need to be addressed in the near future:

- Responsibilities of municipalities (to supply drinking water);
- Right of consumers (to have supply of drinking water);
- Role and legal position of public companies, and of private operators.

5.2.1 Responsibilities

There are at least two levels of responsibilities that play a role in the water sector. There are the responsibilities directly linked with the management, operation, planning, etc., of a water company, which can be either the responsibility of a water company or of a municipal service.

Key decisions in the water sector need to be taken at the national level:

- Planning of water infrastructure;
- The planning and incorporation, in the central budget, of capital expenditures (as stated in the PRSP);

- Decisions on appropriate business models and desired scale of operation;
- Conditions under which public and/or private operators can operate;
- Legal structures for the water sector.

Currently, this task is primarily performed by the State Committee for Water Systems. Given the workload of the committee (including that related to the implementation of the FS for urban WSS), it looks necessary to strengthen the committee.

5.2.2 Legal framework

An essential prerequisite for the institutional setup of water services is an appropriate legal framework. The law should clearly indicate who has the primary responsibility for (rural) water supply and sanitation.

In this sense it is advisable to clearly define the responsibility: typically, municipalities are primarily responsible for supplying water and sanitation services (this is the most common approach in Europe). Armenian laws need to be checked in this sense, and possibly adjusted accordingly. Issues that will need to be addressed are (at least) to establish:

- The obligation to supply water when demanded by a customer against timely payments for the service (this obligation can be transferred to, for example, municipalities);
- A legal framework for associations of municipalities;
- A legal framework for public companies or for economic activities of public bodies (like a department in a municipal administration), as well as for private operators of WSS systems.

Such legal provisions have been applied in European countries, enabling a transparent and publicly controlled/monitored organisation of the water sector. Different legal models that are applied in other countries should be taken into account when selecting a model for the legal framework in Armenia.

5.2.3 Regulatory issues

Key regulatory issues that should be addressed at the national level are:

- Setting service and environmental standards (tap water quality, regularity of supply, pressure, etc.; quality of treated wastewater discharged to water bodies, etc.);
- Assure compliance and enforcement with standards;
- Monitoring and assessing performance (*e.g.* laboratories for water quality tests);
- Environmental and service standards compliance and enforcement;
- Providing operation licences for water companies and setting the conditions under which water companies are allowed to operate (in particular, when allowing private companies on the water market, clear rules should be set, such as the responsibilities, the tariff structure, the maximal contract period, etc.);
- Capital expenditures programme approval;
- Setting tariffs (tariff structure and level, taking into account needs for revenues or (partial) cost recovery but also affordability);

- Preventing misuse of monopoly power;
- Disputes resolution mechanisms (including complaints from consumers).

Currently these issues are addressed (mainly) by the SCWS. Again, it is necessary to increase the capacity of the SCWS to perform these tasks in the framework of the implementation of the FS for rural WSS.

5.2.4 Ownership

The ownership of the existing infrastructure should be clearly regulated. In most cases, water supply and sanitation infrastructure is owned by the municipality. However, it is also possible to transfer the ownership to a public (*e.g.* in Germany) or private water company (*e.g.* in England)[32]. A strong argument for public instead of private ownership is the natural monopoly position of water companies. However, whatever organisational model is preferred, a clear legal structure is needed.

5.3 Business model

5.3.1 Public or private operators?

In the past, water companies were supposed to supply basic human demands, which was (and still is by many) viewed as a public task. Therefore, in Europe, but also in the Soviet Union, water companies were (and still are mainly) owned by the public.

Private involvement in the WSS sector started at the end of the last century by the privatisation, in the UK (England), and private operation, of publicly-owned water supply and sewerage systems on the basis of different types of contracts (*e.g.* in France: lease, *affermage*, concession). Moreover, in new EU member states, private companies are sometimes involved in the water sector.

The economic situation of the water sector is characterised by the natural monopoly that it has. This makes it less easy to answer the question of how water supply and sanitation can be best organised from the economic point of view, *i.e.* private or public?

On the one hand it could be expected that private companies would work as efficiently as possible (as this would maximise their profits). However, due to the natural monopoly, they could also extract extra profits by misusing their monopoly power.

Therefore, either effective regulation or competitive pressure created by market competition would be much needed to prevent them from eventually misusing their monopoly power.

On the other hand it is expected that, in general, public companies lack incentive for efficiently running their operation[33]. Benchmarking can be one way to keep the costs of public services within certain limits; private sector involvement is another option; while performance-based contracts could create needed incentives for both public and private operators.

As water supply is a natural monopoly, there must be public supervision of the conditions under which a water network is operated by a private or a public enterprise. This supervision is not the easiest task, as it requires a quality legal framework and a lot of highly qualified staff with relevant experience and equipment, while both of these pre-requisites are seldom in place in EECCA countries. Of course, in the absence of these pre-requisites it would be difficult to guarantee a cost-effective water supply service by water companies.

[32] Although, in practise, this may pose problems when maintaining or repairing the (underground) infrastructure.

[33] In the Netherlands, inefficiency losses are estimated at, on average, 15% (Dijkgraaf, 2004).

5.3.2 Scale of operation: capacity constraints and efficiency gains

The scale of operation of any company that provides services to the public has practical implications for the operation of such a company. Typically, a small company will not have all needed skills in-house, and would therefore need external services (from either commercial or public service providers). In a larger company, certain skills can be provided in-house, as there is sufficient demand for such services and sufficient revenues to pay for required skills.

Therefore, a larger scale of operations helps to address capacity constraints with regard to human and financial resources, which are often faced by smaller service providers and small municipalities.

Moreover, increasing the scale of an operation normally creates "economies of scale", making it cheaper to provide the demanded service.

One reason for creating larger water companies (either public or private or in the form of an association of settlements), is that such a company would have efficiency gains above water companies organised at the level of one settlement, especially a small one.

Thus, larger companies have greater chances to achieve financial sustainability with lower tariff rates.

Efficiency gains are to be expected in the following areas:

- Level of the technical skills and labour productivity;
- Monitoring;
- Repairs;
- Administration;
- Attraction of (international) financial resources (loans and grants);
- Collection of user charges.

Although, theoretically, larger companies could supply water at lower costs than many smaller companies, this is not necessarily so:

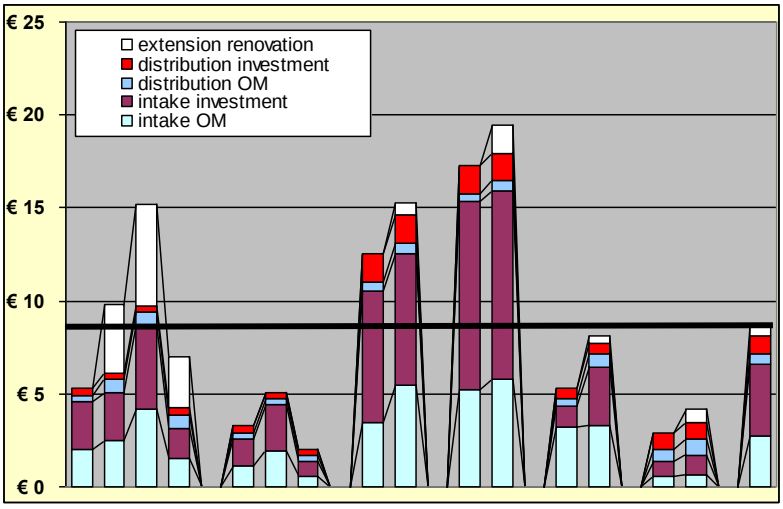
- As water companies constitute a "natural monopoly", there is no direct market incentive to produce at low costs. "Competition for the market" – contracts establishing the right to operate WSS infrastructure under certain conditions (costs, fee structure, quality of service, duration of contract) - in specific municipalities can partly solve this problem;
- Larger companies have the tendency to create staff departments, bureaucratic procedures that can lead to additional overheads.

Moreover, the efficiency gains linked to larger companies can be obtained in other ways. For example, individual municipalities can organise themselves in associations to address certain issues (like water supply and sanitation), such as to share a pool of expertise, or to have a common administration or fee collection (or the same software systems), etc.

5.3.3 Affordability constraints and cross-subsidisation

As shown in the next figure, there may be large unit cost differences between settlements. The unit cost difference between the settlement with the lowest and highest costs can be as much as 1000%.

Figure 5.1: Estimated annual costs per capita in different rural settlements in Armenia



An important argument for organising rural water supply in larger units is their ability to ease affordability constraints in the settlements with the highest unit costs through cross subsidisation.

From the social point of view (water supply at acceptable costs for rural inhabitants), more unified tariffs would be preferable (in the example illustrated in Figure 5.1, the average costs of supply are AMD 3 900 per inhabitant or AMD 13 000 for the "average family", respectively € 8.5 and € 30).

As soon as unit costs differ manifold, if all settlement pay the average tariff/user charge then, in practice, applying a uniform tariff rate will effectively mean cross-subsidisation. Therefore, some (typically smaller) rural settlements will benefit from the cross-subsidisation, while some others would have to pay a little extra. However, overall, the affordability constraints (if they exist) will become much easier.

At the moment, in the rural settlements served by water companies, cross-subsidisation is already implemented, as infrastructure costs may differ considerably, whereas tariffs rates are uniform.

5.3.4 Financial mechanisms and sustainability

To perform the main task of a water utility, sufficient resources need to be available to make investments in renovations, extensions, and maintenance of the water infrastructure. However, the water utility must also be able to attract external finance for longer term investments.

Several financial mechanisms can be and are, in fact, used for financing the water infrastructure:

- To operate systems, user fees are in place (though in many rural settlements this is still not the case);
- Limited local budget contributions are also used to finance operations of the systems;
- The four joint stock water companies active in rural Armenia also have made use of loans.

In most rural settlements without water company services, no structural system for financing the existing water infrastructure exists. User charges are rare, billing is problematic, and also the limited budget contributions have a non-structural character.

Currently, in many cases, the necessary capital repairs are partly paid by in-kind contributions.

Without having at least a minimum of financial mechanisms in place, a water utility can hardly be judged as financially sustainable.

The financial sustainability can be judged by, for example:

- Ability to collect user charges;
- Ability to hire sufficient staff;
- Ability to set aside or attract finance for needed investments in renovations and extensions.

It is clear that if a rural settlement has limited administrative capacities and municipal financial revenues (with large obligations for other public tasks like roads, public buildings, administrative staff, etc.), the financial sustainability is at stake. This clearly is not a problem only linked to WSS infrastructure, but concerns the whole area of activities of municipalities.

It is therefore obvious that any institutional strengthening of rural settlements should not only focus on water issues, but should address the financial position of rural settlements in an integrated way.

However, even if municipalities had more funds for their public tasks and responsibilities, financial sustainability in the water sector may require larger scales of operation (for example, to allow for cross-subsidisation, sharing administrative services, and reducing administrative costs, attraction of loans, etc.).

5.4 Discussion on organisational form

There are various organisational models for rural water supply, for example:

- Incorporated in the "normal" municipal services as a department;
- Organised as a public company, per settlement;
- Provided by a small-scale private operator;
- Association of municipalities that share part of the water supply responsibilities;
- Embedded in a professional water company (that serves more than one settlement).

All of the above options are applied throughout the world with more or less success. For example, in France most communities own the water supply and sewerage infrastructure, but the operation is often contracted to private firms (Veolia, SAUR, etc.). In the Netherlands, the water supply sector has "organically" developed from municipal public companies, to regional public companies (by merging, which often took place in the last decades of the last century).

Although it is not possible to give an objective preference for one of the several options for the organisation of the WSS sector, the organisational structures can be analysed on the basis of their advantages and disadvantages. This is done in the following table, in which, for three basic organisational models, a qualitative assessment is given of the ability to cope with the issues as discussed in Sections 5.2 and 5.3.

Table 5.1 below presents some of the issues and the trade-offs that need to be taken into account when deciding on the way rural WSS will be organised in the future.

Table 5.1: Qualitative assessment of advantages and disadvantages of selected institutional structures for rural water utilities

Criteria	Municipal utility or company	Association of municipal services	Water company
Technical skills (required to operate and maintain water utilities)	Limited, as the scale of operation is small	Sufficient scale to employ certain expertise	Sufficient scale to employ certain expertise
Monitoring skills (requiring increasing knowledge)	Probably not sufficient	Sufficient scale to perform monitoring tasks	Sufficient scale to perform monitoring tasks
Costs to the public and municipality	Possibly low, difficult to automatically apply incentive to supply services at minimal costs and maximal service level	Possibly low. Risk of "autonomous" growth of internal services (like in any larger bureaucratic organisation)	Possibly low. Risk of utilising monopoly position.
Options to ease affordability constraints through cross-subsidisation	Not possible, so large differences between settlements	Possible, but an agreement between settlements in the association is needed	Normal: water companies normally apply one tariff for all clients (thus implicitly cross subsidising more expensive connections)
Financial sustainability	(Very) limited financial capacities (in Armenia, local budgets altogether amount to about 5% of the central budget). Will be difficult to attract loans	Possible: if participating settlements set aside "start capital" and guarantee financial independence of associations.	Normal: in the case where the WSC operates in an economic way, it should be able to attract (inter)national finance
Knowledge of specific local conditions	High: at the level of the settlement, knowledge of local circumstances is guaranteed	Satisfactory, though if the association is large and involves distant settlements, local knowledge may not be used optimally	May be problematic: the larger the company, the more likely that certain local knowledge is absent

Source: own assessment

In general, larger organisational structures, like associations of municipalities, or water companies that serve several settlements, are better equipped to deal with technical issues, specialised skills, monitoring, and administrative issues. An important argument in favour of larger organisational structures is their ability to ease the "affordability" constraints by applying cross-subsidisation. Moreover, the expected financial sustainability is an important issue, as it is inevitable that external financial resources will be needed to implement the Financing Strategy for rural WSS.

An argument in favour of locally organised water utilities is the knowledge and understanding of specific local circumstances. Moreover, smaller organisations would typically have less overheads, thus reducing those types of costs compared to larger organisational structures. However, it may well be that this advantage is offset by higher technical, administrative, and monitoring costs.

For the public, it can be anticipated that the costs of WSS will, in general, increase. Currently, the rural water utilities (apart from the WSCs) are organised locally, and mostly have a lack of funds for proper maintenance and operation. However, the costs are also low. Increasing the quality of the service, setting up supply for municipalities currently not served, etc., will inevitably lead to increasing costs, which may partly be financed from external sources, but also from user charges. In the case where municipalities form associations or, for example, regional water companies, settlements with relatively low supply costs will have to take some of the additional financial burden.

Although some arguments are in favour of small, locally organised public utilities, the arguments in favour of larger water utilities are, in general, stronger due to, for example, their ability to cross-subsidise, their financial sustainability, improved technical knowledge, etc. These larger utilities can be either associations of settlements (note, these should include a minimum of 50 000 inhabitants), larger public companies (regionally organised), or private companies that would operate under performance contracts for a defined period.

Obviously, the municipalities that will be affected by the changes in the institutional framework will need to be involved maximally and given incentives to co-operate in a positive way (for example, by providing long-term finance and structural assistance for capital investments).

Obviously, these legal issues need to be addressed in a broader perspective (defining the role of municipalities; establishing a sustainable framework for municipal finance, etc.).

5.5 Conclusions

It is obvious that for the over 600 rural settlements without WSC services, institutional steps must be taken to strengthen the ability of managing the water infrastructure. Apart from legal issues for rural water supply, it seems inevitable, for the improvement of the WSS in rural settlements, that WSSs should be organised at a larger scale than is currently the case. In various European countries this process of achieving sufficiently large scale has been applied using different approaches. In England, the water sector was privatised, whereas in France the operation of the water infrastructure is often managed by private operators. Larger scale can also be achieved by merging municipal companies into regional public water companies (as in the Netherlands).

These different business models can serve as examples for Armenia, but show that larger scales of operations seem inevitable, and that the institutional framework needs to be adopted for such developments.

It is also recommended to promote the establishment of domestic private operators able to compete and co-operate with international operators.

6. DISCUSSION AND CONCLUSIONS

Present situation and baseline

This report discusses a Financing Strategy for rural WSS in Armenia. First, the present situation concerning rural WSS was analysed. It has been concluded that:

- The institutional set up needs further development. One third of rural settlements (with 45% of the rural population) is served by WSCs; 2/3 lack such services and have either their own water utility or no piped water supply. In particular, the small scale of operation of individual water utilities will make it hard to manage and develop the water infrastructure in the future. Moreover, the legal framework needs further development (*e.g*. clear responsibilities for water supply and the right to be supplied with water);
- The present WSS infrastructure is oversized, needs renovation and improved maintenance. Presently, 50% of the infrastructure needs to be renovated. Some 40 000 inhabitants have no access to piped water supply and the level of "on-plot water supply" could still be increased considerably;
- There is a lack of revenues for financing the needed actions. Whereas model simulations indicate needed expenditures for the present infrastructure of at least AMD 3.8 billion (≈ € 8 mln) per annum, recorded present expenditures are estimated at only AMD 2 billion (of which AMD 1.6 billion by WSCs). This is due to the relatively low tariffs, but more importantly, many rural users do not pay (fully or at all) for water supply (in settlements without WSC services only 20% of the population pays user charges). Moreover, little money is presently available from the central and local budgets;
- In the baseline, the total financing gap in the period 2007–2015 is estimated at AMD 16.5 billion (≈ € 37 mln; maximally AMD 2.8 billion in 2009 and AMD 1.8 billion in 2015). Closing the gap by means of additional finance from the central public budget, loans, and grants, would imply between 0.3% and 0.46% of central public expenditures. This policy would be realistic, as the required finance is more or less the same as the loans and budget contributions already committed in the period 2007–2008 (which comprises just 0.33% of central budget expenditure).

Policy options

Two policy scenarios ("Minimal Water Supply Standards", and MWSS combined with the targets set in the "Poverty Reduction Strategy") and a "Maximal" scenario have been analysed. From the techno-economic analysis the following conclusions can be drawn:

- Water supply infrastructure: compared to the baseline, in the MWSS scenario only a little more water (2%) will be demanded (thus produced). In the Policy scenario, demand will increase by about 15%; and by 60% in the Maximal scenario. However, even in the "Maximal" scenario, the total amount of water demanded will be considerably less than the amount presently supplied (≈ 400 lcd). It is therefore clear that one of the main challenges for both baseline and policy scenarios is to downscale and optimise the present, oversized water supply infrastructure;
- Total annual operational and re-investment expenditures in the policy scenarios do not differ much from the baseline: in the baseline these expenditures are estimated at AMD 2.5 billion (≈ € 5.5 mln), in the MWSS scenario at AMD 2.6 billion, and in the Policy scenario at AMD 2.7 billion. Only in the "Maximal" scenario would there be a more significant increase in expenditures (AMD 3.3 billion). Compared to what it would cost to operate and maintain the present, oversized WSS infrastructure (annual expenditures estimated at AMD 3.8 billion), the policies simulated would even lead to cost savings;

- The analysis of needed investments in the various scenarios shows that the additional investments needed to extend the service level of rural WSS is relatively small compared to the investments needed to renovate the existing WSS infrastructure (which is foreseen in all simulated scenarios and are estimated at AMD 35 billion [≈ € 79 mln]). In the MWSS, additional investment needs would be AMD 2.5 billion (≈ € 5.5 mln); and in the Policy scenario AMD 5.5 billion (≈ € 12 mln). Only in the "Maximal" scenario, would investments in extensions come close to the investments for renovations: AMD 17.7 billion (≈ € 40 mln). Therefore, the biggest financial challenge in all scenarios (apart from Maximal) will be to attract enough funds for the needed renovations;
- The investments for extensions of the WSS infrastructure are mostly concentrated in settlements without WSC services. WSCs would have to do relatively few extensions to comply with the MWSS and Policy targets (only about 10% of total investments in extensions would be implemented by the WSCs). The group of settlements without piped water supply (presently about 40 000 inhabitants) would require between 30-50% of the total investment budget for extensions;
- Additional finance needed to implement the FS is already partially available (ADB, central budget). Therefore, compared to the baseline, financing is already improved in the MWSS and Policy scenarios;
- The financing gap in the MWSS and Policy scenarios is – due to the additional finance available – smaller than in the baseline, respectively AMD 9 billion and AMD 11.5 billion, compared to AMD 16.25 billion in the baseline. Simulations show that a gradual increase of water tariffs, by 92% for the MWSS, and by 120% for the Policy scenario (over the period 2008–2015), would, in principle, generate sufficient additional financial revenues to close the financing gap. As a result, the average water bill for households would increase from AMD 12 000 per year (≈ € 27 per household) to, respectively, AMD 23 000 and AMD 26 500 per household.

Affordability

The affordability analysis shows that applying a 3% threshold for the water bill as a share of household income, does not lead to any major affordability problems for rural households in the baseline. Even for the 20% poorest population the share of the water bill in income was only 2.1% (in 2006), quite below the threshold of 3%. Still, it can be anticipated that a part of the poorest population will need some sort of limited social support (for example, only partly pay the bill, or income subsidies in the range of AMD 6 000 per household per year).

In the baseline scenario, due to the assumed fixed level of user charges, social support would be focussed on the coming few years, as due to economic development, the share of the water bill in rural household incomes will decrease, thus enabling more people to pay their bills without support.

In the policy scenarios, which assume increasing water tariffs, it can be anticipated that, for a relatively small group of poor inhabitants, affordability issues may play a more structural role in the period 2008–2015, as under less optimistic economic circumstances the share of the water bill would remain unchanged or even increase slightly (to 3% in the Policy scenario).

The affordability of the baseline, MWSS, and Policy scenarios has also been assessed for the central budget by comparing the budget contributions, loans, and grants with the central budget projections. This assessment shows that only a slight increase of budget allocation and loans would be needed to close the financing gap. Whereas in the baseline the ratio of budget contributions for rural WSS and loans compared to total budget expenditures shows a share of 0.33%, in the Policy scenario this would be maximally 0.33% (in 2009) and then decrease to 0.20% in 2013.

As the loans and budget contributions that are already committed are included in the policy scenarios, no affordability problems are foreseen for the central budget.

Overall, the implementation of the financing strategy based on the Policy scenario would be more an institutional and organisational challenge than a financial challenge**.**

Institutional changes required for the implementation of the Financing Strategy

It is clear that the present institutional setup of rural WSS is not appropriate for the implementation of the FS for rural WSS. In rural settlements without WSC services, the water utility is a municipal department. In those cases, each municipality needs to take care of all aspects (technical, monitoring, billing, financing, etc.) of the water supply system, while their financial and human resource capacity is often far from sufficient to address the challenge. This is particularly true in small rural settlements (with no nearby water source), where costs of supplying water may be two or more times higher than the average costs of rural water supply in Armenia. Such large cost differences, also make it hard to address the affordability of water supply in smaller settlements with high unit costs. Moreover, the present poor fiscal position of rural settlements is a concern.

Larger water companies or public utilities would be able to apply cross-subsidisation, and would, in general, have better access to finance (assuming financial sustainability) and skilled labour needed to properly operate and maintain the systems. Moreover, the scale of operation will create advantages (technical skills, monitoring, administration, fee collection) compared to small municipal utilities.

Therefore, institutional reform seems inevitable, creating larger water utilities or companies. This will also require legislative action to clearly define: the responsibilities of municipalities (to supply drinking water to the population); the right of consumers (to have a reliable supply of quality drinking water against timely payments); the role and legal position of public companies, etc.. Obviously, these legal issues need to be addressed in a broad perspective (defining the role of municipalities in providing water supply to their population; establishing a sustainable framework for municipal finance).

Next steps

Based on this analysis, the Steering Committee and SCWS need to take decisions on the next steps in the FS. First of all, by agreeing on which approach should be taken in the coming period (MWSS, Policy, or another). The results presented in this report can be used as a basis for this decision.

For the implementation of the FS, at national level, the following actions should be considered:

- Set up a national organisation (implementing agency) responsible for:
  - Collection and regular updating of rural WSS data (financial, technical, etc.);
  - Co-ordinating various ongoing investment programmes (implemented with support from donors and IFIs) and integrating them into a comprehensive WSS sector development programme;
  - Planning of individual projects;
  - Prioritisation of projects (based on transparent procedures) to be co-financed from the public budget;
  - Reporting (to the Government of Armenia, SCWS, and IFIs on administrative issues) and monitoring of progress;
- Adopt MWSS;

- Ensure integration of the FS into the PRSP, MTEF, and annual budgets;

- Attract and safeguard financial resources ([inter]national loans and grants, budget contributions) for the FS;

- Discuss the institutional future of rural WSS with all stakeholders (rural municipalities should be consulted on their preferences before final judgements on institutional structure are taken at national level) and undertake needed institutional reforms.

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ANNEX 1: KEY ISSUES OF RURAL WSS AND THE ROLE OF FINANCING STRATEGY

Introduction

Rural settlements (villages) differ from urban settlements (cities) in various aspects, including their size, population, income, fiscal base, etc. This is reflected in many areas of public interest, and also has its repercussions for rural Water Supply and Sanitation (WSS).

This annex deals with these more general issues concerning rural WSS. The following issues will be addressed here:

- What is Water Supply and Sanitation?
- What are the key features of rural settlements?

In developing countries and countries in transition, amongst other things, the environmental infrastructure needs to be further developed[34]. This is also true for WSS, which is linked to the basic needs of human beings (water for consumption, hygiene and health, for irrigation, and other economic uses). At the global level, Millennium Development Goals (MDGs) have been endorsed by many governments. Also, for the water sector and in the EU, (new) member states have to comply with, for example, the Urban Waste Water Directive (UWW)[35] and the Water Framework Directive (WFD).

To achieve targets set by such policy initiatives, large investments will be needed, urging the development of financing mechanisms.

In this annex, key issues of rural WSS and the role of Financing Strategies for the sector will be discussed.

Water Supply and Sanitation

The following two sections give a brief description of (rural) Water Supply and Sanitation. For further (technical) information and systematic descriptions, reference is made to, for example, the manual for Feasible and supporting documents (EAP TF/COWI, 2004/2005).

An important distinction in both water supply and in sanitation is if a service is being "improved" or "non improved" (see Table 1).

[34] This is **not** necessarily limited to developing countries, as also in developed countries (G8, OECD, EU) a lot of environmentally related investments are still needed.

[35] Which also applies to rural settlements, although the title of the directive indicates otherwise.

Table 1: Improved and non improved WSS infrastructure

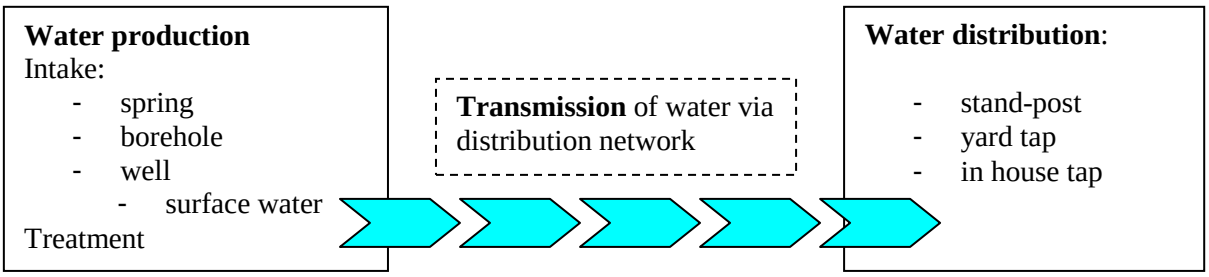
	Non improved	Improved
Water supply	• Unprotected well, • unprotected spring, • vendor-provided water, • bottled water (based on concerns about the quantity of supplied water, not concerns over the water quality) • tanker truck-provided water	• House connection, • public standpipe, • borehole, • protected dug well, • protected spring, • rain-water collection. Such a source should be likely to provide 20 litres per capita per day at a distance of no further than 1 000 metres
Water sanitation	• Bucket latrines (where excreta are manually removed), • public latrines, • latrines with an open pit	• Connection to a public sewer, • connection to septic system, • pour-flush latrine, • simple pit latrine, • ventilated improved pit latrine

Source: UN, as referred to in EAP TF/COWI, 2005, page 1-2

Water supply

Water Supply refers to the complete production chain for drinking water, as illustrated in Figure 1

Figure 1: Water supply chain



Intake of water can be from groundwater or surface water. If the water quality does not meet standards (chemical, bacteriological), it is necessary to treat it before it can be distributed for consumption. This can be the removal of chemicals and biological contamination, or disinfection, depending on the circumstances.

The water intake can be near or even in a settlement (borehole), or can be located at a distance from the settlement (in some cases long distances, such as several kilometres, need to be bridged by the transmission pipes.).

The water distribution system can be:

- Basic (one or a few stand-posts serving a settlement);
- More developed (yard-taps serving one or more dwellings);
- Very developed (in-house taps serving each house with one or more tap-points).

In a rural settlement, there can be a mixture of the above options, connecting stand-post, yard-taps, and in-house taps to the distribution system.

Principally, two systems of water supply can be distinguished:

- Individual water intake by wells, boreholes, or a stream, serving one or a few houses;
- Collective or public water intake and distribution by a network with in-house taps, yard taps, and stand-posts.

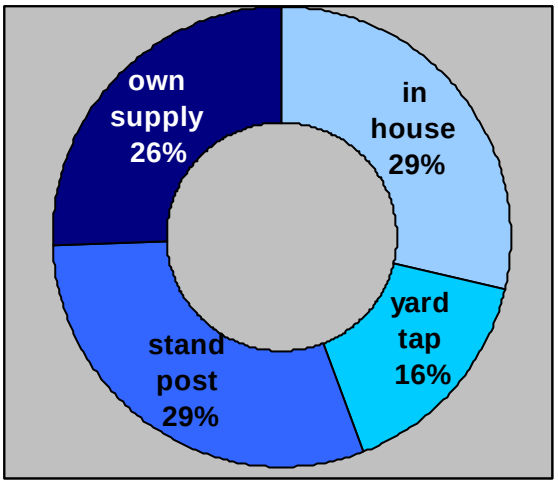
The overall quality of the water supply can be described by parameters like:

- Quantity of supply (sufficient to meet demand or insufficient);
- Distance to supply (in-house, in the yard, or at a stand-post);
- Regularity of supply (is the supply around the clock, or only a few hours per day/per week);
- Biological contamination, chemical quality, taste.

As the rural water supply infrastructure can vary in complexity, and can combine several of the above options, the investment and O&M costs of the system also vary:

- An own well can be dug by the user himself, and supply water at almost no (financial) cost;
- If water treatment for a collective system is needed, this will add to the basic costs of water intake. Also the quantity of water produced will influence costs;
- If the water intake is far away from the settlement, the costs of the transmission pipes can be substantial. Transmission costs are also influenced by various other parameters like the quantity that needs to be transported or whether transport can be arranged by gravity or by pumping;
- A single stand-post requires only a small distribution network (it can be placed at the outlet of the transmission pipe) and thus is relatively cheap; in-house water supply requires a well-developed distribution network with supply pipes connecting all dwellings with the water transmission pipes, which is more costly.

Figure 2: Type of water supply in rural settlements in Armenia (2001)



Whereas in urban areas, in-house water supply is common, in rural settlement this is often not the case. In rural Armenia for example, by 2001 only 29% of the households had an in-house tap (see Figure 2).

Water sanitation

Water sanitation refers to the facilities available for defecation (pit latrines, flush toilets, etc.); collection of sewage (the wastewater discharged by consumers), either in a sewer, ditch, or in a pit latrine or a septic tank; the transport of collected sewage from the settlement to a treatment station or discharge point (in ground or surface water); the treatment of wastewater in a treatment plant (or in the pit latrine or septic tank); and the (final) discharge of treated wastewater in surface or groundwater, and the disposal of wastewater treatment sludge (to agriculture as a fertiliser, or as a landfill, or to an incinerator).

As with water supply, two systems for rural sanitation can be distinguished:

- Individual systems, like pit latrines or septic tanks;
- A collective system consisting of sewerage/ditches and an outlet (sometimes in combination with a treatment station).

It is important that sanitation systems prevent contact between contaminated water and humans, so as to avoid bacteriological infections (which may be fatal in some cases). Humans beings should therefore not be exposed to sewage by open ditches, but also septic tanks and latrine pits need to be situated at a sufficient distance from individual wells/boreholes/surface water used for water intake to avoid contamination (either bacteriological or chemical [nitrates]).

Similar to rural water supply, rural sanitation is usually less developed than urban sanitation. Most urban areas have sewerage. In rural settlements, which are less densely populated than urban areas (most dwellings in rural settlements have an own garden), often sanitation is arranged by a simple pit latrine or a septic tank. In many rural settlements, sewerage is not available. For example, in rural settlements in Armenia, only 3% of the population is served by sewerage (Armstat, 2005).

Treatment of wastewater is either absent (if there is sewerage, it is mostly discharged to a water stream), or basic (wastewater in septic tanks is to a certain extent digested by bacterial processes).

Key issues for rural settlements

Rural settlements differ from urban settlements in various ways, which also has consequences for the WSS infrastructure and the social, financial, economic, and organisational dimensions thereof. The following issues will be discussed:

- Size related to economies of scale and technological choices;
- Income, affordability, and lack of revenues;
- Institutional aspects.

Size and economies of scale

Rural settlements differ from urban settlements as they are small in size (typically between one and 5 000 inhabitants), with a generally low population density (although in the core of a rural settlement, densities can be high, but still lower than in towns).

This physical/geographical characterisation of rural settlements (small, low population density), makes it more expensive to create a high quality water supply and sanitation, based on public supply and sanitation, as is usual in urban settlements.

"Economies of scale" have a negative effect on unit investment and O&M costs in rural settlements. Water intake is more expensive, and also individual household connection pipes need to be, on average, longer than in urban settlements. Moreover, sewerage and wastewater treatment – if similar technologies are applied – is more expensive in rural than in urban settlements.

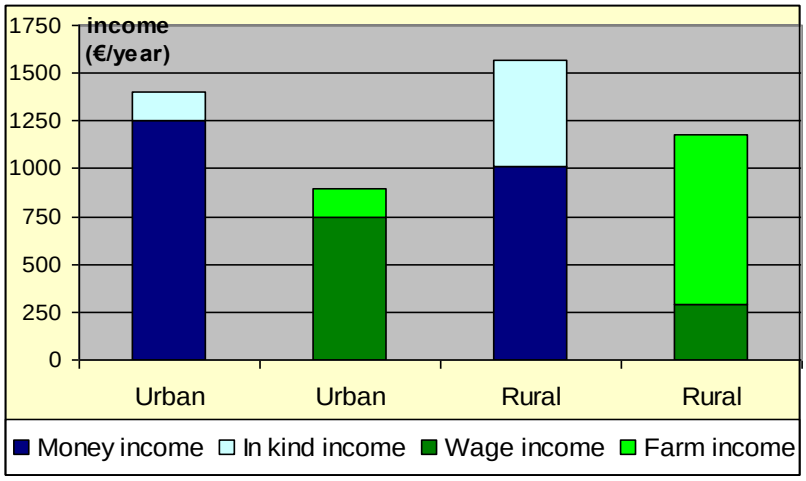
This is one of the reasons that the quality and the level of centralised piped supply and sanitation in rural areas is often lower than in urban settlements. However, it also may be a driver for the application of alternative lower costs (small-scale) technologies.

Rural incomes, affordability, and lack of revenues

In rural settlements, the per capita income often has a different structure than in urban areas.

Figure 3 shows that although in Armenia total income (left or blue bar) is higher in rural than in urban settlements, the share of "money income" is much higher in urban settlements than in rural settlements (where the "in-kind income" forms 36% of total income).

Figure 3: Composition of average household income in urban and rural settlements in Armenia, 2004



Source: based on Armstat, 2006b, table 3.16

The way in which income is earned also differs largely between urban and rural settlements (right or green bars, which only show the two main sources of income, and do not take into consideration, *e.g.* profit, international transfers, pensions). In urban settlements, wage incomes form the main source of income; in rural settlements farming is the main source of income.

Agricultural income, which forms more than 50% of the rural income in the example, is seasonally bound. This indicates that in rural settlements, monthly payment of the water bills will be more problematic.

Incomes in both urban and rural areas will not be evenly distributed. Therefore, a small part of the population will have relatively good incomes, whereas many households may have relatively low incomes, and their incomes could be very unevenly distributed across seasons. Often, 3-5% of income is taken as a threshold for affordability of paying user charges for WSS. This may lead to a substantial part of the population not being able to pay the full water bill.

A variety of mechanisms is available to support this part of the population:

- Set water prices at the affordability level of lowest incomes (but this implies that a large part of population is subsidised without necessity);
- Enable lowest incomes to apply for a waiver for water payments;
- Give general income support to lower income groups, embedded in a wider socio-economic agenda and other policies: poverty reduction, economic development, etc;
- Apply an increasing block tariff (IBT) system, where basic needs (for example 20 lcd) are supplied at low or no costs, whereas water used over and above this volume is sold at higher prices (though such a system would also possibly subsidize small, richer households).

The lower and less regular money income in rural areas may lead to a lower ability to collect user charges. However, this is also influenced by other factors, for example, if water is not metered and supply is irregular, customers will be less willing to pay for the services rendered.

Another factor that reduces potential revenues for water services in rural settlements, is the low local public budget, making it very hard to use public revenues for contributions for water supply (let alone sanitation).

Institutional

Operating a water supply network in a small settlement differs from an urban water network:

- In urban areas the size of the water network (number of customers) is normally large enough to generate revenues sufficient to employ specialised personnel to develop and maintain the technical infrastructure, follow up legislative arrangements, and operate needed administrations;
- In small settlements, sufficiently trained (local) people will not always be available, nor the financial capacity to employ them.

Several business models may apply to WSS in smaller, rural settlements, *inter alia*:

- A WSS infrastructure built and operated by the municipality or by several neighbouring rural settlements or municipalities;
- An institutionalised water utility ("public water utility"), as a separate entity;
- A water company, organised as a public enterprise[36];
- A privatised water company (which has a mandate and assignment to build and operate the WSS infrastructure);
- A water company (either public or private) that serves more than one rural and/or urban settlement (association of settlements).

One consequence of a business model that only serves one rural settlements is that it often lacks sufficient skills to run a WSS in an appropriate way. This is due, on the one hand, to the small scale, and

[36] This may be the same as a "public water utility", depending on the legal system in a country.

on the other, to the **various skills** needed to build and properly operate a WSS infrastructure, which are not necessarily available in each and every rural settlement or municipality.

Another important consequence of locally organised WSS is, that, without outside financial contributions (for example from the central or regional budget), it will have to cover all the costs and investments locally. This may be from either the user charges levied on the customers or contributions from the local budgets, which are typically very low in rural municipalities in EECCA countries.

As explained before, the costs of building and operating a rural WSS infrastructure may differ considerably from place to place, and in general, the unit costs of rural WSS are relatively higher than those of urban WSS (assuming similar service levels).

When developing an FS for rural WSS, both the above consequences of small organised WSS entities should be considered with attention, as it simply may prevent further development of the rural WSS infrastructure in certain rural settlements.

It is therefore strongly recommended to consider the possibility of creating larger water companies, either including several rural settlements or combining urban and rural settlements.

This would enable:

- Use of a pool of expertise that can be financed by the larger utility;
- Setting of a uniform tariff, rather than (largely) differentiated water tariffs for each rural settlement, making use of cross-subsidisation possibilities within the larger entity.

It is not possible to give an exact outline of how large a water utility should be and whether the utility should cover a "closed" geographical region. This also depends on the cost structure of WSS in the different rural settlements, institutional traditions in a country, and legal provisions[37].

An indication of a possible efficient scale of a WSS utility is that it should at least serve some 50 000 inhabitants. For cross-subsidisation purposes it also would be preferable to at least include one or two larger urban settlements.

From a practical and economic point of view[38], the WSS should be organised as a closed region, where the utility has a monopoly to supply water and take care of sanitation. Note that this does not exclude the possibility of "competition for the market", that is competition for the right to operate the regional utility.

Overview of key issues and differences between rural and urban WSS

The following table gives a summary of the main differences between rural and urban WSS.

[37] In many developed countries, regionalised WSS is prescribed by law.

[38] Compare to the fixed line telephone network or electric grid.

Table 2: Overview of key issues and differences between rural and urban WSS

Issue	Rural	Urban
Water intake and production	Small scale for one settlement **or** individual sources	Can be very large scale (industrial size) enabling advanced treatment
Water transmission	Often large distances need to be bridged for a relatively small amount of water, making the transmission relatively expensive	The transmission transports larger amounts of water, making the investment cost per capita lower
Water distribution	Less densely populated, longer distance to be bridged per connection Due to costs, often lower service level, by supply water in yard (not in-house) or by stand-post, serving parts of settlement	Densely populated, shorter distance per connection, making it relatively cheaper to supply in-house water.
Water sanitation, wastewater collection	Often no sewerage available Wastewater not collected are discharged in pit latrine or septic tank	Mostly sewerage available, connecting most houses in the city
Water sanitation, wastewater treatment	(Very) partial treatment in pit latrine or septic tank Mostly no treatment stations (too expensive or lack of collection) Alternative treatment options (reed bed) may be a relatively cheap option, but little experience	Wastewater treatment plants can be (and often are) available, or sewage outlet in surface water
Cost of WSS infrastructure	Per capita investment and O&M costs of comparable technologies are (much) higher than in urban settlements, this influences technology choice (often less advanced) Big unit cost differences between settlement	Per capita investment and O&M costs of comparable technologies are lower than in rural settlements, enabling more advanced technologies
Financial revenues	Collection of user charges is more difficult due to lower service level (lower willingness to pay) Irregular money income makes regular collection throughout the year more difficult Financial contribution from local budget often impossible	If water is metered, collection rates can be high, also depending on service level (high level, higher willingness to pay)
Affordability	Rural household money incomes mostly lower than in urban areas, and unevenly distributed in time (makes monthly payments more difficult)	Urban (money) incomes in general higher than in rural settlement, making more money available for WSS infrastructure More evenly spread during the year
Institutional	Scale of water utility is too small to have all needed skills on board. If organised at community level, lack of possibility to cross-subsidise.	Larger scale enables recruitment of sufficiently trained staff. Larger scale enables internal cross-subsidisation

Financing Strategy, general definition

It is not easy to define what a Financing Strategy entails. In Box 1, a short definition, which is used in this report, is given[39]

BOX 1:Financing Strategy: approximate definition

In this report, Financing Strategy refers to:

- Certain **targets** or goals to achieve: in this case, development targets for rural WSS comply with the MDGs on WSS;
- The **investments** and **expenditures** related to achieving the targets;
- And the different ways (**scenarios**) in which these investments and expenditures can be **financed** (user charges, budget contributions, and loans).

Obviously, the ultimate objective of an FS for WSS is to achieve improvements in the WSS infrastructure, allowing more (rural) inhabitants to have a higher service level for both water supply and sanitation.

In the next section the role of a Financing Strategy will be discussed in more detail.

Role of a Financing Strategy

If a WSS infrastructure needs to be (further) developed, considerable infrastructural investments need to be made, and also the operation and maintenance will require increased expenditures. For a successful implementation of the extension of the WSS services, these expenditures need to be funded/financed.

This does not only require a one-time funding for investments[40], but also the availability of financing for operational and maintenance expenditures and renovations.

A FS, will help to make the choices, which need to be made, explicit. It also will guide (rural) water managers in the process of decision-making, setting (implementation) priorities, etc.

First, the actual situation needs to be known and analysed. Information on the technical state of the WSS infrastructure may be quite well documented and known. However, insight into both the expenditures on WSS and into the way in which these expenditures are financed is often less well documented or absent (at national level).

However, such information is essential for further development of the sector, if unpleasant surprises are to be avoided during implementation[41].

[39] By no means the only definition. On the Internet, it is very difficult to find a comprehensive definition. Most institutions that apply this concept (OECD, World bank, ADB) assume that there is a general understanding of what a Financing Strategy means.

[40] Which often are financed by loans, which need to be paid back, **including** interest payments.

[41] Note that also in developed countries, this is often a problem. For example, in the Netherlands, already 20 years ago it was known that the sewerage system lacked sufficient funds to be maintained properly, nevertheless until today new surprises have been coming to the surface, often leading to large increases of costs and user charges (which have increased over the last ten years by 4% per annum in real terms, exceeding the economic growth rates).

If statistics are not available, or lack the details needed for an FS, information on expenditures on the rural WSS needs to be collected and/or estimated. Moreover, information on financing is needed (revenues of user charges, budget subsidies, loans, and grants).

Once this information is available, a preliminary idea can be formed of the sustainability of the current operations in terms of whether the revenues cover the current expenditures. For example, it can be assessed as to what extent current levels of user charges are sufficient to cover operation and maintenance costs of WSS.

A next step is to extrapolate current trends in expenditure and financing, so as to see how the sector would develop, if no additional policy is implemented. This usually results in the assessment of a "Financing Gap"[42], which shows the difference between the money that needs to be spent on the rural WSS infrastructure and the actual available financial resources.

Such information is normally compiled in a "baseline scenario" ("business as usual" or "no new policy").

Furthermore, in this initial stage, by comparing costs of WSS for consumers (user charges) with their actual incomes, the affordability can be assessed, comparing the share of household income paid for WSS services with a benchmark for affordability[43]. This gives an indication if tariffs can be increased and to which level, and if the poorer parts of the rural population will need some sort of support targeted at the poor, now and in the future.

Next, the FS can indicate the additional needed investments and financing for operations and maintenance to achieve development targets. This is a mostly iterative process, where ambitions are to be translated into estimated future expenditures, which are to be compared with potential available revenues. For example, if the economy in a country is expected to develop rapidly in the medium term, in an FS this can be taken on board by assuming increasing user charges gradually. Such an analysis will clarify if the available finance is sufficient, and as a result, the potentially needed additional sources of finance (for example, additional increase of user charges[44], loans, or budget contributions).

Alternatively, in the absence of additional financial resources, the FS clarifies the fact that the targets set are too ambitious and should be decreased, or the time span for the implementation should be extended.

As part of an FS, one can also look at the way the WSS sector is organised. Quantitative evidence can be provided by assessing the costs and needed revenues at various levels of organisation. For example, in an FS, the costs for improving the WSS infrastructure of different types of rural settlements can be compared (which may differ due to geographical, technical, and economic factors). Such information can support decisions on establishing water utilities that cover larger service areas (also possibly including urban settlements) so as to enable cross-subsidisation, easing the affordability constraints, especially in small settlements with high unit costs of water supply.

It can be concluded that an FS therefore serves to make transparent the social, economic, financial, and institutional consequences of implementing certain WSS development targets and to design a feasible scenario(s) to achieve them.

[42] There may also be a Financing Surplus, if financial resources are larger than expenditures, but this will in most cases not be relevant.

[43] For example, a threshold value of 3-5% of income can be set as a maximum for user charges for WSS.

[44] For example, the EU UWW requires that costs (annual expenditures) are fully recovered by user charges, applying a "market-like" approach. Consumers also pay the full price (and taxes) for gasoline, electricity, bread, vegetables, meat, etc.

ANNEX 2: NATIONAL POLICY DIALOGUE ON FINANCING STRATEGY FOR RURAL WSS IN ARMENIA

Introduction

The National Policy Dialogue (hereafter NPD) on a Financing Strategy (hereafter FS) for Rural Water Supply and Sanitation (hereafter RWSS) was initiated by the State Committee of Water Systems (hereafter SCWS) of the Ministry of Territorial Administration of the Republic of Armenia (hereafter RA) in April 2006, by expressing an interest in a water-related NPD in Armenia.

The water-related NPD focuses at two issues:

- Developing an FS for rural WSS in the RA (with the OECD/EAP Task Force as a strategic partner);
- Facilitating implementation of the principles of integrated water resource management in line with the Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 (with UNECE as a strategic partner).

The first stage of the NPD mainly focussed on the issue of rural WSS and lasted from December 2006 till March 2008.

This annex mainly gives a chronological report of the way in which the National Policy Dialogue was organised. The meetings of the Steering Committee provided a platform for, and served as milestones in the process of the NPD. In between the formal SC meetings, documents, concepts, and questionnaires were developed and discussed in bilateral meetings and communications with representatives of the SC, and data on RWSS were collected with the assistance of the SCWS and rural stakeholders, in preparation for the decisions that needed to be taken during the process of the NPD.

Background

In front of the NPD, several projects on WSS have been executed in the framework of the project:

- "Implementing National Financing Strategy for Urban Water Supply and Sanitation in Armenia"; and in particular,
- "Task 5: Extending the Financing Strategy approach to **Rural** Water Supply and Sanitation".

During the execution of Task 5 in 2006 (which also included testing of the Feasible model and rural cost functions, and the development of guidelines for FS for rural WSS (see OECD/EAP Task Force, 2008)), basic data on Rural Water Supply and Sanitation were collected and further sources of information were identified. A "baseline simulation" of costs of rural WSS was developed with the Feasible model.

Prior to the meeting on 13 December 2006, discussions were already ongoing on the targets of the FS for RWSS. Given the situation in Armenia (in most cases there is access to drinking water near the house in sufficient quantities), it was decided that official UN definitions of MDGs on WSS (in terms of lcd, regularity, and distance to tap/spring) are not relevant for the specific situation in Armenia. Therefore, it was suggested, by the SCWS, to develop the concept of MWSS, which can be seen as an Armenia-specific interpretation of MDGs on RWSS.

2. 1 Steering Committee

A first step in the NPD process was to set up a Steering Committee (hereafter SC) to guide the work in the NPD, to discuss results, and to prepare policy decisions.

The key issues to be discussed in the NPD, the organisation of the NPD, the SC composition and leadership are outlined in the attached Statement of Common Understanding (SoCU) (see Addendum 1: "Statement on Common Understanding of the State Water Committee and the Ministry of Nature Protection of Armenia, and the December 2006 EU Water Initiative Mission on a National Policy Dialogue on water-related issues in Armenia").

The regular and extended SC meetings provided a platform for the NPD. Stakeholders were informed and could make suggestions, ask for further explanation, etc. on the implementation of the NPD (mainly focussing on an FS for RWSS). In addition to the formal SC meetings, there were bilateral meetings, communications, and discussions in between the SC meetings.

Members of the SC are the key Armenian stakeholders; donors and International Financial Institutions (IFIs); rural municipalities/associations of municipalities; water utilities operating, *inter alia*, in rural areas; water users associations; and local Non-Governmental Organisations (NGOs) (see Addendum 2).

In total, five SC meetings took place (four official ones, and the meeting at which the SC was founded [in December 2006]).

Before each meeting, the Consultant (TME) – in close co-operation with the SCWS and the OECD/EAP TF – developed background documentation to inform the dialogue. The documentation was translated into Russian or Armenian and was disseminated to the SC member at least one week in advance to the SC meetings.

Whenever guidance or advice was needed on Policy variables and on MWSS definitions, the Consultant (often supported by the OECD/EAP TF Secretariat) developed a list of options to be discussed, further analysed, or simulated. This resulted in well-prepared sets of options (partially simulated if relevant and feasible) that were discussed during the formal SC meetings. After discussions in the SC, specific options (or parameters) were selected by the SC for further analysis or simulation.

The Consultant then carried out interim or partial analysis of the selected options and reported on the findings in the background documentation prepared and disseminated prior to the next SC meeting.

To facilitate the process of information exchange, and also with the possibility of wider dissemination of (interim) results, the Consultant has developed a project web page (on the Consultant's website, see **http://www.tme.nu/english/Arm_Steering_Committee.htm**) on which project-relevant documentation was posted (agendas; minutes of meetings; presentations; interim reports; and notes) for each of the SC meetings.

This website will remain "on the air" throughout the coming year (during that period, SCWS has to decide if the web page should continue to exist or if it will be moved to an Armenian NPD and Integrated Water Resources Management [IWRM] website).

The SC was chaired by Mr Gagik Khachatryan, 1st Deputy Chairman of the SCWS who provided strong leadership to the process of the NPD. The work of the SC and the policy dialogue was organised (translations, dissemination of documents, invitations, logistics, communications, and various discussions between SC meetings, data collection, etc.) with the support of the OECD/EAP TF Secretariat (Alexandre Martoussevitch), the Consultant, an effective NPD Secretariat (Mrs. Liana Karapetyan, advisor to the1st Deputy Chairman), and Mr. Artem Kharazyan (local consultant)..

2.1.1 SC meeting 13 December 2006

The SC was founded at the meeting of 13 December 2006. During the meeting, the consultants presented a draft working plan for discussion and (afterwards) approval by the SCWS.

In this meeting it was agreed that the Consultant would prepare documents to be discussed at the first (official) meeting of the SC in March 2007 on the following issues:

- "Work plan";
- "Preliminary findings in the baseline scenario";
- "Financing strategies on rural WWS in Armenia"; and
- "Minimum Water Supply Standards for WSS".

2.1.2 SC meeting 22 March 2007

In preparation of this meeting, a working plan was developed in close co-operation with the Chair and Secretariat of the SCWS and the OECD/EAP TF. In the working plan, the following tasks were addressed:

- Assistance in setting up a steering group for the project, and organising steering group meetings;
- Data collection and data delineation;
- Develop and assess a baseline scenario for Rural Water Supply and Sanitation;
- Develop and assess a policy package including SMART targets and a technically, institutionally, and financially feasible scenario to achieve them, including developing a concept on Minimal Water Supply Standards;
- Assistance in developing an Action Plan (AP) for the implementation of the suggested Financing Strategy (FS) for rural Water Supply and Sanitation (WSS) in Armenia.

At this SC meeting, the members of the SC were appointed, and three interlinked issues were presented and discussed:

- Baseline FS for rural WSS, which presents the initial baseline assessment for RWSS in Armenia. This concluded that:
  - Certain financial issues need further investigation (present costs and revenues);
  - There is a general lack of sufficient revenues for operational and re-investment costs;
  - Affordability may pose a problem for the poorest.
- Policy options for water-related Millennium Development Goals (hereafter MDGs) for which different options were presented and discussed:
  - Quantity of water supply (lcd);
  - Distance;
  - Connected population and type of connection;
  - Regularity, etc.

- The concept of Minimal Water Supply Standards, developed by the SCWS. Here the discussion focussed on quantity of water supply (lcd), distance, and regularity, and it was concluded that, in principle, every rural inhabitant should benefit from at least the MWSS (or a higher service level if already available). Further simulations were requested to inform the dialogue on the (im)possibilities of the concept.

It was agreed that – based on these presentations, comments, and concepts of the members of the SC – the Consultant would further develop relevant documents on policy packages for FS for rural WSS, in the framework of the NPD, focussing on:

- The concept of MWSS, by giving examples of household water use (type of use, WHO and EU standards, and rest of the world practises); the present situation for RWSS in Armenia; the way in which MWSS can be implemented;

- Further develop Armenia-specific MDGs for water supply, based on the PRSP and additional information on the present situation on RWSS (for example regularity, on-plot supply).

With the SC it was agreed that it would be useful to collect additional, mainly quantitative, information on Water Supply and Sanitation in settlements not served by WSCs. The SCWS assisted in disseminating 150 questionnaires to 10 *Marzes*.

Moreover, AWSC agreed to supply more detailed data on their rural operations in all 10 *Marzes* of Armenia.

2.1.3 SC meeting 2 July 2007

For this meeting the following documents were prepared:

- Financing Strategies for Rural Water Supply and Sanitation in Armenia, Baseline Simulation (by TME);

- Financing Strategies on Rural Water Supply and Sanitation in Armenia, Millennium Development Goals and Minimal Water Supply Standards, Draft Note (by TME);

- Note on Minimal Water Supply Standards (by SCWS).

Four different policy options were presented and discussed:

- MDGs according to the official UN definitions (where it was concluded that, currently, most of the rural population in Armenia already has a better water supply than stipulated in the MDGs);

- MDGs, based on the PRSP, aiming at increasing on-plot supply from 45% to 70%;

- MWSS, aiming at a to be defined level of supply for all rural inhabitants;

- Combining the MWSS targets with the MDGs, based on the PRSP.

It was agreed to further develop and integrate – quantitatively – the concepts of MWSS and of the RA's specific interpretation of MDGs (the PRSP targets on WSS in combination with the MWSS), taking into account the different types of rural settlements (served by water Companies, those with own [municipal] water services and settlements without piped water supply).

This would then result in the following simulations:

- Baseline;
- MWSS;
- Combined MWSS and PRSP targets.

The SC also asked the Consultant to prepare different "example calculations" on water supply in different situations, with specific attention to water supply in settlements without centralised supply (currently).

At this meeting, the issue of "Forthcoming activities of the SC related to Integrated Water Resources Management" was discussed preliminarily. Moreover, a proposal for improving the situation on the "Internal water supply network in multi-apartment buildings" was discussed.

2.1.4 SC meeting 28 September 2007

In the period prior to this meeting a lot of attention had been paid to collecting additional information on the WSS situation in settlements without WSCs and to collecting further information from the WSCs active in rural settlements, with the purpose of improving the knowledge of the current situation. Results from these questionnaires were obtained with the assistance of the SCWS. High response rates were achieved, making the data very useful for the analysis needed for the NPD on RWSS.

Moreover, example calculations with Feasible were made, as requested by the SC, to illustrate the consequences of various alternatives. Furthermore, initial simulations with the Feasible model were made to estimate the expenditures and available finance and the resulting financing gap for the three simulations agreed on.

The report "National Policy Dialogue on Rural Water Supply and Sanitation in Armenia, Policy packages for rural settlements" served as background material for the discussions in the SC and was disseminated to the members of the SC in advance.

At this SC meeting three presentations were discussed:

- "Survey on Settlements with no WSC Services", showing the results and enabling a better understanding of quantitative issues (level of water production in rural areas, costs, and financing of costs);
- "Examples for Policy Scenarios", giving examples for different types of settlements for different levels of supply;
- "Simulation of Policy Packages with Feasible", showing the first results on expenditures, investments, and financing (gap).

An important decision was made on the way MWSS should be simulated with the following assumptions: quantity (about 50-60 lcd); a maximal distance from the house to the water source (standpipe or yard tap, or an individual source) of 100 metres; and (for piped water supply) at least eight hours supply per day. As a result of the discussions, it was decided that the Consultant would further develop the FS for rural WSS based on three scenarios: baseline, MWSS, and combined MWSS and MDGs, taking into consideration the results of the Consultant's survey and analysis of other surveyed information (JICA survey on rural WSS, and surveys and interviews with the four WSCs active in rural settlements in the RA).

For the scenario "combined MWSS–PRSP", in principle, two simulations should be prepared: one with similar targets for all settlements, and one with a cost-effective approach (cheaper connection to be

realised first). The Consultant also added a "Maximal" scenario, so as to illustrate the difference between the current situation, the situation after implementing MWSS and/or MDGs, and an optimal situation (with on-plot supply for all rural inhabitants).

2.1.5 SC meeting 11 March 2008

The period in between the SC meetings in September 2007 and March 2008 was primarily used to process all additional data on WSS collected in rural Armenia and to create a final, consistent dataset for the final simulations. As the finalisation of scenario simulations with Feasible took more effort than initially anticipated, the meeting (originally planned for November 2007) was postponed to March 2008, after the presidential elections in Armenia.

At the 4th meeting of the SC, concluding the first stage of the NPD (with focus on an FS for RWSS), the draft final report "National Policy Dialogue On Financing Strategy For Rural Water Supply and Sanitation in Armenia" was presented and discussed.

The SC has adopted the MWSS and this concept will be submitted to the relevant governmental bodies. Valuable comments were made by SC members to improve the quality of the scenario calculations and include these in the final report. Further steps for the implementation of the FS were discussed:

- The need to develop – with the assistance of the National Statistical Office – a database on rural WSS;
- The need to set up a "WSS sector programmes/plans implementation unit", and seek international financial support for such a unit.

During Session 2 of the SC meeting, the responsibility for the NPD was transferred from the OECD to UNECE (the strategic partner on IWRM issues). The Chair responsibility of the SC was also transferred from the SCWS to the Ministry of Nature Protection (Water Resources Management Agency).

2.2 Lessons learnt

2.2.1 Steering Committee

It is important that the SC members are committed, represent all key stakeholders, and cover a wide range of interests in the (rural) water sector. It has been proven helpful for the development of certain policies, to have members in the SC on board that are not directly related to the WSS sector, but that have knowledge on water-related issues (for example, the inputs from the Ministry of Health concerning Minimal Water Supply Standards and Sanitation; NGOs concerning sanitation; rural representatives for understanding and appreciating the financial issues and problems linked with rural WSS; water companies on infrastructural issues and investment planning; the Statistical Office on rural population statistics).

It has proven to be important to have a strong leadership in the SC and that the SC Chair is supported by an efficient (local) secretariat. In the case of this project this role was played by both the assistant to the 1st Deputy Chairman of the SCWS and the local consultant.

Involvement in the process of the NPD by an international (donor) organisation is also essential in keeping a NPD on the "right track". In this NPD, the role of the OECD/EAP TF should not be underestimated, as the Secretariat provided essential knowledge on the organisation of an FS for WSS, and made valuable contributions to the process of the NPD, the project implementation, and the project itself.

2.2.2 Data collection

To achieve a successful NPD, it is necessary to collect and interpret reliable relevant data on rural WSS. Such data is often not available from the beneficiary (in the RA this is the SWSC). The involvement of many stakeholders from different perspectives has proven to be an enormous help in defining what kind of data is relevant and what kind of data is available at what institution (often, different institutions do not know of the existence of information in other institutions). In Armenia, the NPD benefited a lot from data on the rural population and settlements, and on rural WSS collected by the National Statistical Service and JICA.

The own surveys performed by the Consultant (on settlements without WSCs and on the WSCs) added valuable information needed as basic input in the development of an FS for rural WSS. The support from the SCWS in performing these surveys was essential to obtaining a high response rate and thus reliable answers. Before performing surveys, it is needed to assess which details of information in the survey are feasible (in relation to the response rate and likeliness of reliable answers).

2.2.3 Timing

The first stage of the NPD in the RA has proven that sufficient time should be taken to develop an FS for rural WSS. As data is scattered and not often readily available for analysis, the process of collecting the right data may take months, or in the case of the RA, more than a year. Timing therefore should have a certain flexibility and not be hampered by procedural obstacles.

Moreover, a too short schedule may underestimate the speed of the decision-making process (which proved to be iterative in the first stage of this NPD). Various stakeholders are involved, and all of them need time to get acquainted with the basic principles of an FS and absorb the information (consultant's reports, presentations during meetings, etc.).

2.2.4 Developing Policy Scenarios

An SC is very helpful and necessary for the definition of policy scenarios. Although the consultant may develop ideas on how rural WSS may be implemented, the input of national stakeholders is key to a successful NPD. In the RA, for example, the concept of MWSS has been proven to be a valuable contribution to the NPD, as it is additional to the MDG targets.

2.2.5 Strengthening capacity of the beneficiary and safeguarding continuation

Initiating an NPD in a country requires that the beneficiary has sufficient capacity to organise the NPD. However, apart from the beneficiary's organisational inputs, it is also important that technical and/or economical skills are (or become) available from the beneficiary.

Therefore, it is advisable that, parallel to the implementation of the NPD by a consultant, skills needed to develop an FS are also developed by the staff of the beneficiary.

As implementation of the results of an NPD will take years, (quantitative) knowledge on the water sector needs to be available to the beneficiary, data need to be stored and regularly updated, progress must be followed, etc. To monitor and steer the FS implementation progress, it is highly recommended that a professional programme and projects implementation unit is created to implement the Financing Strategy and co-ordinate various investment programmes for WSS, typically supported by donors and IFIs.

A certain administrative flexibility would be needed, as the implementation of an FS and related investment programmes involves specific, highly valued knowledge and expertise, while the remuneration of appropriate experts cannot be sustained through the level of salaries paid in a 100% public body in a low income or a low-middle income country, such as Armenia.

APPENDIX: STATEMENT ON COMMON UNDERSTANDING

EUWI-EECCA Component

Statement on Common Understanding of the State Water Committee and the Ministry of Nature Protection of Armenia and the December 2006 EU Water Initiative Mission On A National Policy Dialogue on Water-Related Issues in Armenia

Parties

The State Committee of Water System (hereafter SCWS) of the Ministry of Territorial Administration of the Republic of Armenia (hereafter RA);

The Ministry of Nature Protection of the Republic of Armenia (hereafter MNP) ;

The EECCA[45] component of the European Union (EU) Water Initiative (hereafter EUWI),

The Secretariat of the Environmental Action Programme Task Force (hereafter EAP Task Force), and

The United Nations Economic Commission for Europe (hereafter UNECE);

hereafter jointly called "Parties", have signed the present **document** upon the following:

Objectives

The objective of the present document is to establish a common understanding among the Parties concerned on the organisation of a National Policy Dialogue (hereafter NPD)[46] on water-related issues in Armenia.

Background

National Policy Dialogues are the main mechanism within the EU Water Initiative for identifying priority actions and for establishing multi-stakeholder dialogue with partner countries, including EECCA countries. In April 2006 Armenia expressed an interest in conducting a water-related NPD and a willingness to start the NPD as soon as possible. This was confirmed in a letter from Mr. Khachatryan, 1st Deputy Chairman of the SCWS of Armenia to Mr. Peter Gammeltoft, head of the Water Unit at the Directorate-General Environment in the European Commission.

A mission to Yerevan of representatives of the EU WI EECCA component, EAP Task Force Secretariat, UN ECE and the international consultant - the Institute of Applied Environmental Economics(TME) was organised on Dec. 12-14, 2006. The objective was to discuss with Armenian stakeholders and agree upon the main element of the National Policy Dialogue process, and launch the NPD in Armenia.

Common Understanding:

Against this background the Parties have reached the following common understanding:

The overall goal of the NPD is to help reach the Millennium Development Goals (MDGs) related to water in Armenia. More specifically, the objectives of the NPD are:

(i) to develop a financing strategy for rural WSS with water-related MDGs as target;.
(ii) to facilitate implementation of the principles of integrated water resource management in line with the Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for European Community action in the field of water policy (EU Water Framework Directive, WFD), and relevant Conventions and other international agreements - with an emphasis on financial issues. This activity would inter alia include the development of a pilot project on the integrated water resource management (hereafter IWRM) for a selected river basin, taking into account EU countries' experience.

[45] EECCA stands for the East Europe, Caucasus and Central Asia – the region comprising the republics of the former Soviet Union except Baltic States.

[46] As described in the document « National Policy Dialogues - from Work Programme to Action ».

The NPD will be coordinated with other ongoing projects in the water sector in Armenia, including foreign financed projects. Full account will be taken of past and ongoing work of the EAP Task Force related to this project.

The key institutions in Armenia involved in the NPD will be the State Committee of Water System, the Ministry of Nature Protection and the Water Resources Management Agency (hereafter WRMA). Initially the SCWS will be the main Armenian contact point. The EAP Task Force will – at least, until the finalisation of the financing strategy for the rural water sector in Armenia - act as strategic partner for these institutions in Armenia, providing methodological support and facilitating the NPD process in Armenia.

A Steering Committee (hereafter SC) with multi-stakeholder representation will be established to oversee the implementation of the NPD in Armenia. The Steering Committee will build on, and extend the existing steering group established previously for the ongoing EAP Task Force project on a Financing Strategy for Urban water supply and sanitation in Armenia.

The newly-established Steering Committee will agree on the work programme and discuss documents prepared within the framework of the NPD. The documents will then be submitted to relevant government agencies and other actors in Armenia for further consideration. The Steering Committee will also approve reports for submission to the EUWI-EECCA Component Working Group on progress made, and provide overall guidance for the work.

Key Armenian actors which will be invited to nominate members of the SC representing their respective institutions will be:

- State Committee of Water System of the RA Ministry of Territorial
- Ministry of Nature Protection/ Water Resources Management Agency
- Ministry of Finance and Economy, Department for Public Services Sectors' Projects;
- Ministry of Labour and Social Issues, Department of Social Assistance;
- Ministry of Agriculture;
- National Water Council (taking into account that the Prime Minister of the RA recently gave the directions to consider the necessity of having this Council in the future);
- Public Services Regulatory Commission (PSRC);
- State Sanitary Supervision Service;
- State Statistical Service;

The following donors and International Financial Institutions (IFIs): US AID, UK DFID, JICA, the World Bank, EBRD, KfW and ADB, as well as the local office of the Global Water Partnership will also be invited to nominate Steering Committee members from their respective organisation.

The following actors will each be invited to nominate a member of the Steering Committee:

(1) rural municipalities/associations of municipalities, (2) water utilities operating inter alia in rural areas; (3) water users associations, and (4) local Non-governmental organizations (NGOs). The individuals representing these groups may change according to the issues under discussion.

Other experts might be invited to SC meetings, as appropriate. The composition of the Steering Committee may be adapted to reflect the issues under consideration.

It is envisaged that the SCWS and WRMA will chair the SC on the basis of rotation. It was agreed that the SCWS will chair the SC in 2007. The mandate of the Steering Committee, its Co-Chairs and its composition will be agreed in January 2007 in the process of consultations of the SCWS with other Parties and Armenian stakeholders.

The Secretarial duties of the SC will be implemented by the SCWS.

A detailed work plan for the first area of work until December 2007 was approved at the preparatory meeting for the NPD on 13 December 2006 in Yerevan.

A draft work plan under the second objective of the NPD will be prepared by UN ECE with the support of the EAP Task Force for consideration at the next meeting of the Steering Committee, currently scheduled for June-July, 2007.

The parties acknowledge the importance of reporting on the progress of the NPD in Armenia to the forthcoming "Environment for Europe" Ministerial Conference to be held in Belgrade, Serbia, in October 2007.

The Parties participate in the NPD on voluntary basis, and subject to the availability of adequate resources. The present document does not entail any financial obligations on the Parties with regard to financing other parties' activities in the framework of the NPD, though such financing could take place by agreements (bilateral or multi-lateral).

Signature by Parties:

SCWS:	**1st Deputy Chairman**	**Mr. Khachatryan**
Ministry of Nature Protection:	**Deputy Minister**	**Mr. Matilyan**
EAP Task Force Secretariat:	**Head**	**Mr. Gillespie**
UN ECE:	**Regional Adviser on Environment**	**Mr. Libert**
EUWI EECCA component:	**EC DG ENV Senior Desk Officer**	**Mr. Hecq**

MEMBERS OF THE STEERING COMMITTEE

Ministries, Departments and Organizations

G. Khachatryan	First Deputy Chairman, State Committee of Water System of the RA Ministry of Territorial Administration (SC Chairman)
V. Narimanyan	Deputy Head of Water Resources Management Agency of RA Ministry of Nature Protection
L. Karapetyan	Adviser to the Chairman, SCWS
A. Martusevich	Environment Directorate, Environment & Globalisation Division, OECD EAP Task Force Secretariat
R. Enderlein	UNECE
D. Dorogan	EU commission, Unit ENV D2, Water and Marine Environment Protection
P. Hecq	European Commission, Chairman of the EUWI-EECCA WG
H. Esayan	Head of Water Economy Programs Division, Ministry of Finance and Economy
A. Minasyan	Head of Social Assistance Department, RA Ministry of Labour and Social Affairs
M. Gasparyan	Head of Lands Use and Melioration Department, RA Ministry of Agriculture
A. Arshakyan	Head of Tariff Policy Department, Public Services Regulatory Commission of RA
Y. Poghosyan	RA State Statistics Board Member
N. Bakunts	Head of Division of the State Hygienic and Epidemiology Inspection of
E. Pirumyan	Ministry of Nature Protection, Water Resources Management Agency, Head of Division
A. Malkhasyan	PR Director, Armenian Water and Sewerage CJSC
A. Hovsepyan	Board Member, Country Water Partnership NGO, GWP Armenia
E. Anakhasyan	Armenian Women for Health and Healthy Environment NGO
K. Dadoyan	Head of Water Users Association Support Group, Water Sector Development and Institutional Improvements PIU" SI
S. Vardanyan	Representative of Republican Association of Communities of Armenia
A. Malkhasyan	PR Director, Armenian Water and Sewerage CJSC
M. Galustyan	Lawyer, Armenian Water and Sewerage CJSC
J. Jantzen	Director, Institute for Applied Environmental Economics (TME)

International Organizations

A. Khachanyan	Project Assistant, KfW Armenia office
M. Vardanyan	Environment and Natural Resources Specialist, USAID Armenia
A. Darbinyan	Head of DFID Section
A. Sax	Senior Analyst, EBRD RO Yerevan
A. Simonyan	Environmental and Social Impact Officer, Millennium Challenge Account –
A. Martirosyan	Program Analyst for Environmental Portfolio, UNDP Armenia
H. Ghazaryan	Office Coordinator of REC Caucasus Armenian Branch
Z. Tokhmakhyan	Operations Officer, Sustainable Development Department, Europe and Central Asia Region, World Bank Armenia
G. Arzumanyan	Program manager for Conservation and Sustainable Use of Natural
J. Kloetzer	Economic and Environmental Officer, OSCE Office in Yerevan
P. Lindgaard-Jørgensen	Technical Secretariat, EU Water Initiative EECCA

Invitees

M. Mkrtumyan	Head of Financial-Economic, Calculation and Realization Department, SCWS
V. Tonoyan	Institutional Specialist, JICA Project on Rural Water Supply and Discharge
A. Barseghyan	ADB Armenian Office Representative
A. Kharazyan	Expert/TME
N. Petkova	Project Manager, Environnemental Finance Programme, OECD
R. Mamatkulov	Project Specialist, Social Sectors Division, ADB
A. Grigoryan	Executive Director of Public Advocate Union

ANNEX 3: DATA COLLECTION, ANALYSIS, AND DELINEATION FOR SCENARIO SIMULATIONS WITH FEASIBLE MODEL

Introduction

In this annex, the way in which the Armenian data on rural settlements are processed will be explained in brief.

Data collection in this project mainly concerns the WSS situation in rural Armenia (both infrastructural and financial–economic data), which is modelled in the Feasible module for rural WSS. Feasible requires the definition of (model) villages, which represent a larger group of comparable villages. To enable such delineation of data, a thorough data collection, data processing, and analysis is needed to tailor the data to the Feasible model in an efficient way.

Some data that need to be collected are key to the inputs in model the expenditures of rural WSS. These are (non exclusive):

- Population;
- Type of and distance to water intake;
- Connection rate to central water supply (piped supply) system;
- Water distribution (in-house, yard tap, standpipe, own connection);
- Water use per capita per type of connection;
- Population density and distribution in a settlement.

Available information in Armenia

The following information was available on rural settlements in Armenia:

- Statistical information (1 000 settlements):
  - Population;
  - Territory (not all *Marzes*, some deviation with territory data on *Marzes*);
  - Elevation;
- Data from census on rural population, population densities, water supply, at the level of *Marzes* (2001);
  - Data from an own survey amongst the water companies active in rural settlements: AWSC (39 rural settlements), Lori WSC (15 rural settlements), Nor Akunq (6 rural settlements), Shirak WSC (6 rural settlements) (2005-2006);
  - Data (water availability, sanitation, and financial-economic) on rural settlements not covered by WSC services, obtained by an own survey in the framework of this project of 150 rural settlements performed in the summer of 2007 (see Annex 4);
  - JICA questionnaire sent to about 565 municipalities, where no water company is established (water supply is taken care of by municipality) (2006). Four hundred and sixteen municipalities returned the questionnaire (in eight our of 10 *Marzes*);

– General data on water companies (number of settlements supplied with water, annual turn over, water fees) (2004-2006).

Population data

The sources used are:

- Census data (grouped per *Marz*);
- Statistical data (per settlement);
- Data used when compiling the JICA questionnaire on 565 municipalities (on the number of inhabitants per village and the number of households, not the population as stated by respondents);
- Data on the number of inhabitants served by water companies.

As data on population are from different sources, there are some deviations. The most relevant and important deviation is between the second statistical and third (JICA questionnaire) source[47]:

- On average, the population used in the JICA survey is 7.5% higher than that from the statistical service. Apparently, different data tables have been used.

On the JICA list, the number of households is also mentioned, per municipality. This makes it possible to estimate the average size of a household (which is also relevant model input), which is 3.5 inhabitants per household in Armenia. In Tavushi *Marz* the average size is smallest (3.2 inhabitants/household); in Kotayq *Marz* the average size is largest (3.9 inhabitants/household).

The population data can also be used to assess the average size of settlements, and the frequency of various subclasses of municipalities (small, medium, and large). The average population per settlement is 1 224 (statistical data), with the largest average size in Armavir *Marz* and the smallest in Syunik *Marz*. Table 1 gives an overview of the rural population data in the *Marzes*.

[47] This has been assessed by compiling two lists (one by the statistical office; one used for the JICA questionnaire) into one integrated list .

Table 1: Rural population in Armenia, by *Marzes*

Marz	Inhabitants, rural	Number of rural settlements	Average number of inhabitants	Average size of household
Aragatsotn	102 825	110	935	3.73
Ararat	164 612	89	1 850	3.74
Armavir	177 067	92	1 925	3.30
Gegharkunik	127 873	82	1 559	3.27
Kotayq	97 724	59	1 656	3.95
Lori	123 397	112	1 102	3.33
Shirak	102 785	118	871	3.90
Syunik	59 695	118	506	3.73
Tavushi	81 954	57	1 438	3.17
Vayotz Dzori	37 547	42	894	3.45
TOTAL	1 075 479	879	1 224	3.48

Source: based on data of about 1000 settlements in Armenia

Population density

An important parameter in assessments of rural WSS is the population density. The Feasible model assumed as a default a population density of 100 inhabitants per square kilometre. Within this default a specification is possible for the core area of a rural settlement and the fringe area. For both, the share of population living there and different population densities can be specified.

As statistical data only give average densities, a specific assessment of population density in rural settlements has been made.

Figure 1: Aerial photos of 9 x 1 ha in rural settlements in Armenia (Google earth)

For core areas, it is assumed that 95% of the population of a settlement actually lives there. The population density for the core area has been assessed by downloading aerial photos of some rural settlements in Armenia from Google earth. The number of dwellings has been counted for one hectare. For nine samples, the average number of dwellings per hectare is 10.7. Assuming about four inhabitants per dwelling, the average density per hectare is 40 inhabitants per square km, *i.e.* approximately 4 000.

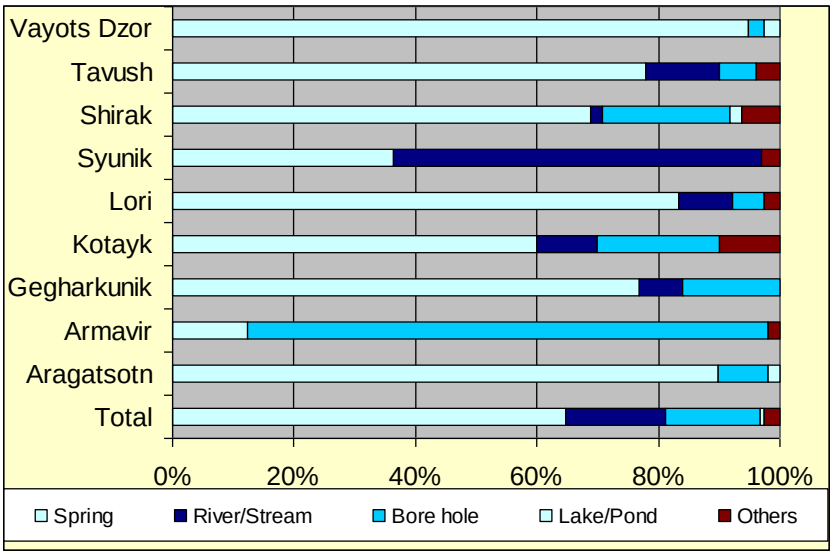
For the 5% of rural population not living in the core area of settlements, an average population density of two inhabitants per square kilometre is assumed.

Water supply and sanitation

Water intake

The situation on water intake can be determined from the results of the JICA survey. This is shown in the following graph for nine *Marzes*.

Figure 2: Water intake in 9 *Marzes*



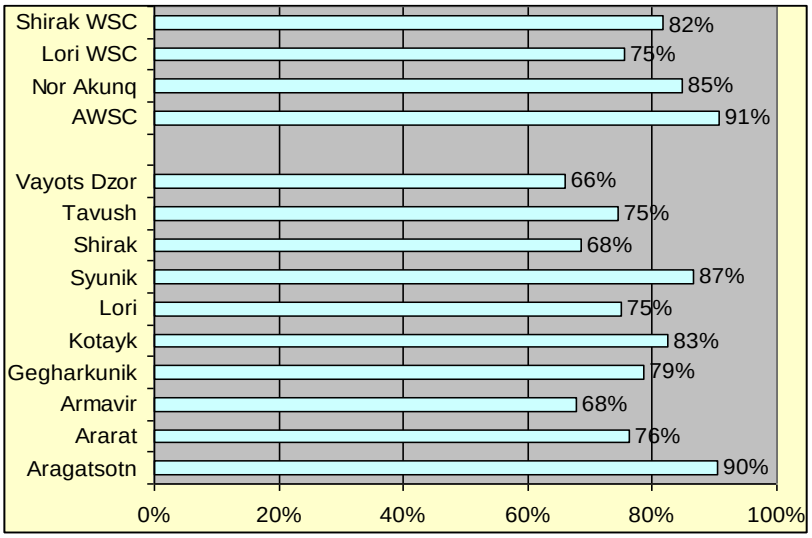
Source: analysis of the results of the JICA survey

The water companies of Shirak and Lori use spring water as intake. In Lori from (mainly) one source, connected to a long pipeline to Vanadzor. Nor Akunq (Armavir) uses boreholes for water intake. The largest water company, AWSC, has about 150 production locations (including water production for urban settlements). About 71% of water produced comes from springs, 23% from boreholes (mainly in the central region), and 6% from surface water.

Connection rate and type: In-house taps, yard taps, and standpipe connections

Household connections are characterised in two ways: the overall connection rate of households to centralised (piped) water supply and the type of connections people have.

Figure 3: Connection rate of rural population to piped water supply in 10 *Marzes* and for 4 WSCs (share of population with access to centralised water supply)

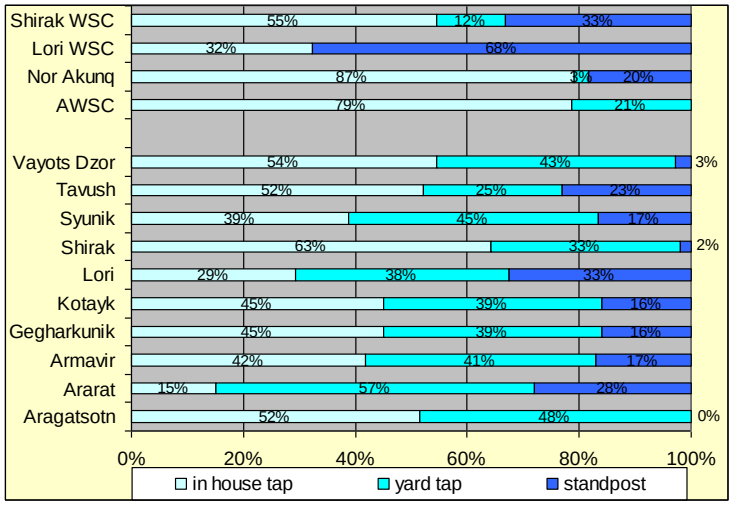


Source: analysis of the results of the JICA survey

Between 66% and 91% of the rural population is connected to centralised (piped) water supply, according to an analysis of the results of the JICA survey and data from WSCs.

For eight *Marzes* (all except Gegharkunik and Shirak) and four WSCs, data are obtained by own surveys on the types of connection to centralised water supply systems in rural settlements. Completed with data from the JICA survey and an estimate for Gegharkunik (assumed to have the same split as Kotayk) the following information on the way households are connected to water supply is available:

Figure 4: Piped water supply to the rural population in 10 *Marzes* in Armenia, and for 4 WSCs, by type of connection



Source: TME surveys (water companies and settlements without WSC service), 2006 and 2007

The data show that, in Armenia, on average 44% of the rural population is served by in-house taps, 41% by yard tap, and the rest by standpipes. For the water companies, data show a large variation.

Sanitation

On rural water sanitation, some information is available from the own survey. This is discussed in Annex 4.

Delineation or grouping of information for scenario simulations

To use Feasible, the data on the 879 settlements need to be grouped for scenario simulations. From a modelling perspective, the following issues need to be covered when grouping the data:

- Type of water intake;
- Geographical and/or institutional situation;
- Size of the settlement.

In the particular case of Armenia, it is also important to know if any water supply and distribution exists, or needs to be (re)constructed.

Water intake

At least three groups of settlements have to be distinguished:

- Water intake from spring water;
- Water intake from groundwater;
- Water intake from river/stream.

Geographical and/or institutional situation

From a practical point of view, water supply can be subdivided between settlements:

- That are not served by a water company; or
- That are served by a water company.

If possible, a further subdivision between *Marzes* is practical. This has been done for the settlements without a water company (based on the JICA survey and our own survey).

Finally, a group of settlements has also been distinguished without piped water supply (basically, in these settlements all water is supplied on an individual basis).

This leads to 15 different groups of settlements (settlements without WSC services in 10 *Marzes*, four water companies, one group of settlements without central supply).

Size of settlement

Although for a baseline the size of settlement can be simulated in an average mode, one needs to be prepared for modelling a policy scenario. In that case it is better to subdivide the rural population in, for example, three classes (small, medium, and large rural settlements). This enables, in a later stage, the assessment of cost-effective approaches in policy scenarios. In the database on municipalities the following classification is used:

- Small settlements: between 0 and 530 inhabitants;

- Medium-sized settlements: between 531 and 1 360 inhabitants;
- Large settlements: over 1 361 inhabitants (and mostly less than 5 000 inhabitants).

Total

The delineation, as described above, for rural water supply in Armenia, has resulted in the following grouping of data, which is used as input in the Feasible model.

Table 2: Delineation of rural settlements in Armenia for water supply

***Marz*, water company**	**Type of intake**	**Nr of groups**	**Number of inhabitants**	**Number of settlements**	**Distance intake, spring (km)**	**Distance intake, borehole (km)**	**Distance intake, surface water (km)**	**Average number of inhabitants/ household**
Aragatsotn	Spring Borehole	3 1	48 254	36 2	5-7.5	 3.5		3.73
Ararat	Spring Borehole	3 3	27 394	15 9	8	 0.7		3.74
Armavir	Spring Borehole Surface w	2 3 1	85 654	5 38 1	0.5-10.2	 0.5-0.7	 6.9	3.30
Gegharkunik	Spring Borehole Surface w	3 2 1	97 144	51 6 3	8.3	 0.5	 6.9	3.27
Kotayq	Spring Borehole	2 1	66 737	10 2	4.6-5.4	 25.5		3.95
Lori	Spring Borehole Surface w	3 3 2	65 172	62 4 2	5-10.9	 0.5-1	 8-70	3.33
Shirak	Spring Borehole Surface w	3 2 2	65 172	31 5 3	3.5-4.2	 1-1.3	 0.3-6	3.90
Syunik	Spring Surface w	3 3	26 149	30 60	2.8-7.7		 5.2-9.2	3.73
Tavushi	Spring Borehole Surface w	3 1 2	65 199	34 3 2	3.7-12	 1.4-6.9	 6.9	3.17
Vayotz Dzori	Spring Borehole	3 1	33 960	36 1	7.5-9.2	 0.5		3.45
AWSC	Spring Borehole Surface	8	381 643	249	6.2-28.4			3.48
Nor Akunq	Borehole	2	31 034	11		1.7		3.30
Lori WSC	Spring	3	22 153	15	12.1			3.33
Shirak WSC	Spring	3	36 630	33	0.3-7			3.90
No piped distribution	Spring Borehole Surface w	3 2 1	42 991	50 10 7	0.1-8.1			3.48
Total		78	1 075 479	879				3.48

Source: team evaluation of data.

In total, the about 879 rural settlements of Armenia, have been delineated into 78 groups of settlements with (more or less) similar characteristics.

Moreover, data on household connections to piped water supply and distribution types have also been inserted into the model. In Figures 3 and 4, the basic data for the delineation are shown.

Other data

In the Feasible model, many default factors are defined to enable assessments. All of these defaults can be changed by the user. Important factors that influence the outcomes of the model are:

- Water use by different type of users (in-house tap, yard tap, or standpipes);
- Distance from core of a settlement to the source of water supply (see Table 2);
- Household size (see Table 2);
- Number of users of standpipes and yard taps;
- Population densities in core and fringe areas and share of population living there (already discussed).

Water availability is, in most cases, not a problem. The results of the survey amongst rural settlements without WSC services show, that water supply per capita varies between 91 and 474 lcd. The water companies, in general, also report large availability of water. AWSC produces, on average, over 600 lcd in rural areas, Lori WSC about 400 lcd, Shirak WSC about 500 lcd, and Nor Akunq shows an exception by only producing 30 lcd[48].

The actual household water use (for food, personal hygiene, washing) in rural settlements is not known. Part of the water produced does not reach consumers due to leakage, public use, and possibly use for irrigation.

For all other factors that influence costs, the default values as defined in Feasible have been used, except labour costs, where the costs have been assessed at about one-third of the international defaults.

[48] It could be that only water that is actually sold is accounted for in this figure for Nor Akunq.

ANNEX 4: SURVEY IN 150 RURAL SETTLEMENTS WITHOUT WATER COMPANY SERVICES

Introduction

With the aim of obtaining more quantitative information on the financial and infrastructural situation in (about) 570 rural settlements not served by a Water (and sewerage) Supply Company (WSC), a questionnaire was developed and submitted to about 150 settlements (15 per *Marz*) in Armenia. The questionnaires (attached at the end of this annex) were disseminated and collected by the SCWS (through *Marzes* offices), and the results of the questionnaires were analysed by the Consultant, TME.

Statistical population, sample, and response

The aim of the survey was to get a sample that is representative for the population living in the (about) 550 rural settlements without water supply from a water company. The following table gives an overview of some of the population characteristics, compared to the response of the sample.

Table 1: Population and settlements in *Marzes* not served by Water and Sewage Companies, all rural settlements and responding settlements in the sample

Marz	**Population**	**# of rural settlements / *Marz***	**Average # of inhabitants per settlement**	**# of settlements / *Marz***	**Average # of inhabitants per settlement**
Aragatsotn	55 112	70	787	13	1 464
Ararat	30 156	24	1 257	10	941
Armavir	93 204	49	1 902	15	2 492
Gegharkunik	104 168	70	1 488		
Kotayq	71 172	42	1 695	10	1 876
Lori	68 120	72	946	15	1 364
Shirak	30 087	50	602		
Syunik	47 296	103	459	14	1 122
Tavushi	70 744	51	1 387	15	1 842
Vayotz Dzor	33 960	40	849	15	1 265
Total	**604 019**	**571**	**1 058**	**109**	**1 564**

Source: Estimated by team, 2007

Of the 150 questionnaires, 109 were completed and returned, although in many cases not all questions were answered. From two *Marzes* – Gegharkunik and Shirak – no questionnaires were returned. The conclusion can therefore be that the response rate is very satisfactory. If the two non-responding *Marzes* are not taken into account, the overall response rate is 91%.

As there is a wide variation between rural settlements (size, altitude, etc.), one also needs to look at how the sample (the results of the 109 questionnaires) compares to the total population, living in the (about) 570 settlements.

If all settlements without WSC services are compared to the sample, by size classification (small, medium-sized, and large settlements), the following analysis of the responses in the sample can be made:

Table 2: Statistical coverage of the response on sample, by size of rural settlement

Type of settlement	All settlements	Response in sample	Coverage
Small settlements: from 0 to 530 inhabitants	254	32	12%
Medium-sized rural settlements: from 530 to 1360 inhabitant	169	32	19%
Larger rural settlements: over 1360 inhabitants	148	45	30%
Total	**571**	**107**	

Twelve percent of the smaller rural settlements is covered by the sample, 19% of the medium-sized settlements, and 30% of the larger settlements. This means that without statistical correction, the results of the larger settlements will weigh about 2.5 times heavier than those of the smaller, and almost 1.5 times heavier than those of the medium-sized settlements.

Figure 1: Coverage of sample and response of total rural settlements without water company services

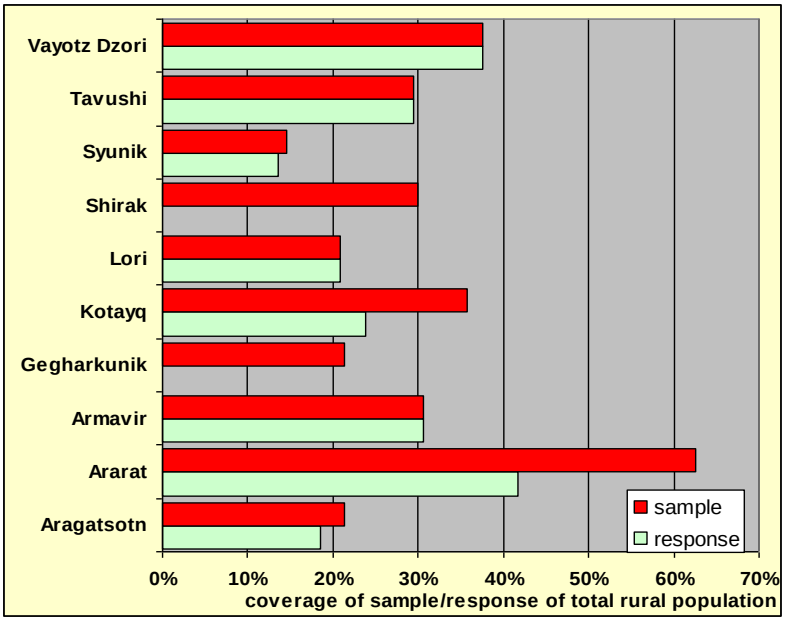
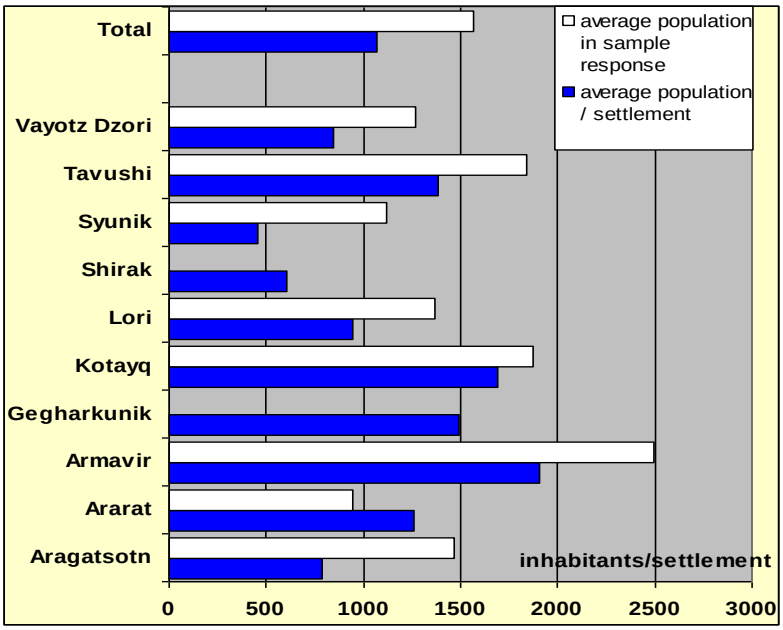


Figure 1 shows the coverage of the sample and response in comparison with all rural settlement without the services of a WSC.

In all *Marzes* (except the non-responding *Marzes* of Gegharkunik and Shirak), the coverage rate is at least 13%; in Ararat the response rate is over 40%.

Figure 2: Average population in settlements of the sample response and of all settlements



The next step taken is to check the representation of the sample, compared to all rural settlements. For this, the average number of inhabitants per settlement of the sample is compared to the averages of all settlements. This is shown in Figure 2.

Figure 2 clearly shows that, on average, the size of rural settlements in the sample is about 500 inhabitants larger than the average size of all settlements. Only in Ararat are the responding rural settlements, on average, smaller.

This means that if further results of the inquiry are to be analysed, this should be considered, and if possible, a (statistical) correction should be carried out.

Financial information

Question 1 of the questionnaire concerns the expenditures on WSS:

Table 3: Expenditures on water supply

1: How large are the annual expenditures on water supply? (Operation & Maintenance and Capital Expenditure [Capex] if any)	Number of answers	Response rate
1. Total (AMD per year)	64	59%
2. Operation and Maintenance (AMD per year)	61	56%
3. Capital expenditures (AMD per year)	33	30%

More than half of the responding settlements are able to quantify expenditures. From the answers, it can be concluded that roughly half of the responding settlements have also made some investments during the last year. The (uncorrected) results are shown in the following table (in AMD per year):

Table 4: Estimated total, operational and capital expenditures per year

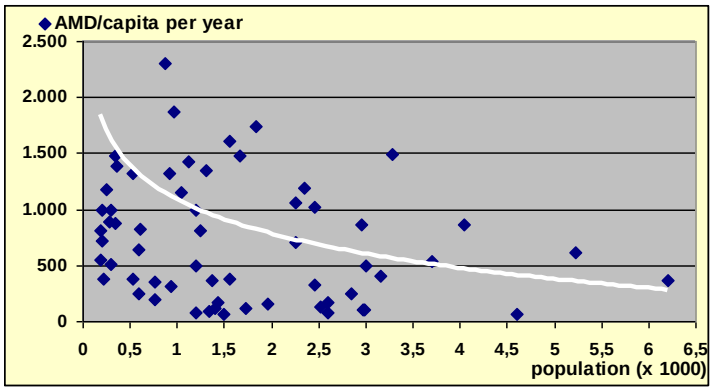
1: How large are the annual expenditures on water supply? (Operation & Maintenance and Capex if any)	Total expenditures	Average per settlement
1. Total (AMD per year)*	80 224 200	1 253 503
2. Operation and Maintenance (AMD per year)	49 515 600	811 731
3. Capital expenditures (AMD per year)	29 908 600	906 321

* The total is slightly higher than the sum of O&M and Capex as, for some settlements, these were not specified separately.

The 64 settlements report, in total, expenditures of AMD 80 million, or, on average, AMD 1.253 million per year per settlement. Considering that the population in the responding settlements is, on average, 500 inhabitants larger than the average population in all relevant rural settlements, this figure cannot simply be extrapolated to all settlements.

By relating inhabitants per settlement to total expenditures, the average expenditures on WS per capita can be estimated. This is shown in Figure 3, which also shows the number of inhabitants per settlement (64 in total).

Figure 3: Average expenditures on water supply in rural settlements, AMD per capita per year



In 61 of the 64 settlements, average expenditures on WS are estimated at between AMD 67 per capita and 2 500 AMD. In three settlements, not shown in the graph, costs are higher.

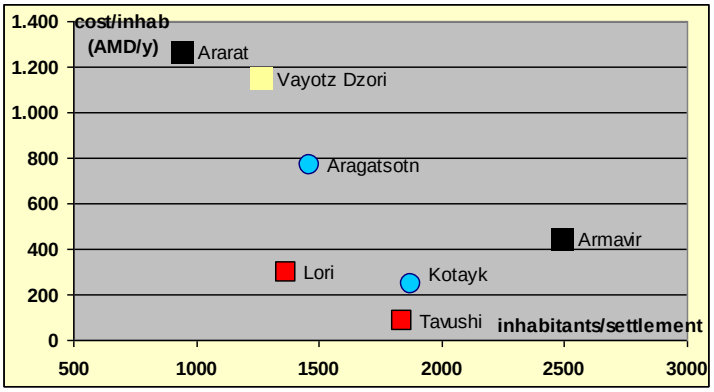
For two small settlements, the expenditures on water supply are estimated at between 7 500-8 500 AMD per capita per year.

From Figure 3, it appears that a correlation between size of the settlement and average expenditures per capita exists. If the sample is subdivided in three groups, the average expenditure per inhabitant can be estimated at:

- Small settlements: from 0 to 530 - AMD 1783 per capita per year;
- Medium-sized rural settlements: from 530 to 1 360 - AMD 853 per capita per year;
- Larger rural settlements AMD 769 per capita per year.

It is also (partially) possible to make a comparison per region. In Figure 4 this is shown, by comparing average expenditures per inhabitant, per year, per *Marz*, with the average number of inhabitants per *Marz*.

Figure 4: Average expenditures on water supply in *Marzes*, in AMD per capita per year



It can be seen that the average expenditures on WSS per inhabitant vary largely. In Ararat and Vayotz Dzori, the expenditures are relatively high (about AMD 1 200 per capita), in Lori, Tavushi and Kotayk, the expenditures are relatively low (under AMD 400 per capita).

Question 2 deals with the rural population who actually pay directly for their water supply.

Table 5: Payment for water by households

2: Do people pay for water supply?	Settlements		Population of sample	
1. Yes	21	19%	45.336	27%
2. No	88	81%	122.035	73%

It can be seen that only about 25% of the rural population actually pays for their water supply.

The average size of settlement that reports revenues from user charges is 2 159 inhabitants, about 600 inhabitants more than the average of the sample, and some 1 100 people more than the country average.

Question 3 is about the way payments are effected. If people pay for WSS, they mostly pay a monthly fee (15x[49]); an annual fee (5x); a partial fee, by providing "in kind" services (2x); or other, unspecified payment methods (1x).

Payment of user charges is more common in larger settlements. The average number of inhabitants in such settlements is 2 160, whereas the average of all the settlements is 1 060 inhabitants (see Table 1).

Question 4 deals with the basis for charging water services. In most cases this is based on a fixed fee (17x), metering is applied three times, other unspecified ways of payment are applied in two settlements.

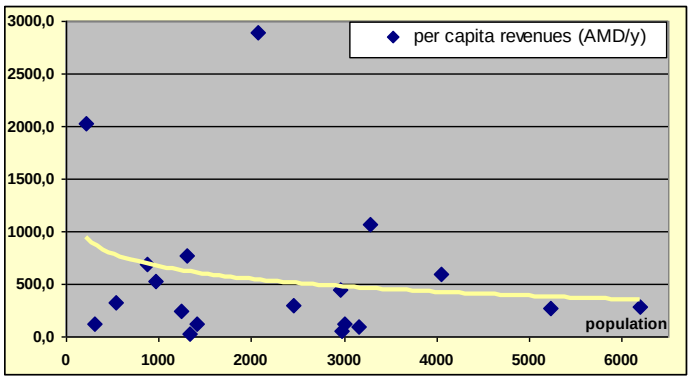
Question 5, asking for the annual revenues from water charges, is only replied to by six of the 21 settlements (where people pay for WSS). In these six settlements, total reported revenues from water charges are AMD 3 869 384/year, or AMD 644 897 per settlement.

Further analysis of the answers provided (on monthly fees, for example, public budget subsidies, total costs, and water supplied throughout the year) by another 13 settlements (minimum) allowed estimates of the annual revenues of water charges. In these 19 settlements, total annual revenues are estimated at AMD 21 237 500, or AMD 1 117 763 per settlement (or AMD 488 per capita per year). This would cover some 25% of total reported expenditures.

The next figure shows the per capita revenues of user charges in the 19 settlements:

[49]Hereafter notation N means that N such observations were made in the sample.

Figure 5: Per capita revenues of user charges in 19 rural settlements in Armenia, in AMD per capita per year

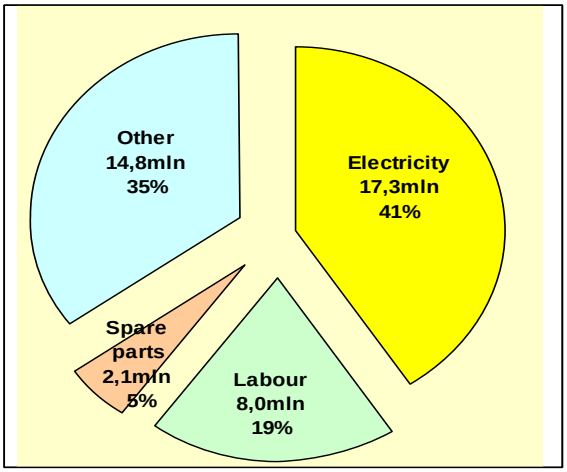


It appears that, as one would expect, user charges (if applied) are – on average – higher in smaller than in larger settlements.

Comparing the (estimated) revenues with the reported expenditures in settlement where the population pays for water, the median level of cost recovery is about 31%, the unweighted average about 45% (minimum 13%, maximum 100%).

Question 7 deals with revenues from other sources, mainly public budget. In total, 37 settlements reported contributions from the municipal budget, with a total of AMD 42.2 mln. Figure 6 gives the subdivision of the amounts per type of municipal contributions.

Figure 6: Subdivision of contribution from municipal budgets, in AMD mln per year



Nine settlements report contributions from the municipal budget for electricity, representing 41% of total contributions. "Other" expenditures are reported by 14 settlements and cover 35% of contributions. These probably refer to cash transfers. Smaller contributions refer to payments for labour and spare parts.

When comparing total expenditures with total budget contributions and revenues from user charges, it can be estimated that of total expenditures of AMD 80.2 mln, just AMD 21.2 mln is covered by user charges (26%), and AMD 42.2 mln by the municipal budgets (53%). For some 20% of expenditures, no financial resources are reported[50].

[50] This may indicate financing problems, but also is a result of non-response (as 34% of settlements that report expenditures do not indicate any source of revenues).

Water supply

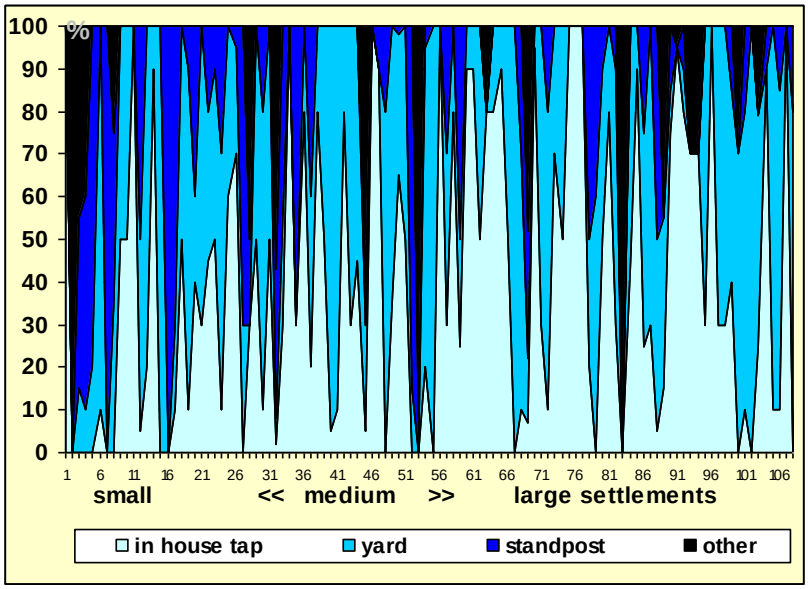
The second set of questions is about water supply in rural settlements without WSC services.

Question 1 asks if piped water is available. In 88 settlements the answer is positive; in 20 settlements no piped water is available (of which 10 in Ararat).

Question 2 deals with the type of connections: in-house tap, yard tap, or standpipes.

In Figure 7, the subdivision for all responding villages is shown. The villages are sorted on the basis of the number of inhabitants (left = smaller; right = larger).

Figure 7: Type of water supply (in-house tap, yard tap, standpipes, other) per rural settlement, sorted from small to larger settlements, in percentages

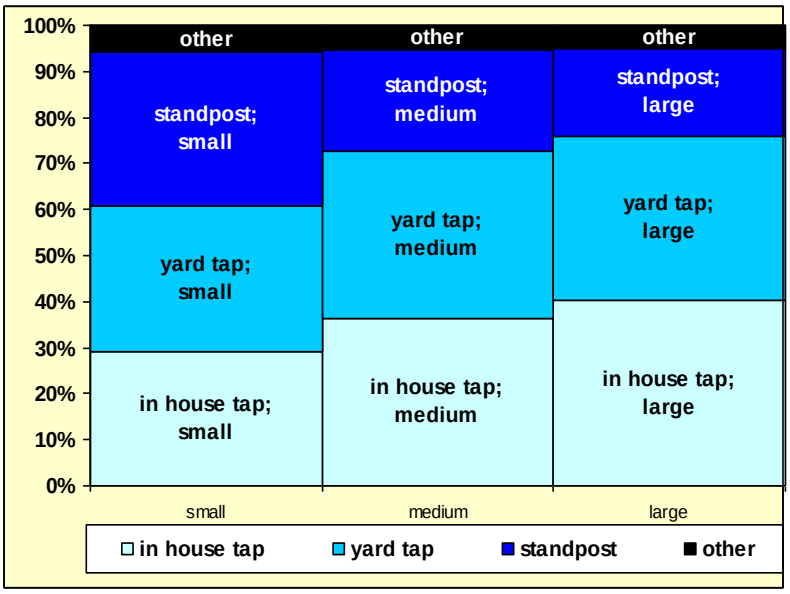


It is obvious that there is a wide variation in the type of supply. There are small villages with a large share of in-house taps, but there are also larger settlements with a small share of in-house taps.

There is, on first sight, no clear correlation between size of the settlement and the quality of the water supply service (in terms of distance from dwelling).

If all settlements are grouped into three classes, as shown in Figure 8, it becomes clear that, on average, in larger villages the population has relatively more access to in-house and yard taps (lighter colour in the figure), smaller settlements more access to yard taps and standpipes (darker blue in the figure).

Figure 8: Type of water supply (in-house tap, yard tap, standpipes, other) for small (< 530 inhabitants), medium-sized (between 530 and 1360 inhabitants) and large rural settlements (> 1 360 inhabitants)



From this figure, it is clear that there is a correlation between size of settlement and type of water supply. The larger the settlement, the higher the share of in-house and yard taps, the smaller the share of standpipes.

A further analysis of the results shows that there are large differences between *Marzes*, see Figure 9.

Figure 9: Type of water supply (share of in-house tap, yard tap, standpipe, other) for eight *Marzes* in Armenia

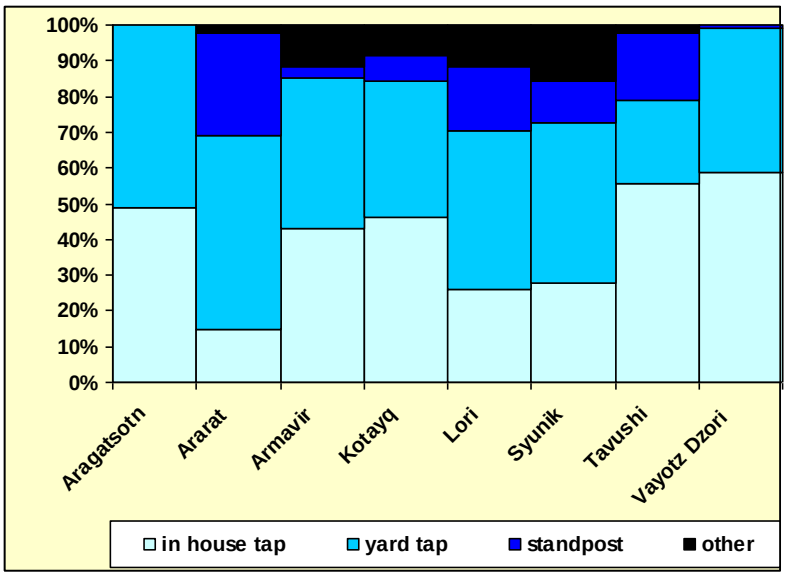


Figure 8 shows that in some *Marzes* (for example Aragatsotn, Tavushi, and Vayotz Dzori), in-house supply is significantly higher than in other *Marzes* (Ararat, Lori, and Syunik).

In general, it can be concluded that the responding settlements have, on average, at least 70% on-plot supply (in-house tap or yard tap). It may well be, however, that yard taps are in reality sometimes more like standpipes (the distance from houses to yard tap and/or standpipes is unknown).

Question 3 deals with the regularity of supply.

Table 6: Regularity of water supply in rural settlements, per *Marz*

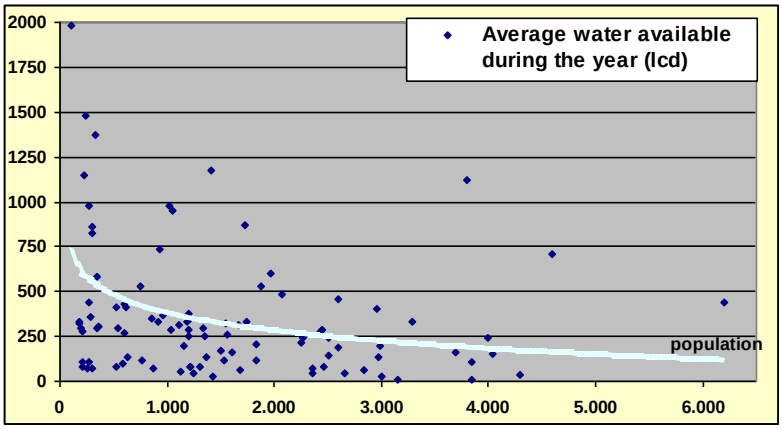
Marz	**Hours per day**	**Days per week**
All responding settlements	15	6.4
Aragatsotn	22	7
Ararat	13	7
Armavir	8	6.5
Kotayq	17	7
Lori	18	7
Syunik	17	6.9
Tavushi	10	5.3
Vayotz Dzori	17	5.4

On average, the responding rural settlements have 15 hours water per day, for 6.4 days per week. The regularity is best in Aragatsotn, with almost around the clock supply, seven days per week. In Armavir, the situation is the worst, with, on average, only eight hours supply, for 6.5 days a week. In Tavushi also, regularity is a problem.

Question 4 addresses the daily quantity of water available. Ninety-six of the 109 responding settlements have answered this, and therefore total daily water supply is estimated at about 46 000 m3 (in summertime, 49 000 m3; and in wintertime, 41 000 m3).

Even more interestingly, the availability of water per capita estimated is, throughout the year, on average, 300 lcd (representing a population of 154 000 [92% of the sample population]). In summer it is 320 lcd, and in winter it is 265 lcd.

Figure 10: Water available per capita (lcd), in relation to the size of rural settlements (99 settlements)



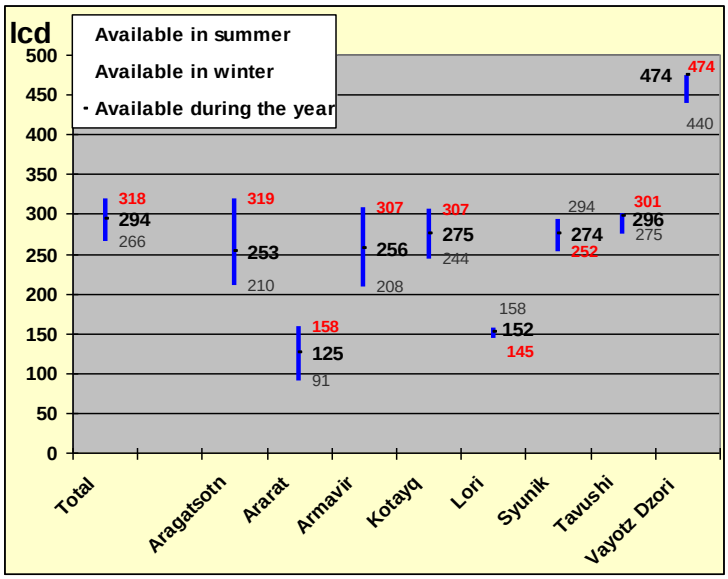
This figure shows that there is a wide variation in water availability in rural settlements.

It looks as if, in small settlements, on average, more water is available than in larger ones.

This is confirmed if the average water availability is estimated for small, medium-sized and larger rural settlements:

- In small-sized rural settlements (< 530 inhabitants) the availability is, on average, 644 lcd;
- In medium-sized rural settlements (between 530–1 360 inhabitants) the availability is, on average, 312 lcd;
- In larger-sized rural settlements (> 1 360 inhabitants) the availability is, on average, 273 lcd.

Figure 11: Average availability of water in eight *Marzes* (in lcd), during the year, summer, and winter



In Figure 11, the average water availability per capita is presented per *Marz*. In most *Marzes*, the average availability is between 250 and 300 lcd. In Ararat, availability is quite low (125 lcd), as it is in Lori (179 lcd). In Vayotz Dzori availability is high, with 474 lcd.

In some *Marzes* (Aragatsotn, Ararat, and Armavir), the difference between water availability during summer and winter can be as great as 40-55%. In the other *Marzes*, differences are less significant. In most *Marzes* supply in summer is higher than in winter, only in Lori and Syunik is the opposite true[51].

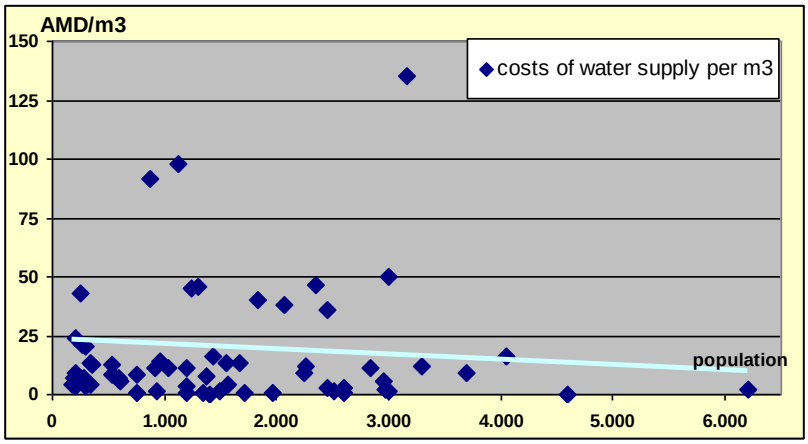
Financial information and water supply combined

The analysis can be pushed further by combining financial and water supply information. This is done in the next figure, relating costs per cubic metre of water available with population size of rural settlements. The financial costs per cubic metre available are estimated by dividing the (partly estimated) annual expenditures per settlement, by the (partly estimated) water availability per year (in cubic metres).

For 63 of the 109 settlements these unit costs could be estimated.

[51] Although water available in summer may be higher than in winter, this does not necessarily mean that water availability "at the tap" in summer is also higher, due to use for irrigation.

Figure 12: Financial costs of water supply, in 63 settlements in Armenia, in AMD per cubic metre



The costs of water supply in rural settlements are relatively low, on average (unweighted) AMD 20 per cubic metre (weighted: AMD 7.8 per cubic metre).

There is also some correlation between size of the settlement and the (non-weighted) costs of water supply:

- In small-sized rural settlements (< 530 inhabitants) the average costs are AMD 26 per cubic metre;
- In medium-sized rural settlements (between 530–1 360 inhabitants) the average costs are AMD 21 per cubic metre;
- In larger-sized rural settlements (> 1 360 inhabitants), the average costs are AMD 16 per cubic metre.

Without correction, the estimated costs of water supply cannot be taken as an estimate for drinking water supply to households. As the results on water quantities available per capita show, the average level of water supply is well above the needs for household use (excluding irrigation). Unfortunately, due to the lack of metering, there is no incentive to save water.

Moreover, supply of water is occasionally unevenly divided over the rural population, due to lack of possibilities to manage water quantities in the network.

Annual expenditures on WSS are also relatively low, as a result of a lack of re-investments and renovations of the water supply system. As the results of the baseline indicate, sufficient funds for re-investments are needed (approximately the same as for operation and maintenance).

Future expenditures will be higher if steps are taken towards a more advanced water management system in rural settlements (with on average possibly a lower supply, and more advanced infrastructure [including metering]).

Sanitation

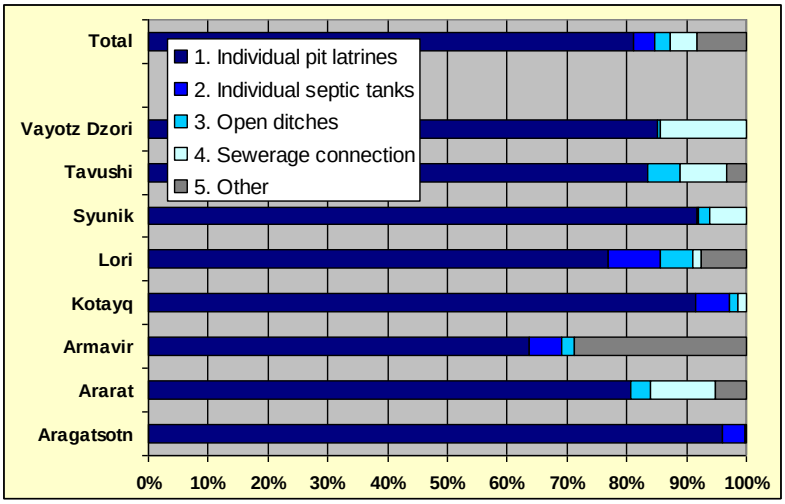
The third, and last part of the questionnaire addresses the situation concerning sanitation in rural settlements (not supplied by WSCs). So far, little quantitative information is available.

Question 1 (the only question on sanitation) is on the types of sanitation available in the settlement (% of population covered by the different options):

- Individual pit latrines;
- Individual septic tanks;
- Open ditches;
- Sewerage;
- Other.

The question was answer by 104 settlements (95% of the sample).

Figure 13: Share of five sanitation options in rural settlements in Armenia, % of population served by different options



By far the most used option for sanitation is the pit latrine. Over 80% of the rural population in settlements without WSCs use this option. Septic tanks, open ditches, and sewerage are each used by, on average, 3% of the sample. Other, unspecified options are used by 8%.

Extrapolation of the sample results

Based on the sample and with the help of statistical techniques, a best estimate can be made for various parameters. For the Financing Strategy, the focus is on water supply (availability), and the annual expenditures and financing thereof by user charges and budget.

The extrapolation is based on a subdivision of the rural settlements without WSC services in eight *Marzes* (for two *Marzes* no information is available). For each *Marz*, the results were subdivided into small, medium-sized, and large settlements. For all settlements in the eight *Marzes*, the same has been done for the number of inhabitants. By comparing, per subgroup (for example, “Lori [small]l”), the number of inhabitants in the sample with the total number of inhabitants in all relevant settlements, a factor with which the sample results can be multiplied can be determined (assuming that the sample represents all settlements in the subgroup, which in reality may deviate substantially). In this way one can calculate a “best estimate” of water availability, expenditures, user charge revenues, and municipal budget contributions.

Table 7: Estimated available drinking water, total expenditures, and way of financing per *Marz*, reported by rural settlements in the sample

	Available water (mln m3/y)	Total expenditures (AMD mln/y)	User charges (AMD mln/y)	Municipal budget (AMD mln/y)	Deficit (-) or surplus (AMD mln/y)
Aragatsotn	1.8	14.6	2.4	11.8	-0.4
Ararat	0.4	11.9	1.5	7.8	-2.5
Armavir	3.5	18.2	8.2	16.8	+6.8
Kotayq	1.9	4.6	1.6	1.6	-1.4
Lori	1.1	6.6	0.3	3.2	-3.0
Syunik	1.6	0.0	0.0	0.0	-0.0
Tavushi	3.0	2.6	0.0	0.3	-2.3
Vayotz Dzori	3.3	21.8	7.2	0.8	-13.9
Armenia	**16.5**	**80.2**	**21.2**	**42.3**	**-16.7**

For the sample, the water availability is estimated at 16.5 mln m3 per year, with annual expenditures of AMD 80.2 mln. About 80% of the financial costs is covered, of that 26% by user charges, the rest by municipal budget contributions. In one case a surplus is reported (Armavir). If the results of the sample are extrapolated using information on the population characteristics of small, medium-sized and larger rural settlements, the following results can be calculated.

Table 8: Estimated available drinking water, total expenditures, and ways of financing them, per *Marz*, extrapolated for all relevant settlements

	Available water (mln m3/y)	Total expenditures (AMD mln/y)	User charges (AMD mln/y)	Municipal budget (AMD mln/y)	Deficit or Surplus (AMD mln/y)
Aragatsotn	5.9	44.6	4.3	47.8	-7.5
Ararat	1.0	44.7	7.2	24.8	12.7
Armavir	11.5	45.3	20.0	44.3	-19.1
Kotayq	7.5	19.9	6.2	3.4	10.3
Lori	4.0	26.7	0.9	14.1	11.6
Syunik	7.9	28.0	0.0	0.0	28.0
Tavushi	8.4	9.9	0.0	0.6	9.3
Vayotz Dzori	6.7	48.1	11.9	1.3	34.9
Armenia	**52.9**	**267.0**	**50.4**	**136.5**	**80.1**

The extrapolation results in an estimated availability of water of 52.9 mln m3 per year in the settlements not served by WSCs (eight *Marzes*, excluding Gegharkunik and Shirak).

Total expenditures are estimated at AMD 267 million, of which 19% is covered by user charges and 51% by the municipal budget, while, for 30%, there is no indication of sources of coverage.

Inclusion of Gegharkunik and Shirak increases the mentioned estimates by about 28% (estimate based on population) and would result in annual availability of water of 68 mln m3, total expenditures of AMD 343 mln, user charge revenues of AMD 65 mln, and budget contributions of AMD 175 mln.

Questionnaire

Name of Community:

Information on financial issues

Question 1: How large are the annual expenditures on water supply? (Operation & Maintenance and Capex if any)
1. Total (AMD per year)
2. Operation and Maintenance (AMD per year)
3. Capital expenditures (AMD per year)

Question 2: Do people pay for water supply?
1. Yes
2. No

Question 3: If YES, How do people pay for water supply?
1. Monthly money fee
2. Annual money fee
3. Other way of money payment method
4. Non money payment (in kind)

Question 4: How is the fee calculated?
1. Water use, measured by metre
2. Fixed fee
3. Other

Question 5: How large are the annual revenues of water tariffs?
1. Annual revenues in the community are: (AMD per year)

Question 6: Who collects the money?
1. Employee
2. Other

Question 7: What are OTHER resources of revenues for the water supply system? (AMD per year)
1. Municipal budget, payment for electricity
2. Municipal budget, labour
3. Municipal budget, spare parts
4. Municipal budget, other
5. Subsidies from *Marz*
6. Subsidies from State

Current water supply situation

Question 1: Is piped water supply available?
1. Yes
2. No

Question 2: Which percentage of the population has access to water supply?
1. Tap in the house, %
2. Yard tap, %
3. Tap available within 100 metres from house, %

Question 3: Water supply availability in the community
1. How many hours per day? (hours per day)
2. How many days per week? (days per week)

Question 4: Please estimate the daily amount of water available in your community (m3/day)
1. Average available during the year
2. Available in the summertime
3. Available in the wintertime

Current water sanitation

Question 1: Please indicate if the water sanitation is arranged in your community

1. Individual pit latrines
2. Individual septic tanks
3. Open ditches
4. Sewerage connection
5. Other

ANNEX 5: EXAMPLE SIMULATIONS

Introduction

At the request of the Steering Committee, various options of levels of water supply in rural settlements have been simulated with Feasible. The results give a general idea of what level of supply can be achieved at what cost, but are not exactly representative for the final results.

For that purpose, for three different types of settlements, simulations were carried out:

- A settlement of 1 200 inhabitants, of which 65% are connected to a central water supply system (50% in-house tap; 50% standpipe) and 35% have no access to piped water;
- A settlement of 250 inhabitants, with no piped water available;
- A settlement of 850 inhabitants, with no piped water available.

The first example simulation refers to the "average rural settlement" in Armenia, and shows the consequences of different policy choices for such villages. The second and third examples serve to illustrate the possible consequences of policy options in settlements that currently have no access to piped drinking water. There are about 100 such villages in Armenia.

The following policy options have been simulated:

- **BL**: baseline situation (as described above);
- **MWS SP20**: scenario based on Minimal Water Supply Standards (MWSS). The population not served by piped water (in the BL) will be served by standpipes, assuming 20 lcd water available at (new) standpipes (100 lcd for yard taps, and 150 lcd for in-house tap). Standpipe is maximally 100 metres from the dwelling;
- **MWS SP50**: is the same as the MWS SP20 scenario, except that instead of 20 lcd, 50 lcd is available at standpipes;
- **MWS SP50+** (only in Example 1), is the same as MWS SP50, except that the distance from standpipe to dwelling is, maximally, 50 metres;
- **PRS**: scenario based on the targets for rural water supply in the Poverty Reduction Strategy Paper. The assumption is that 50% of the population **not served** (in the BL) by in-house (or yard tap) will be connected to piped water by in-house tap;
- **PRS MWS**: scenario based on combining targets of the MWSS and the PRSP. The assumption is that 50% of the population **not served** (in the BL) by in-house or yard tap will be connected to piped water by in-house tap (as in the PRS); the other part of the population not served by in-house, yard tap, or standpipe will be served by standpipe (50 lcd);
- **PRS MWS+** (only in Example 1), same as PRS MWS, but with standpipes at a maximum of 50 metres;
- **MAX**: 95% of the population is connected to piped water by in-house tap (100 lcd);
- **MAX+** (only in Example 1): same as MAX, except that 200 lcd is available at in-house taps.

For all simulations it has been assumed that 5% of the population of the settlements lives outside the core area of the settlement (in the fringe area) and will not be served by piped water, but by protected water sources.

Per example, the results are presented in three graphs:

- The first graph illustrates the number of inhabitants connected to different types of water supply (in-house and standpipe) and the amount of water supplied in the settlement, under the different scenario assumptions;

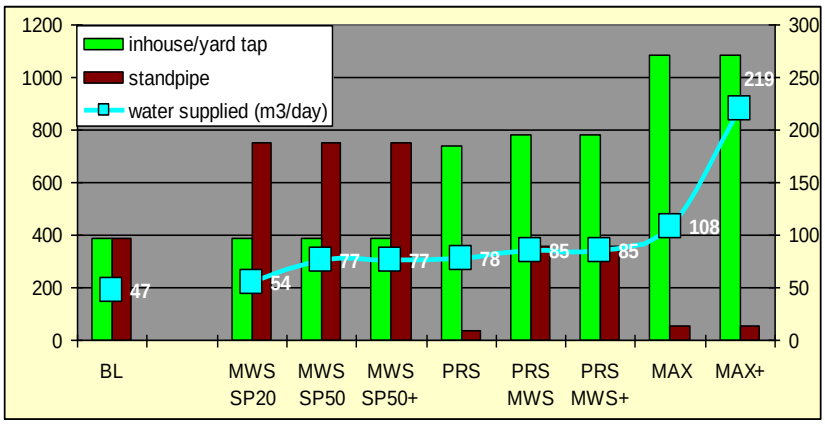
- The second graph focuses on presenting the annual expenditures (operation and maintenance expenditures, and re-investment expenditures) and the average costs of supplying water (in AMD per cubic metre);

- The third graph shows the annual costs per household connection (on average, four members per household are assumed) for households connected to in-house taps, for households using standpipes, and the average for all households.

Settlement with 1 200 inhabitants

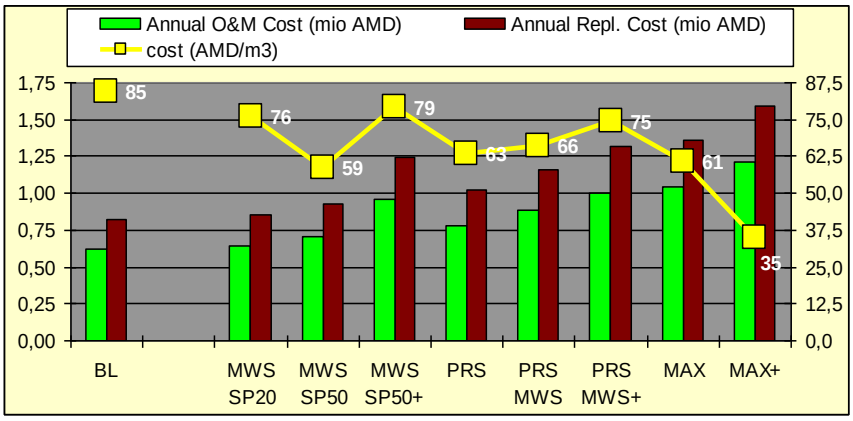
In this example settlement of 1 200 inhabitants, 65% of the population is connected to a central water supply system (50% in-house tap; 50% standpipe) and 35% have no access to piped water. Implementation of the MWSS would imply that 95% of the population will have access to piped water. In the MWS options this is by means of standpipe and in the combined PRS MWS option by means of in-house tap and standpipe. In the PRS option, there is mainly a shift from standpipe to in-house connections, and no increase in the number of inhabitants served by piped water.

Figure 1: Connection to piped water and amount of water supply, 1 200 inhabitants



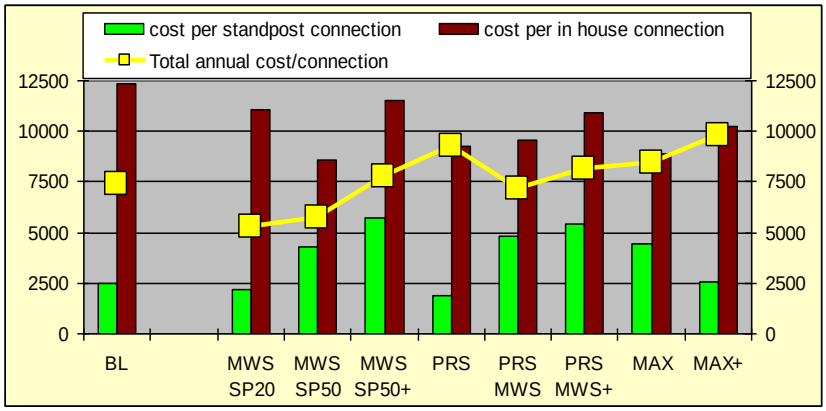
The graph shows that, compared to the baseline, the higher the level of service, the more in-house taps and the more water supplied to the village. In the MAX+ case, the water supply amount is four times the amount of the baseline.

Figure 2: Total annual expenditures on operation and maintenance and re-investments, and costs per cubic metre water supplied



Although higher levels of water supply involve higher annual expenditures, unit costs of water supply will decrease at the same time. In the baseline, unit costs are highest at AMD 85 per m3, and the unit costs of MWSS and the combined scenarios of PRS MWS result in lower unit costs of between AMD 59–79 per m3. With "maximal" supply, costs would decrease to AMD 35 per m3.

Figure 3: Annual costs per household connection, total average, for households served by in-house tap and by standpipe



This figure shows that the costs per connection do not necessarily increase very much with a higher level of services.

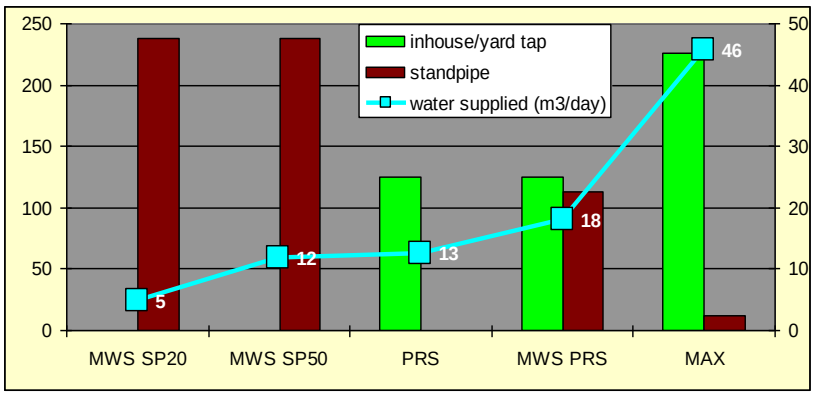
Due to the larger scale of the water supply network, the costs per connection will actually be lower in the MWS SP50 option than in the baseline (in this particular example). Combined targets (PRS MWS) would lead to about the same costs per connection as in the baseline.

The higher total costs in the settlement (as shown in Figure 2) are compensated for by a larger number of inhabitants in the settlement that receive services (and thus would be more willing to pay).

Settlement with 250 inhabitants, no piped water available in base year

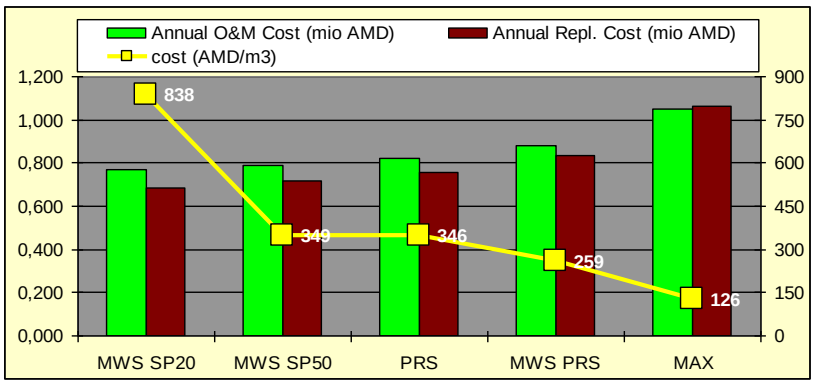
In the base year, this settlement has no central water supply. Water can be taken in at a 4 km distance. The MWSS option in this case implies provision of water through standpipes (about four in a village of this size) to 95% of the population. The PRSP option would assume in-house connections for about 50% of the population. The option with combined target (MWSS and PRSP) also assumed standpipes for the remainder of the inhabitants.

Figure 4: Connection to piped water and amount of water supply, 250 inhabitants



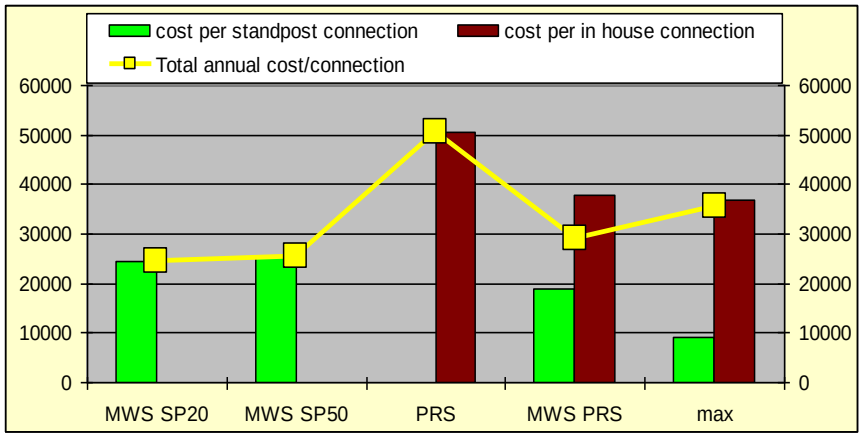
The graph shows that the higher the level of service, the more in-house taps and the more water supplied to the village. Whereas in the MWS option, at a minimum, only 5m3 is available each day, in the combined option (MWS PRS) 18m3 is available, and in a "maximal" approach 46m3 is available.

Figure 5: Total annual expenditures on operation and maintenance and re-investments, and costs per cubic metre water supplied



The MWSS policy costs AMD 1.5 mln per year and a combined approach would cost AMD 1.7 million. To achieve "maximal" supply, AMD 2.1 mln per year is needed. Unit costs decrease from AMD 838 per m3 in the MWS SP20 option, to AMD 126 per m3 in case of the MAX option.

Figure 6: Annual costs per household connection, total average, and for households served by in-house tap and by standpipe



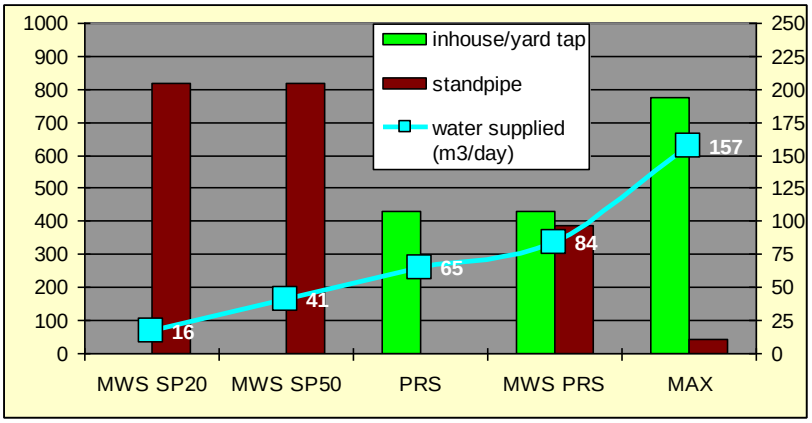
This figure shows that the costs per connection would be about AMD 25 000 per connection per year and 20% higher in the combined PRS MWS case.

Compared to the costs of supply in average rural settlements with 1 200 inhabitants, costs are considerably higher in a small village of 250 inhabitants. Whereas MWSS and combined PRS MWS would cost between AMD 5 000 and 7 500 in an average-sized village, in the small village costs per connection (in this example) are five times higher.

Settlement with 850 inhabitants, no piped water available in base year

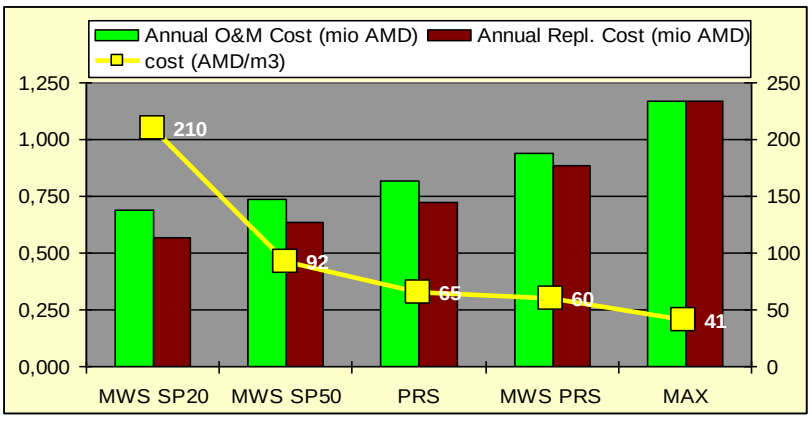
In this example, it is assumed that at a distance of 500 from the village, water can be taken in. The same assumptions concerning the different development options as in the village of 250 inhabitants apply.

Figure 7: Connection to piped water and amount of water supply, 850 inhabitants



As in the other examples, the water supply situation also improves here. In the maximal option (MAX), supply is almost 10 times higher than in the very basic supply option (MWS SP20).

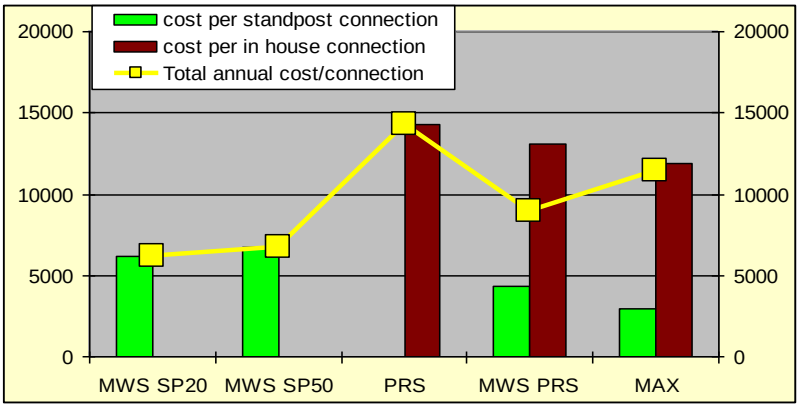
Figure 8: Total annual expenditures on operation and maintenance and re-investments, and costs per cubic metre water supplied



In this example, basic water supply costs AMD 1.2–1.4 mln per year for the settlement. Achieving combined targets (PRS MWS) would increase costs to AMD 1.8 mln.

Unit costs for water supply drop from AMD 210 per m3 for very basic supply to AMD 41 per m3 for maximal supply.

Figure 9: Annual financial costs per household connection, total average, for households served by in-house tap and by standpipe



MWSS in this example costs AMD 6 000–7 000 per year per household, achieving combined targets of AMD 9 000.

This is slightly higher than in the case of the example of 1 200 inhabitants, but considerably lower than for the village with 250 inhabitants.

Discussion of the results

In general, costs will increase with service level, but the same service level in different situations may lead to quite different cost outcomes.

The simulations of the different policy options for the example clearly show large cost differences between options. Most remarkable is that the **total annual costs** of minimal water supply are lower in the larger village (850 inhabitants) than in the small village (250 inhabitants). This is due to the distance between the village and water intake in the small village, which is assumed to be 4km (in Example 3 it is 500 metres). The costs of transmission pipes (which are relatively high) heavily influence this outcome.

The results indicate that to achieve MWSS in villages with already existing water supply (Example 1), costs of water supply would hardly need to increase, and could even lead to lower – per household – costs (compared to the baseline). Even the combined targets of MWSS and PRSP can be obtained at about the same costs per household as in the baseline.

For villages without water supply (Examples 2 and 3), the step from no supply to MWSS is larger than the following steps needed to achieve combined targets of MWSS and PRSP. This may be an argument in favour of targeting the combined approach rather than just MWSS (as it also leads to lower per cubic metre costs).

A final observation is that in small villages currently without any kind of central water supply, supplying the population with piped water (standpipe, standpipe plus in-house taps; or in-house taps) can be quite expensive (costs of supplying water may be in the range of AMD 150-350 per cubic metre).

ANNEX 6: COMPARISON OF FINAL WITH PRELIMINARY RESULTS

Introduction

During the project, several assessments were made on the expenditures on rural WSS. In May 2007, the baseline was simulated and then in October 2007 policy scenarios were also simulated. These earlier simulations were based on less complete data than is available for this final study.

Some of the main differences are explained and illustrated in this annex.

Baseline

After the first assessment of the baseline, important new information has become available, especially on the connection of the rural population to water supply services. It appears that, currently, the level of on-plot supply to households is significantly higher (68% of rural population) than was assumed in the first simulations (45% of rural population). This leads to significant higher (> 60%) assessment of annual expenditures (re-investments and operational and maintenance).

Policy scenarios

Although the input for the policy scenarios for the final assessment also differs significantly from the initial inputs in Feasible, the difference in the resulting assessments of costs is smaller than for the baseline.

For example, for the MWSS scenario, initially annual re-investments were estimated at AMD 3 177 billion and in the final assessment at AMD 3 201 billion.

For the policy scenario, initially annual re-investments were estimated at AMD 3 785 billion and in the final assessment at AMD 3 371 billion.

Settlements without central water supply services

One of the issues to be addressed in a Financing Strategy for rural water supply, is the lack of centralised water supply in part of the (about) 850 rural settlements. In the earlier simulations, little information was available on the characteristics of such settlements.

After analysing all data collected during the project, especially the additional information on rural water supply collected by the surveys amongst rural settlements by the JICA project and our own project, it was possible to identify (a sufficient sample of) settlements without centralised water supply in the data collected.

From the analysis of the data on these settlements, a more precise picture can be drawn on the current situation in such settlements. Main additional information used in the current simulation is on, (i) type of water source (spring, borehole, surface water), and (ii) the distance from the settlement to the source of water. However, the estimate of the number of such settlements and the total number of inhabitants could also be improved.

Whereas in the initial assessment these settlements were grouped into two “model settlements”, assuming use of boreholes at an average distance of 10 kilometres, in the current assessment, this group of settlements is divided into six “model settlements” (see the following table).

Model settlement (old)	Number of settlements (old)	Total number of inhabitants (old)	Distance to water source (km) (old)	Model settlement (new)	Number of settlements (new)	Total number of inhabitants (new)	Distance to water source (km) (new)
No supply, borehole small	88	21 560	10	No supply, spring small	21	5 376	3.7
No supply, borehole medium	33	28 347	10	No supply, spring medium-sized	26	19 916	8.1
				No supply, spring large	3	7 326	2.7
				No supply, borehole small or medium-sized	6	2 598	1.1
				No supply, borehole large	4	6 868	0.1
				No supply, surface water small	6	678	5.5
Total or average	121	49 907	10	Total or average	66	42 762	4.9

It can be seen that:

- The number of settlements without central water supply is estimated at 66 (new) instead of 121 (old);
- The total number of inhabitants is estimated at 42 762 (new) instead of 49 907 (old);
- The average distance between settlements and water source is estimated at 4.9 kilometres instead of 10 km.

As for some reason in Feasible[52], the unit investments (per kilometre) of transporting water from source to settlement is (much) higher for borehole supply than for spring and surface water supply, the result is that, currently, the investments for these group of settlements are estimated at about a factor 10 lower than in the initial assessment.

[52] Probably an error in the formula for investment costs of transmission pipes for boreholes.

ANNEX 7: NUMERICAL DATA BEHIND GRAPHS IN THE REPORT

This annex shows the tables that are used for the graphs in the report.

Figure 2.1: Rural water supply per *Marz* in Armenia, inhabitants per type of connection

Marzes	**AWSC**	**Nor Akunq**	**Lori WSC**	**Shirak WSC**	**No WSC**	**No supply**	**Total**
Aragatsotn	47 713				48 254	6 858	102 825
Ararat	134 456				27 394	2 763	164 612
Armavir	52 829	31 034			85 654	7 550	177 067
Gegharkunik	23 705				97 144	7 024	127 873
Kotayq	26 552				66 737	4 435	97 724
Lori	33 124		22 153		65 172	2 948	123 397
Shirak	36 068			36 630	26 267	3 820	102 785
Syunik	12 399				45 470	1 826	59 695
Tavushi	11 210				65 199	5 545	81 954
Vayotz Dzori	3 587				33 960	0	37 547
Total	**381 643**	**31 034**	**22 153**	**36 630**	**561 250**	**42 769**	**1 075 479**

Figure A & Figure 2.2: Rural population, by type of connection to water supply, 2006

Marzes	**In house tap**	**yardtap**	**stand post**	**no supply**
Aragatsotn	44%	42%	9%	4%
Ararat	10%	39%	46%	5%
Armavir	27%	27%	41%	5%
Gegharkunik	31%	27%	37%	5%
Kotayq	36%	32%	27%	5%
Lori	17%	22%	56%	5%
Shirak	38%	20%	37%	5%
Syunik	31%	36%	28%	5%
Tavushi	37%	18%	41%	5%
Vayotz Dzori	33%	26%	37%	5%
AWSC	66%	24%	5%	5%
Nor Akunq	73%	3%	19%	5%
Lori WSC	65%	0%	30%	5%
Shirak WSC	52%	11%	31%	5%
no WCS	29%	26%	34%	12%
WSC	64%	21%	10%	5%
no supply				100%
Total	44%	24%	24%	9%

Figure 3.7: Needed additional investments in extensions to achieve targeted water supply in the different scenarios, 2008-2015. mln AMD

	MWSS	Policy	MAX
WSCs	216	558	4 194
no WSCs	1 170	3 042	10 926
no Supply	1 080	1 926	2 664
Total	**2 466**	**5 526**	**17 784**

Figure B &Figure 3.8: Annual total expenditures (for operation and maintenance, re investment, renovations and extensions) in different scenarios

Scenario	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Maximal	3 492	5 715	6 870	6 971	7 073	7 174	7 276	7 377	7 479	5 357
Policy	3 492	4 182	5 267	5 299	5 330	5 362	5 393	5 424	5 456	4 796
MWSS	3 492	3 800	4 868	4 882	4 896	4 910	4 924	4 938	4 952	4 658
Baseline	3 492	3 492	4 545	4 545	4 545	4 545	4 545	4 545	4 545	4 545
Renovations (common for all scenarios)	**1 009**	**1 009**	**2 063**	**2 063**	**2 063**	**2 063**	**2 063**	**2 063**	**2 063**	**2 063**

Figure E: Assessment of available finance in the various scenarios

Scenario	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Maximal	3 434	3 408	4 063	3 952	3 685	3 987	4 299	4 509	3 287	3 497	3 497
Policy	3 434	3 404	4 030	3 889	3 587	3 854	4 129	4 313	3 064	3 248	3 248
MWSS	3 434	3 404	4 014	3 856	3 538	3 789	4 048	4 215	2 950	3 118	3 118
Baseline	3 434	3 389	3 086	1 731	1 943	2 151	2 367	2 497	2 628	2 758	2 758
Renovations (common for all scenarios)	**1 045**	**1 131**	**1 343**	**1 556**	**1 768**	**1 976**	**2 192**	**2 322**	**2 453**	**2 583**	**2 583**

Figure 3.10: Estimated financing gap for rural WSS in Armenia, including renovations, loans and budget subsidies, in the Minimal Water Supply Standards scenario (in AMD x 1 million)

Figure 3.11: Balanced financing gap for rural WSS in Armenia, by increasing the user charges (70% higher 2015), in the MWSS scenario (in AMD x 1 million)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
O & M	1 103	1 103	1 110	1 116	1 122	1 129	1 135	1 142	1 148
re investments	1 379	1 379	1 387	1 394	1 402	1 410	1 417	1 425	1 433
Renovations	1 009	1 009	2 063	2 063	2 063	2 063	2 063	2 063	2 063
Extensions	0	308	308	308	308	308	308	308	308
total expenditures	3 492	3 800	4 868	4 882	4 896	4 910	4 924	4 938	4 952
user charge revenues fig 3.10	1 147	1 411	1 676	1 931	2 181	2 440	2 608	2 775	2 943
Budget	690	347	576	462	462	462	462	175	175
loans grants	1 568	2 255	1 605	1 146	1 146	1 146	1 146	0	0
total revenues	3 404	4 014	3 856	3 538	3 789	4 048	4 215	2 950	3 118
financing gap fig 3.10	87	-214	1 011	1 343	1 107	862	708	1 988	1 834
user charge revenues fig 3.11	1 147	1 411	1 840	2 327	2 888	3 547	4 162	4 863	5 662
financing gap fig 3.11	87	-214	847	947	400	-245	-846	-100	-885

Figure 2.5: Estimated financing gap for rural WSS in Armenia, without renovations, budget contributions and loans, 2006 – 2015, in the baseline (in AMD x 1 million)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
O & M	1 103	1 103	1 103	1 103	1 103	1 103	1 103	1 103	1 103
re investments	1 379	1 379	1 379	1 379	1 379	1 379	1 379	1 379	1 379
total expenditures	2 482	2 482	2 482	2 482	2 482	2 482	2 482	2 482	2 482
user charge revenues	1 131	1 343	1 556	1 768	1 976	2 192	2 322	2 453	2 583
total revenues	1 131	1 343	1 556	1 768	1 976	2 192	2 322	2 453	2 583
financing gap	1 351	1 139	927	715	506	290	160	29	-101

Figure 2.6: Estimated financing gap for rural WSS in Armenia, including renovations, loans and budget subsidies, in the baseline (in AMD x 1 million)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
O & M	1 103	1 103	1 103	1 103	1 103	1 103	1 103	1 103	1 103
Re investments	1 379	1 379	1 379	1 379	1 379	1 379	1 379	1 379	1 379
planned Renovations	1 009	1 009	339	339	0	0	0	0	0
Renovation	0	0	1 724	1 724	2 063	2 063	2 063	2 063	2 063
Total expenditures	3 492	3 492	4 545	4 545	4 545	4 545	4 545	4 545	4 545
User charge revenues	1 131	1 343	1 556	1 768	1 976	2 192	2 322	2 453	2 583
Budget	690	175	175	175	175	175	175	175	175
Loans grants	1 568	1 568	0	0	0	0	0	0	0
Total revenues	3 389	3 086	1 731	1 943	2 151	2 367	2 497	2 628	2 758
Financing gap	102	405	2 815	2 603	2 394	2 178	2 048	1 918	1 787

Figure 3.12: Estimated financing gap for rural WSS in Armenia, including renovations, loans and budget subsidies, in the Policy scenario (in AMD x 1 million)

Figure 3.13: Balanced financing gap for rural WSS in Armenia, by increasing the user charges (120% higher in 2015), in the Policy scenario (in AMD x 1 million)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
O & M	1 103	1 103	1 118	1 132	1 146	1 160	1 174	1 188	1 202
Re investments	1 379	1 379	1 396	1 413	1 431	1 448	1 465	1 482	1 500
Renovations	1 009	1 009	2 063	2 063	2 063	2 063	2 063	2 063	2 063
Extensions	0	691	691	691	691	691	691	691	691
Total expenditures	3 492	4 182	5 267	5 299	5 330	5 362	5 393	5 424	5 456
Uer charge revenues Fig 3.10	1 147	1 427	1 708	1 979	2 246	2 522	2 705	2 889	3 073
Budget	690	347	576	462	462	462	462	175	175
Loans grants	1 568	2 255	1 605	1 146	1 146	1 146	1 146	0	0
Total revenues	3 404	4 030	3 889	3 587	3 854	4 129	4 313	3 064	3 248
Financing gap Fig 3.10	87	152	1 378	1 712	1 476	1 232	1 080	2 360	2 208
User charge revenues Fig 3.11	1 147	1 427	1 913	2 483	3 156	3 968	4 768	5 703	6 793
Financing gap Fig 3.11	87	152	1 173	1 208	566	-214	-982	-453	-1 513

Figure 3.14: Estimated financing gap for rural WSS in Armenia, including renovations, loans and budget subsidies, in the Maximal scenario (in AMD x 1 million)

Figure 3.15: Partially balanced financing gap for rural WSS in Armenia, by increasing the user charges (double in 2015), in the Maximal scenario (in AMD x 1 million)

	2007	2008	2009	2010	2011	2012	2013	2014	2015
O & M	1103	1103	1149	1195	1241	1287	1333	1379	1425
re investments	1379	1379	1434	1490	1546	1601	1657	1712	1768
renovations	1009	1009	2063	2063	2063	2063	2063	2063	2063
extensions	0	2223	2223	2223	2223	2223	2223	2223	2223
total expenditures	3492	5715	6870	6971	7073	7174	7276	7377	7479
user charge revenues fig 3.10	1150	1460	1771	2078	2379	2691	2901	3112	3322
budget	690	347	576	462	462	462	462	175	175
loans grants	1568	2255	1146	1146	1146	1146	1146	0	0
total revenues	3408	4063	3493	3685	3987	4299	4509	3287	3497
financing gap fig 3.10	84	1652	3377	3286	3086	2875	2767	4091	3982
user charge revenues fig 3.11	1150	1460	1983	2606	3343	4235	5113	6142	7343
financing gap fig 3.11	84	1652	3164	2757	2122	1332	555	1060	-40