



**ASSESSMENT OF QUALITY OF CONSTRUCTION WORKS, COSTS AND PRESERVATION OF
INFRASTRUCTURES AND MACHINERY PROVIDED TO THE COMMUNITIES**

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EXECUTIVE SUMMARY

This study is ordered by the Armenian Social Investment Fund (ATDF) and analyses the results of the “Social Investments and local Development” (SILD) project funded by the World Bank. The report presents the results of the assessment of quality of construction works of micro-projects, costs and preservation of infrastructures and equipment given to the communities.

The study is carried out by the Urban Foundation of Sustainable Development (UFSD) according to the contract TCWA-2 signed with ATDF based on the Methodology approved by ATDF. 25 projects have been assessed under two components of SILD:

Component 1: Support to the social-economic development and local capacity development – 20 micro-projects.

Component 2: Support to inter-municipal social-economic initiatives 5 sub-projects.

The aim of the study is to assess the quality of the construction works, costs, and the state of preservation of renovated or newly constructed infrastructures, and equipment handed over to the communities. It summarizes the results of the assessment carried out in the following subject areas -objectives:

1. Quality of the design
2. Quality of the construction works
3. Assessment of costs of construction
4. Preservation of infrastructures
5. Preservation of the equipment given to the communities/

Each of the these objectives have been assessed by aggregating information received from a number of questions (sub-objectives) by means of desk research, physical observation of infrastructures and qualitative interviews.

The results of the study show that projects under SILD Component 1 have been implemented in accordance with the proposals submitted by beneficiary communities, serve their purpose and have important social significance in the life of the communities. Project Implementation Committees (PICs) in most cases have had active involvement in all stages of the project; communities demonstrate high level of responsibility in preservation of the renovated or newly constructed infrastructures.

In the studied projects, the quality of construction works is evaluated with scored from 1 to 4 (where 1 is ‘bad’ and 4 is ‘excellent’) according to the criteria described in the methodology and based on discussions of the consultants. ‘Good’ and ‘excellent’ scores prevail in studied projects (70%).

Table 1. Number of projects per scoring (assessed according to the quality or works (Summary)

Excellent (4)	Good (3)	Fair (2)	Bad (1)
7	8	5	-
35%	40%	25%	-

In most of the studied projects, the quality of construction works is interlinked with the quality of materials used, although capacities of the construction, technical inspection and design companies and partially the design solutions have also had influence on the final quality. All such instances are presented in detail in this study. In Table 2, the scores for quality of construction works and for preservation are shown next to each other. In 18 cases out of 20 (except Parpi and Ararat kindergartens), the scores for quality of construction works and for preservation of infrastructures coincide.

Table 2. Relation of quality of works and preservation of the infrastructure

	Name and type of the project	Code	Score for construction	Score for preservation
1.	Reconstruction of the kindergarten in Parpi	TAN-04	3	4
2.	Reconstruction of the kindergarten in Ohanavan	TAN-03	2	2
3.	Reconstruction of the 3 rd block of the kindergarten in Ararat	TAT-06	3	4
4.	Renovation of the ambulatory in Norashen	TAT-01	2	2
5.	Reconstruction of the kindergarten in Argavand	TAR-04	2	2
6.	Reconstruction of the kindergarten in Chambarak	TGQ-06	2	2
7.	Construction of drinking water system in Artsvanist	TGQ-11	4	4
8.	Construction of the kindergarten in Gyulagark	TLR-03	4	4
9.	Renovation of the cultural center in Spitak, construction of the heating system	TLR-11	3	3
10.	Reconstruction of the sports school in Alaverdi	TLR-01	3	3
11.	Construction of irrigation water supply system in Jrvezh	TKQ-09	4	4
12.	Reconstruction of the Arevik kindergarten in Gyumri	TSH-12	3	3
13.	Construction of the music school in Pemzashen	TSH-18	4	4
14.	Construction of a school for 100 students in Krasar	TSH-02	3	3
15.	Reconstruction of Sero Khanzadyan museum	TSQ-01	3	3
16.	Construction of drinking water catchments and pipeline in Akhlatyan	TSQ-04	4	4
17.	Reconstruction of drinking water distribution network in Khndzoresk	TSQ-08	4	4
18.	Reconstruction of the drinking water distribution network in Agarakadzor, construction of DR reservoir	TVZ-05	4	4
19.	Reconstruction of the 2 nd block of the school in Ptghavan	TTV-09	2	2
20.	Reconstruction of the 'Bridge of Hope' social center in Noyemberyan	TTV-13	3	3

The preservation assessment results of the equipment provided to the communities under Component 2 are good and have received high scores with 1-4 grade .

Tashir	Aparan	Tsakhkahovit	Akhuryan	Vardenis
4	3	3	3	3

The obtained equipment has significantly contributed to the improvement of municipal services in consolidated communities and has made those services accessible in all settlements. In all assessed projects, the pieces of provided equipment correspond to what have been requested by the communities and are registered in the

community inventory list. Communities ensure security and smooth operation of the equipment by qualified workers. A common drawback is lack of closed parking areas in four communities out of assessed five.

INTRODUCTION

The Urban Foundation for Sustainable Development has carried out an assessment of quality of construction works in micro/sub-projects, cost effectiveness, as well as of maintenance of infrastructures and equipments provided to the communities in the framework of the “Social Investments and Local Development” (SILD) project funded by the World Bank. The study started on November 13, 2020 according to the TCWA02 contract.

The terms of reference of the assignment covered two components of SILD:

Component 1 (Support to social-economic development and capacity development at local level), refers to micro projects geared toward addressing primary needs of vulnerable communities, such as educational institutions (kindergartens, schools and special schools), primary healthcare institutions, community centers, water supply and wastewater treatment systems. Besides, the renovated facilities are being provided with furniture and equipment.

Component 2 (Support to Inter-Community Social and Economic Development Initiatives), is associated with the consolidation of communities in the framework of territorial-administrative reform. The implemented sub-projects are aimed at improvement of social and economic infrastructures and related services in consolidated communities.

The terms of reference of the assignment required 25 projects to be studied: 20 under Component 1, and 5 under Component 2. The projects were selected from the list of completed projects provided by ATDF based on the following criteria:

- Projects should be implemented during the last 5 years,
- Projects are geographically distributed throughout all 10 regions of Armenia,
- Projects are of different types.

Selected projects, as shown in Table 3, comply with the above mentioned criteria in terms of diversity of types and geographical distribution.

Table 3. Distributon of projects according to geography and types

Region	Primary health	School	Kinder garten	Specializ ed school	Drinking water system	Irrigation water system	Community center	Total

	care facility							
Ararat	1		1					2
Aragastotn			2					2
Armavir			1					1
Gegharkunik			1		1			2
Kotayk						1		1
Lori			1	1			1	3
Shirak		1	1	1				3
Vayots Dzor					1			1
Syunik					2		1	3
Tavush		1					1	2
TOTAL	1	2	7	2	4	1	3	20

According to the abovementioned criteria, the following projects were selected for assessment:

Table 4. Projects studied under Component 1

	Region/Community	Title/type	Code
1.	Aragatsotn region, Parpi	Reconstruction of the kindergarten in Parpi	TAN-04
2.	Aragatsotn region, Ohanavan	Reconstruction of the kindergarten in Ohanavan	TAN-03
3.	Ararat region, v. Ararat	Reconstruction of the 3 rd block of the kindergarten in Ararat	TAT-06
4.	Ararat region, Norashen	Renovation of the ambulatory	TAT-01
5.	Armavir region, Argavand	Reconstruction of the kindergarten in Argavand	TAR-04
6.	Gegharkunik region, Chambarak	Reconstruction of the kindergarten #3	TGQ-06
7.	Gegharkunik region, Artsvanist	Construction of drinking water system	TGQ-11
8.	Lori region, Gyulagarak	Construction of a kindergarten	TLR-03
9.	Lori region, Spitak	Renovation of the cultural center and construction of heating system	TLR-11
10.	Lori region, Alaverdi	Reconstruction of the sports school	TLR-01
11.	Kotayk region, Jervezh	Construction of irrigation water supply system	TKQ-09
12.	Shirak region, Gyumri	Reconstruction of the Arevik kindergarten	TSH-12
13.	Shirak region, Pempashen	Construction of the music school	TSH-18
14.	Shirak region, Krasar	Construction of a school for 100 students	TSH-02
15.	Syunik region, Goris	Reconstruction of Sero Khanzadyan museum	TSQ-01
16.	Syunik region, Akhlatyan	Construction of drinking water catchments and pipeline	TSQ-04
17.	Syunik region, Khdzoresk	Reconstruction of drinking water distribution network	TSQ-08
18.	Vayots Dzor region, Agarakadzor	Reconstruction of the drinking water distribution network and DR Reservoir	TVZ-05
19.	Tavush region, Ptghavan	Reconstruction of the 2 nd block of the school	TTV-09
20.	Tavush region, Noyemberyan	Reconstruction of the 'Bridge of Hope' social center	TTV-13

Under Component 2, the following projects have been assessed¹.

¹ Detailed list of projects assessed under Component 2 are presented in Annex 1.

Table 5. Projects studied under Component 2

	Region/ community	Title of the project	Code
1.	Aragatsoth, Aparan	Project for improving waste management, utility services and road maintenance in Aparan consolidated community.	W-03
2.	Aragatsoth, Tsakhkavohit	Project for improvement of utility services and road maintenance, sustainable water supply and commuting in Takhkahovit consolidated community.	W-01
3.	Gegharkunik, Vardenis	Project for improvement of utility services and road maintenance in Vardenis consolidated community through upgrading the technical capacities.	W-08
4.	Lori, Tashir	Project for improvement of utility services and road maintenance.	W-13
5.	Shirak, Akhuryan	Project for improvement of economic environment in Akhuryan consolidated community through upgrading technical capacities and improvement of services.	W-11

The aim and the objective of the assessment

The aim of the assignment is to assess the quality of construction works in micro/sub-projects and cost effectiveness, as well as the maintenance of infrastructures and equipment provided to the communities, in the framework of the “Social Investments and Local Development” (SILD) funded by the World Bank.

The objectives of the assessment are related to the following five areas:

- 1) Assessment of the quality of the designs,
- 2) Assessment of the quality of construction works,
- 3) Assessment of cost of the effectiveness of construction works,
- 4) Assessment of maintenance and preservation infrastructures,
- 5) Assessment of preservation of equipment provided to the communities.

Each of the given objectives has been assessed by means of a number of sub-objectives (questions). Information and data received from sub-objectives are aggregated in the assessment of the given objective.

Table 6. Objectives and sub-objectives (questions)

	Objectives	Sub-objectives (questions)
1	Assessment of the quality of the designs	1.1 Engagement of the community in the process of designing. 1.2 Submission of needed documents (data, technical conditions, other) by the community in due quality and time. 1.3 Correspondence of design to the project proposed by the community. 1.4 Existence of positive conclusion to the design by independent expertise body as specified by the law. 1.5 Deficiencies of the designs and the reasons. 1.6 The main reasons for changes in the design, cost estimations documents and deadlines. 1.7 Issues related to author’s supervision.
2.	Assessment of the construction works	2.1. Engagement of the community in oversight of construction works. 2.2. Correspondence of the construction works to the design and existing construction norms. 2.3 The impact of design solutions and used materials on the quality of the construction. 2.4 Deficiencies of construction works and their reasons. 2.5 Issues arisen during expoytation and their reasons. 2.6 Delays (if any) in the construction works and their reasons.

		2.7 Issues related to technical supervision during construction works and the appropriate capacity of organizations carrying out technical supervision for the given task. 2.8 Deficiencies arisen in post-construction period and their correction by the contractor.
3	Assessment of preservation of infrastructures	3.1 The current condition of the infrastructures, their preservation. 3.2 Planning of the preservation costs; their correspondence to the initial budget. 3.3 Effect of deficiencies of design and construction works on the state of preservation.
4	Assessment of costs of construction works	4.1 Mechanisms for price formation of construction works, materials and equipment in budget estimates. 4.2 Cost of implemented works as compared with units costs of similar works (for example, cost of 1 m ²).
5	Assessment of preservation of equipment provided under sub-projects	5.1 Current condition of the provided equipment, parking locations, safety measures undertaken. 5.2 Usage of the equipment according to initial purpose. 5.3 Proof that the equipment is being operated according to technical documentation. 5.4 Guarantee and post-guarantee service of the equipment. 5.5 Actual costs of operation and maintenance as compared with the initial plan. 5.6 Registration in the inventory list of the community, order of renting out to third parties, existence of and adopted pricelist. 5.7 Qualification of the engaged staff. 5.8 Correspondence of provided equipment to the specifications requested by the community.

Methodology of the assessment

The assessment of preservation of projects has been carried out in combination of several methods:

- Desk research,
- Field research – physical observation and evaluation of conditions of infrastructures and equipment,
- Qualitative interviews.

Desk research: The experts have studied documents related to the selected projects that are kept in the archive of ATDF, especially those documents that refer to the objectives of the assessment. Particularly, the reports of initial and post expertise, protocols of Project Implementation Committee and Initiative Group meetings, cost estimations as stated in the contracts, final performance reports, conclusions of the technical expertise, communication between the beneficiaries and ATDF related to changes of the work volume, dates, designs, etc.

Some documents have been studied at the field research stage, too, particularly the documents of the provided equipment, property titles, technical certificates, community council's decisions about inclusion of the equipment on community inventory list, rental agreements, price lists, documents ensuring users' qualifications, etc.

At the field study stage the observable problems related to construction works, their reasons have been studied, the condition of their preservation has been evaluated.

Qualitative interviews were carried out with the aim to identify the opinions of the stakeholders about the infrastructures. Interviews were conducted based on interview guides that were elaborated beforehand and reflected objectives of the assessment². Interviews were conducted with the following actors: local authorities, PIC/IG members, infrastructure operator, beneficiary/user of the infrastructure, designer, constructor, technical supervisor within their scope of engagement and competence.

For assessing the quality of the construction works, a scale from 1 to 4 has been used where '1' is bad and '4' is excellent. Thus:

² The interview guides are presented in Annex 2.

'1' (bad) have been scored those construction works that have been implemented very poorly, multiple serious drawbacks have been detected because of poor quality of works, materials and products used (door handles and hinges, windows, doors), because of bad condition of engineering networks that require considerable resources for improving. The operation of such infrastructure is not possible.

'2' (fair) have been scored those works that have been implemented not too bad, the identified drawbacks are serious and many, but mostly relate to finishing of interior and exterior, quality of site improvement, and quality of the materials and produces used. Identified drawbacks can be corrected by investing additional resources. Despite defects, the infrastructure is possible to operate.

'3' (good) have been scored those infrastructures that have a few not serious defects that are related to interior or exterior finishing, quality of materials used and site improvement. Such defects are possible to eliminate by improved maintenance and they do not hinder operation of the infrastructure.

'4' (excellent) are scored infrastructures that have no defects.

Table 7. Breakdown of questions per respondents

Respondents	Questions				
	On quality of designs	On quality of construction works	On correspondenc e of costs to estimates	On preservation of infrastructures	On preservation of the equipment
Responsible local authority	✓	✓	✓	✓	✓
PIC/IG chair or deputy	✓	✓	✓	✓	✓
Manager of the infrastructure	✓	✓	✓	✓	✓
Beneficiary of the infrastructure	✓	✓		✓	✓
Design company representative	✓	✓			
Construction company representative	✓	✓	✓	✓	
Technical supervision company representative	✓	✓			

I. RESULTS OF THE ASSESSMENT (Component 1)

1. Assessment of the quality of the designs

For assessing the quality of designs, the consultants studied relevant project documents and conducted interviews with the beneficiaries of the projects.

1.1. **Engagement of the communities at the design stage.** In case of most of the assessed projects, the community heads and the representatives of the PICs mentioned that their community had had active involvement in the designing process, have contributed ideas and solutions relevant to the given infrastructure. For example, elements suggested for Noyemberyan’s “Bridge of Hope” center were

taken into account by the designer to make the facility better fit for children with special needs. In case of the school in Krasar, the PIC has participated in discussing the design of the roof. In a number of cases it was not possible to get any information about communities' engagement. This refers to those communities where in the result of political changes and local elections following them, the leadership (community head and the council) have changed, and normal knowledge transfer to the new leadership has not taken place. In such cases consultants encountered difficulties in finding PIC members and interviewing them. For example, in case of the kindergarten in Ohanavan (TAN-03) consultants could not get relevant information from the former community head who objected that much time had passed and details have elapsed. A similar situation was in Norashen project (TAT-01) where the current leadership is unaware of the details of the process.

1.2. Submission of needed documents by the community in due quality and time. According to the heads of assessed communities, needed documents and relevant information about technical conditions of infrastructure/utility networks (water supply system, electricity, waste water removal, natural gas supply) have been submitted to the designers in due manner. During interviews, the designers did not mention any instances of delayed provision of required documents, or did not remember such cases. During desk research of documents kept in the ATDF archive, the consultants did not come across any evidence of non-submission or delay of required documents by the communities to the designers. However, the study of the documents demonstrated that the dates of submission and their quality have caused changes in the designs in three cases which are documented accordingly: In case of Ararat kindergarten (TAT-06), it was not possible to join the sewage to the existing waste water removal system as technical conditions provided by the community were not complete, therefore the designer had to make relevant changes in the design. In Krasar project (TSH-02), the provided technical condition of water supply did not correspond to the existing pressure in the pipeline, therefore a pump was added to the design. Likewise, the technical condition of water supply was changed also in Alaverdi sports school (TLR-01).

1.3. Correspondence of the design to the project proposed by the community: The community heads and PIC members unanimously stated that the designs assessed under Component 1 correspond to the proposals of the communities. Moreover, interviewees brought many facts and justifications why they had preferred and prioritized those projects underlining the previous deplorable condition and the immense social impact that ATDF's project has had in the life of the local society. Although the current assignment did not include studying social impact of the improved infrastructures, however in many cases the interviewees highlighted the positive social and economic significance of the renovated and newly built constructions in the life of the community.

1.4. Existence of positive conclusion to the design by independent expertise body as specified by the law: Research of documents show that all projects have been positively evaluated by the independent expert bodies and their positive conclusions are documented and are in place. However, in all cases, the experts evaluating the designs have made comments and recommendations to all project designs. Those comments are of different character: *constructive* remarks (Noyemberyan "Bridge of Hope", Alaverdi Sports school); comments referring to the *drawing* of the design (Alaverdi Sports school, Norashen ambulatory, Ohanavan kindergarten, Goris museum); comments referring *mistakes in calculations of volumes / measurements and need for corrections* (Noyemberyan "Bridge of Hope",

Alaverdi Sports school, Norashen ambulatory, Chambarak, Parpi kindergartens, Goris museum). All comments made by independent experts have been addressed by the designers.

Usually, only 10-15 days are allocated for the contracted independent expert body to carry out evaluation of the design. Therefore, the latter are able to consider only large chunks of works that have big budgets, as for more detailed analysis and evaluation more time is required. That is why during construction works there occurred need for making changes in almost every design. This aspect is further elaborated in point 1.6.

1.5. Drawbacks of the designs: The consultants identified pitfalls in design in almost all projects. The most common of them is mistakes made in calculations of work amounts/volumes and their costs. Absence of complete technical descriptions and vague, unspecified quality requirements for produces, materials and equipment/appliances (such as doors and windows made of medium density fiber boards and metal-plastic, water taps, faucets, lamps, handles, locks, latches, valves, flexible pipes, toilet vats, etc.) are also common deficiency in the designs, that are observed in most of the projects, particularly those implemented in Ararat, Ptghavan, Gyumri, Chambarak, Norashen communities.

The experience of the consultants show that usually such deficiencies happen in the result of incomplete or inconsistent measurements, as they do not have consequences for the designer. Lack of designers' teamwork or the design company's backlog might have created subjective reasons for pitfalls that appear in the design.

1.6. The main reasons for changes in the design and cost estimations documents: Deficiencies in design solutions and calculations of volumes are present in almost all projects. During construction works, changes of different character and depth were made in the design, which are duly documented. Those changes can be grouped in the following way:

- ✓ **Changes proposed by the contractor and the PIC** mainly refer to corrections or changes in the work volumes. For example, the height of laying tiles on the wall (Ararat kindergarten) and the thickness of under-layer of gravel during asphaltting works of the yard (Ohanavan kindergarten) have been increased; the asphalt-concrete cover has been changed for breccia (Noyemberyan "Bridge of Hope" center, Argavand kindergarten); snow stoppers have been placed on the roof, warming system is added in the drainage pipes (Spitak cultural center), the plaster on the ceiling has been changed for drywall, the wire grid fence has been changed for metal one (Chambarak and Argavand kindergartens).
- ✓ **Changes made because of discovering defects in hidden works**, particularly discovered during excavation works the design of the foundations had to be changed connected with the marks of column caps (Krasar school); dilapidated condition of walls has been identified (Noyemberyan "Bridge of Hope" center); blocks of the roof have been installed with wrong slant in case of Alaverdi sports school, beside the technical condition of water supply have been changed.
- ✓ **Changes made because of finalization and correction of measurements** are reported in all projects, in the result of which the estimated costs were reduced in some cases such as in reconstruction of Gyumri "Arevik" kindergarten. Changing the plaster with drywall in Chambarak kindergarten also resulted in reduction of costs.

- ✓ **Changes made based on PIC's new proposals about design solutions:** In Agarakadzor water supply project, the PIC proposed not to build a dumping well which might cause scarcity of water during the pressure drop. The saved money was used to construct additional 90 meters of water pipeline.
- ✓ **Changes made because of alternation in technical conditions,** such as in case of Ararat kindergarten sewage, Krasar school and Alaverdi sports school water systems.

The changes described above have been agreed with the client, are duly documented, have not resulted in increase of costs, on the contrary, in some cases have reduced the costs estimated before. Regarding the deadlines for completing the designs, the studied documents show that in most cases violations of the dates that are worth mentioning did not taken place. In only one case, the designer of reconstruction of Ararat kindergarten has asked to extend the deadline of submission of the design to make necessary changes in the design as recommended by additional expertise commissioned by ATDF.

1.7. Issues related to author's supervision. Interviews with the authors of the design, contractors, technical controllers indicate that no issues arose related to the authors' supervision, all questions that have emerged during construction or new suggestions have been addressed in collaboration of parties.

2. Assessment of the quality of construction works

2.1. Engagement of the community in oversight of construction works: There is no written evidence about engagement of the community in construction works in the documents studied by the consultants. However, according to oral statements, communities have demonstrated active interest and participation in overseeing the construction works in their respective communities. PIC members have regularly been present and followed the process of construction, have lent support to the contractors to quickly resolve issues that arose in the process, local labor have been engaged in local works. Chambarak kindergarten project is an exception, though. During interviews it became clear that the PIC chairman has been inactive, the relations between the community and the contractor were strained because of dissatisfaction with the quality of the works. In case of Ptghavan school, the PIC and Ayrum municipality have closely followed and overseen the reconstruction, however they state that dissension had arisen with the contractor over quality of work.

2.2. Correspondence of the construction to the design and existing norms: In most cases construction has been carried out in compliance with the design and accepted norms, however, in certain cases some inconsistencies have been observed:

- In Ptghavan school, on the main façade, the basalt window ledges are installed incorrectly, are not placed under the window frame, with a gap of 2-3 cm. Several window ledges are placed at the same level as the surface of the wall while they should have protruded for 30 mm. This detail is elaborated in the design but has not been fulfilled; therefore it is violation of the construction norms.
- In Noyemberyan "Bridge of Hope" center, the plastering of the outer walls is done very unevenly, although general look is fair. The work does not correspond to what is stated in the cost estimation which is violation of construction norms.

- In Ptghavan school and Ararat kindergarten, while covering the yards with asphalt, the soil layer was not removed properly and grass comes out of the cracks.
- In Alaverdi, Ptghavan, Norashen, Krasar and Chambarak projects, the grade of concrete mix is low that is why it has started destroying, the pave and the curbs are collapsing.
- In Alaverdi, Ptghavan, Norashen, Krasar and Chambarak projects, the soil loading under the overlay is not done properly and does not correspond to the construction norms.
- In Gyumri, Norashen, Krasar projects, the deformation of the majority of metal-plastic windows and doors is possibly due to the fact that metal profiles do not correspond to the norms (1.2 mm) or are not installed at all.
- In Krasar school, the double-glazed windows allow condensation between glasses.
- In Argavand kindergarten, because of wrong inclination of the breccia cover of the yard, rainwaters accumulate at the entrances to the building.
- In Argavand kindergarten, in some places the wall tiles in the toilets have fallen, most probably because of low quality glue.
- In Parpi kindergarten, the walls along the baseboards of the first floor dampen, in some places the dampness reaches the windowsills. It is because the rainwaters and snowmelts penetrate from outside, from base of the plinth which does not have the proper outward inclination, and there are empty areas under the blocks of the cap.
- In Chambarak kindergarten, the outer walls are damp in certain places because of incorrect removal of rainwater and snowmelts.
- In Ohanavan kindergarten, in a few areas the heating radiators do not work properly. According to the employer, because of incorrect welding of pipe junctions, some segments of the system are blocked.

2.3. The impact of design solutions and selection of construction materials on the quality of work: In most cases, the design solutions have not impacted the quality of work, but this is not the case with the materials used. The absence of detailed description of materials, produces and equipment in the designs negatively impact the quality of work. In most of the projects, the following problems have been identified:

- Poor quality of door handles, locks, water taps, valves, flexible pipes, elements of toilet cisterns
- MDF panel doors
- Metal- plastic window frames and doors
- Plastic baseboards

2.4 Drawbacks in quality of construction works, operation and maintenance of infrastructures: Table 8 below summarizes the analysis of work quality, the state of maintenance and preservation of projects assessed under Component 1. The assessment is done based on the field work; using a scale “bad-fair- good- excellent” according to criteria as describe in the ‘Introduction’. Identified drawbacks are grouped according to the following directions:

- Violation of schedule
- Drawbacks in design solutions
- Quality of materials and produces

- Drawbacks in quality of construction works
- Quality of technical supervision
- Drawbacks in operation and preservation

Table 8. Quality of construction works, main problems in operation and preservation and their reasons

#	Name of the project	Code	Quality of construction	Main drawbacks	Reasons of the drawbacks					
					Violation of schedule	Design solutions	Quality of materials and products	Quality of construction works	Quality of technical supervision	Operation, preservation
1	Reconstruction of the 3 rd block of Ararat kindergarten	TAT-06	Good (3)	The main drawbacks are connected with low quality MDF doors that quickly come out of order and are not possible for restoring. Neither in the design nor in the cost estimation quality requirements for MDF doors are not specified. No technical description is provided.		V	V			
						1	1			
2	Reconstruction of of Parpi kindergarten	TAN-04	Good (3)	On the ground floor the lower part of the walls along baseboards get damp for about 20 cm, in some places till the windowsills. The doors do not have enough inclination.		V		V	V	
						1		1	1	
3	Reconstruction of Norashen ambulatory	TAT-01	Fair (2)	<p>Metal-plastic windows do not open-close properly, with clearances. Some of the windows open fling open while being in closed position even from light wind. The reason might be substandard metallic profiles or their absence.</p> <p>However, it is possible to improve the situation by adjusting the windows from time to time.</p>			V	V	V	V

				There are traces of dampness on lower parts of th wall in some of the rooms. The wall next to the window in the obstetric room is also damp, as well as on lower parts of th outer walls. The reason may be the absence of horizontal hydroisolation and penetration of water through cracks that appear because of deformation of the pave.				V	V	
				The breccia pave is of low quality, with multiple cracks. In some places the outlay has sagged and craks have appeared in the places of connecting with the walls from where the walls get dapmed. The reason is the soil loading is not done proprly. The concrete mix between basalt tiles is of low grade that is why it has started destroying.	V			V	V	
				It was planned in the design to clad the fence of the central entrance with basalt tiles, however during construction the cladding was changed for plastering with cement-sand mix and was painted. Currently, the paint is destroying. This deviation from the design aimed at reducing construction costs.				V	V	
				Total issues per type	1		1	4	4	1
4	Renovation of the cultural center in Spitak, construction of the heating system	TLR-1 1	Good (3)	There are signs of dampness and mold on the walls of the music room on the groud floor, some were already dried. It is partially due to absence of heating and condensed water flowing over the windows onto the walls. Another reason is insufficient leakproofness of wall connections. The reason for not heating is that the gas pipleine was built with delay and the heating started towards the end of the winter.	V			V	V	V
				Total issues per type	1			1	1	1
5	Reconstruction of the sports school in Alaverdi	TLR-0 1	Good (3)	There are many horizontal and vertical cracks on the walls of the gym, especially on the connection places of thermoisolation boards. The reason is insufficient elaboration of the boards.				V	V	

				There are sign of dmpness on lower parts of outer rare walls where no hydroisolation was done.	V					
				Cracks have appeared on the breccia pave because of insufficient soil load and poor quality of mix.				V	V	
				Total issues per type	1			2	2	
6	Reconstruction of Gyumri Arevik kindergartn	TSH-1 2	Good (2)	The outer doors do not open and close properly. The doors do not fit their frames well leaving gaps (often large). The windows also do not open and close properly, there are gaps in between the frames and the walls through which wind and rain penetrate inside. Such gaps are covered with sticky bands, in wider gaps the clearances are stuck with cotton. The impression is that the frames are deformed. It is possible that the metallic profiles in the windows are either too thin (thinner than the norm of 1.2mm) or do not exist at all. However, the community can regulary adjust the windows which will help address the problem.			V	V	V	V
				Inner doors of MDF are of low quality and get out of order very quickly.	V	V	V			
				The paint on the outer walls is washing away because of low quality.			V	V	V	
				Total issues per type	1	1	3	2	2	1

7	Construction of Krasar school for 100 students	TSH-0 2	Good (3)	<p>The plaster on the ceilings of the second and partly on the first floors is destroying. There are places with signs of dampness and mold on the upper corners of the outer walls under the gutters. The ceiling of the gym, boiler room get damp, plaster peels off from the walls and ceiling.</p> <p>The roof of the building is complex, architecturally uneven and broken into different levels, because of which multiple tin coverings are applied, the connections of which are often not properly elaborated. Wahter removal is done through gutters near which the walls are also becoming damp. No snow stoppers have been envisioned . The cut of the gutters is small.</p>		V	V	V	V	
				<p>Some of the windows do not open-close properly. Some the double-glazed windows allow condensation between glasses.</p>			V	V	V	V
				Total issues per type		1	2	2	2	1
8	Reconstruction of the 2 nd block of Ptghavan school	TTV-0 9	Fair (2)	<p>MDF doors are of low quality, the outer layer gets out of order and is not possible to recover. The doors get loosened and sag on the hinges, the handles and locks break.</p>		V	V			
				<p>In the central block, 6 heating sections (2 on the first floor, and 4 on the second floor) do not work.</p>				V	V	
				<p>Vinyl cover is ditached from the underfloor because of low quality of glue or insufficient drying of the underfloor.</p>	V		V	V	V	
				<p>In the design, the baseboards are assigned to be of MDF, while in the cost estimation the material is not specified. In the result plastic basedboards are installed which break quickly especially in the corners of the doors.</p>			V	V	V	V

				On the main façade, the basalt window ledges are installed incorrectly, are not placed under the window frame, with a gap of 2-3 cm.				V	V	
				Several window ledges are placed at the same level as the surface of the wall while they should have protruded for 30 mm. This detail is elaborated in the design but has not been fulfilled.				V	V	
				In the yard, basalt curbs are not placed in a straight line, in some places they are lost.				V	V	
				The building is not preserved properly. The lower parts of the walls are all black from traces of shoes, the corners are broken.						V
				Total issues per type	1	1	3	6	6	2
9	Noyemberyan "Bridge of Hope" Center	TTV-13	Good (3)	MDF doors are of low quality, the outer layer gets out of order and is not possible to recover: Neither in the design nor in the cost estimation quality requirements for MDF doors are not specified. No technical description is provided.	V	V	V			
				The plaster of the outer walls is uneven and is covered with thin cracks.				V	V	
				Total issues per type	1	1	1	1	1	
10	Agarakadzor drinking water supply system restoration and DRR construction	TVZ-05	Excellent (4)	No defects	V					
11	Akhlatyan drinking water supply system	TSQ-04	Excellent (4)	No defects						
12	Reconstruction of Argavand kindergarten	TAR-04	Fair	Because of wrong inclination of the platform of the yard, rainwaters accumulate at the entrances to the building.		V		V	V	

			(2)	High level of groundwaters get yet higher because of melting snow causing dampness on the lower parts on the inner walls of the ground floor along the baseboards.		V				
				Tiles in the toilets that are adjacent to the outer walls are falling. In other places of the same walls cavities were detected. Tiles on the inner walls are firm.			V	V	V	
				Total issues per type		2	1	2	2	
13	Artsvanist drinking water supply sysem construction	TGQ-11	Excellent (4)	No defects						
14	Rconstruction of Chambarak kindergartn #3	TGQ-06	Fair (2)	Basalt breccia cover around the kindergarten and on the playground is deteriorating, concrete curbs are loose. The concrete mixture is of low quality and the soil loading is done insufficiently.				V	V	
				Because of incorrect removal of rainwater from the roof and the peaks the outer walls get damp in some places.				V	V	
				Basalt blocks of the ground base are loosen becauae of low quality of works.				V	V	
				The outer plaster surrounding the windows peel off because of low quality of work.				V	V	
				Inner doors are of low quality, sag from the hinges and cannot be closed properly.		V	V			
				Inner walls are damp in many places, the paint molds. The reason is spraying of water from poor connections of the pipes.				V	V	
				Some of the water heating panels on the roof have fallen from the stand.				V	V	
				Fireproof voice alarm system does not work.						V

				Total issues per type		1	1	6	6	1
15	Reconstruction of Sero khanzadyan museum in Goris	TSQ-01	Good (3)	Some minor dfcts have occurred because the building was not heated in the winter.						V
				Total issues per type						1
16	Reconstruction of Gulagarak kindrgartn	TLR-03	Excellent (4)	No defects						
17	Jrvezh irrigation water system construction	TGQ09	Excellent (4)	No defects						
18	Khdzorsk water distribution system	TSQ-08	Excellent	No defects						
19	Rconstrfuction of Ohanavan kindergarten	TAN-03	Fair (2)	There are cracks on the walls and the ceiling which contractor and the communit head are because of earthquake.						
				In some sections of the heating systmen the radiators do not get warm properly. According to the operator, in some places the pipes got blocked during welding of the pipe pieces.				V	V	V
				The flexible pipes of the water taps in the toilets have cracked, leakage of water took place which dampened large surface of walls. The reason is that the kindergarten did not operate in winter and water was not pours out from the system.						V
				Total issues per type				1	1	2
20	Reconstruction of Pemzashen music school	TSH-18	Excellent (4)	No defects						

Number of identified issues per type	7	9	13	28	28	10
Percentage of detected issues per type	7.4	9.5%	13.7%	29.5%	29.5%	10.5%

Thus, the ratio of causes of identified problems is as follows:

- Violation of deadlines -7.4%
- Drawbacks in design -9.5%
- Drawbacks connected with quality of materials – 13.7%
- Drawbacks connected with quality of construction works – 29.5%
- Drawbacks in technical supervision – 29.5%
- Drawbacks in maintenance and preservation – 10.5%

It should be noticed that the mentioned percentages derive from the pool of all defects identified (one or more drawbacks could have been found in one project), and do not represent the ratio of defects in 20 studied projects as presented in the Introduction.

2.5 Issues arisen during operation and their reasons. Issues and drawbacks related to the design, quality of construction works, and violation of construction norms and standards become evident during operation; the longer the infrastructure is exploited, the more severe the problems are displayed. Problems identified during exploitation of the infrastructure can be divided into several groups that are presented in Table 9.

Table 9. Issues arisen during operation

Issue	Reason	Project encountered
Interior doors	Low quality of MDF doors; locks, handles get out of order very quickly.	Norashen, Ararat, Noyemberyan, Gyumri, Ptghavan, Chambarak
Metal-plastic products	Most of the windows and the frames of the outer doors are deformed.	Gyumri, Norashen, Krasar, Ohanavan
Paving	The overlay gradually sits and deteriorates because of insufficient soil loading and low quality of concrete mixture.	Alaverdi, Ptghavan, Norashen, Krasar, Chambarak
Outside walls	The painted parts have faded because of low quality or inappropriate paints.	Norashen, Gyumri
Flooring	Vinyl floor covers separate from the main flooring because of low quality of the glue or insufficient dryness of the under layer at the time of covering.	Ptghavan
Dampness	Traces of dampness in many projects, particularly on the ground floors of the buildings because of absence of horizontal hydro isolation of walls, penetration of water through the deformed or damaged paving; in case of Krasar also because of seepage from the roof.	Norashen, Alaverdi, Argavand, Parpi, Ptghavan, Gyumri, Ohanavan, Krasar, Chambarak

2.6 Delays (if any) in the construction works and their reasons. In most of the assessed projects (45%), no delays happened. In the other cases the delays happened due to three main reasons:

- Unforeseen works, changes in the design
- Unfavorable weather conditions
- Because of the contractor

Table 10 summarizes the reasons of delays based on their frequency and spreading as recorded in the studied documents.

Table 10. Reasons of the delays

	Reason of the delay	Project	Number of cases
1	Unforeseen works, changes in the design and work volumes	Goris, Ohanavan, Ptghavan	3 (15%)
2	Unfavorable weather conditions	Spitak, Pempashen, Agarakadzor, Alaverdi, Gyulagarak	5 (25%)
3	Because of the contractor	Norashen, Gyumri, Noyemberyan	3 (15%)
4	Was not delayed or was completed ahead of time.	Argavand, Parpi, Chambarak, Khndzoresk, Jrvezh, Ararat, Krasar, Akhlatyan, Artsvanist.	9 (45%)

2.7 Issues related to technical supervision during construction works. Representatives of the communities, PIC members mention that no issues have come up in relation to technical supervision. Representatives of the organizations providing technical supervision services have regularly visited the construction site, have collaborated with the community and the contractor. However, it must be mentioned that many drawbacks identified in the projects are linked with inadequate technical supervision. For example, the incorrect placement of doors in Gyumri (Arevik) kindergarten, or poor implementation of the roof and

ceiling of Krasar school, as well as many shortfalls in construction works of Norashen ambulatory and Chambarak kindergarten could have been detected and prevented if supervision was carried out in due manner.

2.8 Defects arisen in post-construction period and their correction by the contractor. In most cases – 70% of projects, community representatives and members of the PIC state that no defects have been identified during the guaranty period. Such has been the response in regards to Ohanavan and Norashen projects, which, however must be regarded with reservation. Thus: Ohanavan kindergarten was completed in September, 2017. Because of political changes of 2018, it did not operate for more than a year. As stated by the new head of the community, defects have come up during that period of time. After working for only four months, the kindergarten locked down again this time because of coronavirus pandemic and was reopened in February, 2021. As for Norashen project, many defects emerged immediately after the ambulatory started to operate, according to the people working there. It can be concluded, that in both cases the former community heads who had to give way to the new leadership, have not been willing to transfer the entire information about the project to them.

In case of three projects, minor defects have been noticed which the contractor corrected (Spitak, Krasar, Alaverdi). In another three projects, serious defects identified in post-construction period were not corrected by the contractor, or were corrected partially leaving the problem unsolved. Many claims of the employers of the infrastructures were left unanswered by the contractor. Such projects are Chambarak kindergarten, Gyumri Arevik kindergarten, Ptghavan school. Such shortfalls are described in detail in point 2.4.

3. The preservation of the infrastructure

3.1 The current condition of the infrastructures, their preservation. As described in the Methodology of this assessment, the state of preservation of projects implemented under Component 1 is evaluated with a scale from 1 to 4 where 1 is 'bad', 2 is 'fair', 3 is 'good' and 4 is 'very good'. The assessment is done based on observations made during the period of field study and finalized by consented opinions of the experts. In majority of cases, though in not all, the preservation of the infrastructure is linked with the quality of construction works. Table 11 shows the evaluation of preservation of infrastructures in combination with the evaluation of quality of works.

Table 11. Evaluation of the preservation of infrastructures.

	Type of the project	Code	Score for preservation	Score for quality of construction works
1.	Reconstruction of Parpi kindergarten	TAN-04	4	3
2.	Reconstruction of Ohanavan kindergarten	TAN-03	2	2
3.	Reconstruction of Ararat kindergarten 3 rd block	TAT-06	4	3
4.	Reconstruction of ambulatory in Norashen	TAT-01	2	2
5.	Reconstruction of Argavand kindergarten	TAR-04	2	2
6.	Reconstruction of Chambarak kindergarten #3	TGQ-06	2	2
7.	Drinking water network construction in Artsvanist	TGQ-11	4	4

8.	Construction of Gyulagarak kindergarten	TLR-03	4	4
9.	Renovation of Spitak cultural center, constructing heating system	TLR-11	3	3
10.	Reconstruction of sports school in Alaverdi	TLR-01	3	3
11.	Construction of irrigation network in Jrvezh.	TKQ-09	4	4
12.	Reconstruction of Arevik kindergarten in Gyumri	TSH-12	3	3
13.	Construction of Pempashen music school	TSH-18	4	4
14.	Construction of Krasar school for 100 pupils	TSH-02	3	3
15.	Reconstruction of Sero Khanzadyan museum in Goris	TSQ-01	3	3
16.	Drinking water network construction in Akhlatyan	TSQ-04	4	4
17.	Drinking water network reconstruction in Khndzoresk	TSQ-08	4	4
18.	Drinking water network and reservoir construction in Agarakadzor	TVZ-05	4	4
19.	Reconstruction of the 2 nd block of Ptghavan school	TTV-09	2	2
20.	Reconstruction of "Bridge of Hope" center in Noyemberyan	TTV-13	3	3

Preservation of 9 projects are scored '4' among which are all five water supply networks, as well as three kindrgartens and one specialized (music) school. 6 projects are scored '3'. The Chambarak kindergarten has the lowest score. Norashen ambulatory, Ptghavan school, Argavand and Ohanavan kindergartens are not well preserved either. In 18 projects, the scores for preservation and quality of construction works coincide which proves that the two correlate and are interlinked.

Table 12. Preservation of the infrastructures in percentage

Score	Number of projects scored	Percentage
Very good '4'	9	45%
Good '3'	6	30%
Fair '2',	5	25%
Bad '1'	-	-

3.2 Planning of the preservation costs; their correspondence to the initial estimation. Data obtained from studied documents and information received from the communities regarding the estimated and actual spending for preservation of improved infrastructures are presented in the table below.

Table13. Planned and actual costs for maintenance and preservation (in AMD)

	Project, community	Code	Costs estimated in the expert assessment stage	Actual costs of the previous year	Difference between estimates in the expert assessment stage and actual costs
1	Kindergarten, Parpi	TAN-04	23 750 000	16 000 000	7 750 000

2	Kindergarten, Ohanavan	TAN-03	21 350 000	0	21 350 000
3	Kindergarten, Ararat	TAT-06	46 700 000	74 309 326	-27 609 320
4	Ambulatory, Նորաշեն	TAT-01	16 800 000	18 112 000	-1 486 000
5	Kindergarten, Argavand	TAR-04	10 500 000	1 440 000	9 060 000
6	Kindergarten, Chambarak	TGQ-06	23 535 000	18 286 800	5 248 200
7	Water pipeline, Artsvanist	TGQ-11	7 410 000	7 410 000	0
8	Kindergarten, Gyulagarak	TLR-03	13 200 000	11434 092	1 765 908
9	Community center, Spitak	TLR-11	35 157 000	13 725 000	21 432 000
10	Sports school, Alaverdi	TLR-01	12 485 000	16 908 000	-4 423 000
11	Water pipeline, Jrvezh	TKQ-09	7 200 000	0	7 200 000
12	Kindergarten, Gyumri	TSH-12	25 150 000	21 790 000	3 360 000
13	Music school, Pempzashen	TSH-18	15 110 000	13 068 800	2 042 000
14	School, Krasar	TSH-02	44 725 000	41 645.200	3 079 800
15	Museum, Goris	TSQ--01	1 300 000	1 321 190	-21 190
16	Water pipeline, Akhlatyan	TSQ-04	1 190 000	0	1 190 000
17	Water pipeline, Khndzoresk	TSQ-08	356 000	3 870 000	-3 514 000
18	Water pipeline, Agarakadzor	TVZ-05	960 000	960 000	0
19	School, Ptghavan	TTV--09	39 666 000	47 126 000	-7 460 000
20	Community center, Noyemberyan	TTV-13	22 551 000	22 832 000	-281 000

The analysis shows that in the majority of projects (12 projects, 60%) communities have spent less money for maintenance and preservation than is was initially planned by the community during the expert assessment stage. In one case, the estimated cost coincides with the actual expenditure. In the other seven cases more has been spent than was planned. If we look at the costs in comparison with the types of the projects, several patterns can be distinctively seen:

- **Kindergartens** – Out of all assessed kindergartens only three have operated in 2020 – in Ararat, Gulagarak and Gyumri (except for the periods of lockdown due to COVID-19) including winter months. In the first two cases, the actual costs considerably exceed estimations. The other kindergartens have operated only for a few months that year, and the expenditures for preservation and maintenance remained partially unspent (only salaries and partly utilities were covered).
- **Public schools and specialized schools** – The actual costs of Ptghavan school are surpassed, while those of Krasar are underspent. The expenditures of Alaverdi sports school are surpassed too, although the school has operated only a few months. As for Pempzashen music school, the planned and actual costs are almost identical.
- **Community centers** – In two of the community centers out of three assessed, Sero Khanzadyan museum in Goris and 'Bridge of Hope' in Noyemberyan, the actual costs for maintenance and preservation correspond to what had been planned. While in Spitak cultural center, the initially estimated costs were not spent fully as the heating system was not started during winter months.

- Water system networks – Jrvezh irrigation network is transferred to the Water Users Association, therefore the community does not bear any responsibility for its maintenance. In the other water system related projects, the salary of the plumber is the only cost spent for maintenance. No other maintenance-related expenditures were needed. In Khdzoresk project, costs for preservation considerably exceed what was planned as Goris municipality initiated installing water meters which was not foreseen in the design.

It should be taken into account that many reconstructed or newly constructed infrastructures have operated below their full capacity or for only limited time because of restrictions caused by pandemic. Therefore, results for 2020 may be not complete to serve as a basis for analysis. However it is evident, that the calculation of costs presented in the section 'Costs estimated after completion of the project' in the Final Expertise should be done more accurately.

3.3 The impact of drawbacks of design and construction works on the state of preservation. In most of the projects, flaws of the design and/or construction works have had decisive impact of preservation and maintenance of the infrastructure. In projects that have scored low as presented in point 3.1, many issues have emerged that are interlinked with the shortfalls of design and construction works. Similar deficiencies increase, and yet will increase costs for communities to duly maintain and preserve the infrastructures.

Drawbacks referring designs, construction works and materials described in points 1.5; 2.2; 2.3; 2.5 have had immediate impact on preservation of the infrastructure. However, in certain projects such as Ptghavan school, Arevik kindergarten of Gyumri, there is need for enhancing efforts for preserving the infrastructure, by paying more attention to current repairs so that accumulation of damages and related increase of costs are avoided in future.

4. Assessment of costs of construction works

In this section of the assessment, the pricing mechanisms for construction works, materials and equipments are analyzed, unit costs presented in cost estimations of ATDF and other organizations, as well as cost estimates made by ATDF and the ones provided by successful tenders are compared. The impact of reducing the prices on the quality of the construction works is assessed.

4.1. Mechanisms of pricing of construction works, materials and equipments in cost estimations

The ATDF's pricing base is elaborated according to the principles set forth in the "Order of cost calculation for construction works in RA" (hereinafter referred as *Norms effective in RA as of 1984*). In RA, cost estimations are mostly elaborated based on the methodology adopted by the Government decree of 23.06.2011, N879, on calculation of costs for construction works. The unit cost is comprised of the sum of the price of materials for the given work (line), wages and those for operation of one or more equipment/machinery. It is possible that the line consists of only material(s), only wages or/ and only equipment.

Prices for wages and operation of equipment/machinery are partly based on Norms effective in RA as of 1984 after indexation (ruble-dram). Wages and operation of equipment/machinery prices are calculated in drams, while prices for materials correspond to the Norms effective in RA as of 1984. Prices of the materials partially coincide with prices published in the reference guides of the Ministry of Finance (formerly published by the Pricing Policy Analytical-information Center).

Price components of certain lines are partially or fully reviewed; these refer to those materials that are not included in the reference guide, or to works that have not been envisioned in the Norms. Thus, prices of some materials are accepted based on market research through soliciting information from several importing and producing companies. Wages and prices for operation of equipment are decided through inquiries from different sources.

In such cases, decision about pricing is made based on internal discussions. Part of the revisions is dictated by special requirements for materials, equipments and quality of works set forth by ATDF. According to the SILD manual, cost estimations of the projects are made according to the form approved by the World Bank created on ATDF's unit cost base. Meanwhile, in the cost estimations produced by ATDF, calculation of indirect costs considerably differs from those accepted in RA.

Thus:

Table 14. Comparison of costs effective in RA with those accepted in ATFD (%)

	Indirect costs	Effective in RA %	Accepted by ATDF %
1	Transportation costs (only for materials)	Changeable, dependent on the marz	Changeable, dependent on the marz
2	Other materials (only for materials)	5	--
3	Storage costs (only for materials)	2	--
4	Overhead	13.3	8
5	Profit	11	10
6	Temporary buildings and constructions	changeable	--
7	Winter price increase	changeable	--
8	For small volumes		
	- up to 25 mln drams	2	--
	- up to 50 mln derams	1,5	--
	- up to 100 mln drams	1	--
9	Cost for removal of non-regular garbage	0,15	--
10	Technical supervision	Changeable	Changeable
11	Author's supervision	0,6	Changeable
12	Unforeseen works and expenditures	Changeable	--
13	Insurance	--	0,5 (for projects above 100 mln)
14	Design services	--	Changeable

15	Technical expertise services	--	Changeable
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Comparison of indirect costs effective in RA and those accepted by ATDF presented in the table demonstrate the following:

1. Percentage of transportation costs are elaborated by the Ministry of Urban Development depending on the conditions of the construction (location of the construction site, distance of transportation, complexity of delivery to the construction site). Estimations of this item coincide in the Norms of RA and those produced by ATDF.

2. For 'other materials', the Urban Development Committee specifies 5%. ATDF recalculates the costs specified in the Norms in roubles and adds to the cost of the materials.

3. For storing materials on the construction site, the Urban Development Committee foresees 2%, while ATDF does not apply such percentage.

4, 5. For overhead and profit each apply their percentages respectively.

6. The Urban Development Committee specifies percentage for temporary constructions (movable or modular) storages, temporary engineering networks (electricity, water, access roads, etc), while ATDF does not apply such a percentage.

7. Climatic conditions and winter price increase on construction works is accepted by the norms of the Urban Development Committee, depending on the location and zoning of construction site. Three zones are specified in Armenia – warm, mild and cold. ATDF does not apply such percentage.

8. ATDF does not apply additional costs for small volume construction works, while the The Urban Development Committee accepts the following percentages:

- for up to 25 mln drams – 2%
- for 25-50 mln drams – 1.5%
- for more than 500 mln drams – 1%

9. The Urban Development Committee applies 0.15% for removal of non-regular garbage. ATDF does not apply such percentage.

10. Percentage for technical supervision is changeable according to the norms, depending on the volume of works:

- for up to 50 mln drams -2%
- for 50 -100 mln drams - 1.8%
- for 100 - 300 mln drams – 1.5%
- for 300 – 500 mln drams – 1.3%
-

These percentages indicated above are included in the cost estimates. ATDF does not include these in cost estimates; it is calculated separately and is subject to competitive assessment.

11. The Norms, foresee 0.4% for author’s supervision which is indicated in the cost estimations. ATDF does not include it in the cost estimations; it is calculated separately and is subject to competitive assessment.

12. Unforeseen costs and expenditures elaborated by the Urban Development Committee is changeable depending on the type of construction, client, etc. Is not applied by ATDF.

13. Insurance is applied in case of large projects.

14. Designing services are applied by ATDF, is calculated separately and is assessed on competitive basis.

15. Technical expertise services are applied by ATDF, is calculated separately and is assessed on competitive basis.

As percentages described in points 10, 11, 13, 14, 15 are not included in cost estimations, they will not be considered in the analysis below.

To improve the existing order, ARDF might consider expedient to:

- Elaborate new working lines that are not envisaged in the norms and include them into the cost estimation base.
- Make some revisions in the lines of the Norms if they do not correspond to the requirements of ATDF.

In general, budget estimations that are elaborated on the ATDF base are more clear and concise. Calculation of unit costs for materials, salaries and equipment in general do not differ from adopted approach of the Urban Development Committee of RoA. While elaborating budget estimates, unit costs that are already calculated in the Base are included readily, which allows to devise many estimates in a short time and avoid from estimating different costs for similar units.

Therefore, it is advisable to:

- Apply the same percentages and indexes in ATDF's base and in the order of elaboration of cost estimations. According to the currently effective order, some percentages for equipment (overheads, profit, etc.) are not calculated.
- Update data included in the base more frequently.
- Make the sequence of chapters in the cost estimates compatible with the accepted form: interior works – construction, plumbing, electrical works, afterwards external networks and landscaping
- Review the costs for materials, wages and equipment that are apparently not correct. For example, the cost for operation of a bulldozer is priced considerably higher than that of an excavator, while in the cost estimation of Akhlatyan project for construction of water supply system, the cost of bulldozer's operation is assessed more realistically. If prices of some materials are not included in the guide, in such cases inquiry must be made among at least three suppliers or producers and make decision based on costs provided by them.

Labor costs also differ from those accepted in RoA:

- Concrete and iron-concrete works, installation of metal doors are estimated lower in the Base than accepted in RoA and need to be updated;
- Plaster, masonry works, tiling floors with ceramic-granite are estimated higher than accepted in RoA;
- Tiling of walls, covering with latex paints, vinyl floor covering are higher than accepted in RoA;
- Works referring roofing as well as to asphalt –concrete covering are estimated considerably higher than accepted in RoA;

It should be mentioned, though, that labor costs are based on the method of calculation dating back to 1984 with further indexation and mostly do not correspond with accepted market prices. Therefore, labor costs must be calculated based on regular market research and analysis.

4.2. Comparison of construction works implemented with financial resources of ATDF and other organizations

In the table 15.1; 16.1; 17.1 ; 18.1; 19.1 presented below costs of similar works implemented by ATDF and with other resources are presented. While in tables 15.2; 16.2; 17.2; 18.2; 19.2 unit cost and indirect costs of the same project are compared.

Table 15.1 Comparison of construction costs of Krasar school (ATDF) and 'Varduhi' art school in Gyumri (Oyunjian Fund)

Construction of Krasar school for 100 students (ATDF)		Varduhi' art school in Gyumri (Oyunjian Fund)	
Item	Sum	Item	Sum
Estimated direct costs	145792.08	Construction works including overhead and profit	272034.22
Overhead 8%	11663.366	Temporary buildings 1.5%	4080.513
Sub-total	157455.441	Sub-total	276114.733
Profit 10%	15745.544	Winter price increase 1.6%	4417.836
Sub-total	173200.985	Cost for removal of non-regular garbage 0.15%	414.172
Other costs 2%	3464.020	Sub-total	280946.741
Sub-total	176665.005	Equipment	4318.910
VAT 20%	35333.001	Sub-total	285265.651
Sub-total	211998.006	Unforeseen costs 3%	8557.970
Insurance 0.5%	1059.990	Sub-total	293823.621
		VAT 20%	58764.724
TOTAL	213057.996	TOTAL	352588.345

Table 15.2 Comparison of costs for 1 m² and the percentage of indirect costs of Krasar school (ATDF) and 'Varduhi' art school in Gyumri (Oyunjian Fund)

Project	Square of the construction	Cost of 1 m ²	Indirect costs (%)
Construction of Krasar school	822.5m ²	213057.996/822.5= 259.037 thousand drams	46,1%
'Varduhi' art school in Gyumri	1402.3m ²	352588.345/ 1402.3 = 251.436 thousand drams	63.1%

Table 16.1 Comparison of construction costs of Gulagarak kindergarten (ATDF) u Stepanakert kindergarten (AR Urban Development Committee)

Construction of Gulagarak kindergarten (ATDF)		Stepanakert kindergarten (AR Urban Development Committee)	
Item	Sum	Item	Sum
Estimated direct costs	121724.5	Construction works including overhead and profit	681554.15
Overhead 8%	9737.960	Temporary buildings 12.5%	10223.312
Sub-total	131462.960	Sub-total	691777.462
Profit 10%	13146.246	Winter price increase 0.8%	5534.220
Sub-total	144608.711	Removal of non-regular garbage 0.15%	1022.331
Other costs 2%	2892.174	Sub-total	698.334.013
Sub-total	147500.885	Equipment	10079.290
VAT 20%	29500.177	Sub-total	708413.303

Sub-total	177001.062	Unforeseen costs 3%	21252.399
Insurance 0.5%	885.005	Sub-total	729665.702
		VAT 20%	145933.140
TOTAL	177886.067	TOTAL	875598.842

Table 16.2 Comparison of costs for 1 m² and the percentage of indirect costs of Gulagarak kindergarten (ATDF) and Stepanakert kindergarten (AR Urban Development Committee)

Project	Square of construction	Cost of 1m ²	Indirect costs (%)
Construction of Gulagarak kindergarten	646.4m ²	177886.067/646.4=275.195 thousand dram	46,1%
Stepanakert kindergarten	3398.88m ²	875598.842/3398.88=257.614 thousand dram	≈58.4%

Table 17.1 Comparison of construction costs of the roof of Gulagarak kindergarten (ATDF) and the roof of residential building in Martuni (Governors office of Gegharkunik)

Construction of the roof of Gulagarak kindergarten (ATDF)		Construction of the roof a residential building in Martuni Governors office of Gegharkunik	
Item	Sum	Item	Sum
Estimated direct costs	20187.925	Construction works including overhead and profit	16851.94
Overhead 8%	1615.034	Temporary buildings 1%	168.519
Sub-total	21802.959	Sub-total	17020.459
Profit 10%	2180.295	Winter price increase 1.6%	272.327
Sub-total	23983.255	Removal of non-regular garbage 0.15%	25.531
Other costs 2%	479.665	Sub-total	17318.317
Sub-total	24462.920	Equipment	
VAT 20%	4892584	Sub-total	
Sub-total	29355.504	Unforeseen costs 3%	519.550
Insurance 0.5%	146.778	Sub-total	17837.867
		VAT 20%	3567.573
TOTAL	29502.282	TOTAL	21405.440

Table 17.2 Comparison of costs for 1 m² and the percentage of indirect costs of the roofs of Gulagarak kindergarten and residential building in Martuni

Project	Square of construction	Cost of 1m ²	Indirect costs (%)
Construction of the roof of Gulagarak kindergarten	850m ²	29502.282/850=34.708 thousand drams	46.1%
Construction of the roof of residential building in Martuni	564m ²	21405.440/564=37.953 thousand drams	59.7%

Table 18.1 Comparison of construction costs of Akhlatyan water supply system (ATDF) and irrigation system in Gavar new orchards (Governor's office of Gegharkunik)

Construction of Akhlatyan water supply system (ATDF)		Construction of irrigation system in Gavar for new orchards (governor's office of Gegharkunik)	
Item	Sum	Item	Sum

Estimated direct costs	3235.939	Construction works including overhead and profit`	7088.74
Overhead 8%	258.875	Temporary constructions 3%	212.662
Sub-total	3494.814	Sub-total	7301.402
Profit 10%	349.481	Winter price increase 2.2%	160.631
Sub-total	3844.296	Removal of non-regular garbage 0.15%	10.952
Other costs 2%	76.886	Sub-total	7472.985
Sub-total	3921.181	Equipment	
VAT 20%	784.236	Sub-total	
Sub-total	4705.418	Unforeseen costs 4%	298.919
Insurance 0.5%		Sub-total	7771.905
		VAT 20%	1554.381
TOTAL	4705.418	TOTAL	9326.285

Table 18.2 Comparison of costs for 1 m² and the percentage of indirect costs of the Akhlatyan water supply system and irrigation system in Gavar for new orchards

Project	Length of the construction	Cost of 1 meter	Indirect costs (%)
Akhlatyan water supply system	578 m	4705.418/578=8.141 thousand drams	45.4%
Irrigation system for new orchards in Gavar	1015 qū	9326.285/1015=9.188 thousand drams	≈65.4%

Table 19.1 Comparison of costs of construction of the daily regulation reservoir (DRR) in Agarakadzor (ATDF) and construction of DRR in Sarnaghbyur (Governor's office of Shirak)

Agarakadzor water supply system/DRR (ATDF)		Sarnaghbyur water supply system/DRR (Shirak Governor's office)	
Item	Sum	Item	Sum
Estimated direct costs	15828.052	Construction works including overhead and profit`	12595.88
Overhead 8%	1266.244	Temporary buildings 1.2%	151.151
Sub-total	17094.296	Sub-total	12747.031
Profit 10%	1709.429	Winter price increase 1.12%	142.767
Sub-total	18803.726	Removal of non-regular garbage 0.15%	19.121
Other costs 2%	376.075	Sub-total	12908.918
Sub-total	19179.800	Unforeseen costs 3%	387.268
VAT 20%	3835.960	Sub-total	13296.185
Sub-total		VAT 20%	2659.237
TOTAL	23015.760	TOTAL	15955.422

Table 19.2 Comparison of costs for 1 m³ and the percentage of indirect costs of construction of Agarakadzor DRR and DRR of Sarnaghbyur of Shirak region

Project	Construction volume	Cost of 1m ³	Indirect costs (%)
Construction of DRR in Agarakadzor	300i ³	23015.760/300=76.719 thousand drams	45.4%
Construction of DRR in Sarnaghbyur of Shirak region	150i ³	15955.422/150=106.37 thousand drams	59.3%

While comparing, estimations have been accommodated so that to make similar elements comparable: in case of buildings, external communication and landscaping works are not regarded leaving only works related to construction for comparison. In case of pipelines, similar diameters are considered.

1. In comparison of Krasar school (ATDF) and Gyumri 'Varduhi' Art school (Oyunjian Fund) the following items are not considered:

- Landscaping
- External water supply
- External water removal system
- External part of the gas pipeline

2. In comparison of Gulagarak kindergarten (ATDF) and Stepanakert kindergarten (NK Urban Development committee) the following items are not considered:

- Landscaping
- Fencing
- Outer water removal system
- External part of the gas pipeline

3. In comparison of the roof of Gulagarak kindergarten (ATDF) and the roof of residential building in Martuni (Gegharkunik Governor's office –marzpetaran) no correction has been applied.

4. In comparison of the cost of 1meter of pipeline and indirect cost percentage for drinking water supply system (ATDF) and irrigation system of new orchards in Gavar (Gegharkunik Governor's office –marzpetaran), the pipelines are brought to the comparable diameters, and similar lines in cost estimations are compared.

5. In comparison of Agarakadzor drinking water pipeline and DRR (ATDF) and Sarnakhbyur water pipeline and DRR (Shirak Governor's office –marzpetaran) the pipelines are brought to comparable diameters, and similar lines in cost estimation are compared.

The analysis of unit cost of the above mentioned five pairs of projects show that in case of Krasar school and 'Varduhi' art school, the costs for 1m² are rather close. In the other cases, unit costs commissioned by ATDF are lower than the unit costs of similar construction works financed by other organizations. The comparison of construction costs of Gulagarak kindergarten and Stepanakert kindergarten show that in case of Gulagarak, the cost for 1m² is higher for 6.8 %. However, it should be mentioned that Gulagarak kindergarten has been rated as 'excellent' both for quality of construction and for its preservation.

Comparison of the roof of Gulagarak kindergarten (ATDF) and the roof of residential building in Martuni on Yerevanyan 10 (Gegharkunik Governor's office –marzpetaran), indicate that the cost of the latter is higher for 9.35%.

The comparison of the cost of 1meter of pipeline in Akhlatyan and the irrigation system of new orchards in Gavar show that the latter is higher for 12.86%.

1m³ of the DRR built in Sarnakhbyur is higher than that constructed in Agarakadzor for 38.6% .

Regarding indirect costs, in all compared projects, indirect costs commissioned by ATDF are lower and standardized compared with similar lines in budget estimates of other organizations.

4.3. The impact of reduction of cost estimates on the quality of construction works. Cost estimations in all assessed projects have been reduced by this or that amount. The reductions are grouped in the following way:

- Up to 10%
- 10% - 20%
- More than 20%

In Table 20, the level of cost reduction and rating of the quality of construction works are compared.

Table 20. Relation of cost reduction to the quality of works

	Project/ code	Cost estimation of the project in AMD (ATDF)	Actual cost of the project in AMD	Percentage of reduction	Rating of the quality of works
1.	Reconstruction of Parpi kindergarten TAN-04	186,286,898	180,436,910	3.1	3
2.	Reconstruction of Ohanavan kindergarten TAN-03	177,118,560	175,897,780	0.7	2
3.	Reconstruction of Norashen ambulatory TAT-01	37,403,508	37,301,745	0.3	2
4.	Reconstruction of Chambarak kindergarten TGQ-06	174,042,932	161,123,892	7.4	2
5.	Reconstruction of kindergarten in Argavand TAR-04	83,088,841	81,577,758	1.8	2
6.	Renovation of Spitak community center, construction of heating system TLR-11	76,430,405	75,163,300	1.7	3
7.	Construction of Pempzashen art school TSH-18	33,437,921	32,668,607	2.3	4
8.	Construction of Krasar school TSH-02	226,995,896	224,996,302	0.9	3
9.	Reconstruction of S. Khanzadyan museum TSQ-01	69,836,686	69,033,494	1.2	3
10.	Construction of water supply system in Akhlatyan TSQ-04	47,644,655	46,152,814	3.1	4
11.	Construction of water supply system in Khndzoresk TSQ-08	54,142,948	53,169,847	1.8	4
12.	Reconstruction of Noyemberyan Bridge of Hope center TTV-13	74,765,226	72,016,362	3.7	3
13.	Construction of water supply system in Agarakadzor TVZ-05	50,887,736	49,526,702	2.7	4
14.	Construction of water supply system in Jrvezh TKQ-09	29,647,931	29,443,819	0.7	4
15.	Reconstruction of kindergarten in Ararat TAT-06	142,175,596	115,297,991	18.9	3
16.	Construction of the kindergarten in Gulagarak TLR-03	201,644,027	168,980,686	16.2	4
17.	Reconstruction of Sports school in Alaverdi TLR-01	95,980,938	79,558,043	17.1	3
18.	Reconstruction of Arevik kindergarten in Gyumri TSH-12	156,506,738	137,957,415	11.9	3

19.	Reconstruction of the school in Ptghavan TTV-09	185,347,204	156,822,650	15.4	2
20.	Construction of water supply system in Artsvanist TGQ-11	129,563,751	95,892,239	26.0	4

In majority of projects (70%), the initial cost estimations were reduced for 10%. Four projects under this category have rated 'excellent' for quality of construction works, six projects have rated 'good', and four as 'fair'.

In only one project, the initial estimation is reduced for more than 20% - in case of construction of Artsvanist water supply system which has been rated as 'excellent' which means that the reduction of cost estimate has not impacted the quality of construction works.

Cost estimations have reduced from 10% - 20% in the following projects: Ararat kindergarten -18,9%, Gulagarak kindergarten-16,2%, Alaverdy sports school -17,1%, Ptghavan school-15,4% , Gyumri 'Arevik' kindergarten -11,9%. In one case out of the mentioned five, the quality of construction works is rated as 'excellent', three are rated as 'good', and one as 'fair'. This indicates that the reduction of the initial cost estimations has not had significant impact on the quality of works.

Thus, the analysis shows that the reduction of the construction costs as compared to the initial estimation, irrespective of the size of reduction, did not have any impact whatsoever on the quality of the works, therefore no correlation is identified between the reduction of the costs and the quality of the product.

II. ASSESSMENT OF EQUIPMENT PROVIDED TO THE COMMUNITIES (Component 2)

5. Assessment of the equipment

Under Component 2, equipment provided to five consolidated communities – Aparan, Akhuryan, Vardenis, Tsaghkahovit and Tashir – have been assessed. The detailed list of equipment handed over to the communities is presented in Annex 1. The aim of transferring equipment to the communities is to improve water supply and wastewater removal and other utility services, improve quality of road maintenance, upgrade existing machinery, and provide better accessibility of population to municipal services and better economic opportunities for businesses. The assessment was carried out within the framework of questions set by the client, and referred to the documents, conditions in which the equipment is kept and operated, qualification of the assigned staff, etc.

The quality of preservation of the equipment is assessed through a scale from 1 to 4, where '1' is bad, '2' is fair, '3' is good and '4' is excellent.

'1' (bad) score was given in the following cases: The equipment is out of order, is operated by unqualified staff. Necessary spare parts, materials have not been obtained, guarantee and post-guarantee maintenance is

not carried out, therefore costs for operation and maintenance are continuously growing. The equipment is kept in open space, no safety measures are undertaken.

'2' (fair) score is given in cases when the equipment is operated by qualified staff, necessary spare parts and materials are purchased for due maintenance. Guarantee and post guaranty maintenance is carried out. However the equipment is kept in random places.

'3' (good) – score is given in cases when the equipment is operated by qualified staff, necessary spare parts and materials are purchased for due maintenance. Guarantee and post guaranty maintenance is carried out, the equipment is regularly washed and kept clean, is stationed in a dedicated place, safety is ensured.

'4' (very good) - score is given in cases when the equipment is operated by qualified staff, necessary spare parts and materials are purchased for due maintenance. Guarantee and post guaranty maintenance is carried out, the equipment is regularly washed and disinfected. It is stationed in a covered place where security is ensured.

5.1 **Preservation and conditions in which equipemnt is kept** . In all communities, the equipment is well preserved and is kept in proper condition. However only in one community, Tashir, closed stationing space is available. In Akhuryan and Tsakhkahovit, closed parking spaces are planned to build. In Vardenis and Aparan, equipment is kept in different sites belonging to the community. Although all five communities undertake all measures to ensure safety and security of the equipment, absence of closed parking spaces (except Tashir) make it difficult to start the engines in cold winter months which result in overspending of fuel and increased emissions into the atmosphere.

In all communities the security of equipment is well organized, cameras and night lighting is in place. Thus, the preservation of the equipment provided to the selected communities can be assessed in the following way:

Table 21 Evaluation of preservation of the equipment

Tashir	Aparan	Tsakhkahovit	Akhuryan	Vardenis
4	3	3	3	3

5.2 **Operation of the equipment according to technical specification.** In all assessed commnities the equipment is being used for the purposes that were stated in the project proposals:

Vardenis – Because of scarecity of equipment (in often cases their total lack) roads inside the community, sometimes also roads between communities became impassable during long winter months, and were hard and bumpy for driving during summer times. The community uses the obtained equipmnt for flattening the roads, removal of soil, cleaning from snow, etc. Thanks to the new equipment, waste management and sanitary cleaning services have been improved and made accessible to more people.

Tsakhkahovit – Thanks to the new equipment the community is able to efficiently and timely get rid of heaps of garbage that appeared here and there from time to time, improve waste management and sanitary cleaning. Now the residents are willing to pay for the service as they see the change. The repair works on the drinking water pipelines are carried out on time and with due quality. The condition of roads between settlements inside the community has also improved. It is possible to keep the roads open during winter months. Various functions of the utility services are made effective and efficient.

Akhuryan - The community has considerably improved waste management and sanitary cleaning service, the number of population receiving service has grown because of extending the geography of services to new

communities. The condition of roads and quality of utilities are also improved. The upgraded equipment let to farmers, entrepreneurs and SMEs increase efficiency of their work and meantime increase the local budget.

Tashir - The obtained equipment have created preconditions for economic growth in the community, has fostered for development of tourism as environment has become clean. New employments have been created for providing improved services in waste management, sanitary cleaning, road maintenance, etc.

Aparan – The new equipment is used for waste management, cleaning roads between settlements from snow, as well as making the community attractive for business investments. Thanks to the new machinery it is possible to repair damage caused by natural disasters (hailstorms, snowstorms, flood, etc.) and accidents on the water supply system.

5.3. Operation of the equipment according to the technical specifications. In all assessed projects, the equipment is being operated strictly according to their technical specifications and documents.

5.4. Guarantee and post-guarantee service. According to the requirements of guarantee service documents, in all projects the equipment has passed technical examinations (TE1 and TE2). Besides, on an as needed basis current non-guarantee service have also been organized which are duly documented. Particularly, Akhuryan community purchased wheels, primary and secondary air filters, fuel filter, lubricating oils, regulation of wheel camber and balancing, spark plug change, examination of the steering wheel, system diagnostics. Also, sets of gaskets, sealants, break discs / pads, engine mounts were purchased. Tsakhkahovit purchased windshield, dynamo bearings, thermostat.

5.5. Registration of the equipment. In all communities, the provided equipment has been registered in the community inventory list as community property.

5.6. Qualification of the service personnel. Vardenis, Tashir, Akhuryan communities are staffed with qualified and experienced workers to service. Aparan managed to hire only one driver instead of two needed. In Tsakhkahovit, the driver was not acquainted with the new generation equipment, therefore a training was organized for him at Yerevan municipality utility department.

5.7. Correspondence of the equipment to the requested specifications

The provided equipments mostly correspond to what was specified in the requests of the communities with only slight deviations.

Table 22. Correspondence to the requested specifications

Item	Requested	Provided
<i>Akhuryan</i>		
Dump truck	Engine 260 hp	Engine 245 hp
<i>Aparan</i>		
Multi-functional equipment	Engine 55,4 kW ; Lifting capacity 1220 kg	Engine 37,3 kW, Lifting capacity 750 kg
Garbage truck	Engine 204 hp	Engine 152 hp
<i>Tsakhkahovit</i>		
Garbage truck	Engine 240 hp	Engine 225 hp

All-terrain semi-truck	Number of seats: 5	Number of seats 4
<i>Vardenis</i>		
All-terrain semi-truck	Number of seats: 5	Number of seats: 4

5.8. Conditions of renting out the equipment. In order to make the obtained equipment accessible for private sector and individual farmers, Akhuryan, Tsakhkahovit, Vardenis and Tashir communities sign agreements with possible clients in which the type of work, timefram and the cost for rent are stated. The equipment is operated only by the responsible employee. This practice allows the community to get additional income in the local budget. Community councils of Akhuryan, Vardenis and Tashir have set tariffs for rentals. Tsakhkahovits does not set such tariffs and the cost for rent is decided case by case. Minibuses obtained by Tshahkahovit have not been operated at the time of assessment because of travel restrictions due to pandemic. Aparan community has decided not to rent out the obtained equipment to third parties to avoid possible damages.

5.9. Actual costs for operation and maintenance. Table 23 presented below shows that there is considerable deviation between planned and actual costs made for operation and maintenance of provided equipment. The difference is especially big in case of salaries and costs of fuel.

In three of the projects out of five studied (Akhuryan, Tsakhkahovit, Aparan), the estimated budget lines for salaries are underspent. Additional analysis showed that the reason is that lower salaries had been assigned than it was planned primarily (Akhuryan), and fewer persons were employed (Aparan, Tsakhkahovit): On the contrary, in Vardenis the costs for salaries were exceeded twice. According to the Initiative Group representative, incorrect estimation had been made by the former community management. In case of Tashir community, estimated and actual costs for operation and maintenance almost coincide.

The next budget line where big discrepancies are found between planned and actual costs refers to fuel. In Akhuryan community, as stated by the community head, an arithmetical error has occurred. In Aparan, the reason for big difference between planned and real expenditures for fuel (19,452,850 dram) could not be explained by the local authorities. Likewise, the community could not hire required number of employees. In case of Tsakhkahovit, the money spent for fuel is ten times less than was earmarked. The reason is limited operation of commuting inter-community buses because of quarantine restrictions in 2020. In Vardenis, the difference between planned and actual costs for fuel is explained by inaccurate calculations by the former community leadership. In case of Tashir, the costs for fuel included also lubricants. Besides, the equipment was lent out t individuals who took care of the fuel themselves.

Table 23. Actual costs for maintenance and operation in 2020
Akhuryan

Description of costs	Planned	Actual
Salary	16,560,000	9,918,000
Utilities	240,000	240,000
Materials, tools, equipment	250,000	530,000
Fuel	43,953,600	4,252,795
Current repair	1,000,000	1,020,000
Other costs including maintenance, security, parking.	300,000	300,000

Total	62,303,600	16,260,870
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Aparan

Description of costs	Planned	Actual
Salary	11,760,000	9,600,000
Utilities	-	-
Materials, tools, equipment	1,200,000	1,208,000
Fuel	25,918,400	6,465,550
Current repair	360,000	360,000
Other costs including maintenance, security, parking.	1,278,000	279,900
Total	40,516,400	17,913,450

Tsakhkahovit

Description of costs	Planned	Actual
Salary	32,400,000	25,700,000
Utilities	-	-
Materials, tools, equipment	1,300,000	1,772,000
Fuel	51,134,400	5,300,000
Current repair	1,040,000	1,050,000
Other costs including maintenance, security, parking.	790,000	800,000
Total	86,664,400	34,622,000

Vardenis

Description of costs	Planned	Actual
Salary	4,800,000	9,360,000
Utilities	145,000	145,000
Materials, tools, equipment	1,340,000	4,900,000
Fuel	56,686,660	12,256,500
Current repair	1,145,000	1,145,000
Other costs including maintenance, security, parking.	344,000	5,500,000
Total	64,460,660	33,306,000

Tashir

Description of costs	Planned	Actual
Salary	9,714,000	9,962,500
Utilities	310,000	310,000

Materials, tools, equipment	1,650,000	2,000,000
Fuel	15,000,000	7,200,000
Current repair	450,000	590,000
Other costs including maintenance, security, parking.	330,000	410,000
Total	26,454,000	20,472,500

III. FINDINGS AND RECOMMENDATIONS

Findings

- All projects assessed under SILD Component 1, referring reconstruction and renovations of infrastructures are appraised by beneficiary communities as enormously important, of utmost priority and having had considerable positive social effect on communities' life. All projects correspond to what was proposed by the communities, and almost all of them serve their purposes in their best way.
- The quality of construction of the infrastructures in general is good. The observed drawbacks, in many cases are connected with the quality of materials used and partially, with the quality of works that can be attributed also to the insufficient technical supervision.
- In a number of projects, completion deadlines have been extended mostly connected with climatic conditions, changes in the designs, unforeseen additional works as well as because of failures of the contractors.
- Communities in general have demonstrated utmost responsibility and care in properly maintaining and operating the improved infrastructures. In 45% of observed projects, the preservation of the infrastructures is rated as 'excellent'.
- The equipment and machinery provided to the communities under Component 2, have critical importance for improving quality of municipal services and making them accessible to all settlements of the consolidated communities. Thanks to the new equipment, new employments have been created; preconditions are created for fostering economic activity. However, costs for operation and maintenance of equipment, especially those for fuel and wages are calculated inaccurately in several leaving space for corruption risks.

Recommendations

For continuous improvement of quality of works and making further maintenance and operation more efficient, the consultants recommend the following:

Recommendations for improvement of designs and timely completion of tasks

- Elaborate mechanisms for fining those design companies that fail to fulfill work in due quality and time. In recurring performance failures, temporarily debar such companies from participating in tenders announced by ATDF, after duly notifying them beforehand.

- Include in the design package technical specifications and quality requirements for produces and equipment such as MDF doors, handles, windows, water taps, paints, valves, flexible pipes, etc., and reflect those requirements in the design assignment. Along with technical requirements for doors and windows, include requirement for 1.2mm metal profile for the window frames and reflect it in the budget estimation.
- Require improved accurate calculations of work volumes and measurements.
- Be more consistent in documenting the time of provision of technical conditions, elaboration of designs, and possible changes of the design.
- Allocate more time for carrying out expert assessment of the designs to allow more detailed estimation of work volumes.

Recommendations for improving technical supervision

- Elaborate mechanisms for fining those organizations carrying out technical supervision who fail to fulfill their tasks in due quality and time. In case of recurring performance failures, temporarily debar such companies from participating in tenders announced by ATDF, after duly notifying them beforehand.
- Propose companies providing technical supervision services limit the number of tasks assigned to a technical supervisor during the same period of time dependent on the volume of work and their geographical location.
- Establish effective collaboration between engineers of ATDF and technical supervisors.

Recommendations for improving quality of construction works and meeting planned dates

- Construction companies that demonstrate negative performance indicators recurrently shall be temporarily debarred from participating in tenders announced by ATDF, after being notifying about such decision beforehand.
- Establish a procedure for contractor construction companies on having had the list of materials approved beforehand by the ATDF in a written form.
- Extend the guarantee period from one to two years.
- For making the timeframe of construction works more realistic, except the work schedule, it is advised to elaborate a plan for implementation of works (especially for complex and new constructions) in which winter season schedule is detailed.
- In projects on drinking and irrigation water supply systems, consider requirement for installing water meters.
- Limit the number of projects to 6-7 for ATDF's engineers carrying out oversight of construction works depending on their complexity and geographical location.

Recommendations for improvement of preservation of infrastructures

- After completion of the guarantee period, make the final payment to the contractor after approval by the ATDF engineers carrying out oversight.
- Consider using high quality washable paints for interior finishing in school buildings.
- Recommend larger communities to create a caretaker's position in reconstructed kindergartens to attend to current minor issues in avoidance of their accumulation.

Recommendations about cost estimations and the basis for unit costs

- Include new lines in the cost estimation base that are not foreseen so far according to the existing norms, as well as make relevant amendments in the existing lines if they do not correspond to the ATDF's requirements.
- Apply the same percentages and indicators for materials and equipment in ATDF's bas and in the order of elaborating cost estimates. Currently, according to the effective order, some percentages (such as indirect costs, profit, etc.) are not applied for equipments.
- It is desirable to update data in the base more frequently, and review costs of materials, labor and equipment which are apparently not correct/obsolete.
- Make the sequence of chapters in the cost estimates compatible with the accepted form: interior works – construction, plumbing, electrical works, afterwards external networks and landscaping.

Recommendations for preservation of the provided equipment

- Consider existence of closed parking places in the community as a condition for providing equipment.
- Organize a mandatory training for the staff involved in operation of new equipment.