Paper 02(11), May 2011, Armenia, Yerevan
Economic Development and Research Center (EDRC)

Assessment of Heat Supply and Heating Options in Multi-Apartment Blocks in Armenia

Report on Statistical Household Survey Urban Heating Project Beneficiary Households

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Armenia Renewable Resource and Energy Efficiency Fund

Assessment of Heat Supply and Heating Options in Multi-Apartment Blocks in Armenia

(2010-2011 Heating Season)

Report on Statistical Household Survey Urban Heating Project Beneficiary Households

Yerevan 2011

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The Survey was conducted in the framework of the World Bank Urban Heating Project.

Assessment of Heat Supply and Heating Options in Multi-Apartment Blocks in Armenia

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List of Acronyms

AHS (2005)	**Assessment of the Heating Situation (Survey), 2005**
AHS (2007)	**Assessment of the Heating Situation (Survey), 2007**
AHS (2009)	**Assessment of the Heating Situation (Survey), 2009**
AHS (2010)	**Assessment of the Heating Situation (Survey), 2010**
AHS (2011)	**Assessment of the Heating Situation (Survey), 2011**
EDRC	**Economic Development and Research Center**
HH	**A Household living in a multi-apartment block in urban areas of Armenia**
ISLS	**Integrated (HH) Survey on Living Standards**
MAB	**Multi-Apartment Blocks**
NSS	**National Statistical Service of the Republic of Armenia**
PSU	**Primary Sample Unit**
R2E2	**Renewable Resource and Energy Efficiency**

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Introduction

Armenia Renewable Resources and Energy Efficiency Fund, with the funding received from the World Bank, Government of Armenia and Global Partnership for Result-Based Assistance, is implementing a project aimed at supporting the poor households included in the Family Benefit program in connecting to the gas supply system and/or installing a heater.

The beneficiaries of the project are those households living in their owned apartments in multi-apartment blocks that are included in the Family Benefit Program and as of January 1, 2010 have a score of 36.01 and above; furthermore, the MAB is connected to the gas system.

As of May 1, 2011 10 851 poor families from cities and towns of Armenia applied to R2E2 Fund: support was provided to households in 38 towns and cities (heaters were installed in 4 754 apartments, while 2 938 apartments were connected to the gas system).

In order to collect quantitative and qualitative data on the improvement in heating conditions of beneficiary HHs, as well as assess both positive and negative changes in beneficiary HHs due to improvement in heating conditions, assess the level of satisfaction from installed heaters, design works for connection and installation, changes in expenditures for heating due to improved heating option a Survey of beneficiary families was carried out with the emphasis to compare the heating conditions before and after support provided.

The present Report contains quantitative and qualitative data on the change in the heating conditions of beneficiary HHs. Respective sections of the report discuss the activities and works performed under the Project and level of beneficiary satisfaction, heating options used, preferences for various options, heating expenses, etc.

Annexes attached to the Report contain the brief description of the Survey methodology, as well as analytical tables related to each of the Report chapters.

Summary of main findings

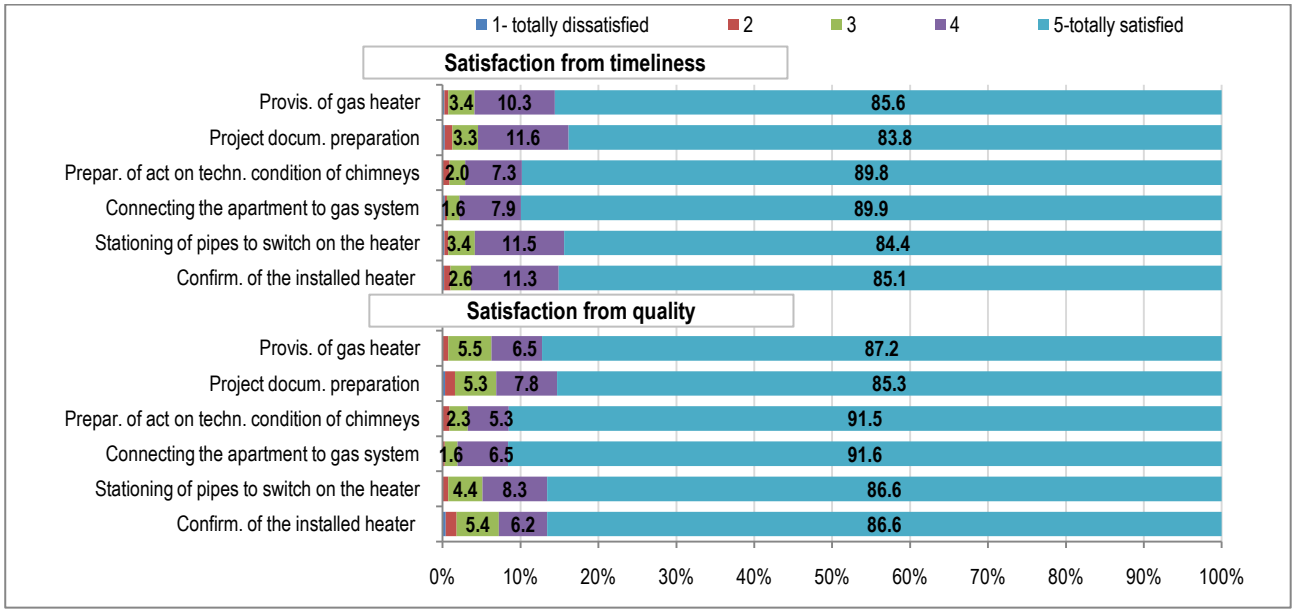
- Changes in heating conditions as a result of the project implementation overall were estimated as positive by the beneficiary households. In particular, installed heaters were considered as clean and safe heating equipment that provide for sufficient heat in the apartment and purchase of which would not be a feasible option without the assistance provided (due to financial constraints). Unequal distribution of heat in the apartment, inconvenient location of the heater in the apartment, as well as price for gas was mentioned as a shortcoming.
- 79% of beneficiaries considered changes were positive, 24.4% did not see any change and only 5.4% believed changes were negative.
- Satisfaction of HHs from the quality and timeliness of works increased as compared to previous years. Almost no HH was dissatisfied from works.
- Prior to the provision of the assistance under the project, 4.3% of HHs did not heat apartments at all, while only 0.6% of total HHs did not heat apartment in 2010-2011 season. The share of HHs that heated the entire apartment almost doubled reaching 32.3% (14% - before assistance). In parallel, the share of HHs that heated only the most important rooms of the apartments decreased from 50.5% before assistance to 20.4% afterwards.
- 93.5% of HHs used natural gas as the main source of heating; with 90.5% of HHs using manufactures gas-heaters as the main equipment. The latter has decreased from the previous year by 3.1 percentage points. 26.7% of HHs also used a secondary heat option.
- In 2010-2011 heating season, satisfaction from heating increased significantly as compared to the seasons before assistance. 40.3% of all HHs was fully satisfied with heating option, while only 1.8% of HHs were fully satisfied before assistance. Notable, satisfaction is higher in Yerevan than in Marzes.
- Average temperatures in apartments of beneficiary HHs in 2010-2011 increased to 16.9° as compared to the average temperature before assistance (13.8°). In 7.9% of HHs, average temperature exceeded 20 degrees, while in 22.9% of HHs – below 15 degrees.
- Level of illness cases due to insufficient heating this year totaled to 37.8%, while those due to dirtiness of the heating options - 5.4%.
- 75.6% of beneficiary HHs believe the heating equipment they use is adequate and did not express any preference, while 17% would prefer individual heat boilers, 4.8% - local-collective heat boilers or centralized heating. 59.3% of HHs that prefer individual heat boilers mentioned the safety as the main reason for preference, 69.1% of HHs – generation of sufficient heat. The same factors were mentioned also for centralized heating.
- Expenditures for heating in 2010-2011 heating season totaled to on average AMD 11 274 thus increasing from their level before assistance by 34%. Nevertheless, this average is considerably lower than the country average of AMD 27 600.
- Overall, similar to the previous year, the main issue with improving Project efficiency is connected to the selecting a better location for the heater and ensuring the proper operation of the heater.

Chapter 1. Works Performed under the Project and Beneficiary Satisfaction

Survey findings revealed that the satisfaction among beneficiaries from the quality and timeliness of assistance works under the Project is quite high. It is worth noting that the satisfaction level of HHs increased through years. In particular, the share of fully satisfied HHs increased continuously during the past two years, while there were no very unsatisfied HHs this year. Satisfaction grew both from the timeliness and quality of works1.

Figure 1 shows that connections to the gas supply system were performed properly: as a result, overwhelming majority of HHs , 92% an 90%, were satisfied with the timeliness and quality of performed works respectively.

Figure 1. Level of satisfaction from timeliness and quality of works, %



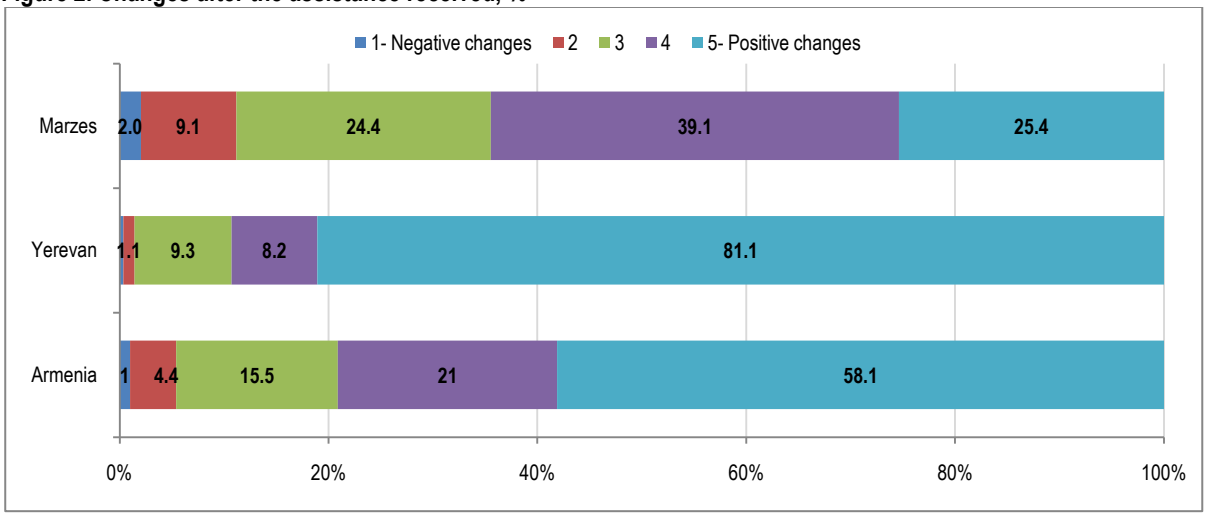
Source: AHS (2011)

Satisfaction from design and estimate works was relatively low (not significantly, though): 0.3% of HHs were very dissatisfied and about 1% were dissatisfied from quality and timeliness of these works.

79% of beneficiary HHs believed the changes were positive, 24.4% did not see any change and only 5.4% mentioned changes were negative.

In particular, 89.3% of HHs in Yerevan evaluated the changes after the received assistance as positive, and only 1.5% mentioned those were negative.

Figure 2. Changes after the assistance received, %



Source: AHS (2011)

[1] Source: AHS (2010) and AHS (2009)

Overall, one could state with confidence that, like in previous years, mostly positive changes were recorded due to the provision of assistance to the beneficiary HHs to improve heating. In particular, they noted:

- It is much cleaner in the apartment due to new heater, it is not humid and no ash,
- Sufficient heat is provided in the apartment, the equipment is clean, thus HH members get unwell less,
- They had received an efficient equipment under the project which they could not afford otherwise,
- They are satisfied with the quality and timelines of performed works.

Many HHs simply thanked for the assistance provided without spelling out the details of positive changes.

Main complaints expressed by beneficiaries were explained by:

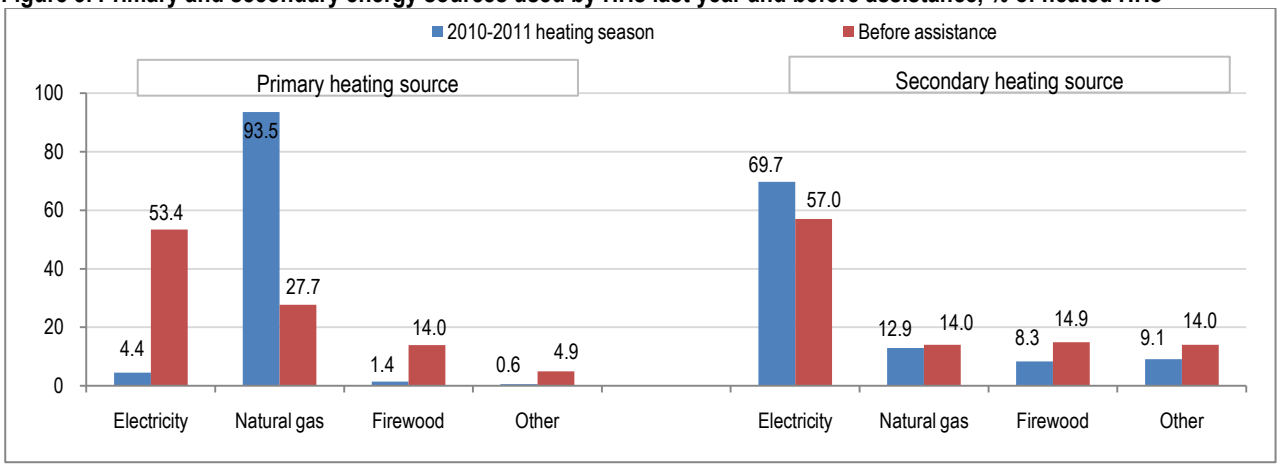
- High gas tariffs,
- The heater does not work partially or completely or is inconveniently stationed,
- Insufficient heat and unequal distribution of heat.

It is worth noting that the prevailing reason for complaint , high price for natural gas, is not related to the project and does not speak about any deficiency of the project.

Chapter 2. Options Used for Heating and Hot Water Supply, Use of Provided Heaters

In 2010-2011 heating season, natural gas was used as a primary source of energy for 93.5% of HHs, while only 27.7% of HHs did so before assistance.

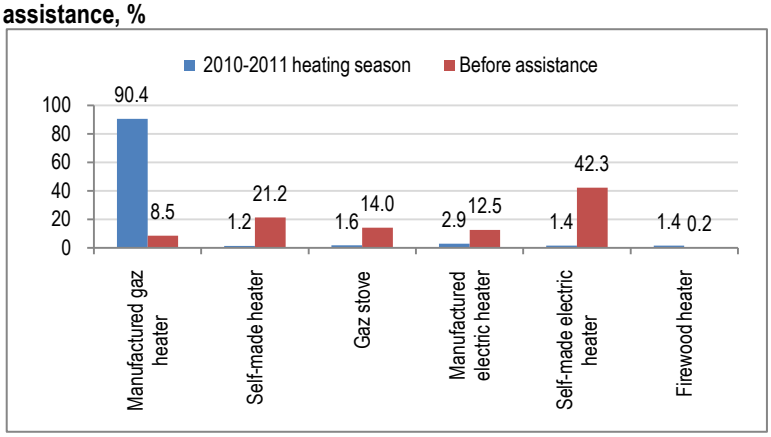
Figure 3. Primary and secondary energy sources used by HHs last year and before assistance, % of heated HHs



Source: AHS (2011)

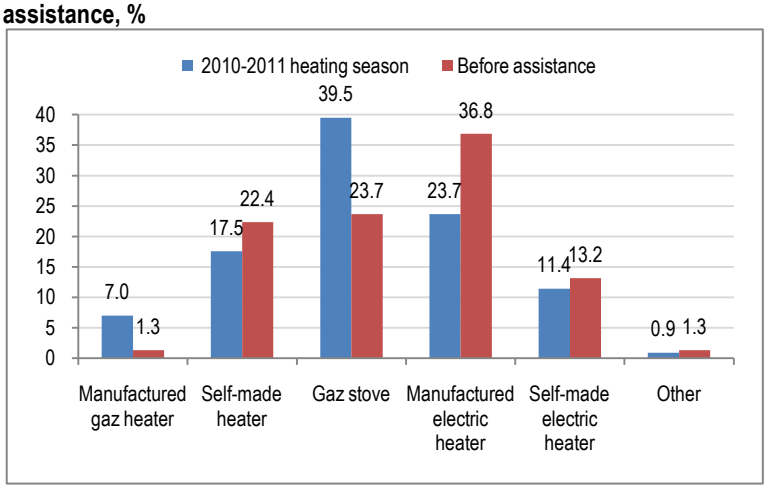
As compared to the previous year, use of natural gas as primary source of energy slightly decreased last year (94.6% in 2009-2010 heating season), while the share of those who used electricity increased to 4.4% of HHs as compared to 3.2% in the previous year.

Figure 4. Primary heating equipment used by HHs last winter and before assistance, %



Source: AHS (2011)

Figure 5. Use of secondary heating equipment by HHs this winter and prior assistance, %



26.7% of heated HHs used a secondary source of energy apart from the main source. About 70% among those 26.7% used electricity as a secondary source, 13% - natural gas and 8.3% - woods.

Overwhelming majority of HHs, 90.4%, used manufactured gas heaters in 2010-2011 heating season, about 3% used manufactured electric heaters. All beneficiary HHs had manufactured gas heaters, however not all of them used those as primary heating equipment. The main reasons for that were mentioned: the heater does not work at all or does not work properly, is not located in a convenient place, does not heat sufficiently or does not provide equal distribution of heat.

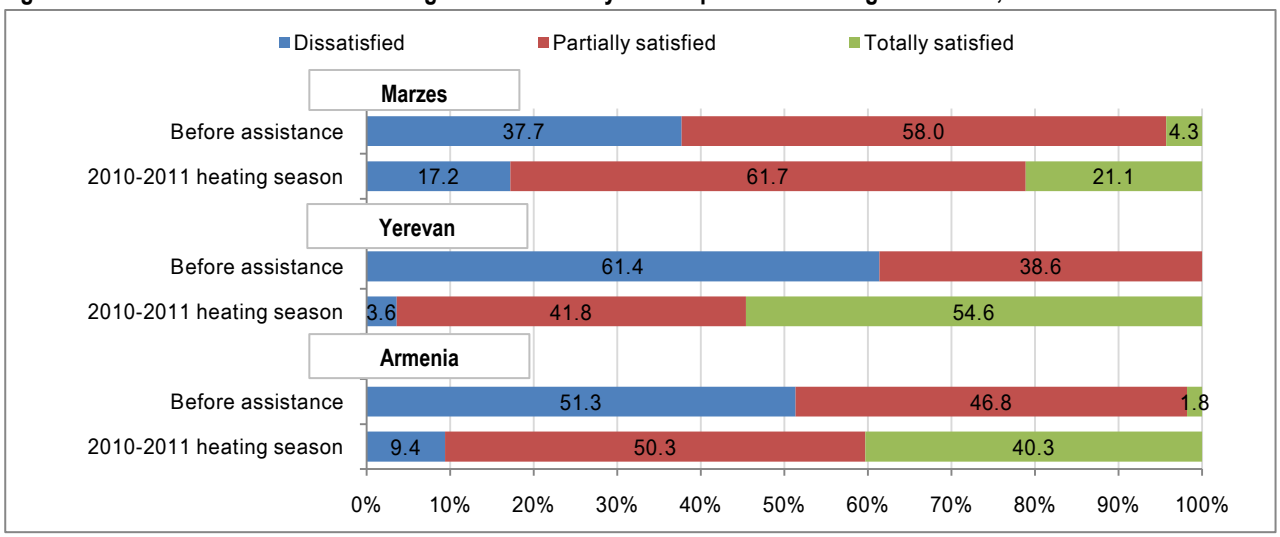
Despite the fact that use of self-made gas heaters decreased after provision of assistance in 2010-2011 heating season (from 21.2% to 1.2%), use of such heaters increased from the previous year (0.2% in 2009-2010 heating season). This can be regarded as a regress taking into account that a self-made heater is not safe heat equipment.

Since the use of manufactured gas heaters as main equipment has increased after provision of assistance, use of other equipment has decreased. In particular, about half of HHs, 42.3%, heated apartments with self-made electric heaters and 12.5% used manufactured electric heaters before assistance. Meanwhile, these rates drastically decreased to 1.4% and 2.9% respectively in 2010-2011 heating season.

Gas oven prevailed as a secondary heating equipment (39.5%) followed by the manufactured electric heaters (23.7%). It is worth noting that 7% of beneficiary HHs used the manufactured gas heaters not as primary, but secondary heating equipment. The main reasons for that were that the heater did not work properly or were not located conveniently. In about 29% of cases, self-made electric and gas heaters were used as secondary equipment.

The level of satisfaction from heating conditions increased significantly after provision of assistance.

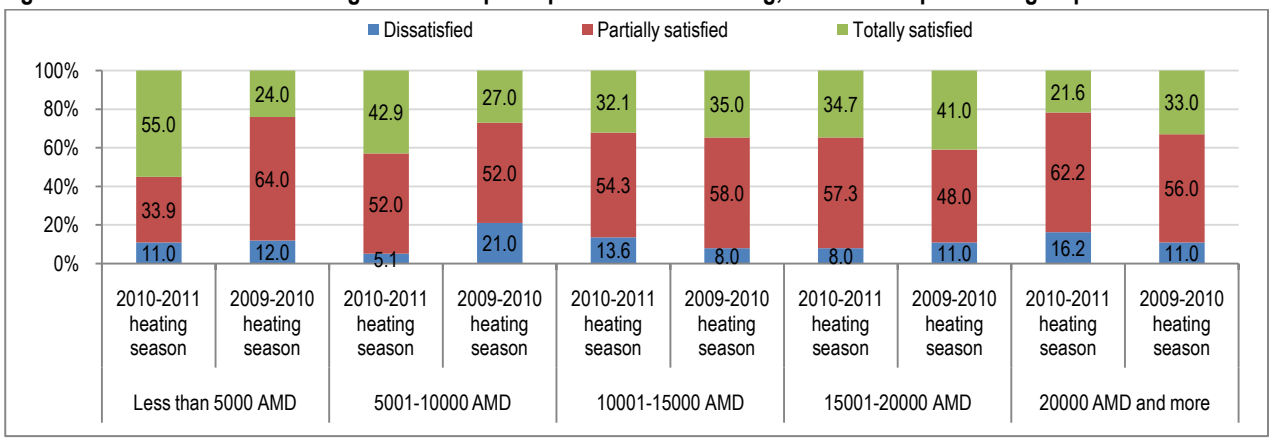
Figure 6. Satisfaction of HHs from heating conditions last year and prior to receiving assistance, %



Source: AHS (2011)

If 51.3% of HHs were dissatisfied with heating conditions before assistance, only 9.4% expressed dissatisfaction in 2010-2011 heating season. The share of HHs partially satisfied with heating increased by 3.5%; therefore, the share of HHs fully satisfied from heating conditions increased significantly reaching 40.3% in 2010-2011 heating season (1.8% before assistance). Level of satisfaction is especially high in Yerevan, 54.6% as compared to 21.1% in Marzes. It is worth noting that assistance caused significant positive changes for beneficiary HHs in Yerevan, since there was no HH fully satisfied with heating before assistance.

Figure 7. Satisfaction from heating conditions per expenditures on heating, % in each expenditure group



Source: AHS (2011)

The level of satisfaction can be discussed also in relation to the monthly bills for heating. As it can be seen from Figure 7, more than half (55%) of HHs that paid AMD 5 000 were fully satisfied with heating of the apartment. In this and the

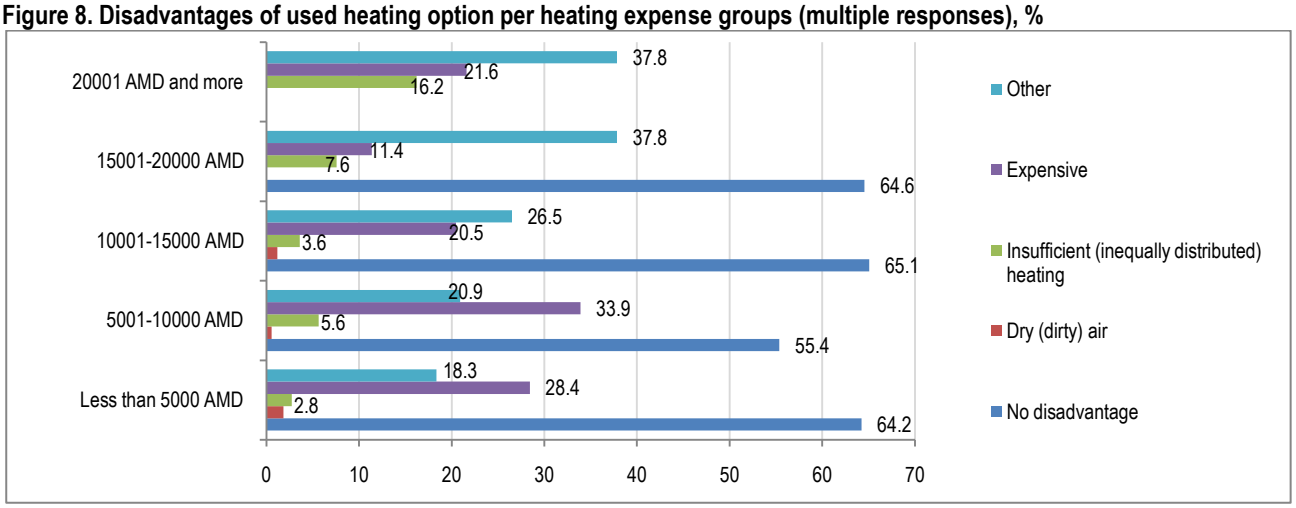
next two groups (broken down per heating expenses) satisfaction level from heating increased as compared to the previous year, along with reduction in the share of dissatisfied HHs.

Share of dissatisfied HHs is the largest among HHs that paid AMD 20 000 and above per month, 16.2%. Notably, dissatisfaction increased as compared to the previous year decreasing the share of satisfied HHs from 33% in the previous year to 21.6% in the current year.

64.2% of HHs paying less than AMD 5 000 and 64.6% of those paing AMD 15 001- 20 000 believed that the equipment they were using for heatin has no disadvantages. All HHs that paid AMD 20 000 and above mentioned at least one disadvantage. It is worth noting that high expenses on heating with a particular equipment type is a disadvantage which is, however, not related to the project activities, including the quality of provided heaters. Very often HHs cannot afford using the gas heaters due to high expenses on heating.

Another disadvantage of the heating equipment was mentioned to be the equipment is not operating properly or switches off frequently.

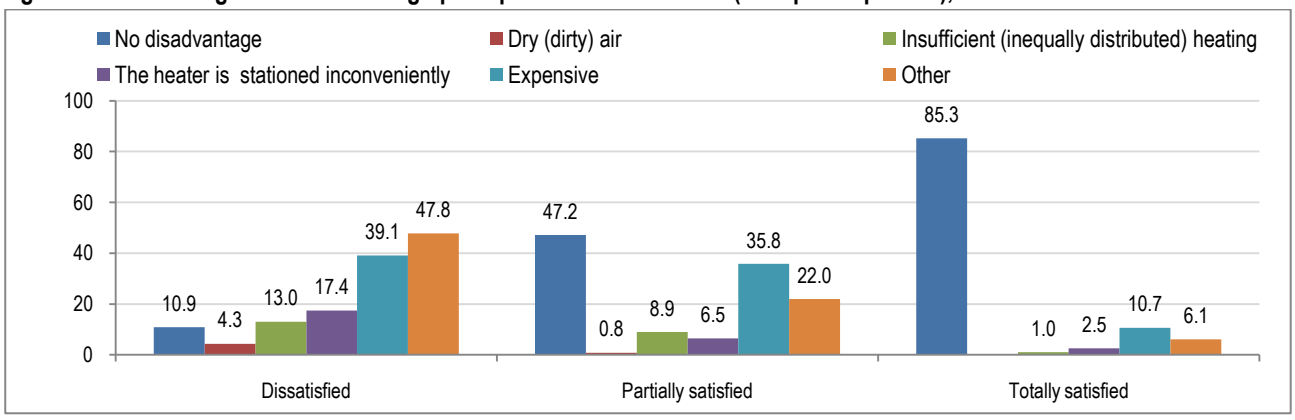
Figure 8. Disadvantages of used heating option per heating expense groups (multiple responses), %



Source: AHS (2011)

Figure 9 shows the disadvantages of heating option mentioned by HHs broken down per satisfaction level. 85.3% of HHs fully satisfied with heating conditions did not mention any disadvantage, 10.7% mentioned high expenses, and 2.5% noted the inconvenient location in the apartment.

Figure 9. Disadvantages of used heating option per satisfaction levels (multiple responses), %



Source: AHS (2011)

About half of HHs dissatisfied with heating conditions (47.8%) mentioned other disadvantages, e.g. as noted above – the heater did not work properly and heating was not sufficient. Around 40% of HHs mentioned the heating cost as a reason for dissatisfaction. There were dissatisfied HHs that did not mention any disadvantage (10.9%).

In interviewing the beneficiary HHs we asked to give their overall assessment on provided assistance and changes in heating conditions. About 60% of expressed assessments were on satisfaction and that changes were positive. Main

difficulties were explained by high cost of heating, inoperable heater or inconvenient location, insufficient heat or unequal distribution of heat.

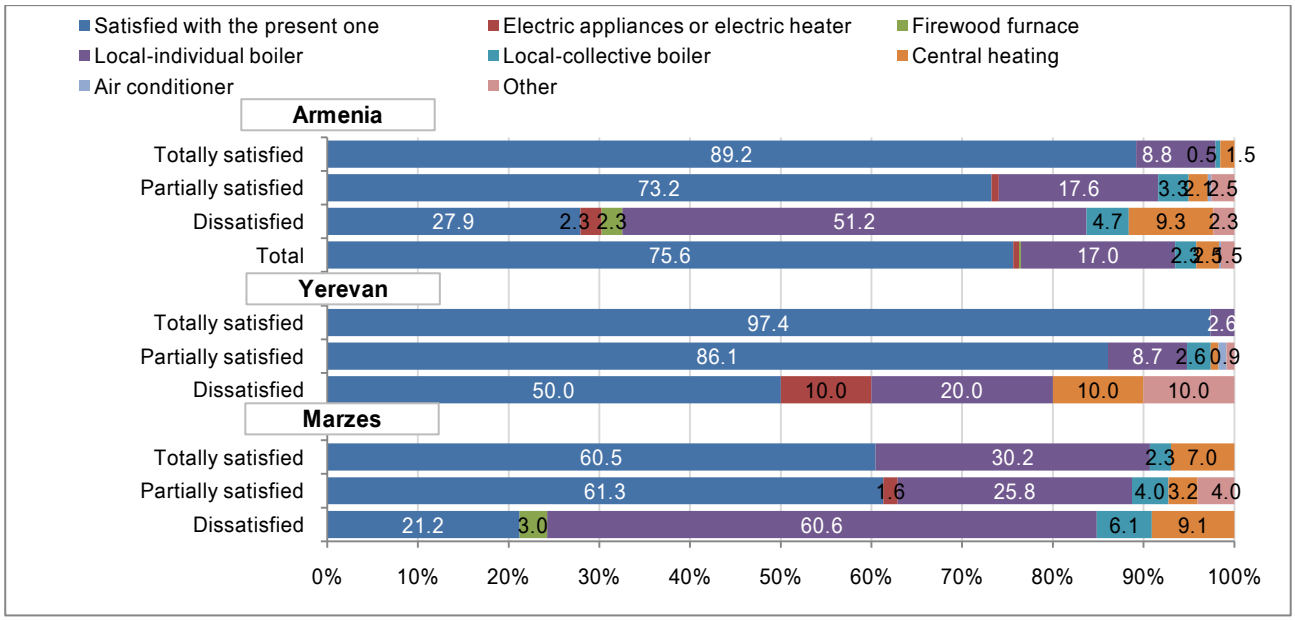
Chapter 3. Preferences for Heat Options and Reasons Thereof

Overwhelming majority of HHs totally satisfied with their heating conditions (about 90%) considered their heating equipment as appropriate and sufficient and did not mention any other preference (Figure 10). As in previous year, HHs that prefer a heat equipment different from what they use, mostly noted individual or local-collective heat boilers or centralized heating

About 9% of HHs happy with their apartment heating options would like to heat with an individual heat boiler, 0.5% would prefer local-collective heat boilers while 1.5% would prefer to have centralized heating.

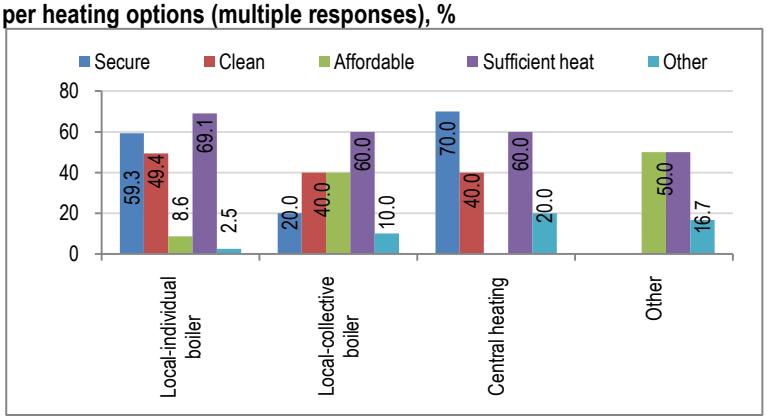
51.2% of HHs dissatisfied with their heating would prefer individual heat boilers, 4.7% - local-collective boilers and 9.3% - centralized heating. 2.3% of unsatisfied HHs mentioned they would prefer to heat with a wood oven with another 2.3% preferring electric heaters.

Figure 10. Preferred heat options depending on the level of satisfaction, %



Source: AHS (2011)

Figure 11. Factors affecting preferences of heating options broken down per heating options (multiple responses), %



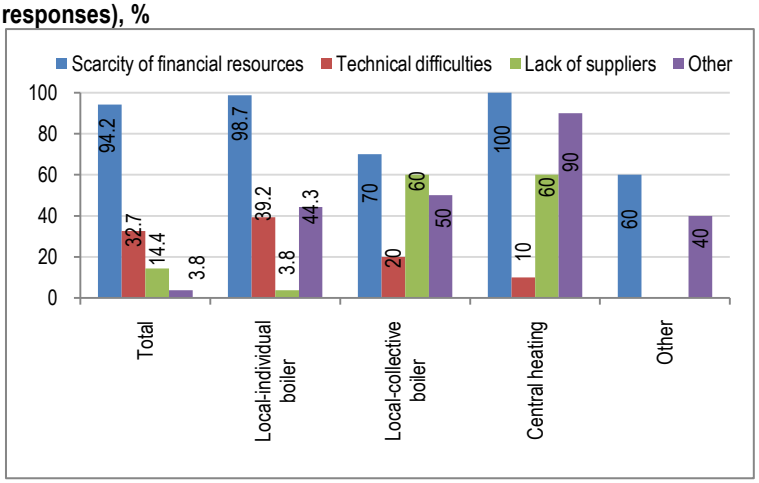
Source: AHS (2011)

Opinions and preferences of beneficiary HHs living in Yerevan and Marzes differ significantly. In particular, 97.4% of HHs that are fully satisfied with their heating option mentioned they would not like to replace the current heating equipment with any other, while only 60.5% of such HHs said the same. Moreover, 30.2% of HHs not fully satisfied with their heating option would prefer individual heat boilers while 60.6% of HHs dissatisfied with heating in Marzes mentioned the same preference.

Figure 11 below summarizes the main advantages that cause preferences among beneficiary HHs. In summary, the major factor for preference is its safety, cleanness and possibility to ensure sufficient heat.

69.1% of HHs that prefer individual heat boilers believe that heat will be sufficient under that option, while 59.3% and 49.4% believed that it is safe and clean respectively. Centralized heating was preferred especially because it was considered safe and providing sufficient heat (70% and 60% respectively).

Figure 12. Reasons for not using the preferred heating option (multiple responses), %



Source: AHS (2011)

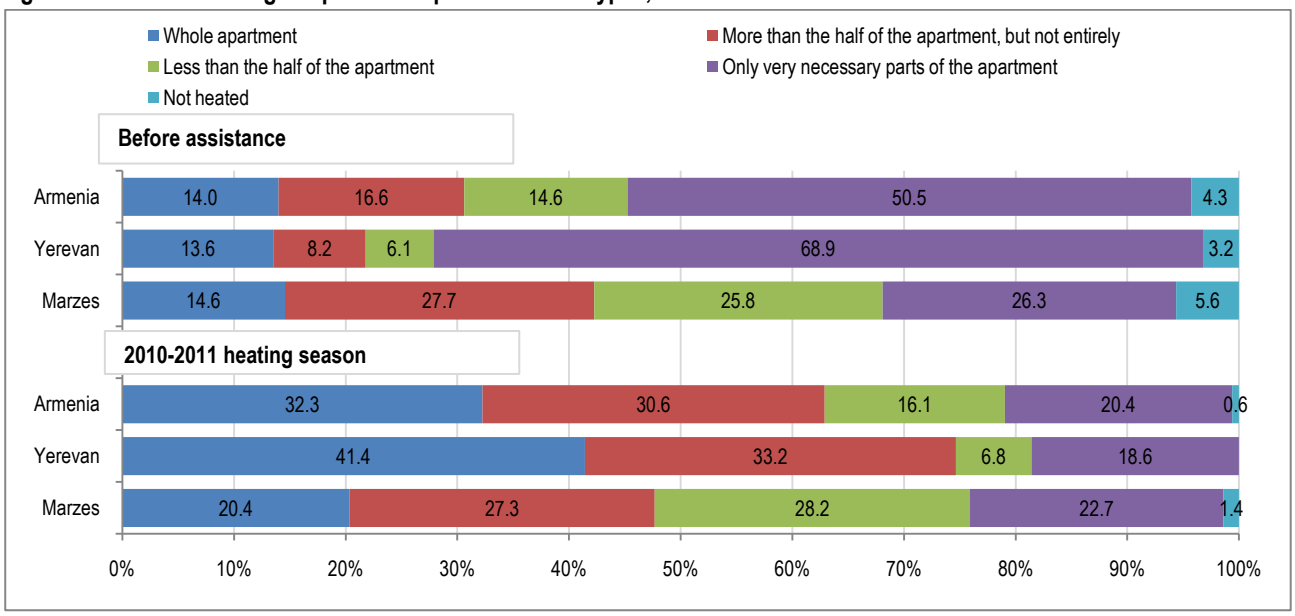
Figure 12 depicts the major problems that hinder beneficiary HHs from using the most preferred heating option. Like in previous years, the major obstacle is financial constraints (for 94.2% of HHs). In particular this was the obstacle mentioned by all HHs that preferred centralized heating.

60% among those that prefer local-collective heat boiler and 60% of those that prefer centralized heating mentioned absence of a supplier as the main obstacle unlike HHs that prefer individual heat boilers (14.4%). Difficulties in technical solutions are not seen causing serious obstacles: 32.7% of HHs that preferred other heating equipment noted these as obstacles.

Chapter 4. Heated Area and Average Temperature

Changes taken place in beneficiary HHs after the assistance can be evaluated as positive in terms of heated area. If 4.3% of all HHs did not heat the apartment at all before assistance, only 0.6% did not heat apartments in 2010-2011 heating season (Figure 13). In parallel, the share of HHs that heated the entire apartment more than doubled reaching 32.3% (14% - before assistance). The share of HHs that heated only the most important areas of the apartment reduced reaching 20.4% as compared to 50.5% before assistance.

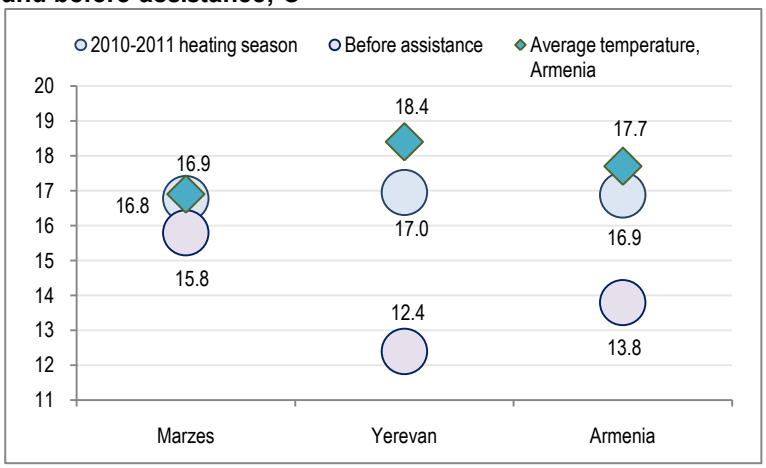
Figure 13. Level of heating of apartments per settlement types, %



Source: AHS (2011)

Here again, there is significant difference between Yerevan and Marzes. In particular, there were no HHs that did not heat apartments during heating season in Yerevan, while 1.4% of HHs in Marzes did not. 41.4% of beneficiary HHs in Yerevan heated the entire apartment against 20.4% in Marzes.

Figure 14. Average temperature in apartments in January, 2011 and before assistance, C°



Source: AHS (2011)

Average temperatures in apartments of beneficiary HHs in 2010-2011 heating season increased reaching 16.9° as compared to the previous years (13.8° before assistance). However, this is lower than the country average of 17.7° (Figure 14).

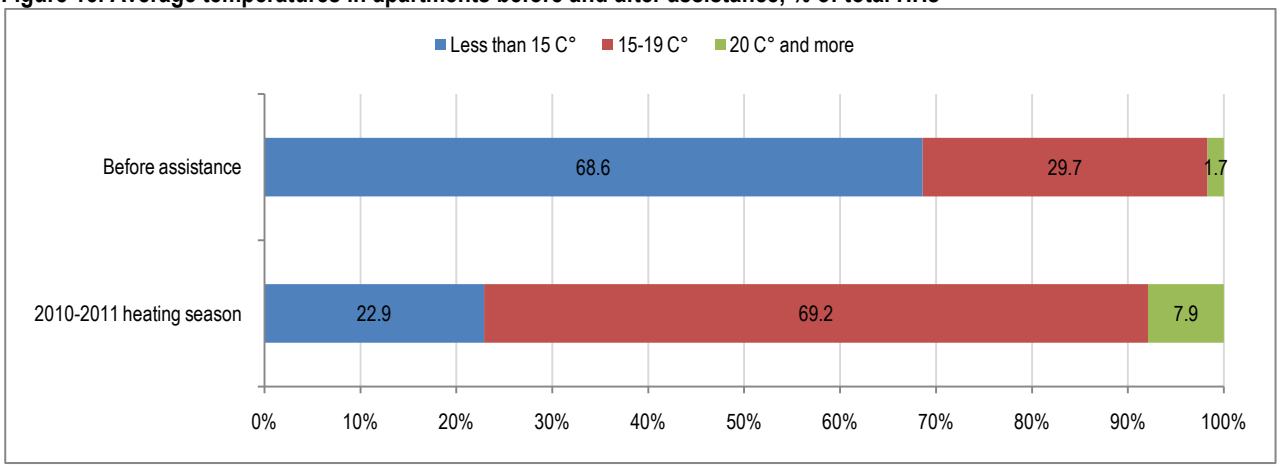
It is worth noting that average temperatures in Yerevan (12.4°) before assistance were well below the average for Marzes (15.8°).

The picture changed after assistance: average temperatures almost equaled: average temperature in 2010-2011 heating season equaled 17° in Yerevan and 16.8° in Marzes.

The share of HHs with average temperature below 15° decreased almost three times after assistance. They constituted 22.9% after assistance as compared to 68.6% - before it (Figure 15). Nevertheless, this share remains quite high.

The share of HHs with high average temperatures increased reaching 7.9% in 2010-2011 heating season (1.7% before assistance). HHs that had on average 15-19° prevail - 69.2% of total.

Figure 15. Average temperatures in apartments before and after assistance, % of total HHs

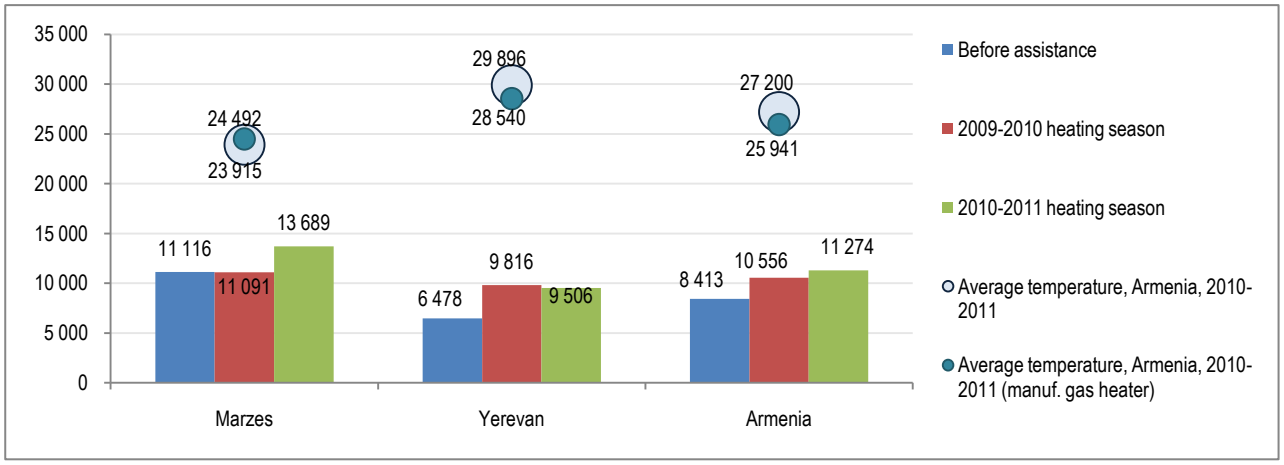


Source: AHS (2011)

Chapter 5. Expenses on Heating and Satisfaction Levels

Expenditures of beneficiary HHs on heating in 2010-2011 increased reaching AMD 11 274 as compared to previous year's AMD 10 556. Expenditures this year increased considerably as compared to expenditures level before assistance – by 34%. This can be explained by the fact that beneficiary HHs used natural gas for heating, the tariff for which increased in April 2010[2] (Figure 16):

Figure 16. Expenditures on heating and hot water in 2009-2010, 2010-2011 heating seasons and before assistance, AMD



Source: AHS (2011)

Average expenditures on heating in Yerevan decreased slightly in 2010-2011 heating season as compared to the previous year, furthermore they are lower than the average for Marzes. This is explained by the fact that winters are colder in Marzes than in Yerevan.

Expenditures on heating by beneficiary HHs are considerably lower than the country average. For comparison, the expenditures of HHs with manufactured gas heaters can be analyzed (as equipment equivalent to those provided to beneficiary HHs). This indicator exceeds that of beneficiary HHs around 2.3 times. This proves that HHs selected as beneficiaries were in need, indeed, and heat their apartments very thriftily. This is also supported by the fact that average temperatures in these apartments are lower than the country averages.

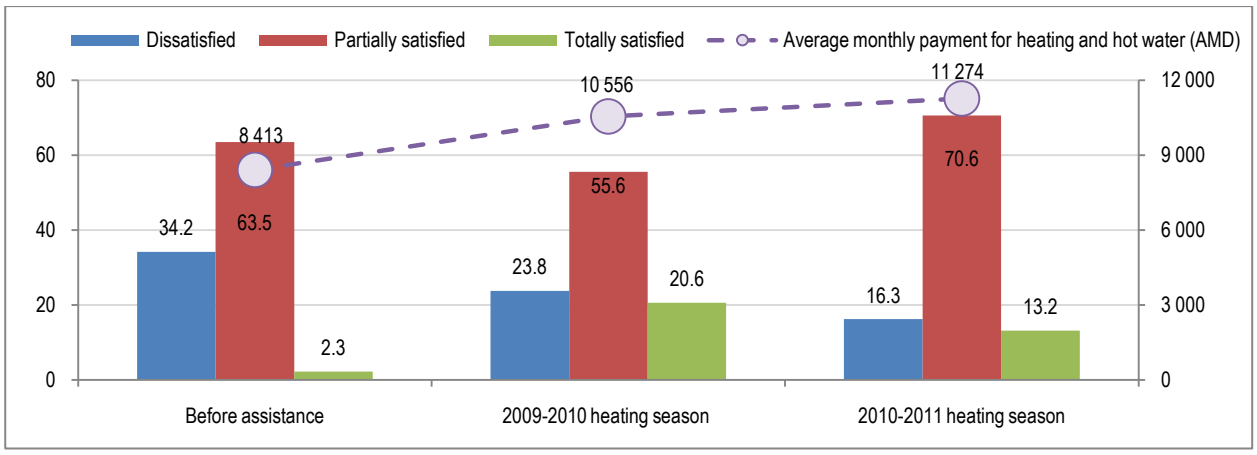
Figure 17 below shows the level of satisfaction and expenditures on heating in 2010-2011 heating season and previous year, as well as before assistance.

So, in 2010-2011 heating season the share of HHs not satisfied with heating decreased to 16.3% from 23.8% in previous year, however, the share of fully satisfied HHs also decreased from 20.6% in previous year to 13.2% in the last year.

[2] For the change in tariffs please see www.psrc.am.

Since, as noted in previous sections, the main disadvantage of the heating option named by HHs is high expenses, here again, the level of satisfaction decreased due to increased costs.

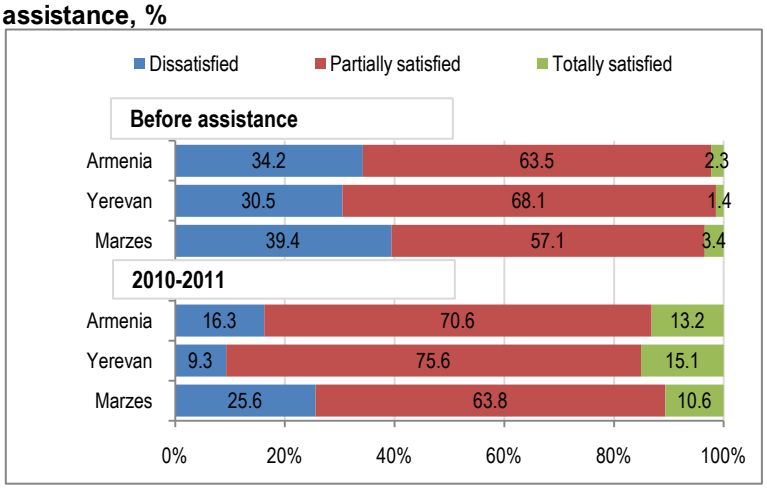
Figure 17. Expenditures of HHs on heating and hot water (right axis, AMD) and level of satisfaction this year, previous year and before assistance



Source: AHS (2011)

Nevertheless, as compared to the situation before assistance, it is visible that heating conditions have improved this year. This is proven by the increased level of satisfaction of beneficiary HHs from expenditures on heating and hot water.

Figure 18. Level of satisfaction of HHs from heating and hot water expenditures last winter, previous winter and before assistance, %



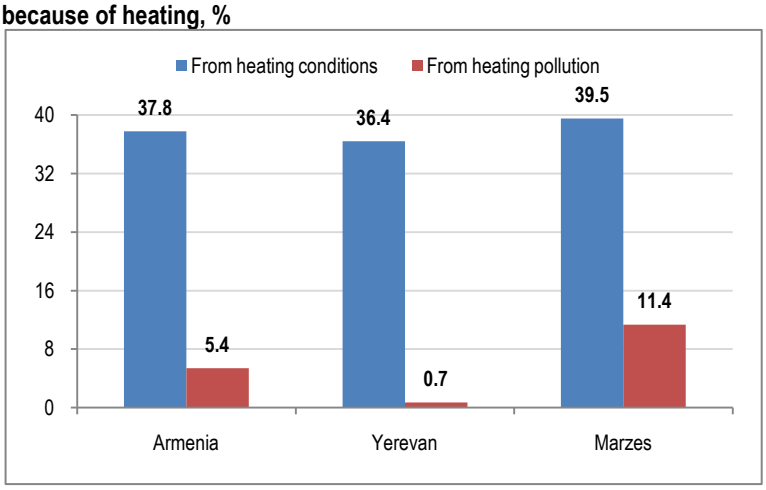
Source: AHS (2011)

Overall, the level of satisfaction is higher in Yerevan than in Marzes (Figure 18). 15.1% of all beneficiaries in Yerevan are fully satisfied with heating conditions as compared to 10.6% of beneficiaries in Marzes.

The levels of satisfaction before assistance did not vary much in Yerevan and Marzes. This, again, shows that assistance in Yerevan was much more efficient than in Marzes.

Chapter 6. Illnesses Due to Inadequate Heating

Figure 19. Cases of illnesses due to heating conditions and dirtiness because of heating, %



Source: AHS (2011)

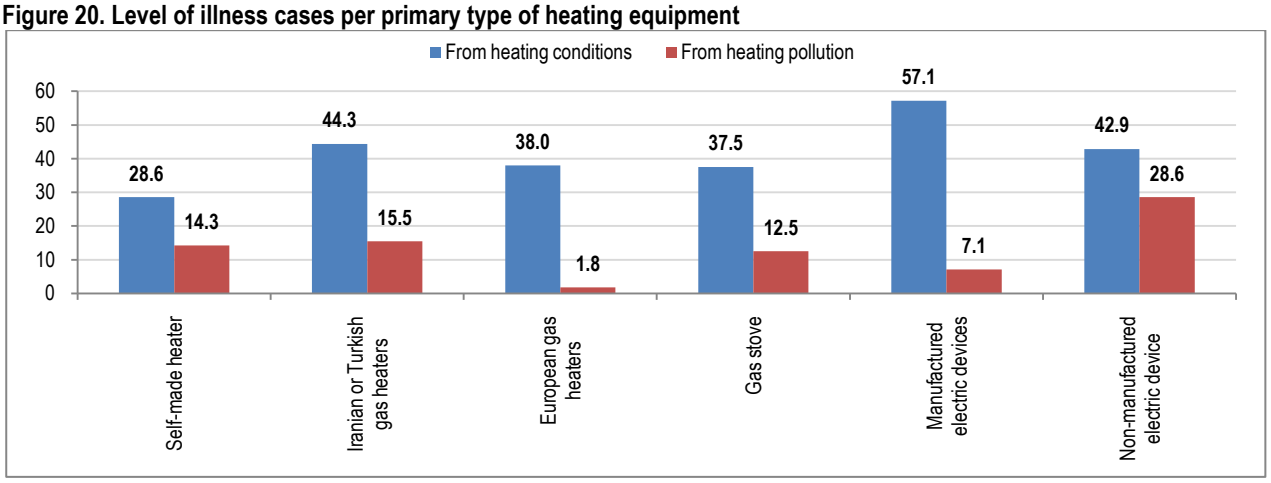
According to the Survey results, 38% of beneficiary HHs had cases of illnesses due to inadequate (insufficient) heating and 5.4% - due to dirtiness because of the specific heating option (Figure 19).

Notably, illnesses due to both cases because of insufficient or dirtiness were higher in Marzes as compared to Yerevan.

The cases of illnesses due to insufficient heating among beneficiary HHs (37.8%) was lower than the country average (44.5%). However, cases due to dirtiness of the heating option were higher than on average in the country in 2010-2011 heating season (5.4% against 4.9% respectively).

Figure 20 presents the illness cases due to insufficient or dirty heating broken down per types of heating equipment.

Figure 20. Level of illness cases per primary type of heating equipment



Source: AHS (2011)

Illness cases due to insufficient heating were considerably high in those HHs that used self-made or manufactured electric heaters (57.1% and 42.9% respectively) as well as in those HHs that used Iranian or Turkish gas heaters (44.3%). I.e. the cases of illnesses were higher in those HHs that for one reason or another did not use the heaters received through the project assistance.

The cases of illnesses due to dirtiness of a heating option were relatively low. 28.6% of HHs that used electric heaters had such cases. This indicator totaled to 14.3% and 15.5% among HHs that used self-made wood oven and Iranian or Turkish gas heaters. HHs using gas stoves also mentioned cases of such illnesses (12.5%).

Annex 1. Methodology of the Project Beneficiary HH Survey

The Survey among poor HHs that were chosen to be the beneficiaries of the Project aimed at collecting quantitative and qualitative data on changes in heating conditions of those HHs, as well as collecting data on both positive and negative changes in these HHs resulting from the improved heating, assessing the level of satisfaction from the installed heater, connection to the gas system, installation design works, changes in expenditures for heating after the provision of assistance.

The present survey provided for collection of data on 2010-2011 heating season, thus, compiling the time series of indicators collected through surveys in previous years.

Like in previous surveys, the large portion of the collected data is of a qualitative nature, e.g. the assessment of HHs on specific issues.

It is worth noting that the tools of the Survey were the Questionnaire and the Sample. Both the Questionnaire and the overall methodology of the Survey were developed by the Economic Development and Research Center based on the questionnaires of previous Surveys.

Sampling and Conducting the Survey

Sampling

Project Beneficiary HH Survey, according to the methodology, was conducted among 500 project beneficiary HHs. The Survey tool, the Questionnaire, in contrast to the first Survey, was also intended on collecting qualitative data.

The basis for stratification and clusterization of the general population was the database of the beneficiaries of R2E2 Fund in 2009-2010. According to the database, there were 4 137 beneficiary HHs in 2009-2010, 2147 of which (52%) living in MABs in Yerevan.

The Survey covered 14 towns and cities of Armenia including the capital city of Yerevan. Overall, the Survey covered 13 urban communities of Armenia and 7 districts of Yerevan.

Table 6. Proportional distribution of he sample of beneficiary HHs and the number of Survey PSUs in Yerevan and Marzes

Marz/Urban Communities	Total number of Beneficiary HHs	Number of Beneficiary HHs in the sample	% in total	Proportional distribution under the sample size of 500 HHs	Proposed distribution, 500 HHs, 10 HHs in each strata PSU
Yerevan	**2147**	**2060**	**58.7%**	**293.4**	**280**
Ajapnyak		206	5.9%	**29.3**	30
Arabkir		321	9.1%	**45.7**	40
Qanaqer-Zeytun		113	3.2%	**16.1**	20
Erebuni		249	7.1%	**35.5**	30
Malatia-Sebastia		354	10.1%	**50.4**	50
Nor Norq		536	15.3%	**76.4**	70
Shengavit		281	8.0%	**40.0**	40
Marzes	**1990**	**1450**	**41.3%**	**207**	**220**
Kotayq Marz					
Abovyan		51	1.5%	**7.3**	10
Byureghavan		53	1.5%	**7.5**	10
Hrazdan		139	4.0%	**19.8**	20
Charentsavan		83	2.4%	**11.8**	10
Lori Marz					
Vanadzor		563	16.0%	**80.2**	80
Alaverdi		92	2.6%	**13.1**	10
Ararat Marz					
Ararat		52	1.5%	**7.4**	10
Shirak Marz					
Gyumri		124	3.5%	**17.7**	20
Artik		50	1.4%	**7.1**	10
Armavir Marz					
Armavir		68	1.9%	**9.7**	10
Syuniq Marz					
Kapan		70	2.0%	**10.0**	10
Goris		36	1.0%	**5.1**	10
Gegharkuniq Marz					
Sevan		69	2.0%	**9.8**	10

It is worth noting that under such structure of the sample, the Survey ensured 95% confidence interval and the maximum deviation does not exceed 5%. The number of PSUs was determined based on the minimum 10 HHs, as well as rounding of proportional sample with the same logic: the final sample size was determined based on minimum numbers. Thus, the sample size equaled 500 HHs, including 280 – in Yerevan and 220 – in Marzes.

Interviewers were provided with primary addresses where interviews should take place, as well as secondary addresses to be used when interviews were not feasible to be conducted in primary addresses.

It is worth noting that the usage of secondary addresses was quite low which is explained by the fact that, whenever an address was identifies and there was someone home to answer the questions, there were no cases of refusing to take part, i.e. secondary addresses were used mainly in cases when the HH members were not home. During conducting this Survey, the level of usage of secondary addresses was relatively high in Lori and Kotayq Marzes. As a result, in order to survey the intended number of HHs, 657 addresses were visited.

Table 7. Use of secondary addresses per Marzes

Marz	Use of Main addresses	Use of secondary addresses	Total surveyed HHs	Share of secondary addresses, %
Yerevan	219	61	280	21.8
Gegharkuniq	6	4	10	40.0
Ararat	7	3	10	30.0
Armavir	7	3	10	30.0
Lori	42	48	90	53.3
Syuniq	12	8	20	40.0
Kotayq	29	21	50	42.0
Shirak	21	9	30	30.0
Total	343	**157**	500	31.4

Questionnaire

A Questionnaire for the "R2E2 Fund Beneficiary HH Project" was developed to conduct the Survey.

For the drafting of the **Questionnaire for the Survey,** the questionnaire of the 2010 Assessment of Heating Situation (conducted by the EDRC) was used; however, it was reviewed to comply with the requirements of the Client to the beneficiary HH survey. The Questionnaire was drafted with the logic to allow for collecting the data on changes in heating situation, prior to assistance and after, in order to be able to assess the impact of the assistance. Moreover, new questions were included in the questionnaire to capture the qualitative data and assessment.

The Questionnaire of the Survey consists of the following 6 separate sections:

Section 1. List of HH members

Section 2. Assistance provided and heated area

Section 3. Heating and hot water supply options

Section 4. Assessment of heating and preferences

Section 5. Illnesses due to heating conditions

Section 6. Interviewer's assessment

The Questionnaire contains 36 questions, based on which more than 100 items of data will be collected on each interviewed HHs.

Annex 2. Analytical Tables

1. Works performed under the project and Beneficiary satisfaction

Table 1. 1. Satisfaction from the quality of performed works, %

	Totally dissatis-fied	Dissatis-fied	Neutral	Satisfied	Totally Satisfied
Certification of the installation of the heater	0.4	1.4	5.4	6.2	86.6
Connection of heater pipes	-	0.7	4.4	8.3	86.6
Connection to the gas system	-	0.3	1.6	6.5	91.6
Preparation of the Chimney and Flue's Act	-	0.9	2.3	5.3	91.5
Preparation of Design and Estimate documents	0.3	1.3	5.3	7.8	85.3
Provision of the gas heater	-	0.7	5.5	6.5	87.2

Table 1.2. Satisfaction from the timeliness of performed works, %

	Totally dissatisfied	Dissatisfied	Neutral	Satisfied	Totally Satisfied
Certification of the installation of the heater	0.2	0.8	2.6	11.3	85.1
Connection of heater pipes	0.2	0.5	3.4	11.5	84.4
Connection to the gas system	0.3	0.3	1.6	7.9	89.9
Preparation of the Chimney and Flue's Act	-	0.9	2.0	7.3	89.8
Preparation of Design and Estimate documents	0.3	1.0	3.3	11.6	83.8
Provision of the gas heater	0.2	0.5	3.4	10.3	85.6

Table 1.3. Complaints broken down per types of services/works

	Complaints on quality	Complaints on timing
Provision of the gas heater	1.8	1.0
Preparation of Design and Estimate documents	0.7	0.5
Preparation of the Chimney and Flue's Act	0.3	0.3
Connection to the gas system	0.9	0.9
Connection of heater pipes	1.5	1.3
Certification of the installation of the heater	0.7	0.7

Table 1.4 Changes after the provision of assistance, %

	Armenia	Yerevan	Marzes
Very negative	1	0.4	2.0
Negative	4.4	1.1	9.1
No change	15.5	9.3	24.4
Positive	21	8.2	39.1
Very positive	58.1	81.1	25.4

2. Heating Options Used, Use of Provided Heaters

Table 2.1. Primary and secondary heat options used by HHs this year and before assistance, % in total heated apartments

	2010-2011 heating season	Before assistance
	Primary energy source	
Electricity	4.4	53.4
Natural gas	93.5	27.7
Wood	1.4	14.0
Other	0.6	4.9
	Secondary energy source	
Electricity	69.7	57.0
Natural gas	12.9	14.0
Wood	8.3	14.9
Other	9.1	14.0

Table 2.2. Use of primary and secondary heating equipment before and after assistance, %

	Primary equipment		Secondary equipment	
	2010-2011 heating season	Before assistance	2010-2011 heating season	Before assistance
Manufactured gas heater	90.4	8.5	7.0	1.3
Self-made gas oven	1.2	21.2	17.5	22.4
Gas-stove	1.6	14.0	39.5	23.7
Manufactured electric heaters	2.9	12.5	23.7	36.8
Self-made electric heaters	1.4	42.3	11.4	13.2
Self-made wood ovens	1.4	0.2	0.9	1.3
Other	1.0	1.3	7.0	1.3

Table 2.3. Satisfaction from heating conditions in HHs of Armenia, this year and before assistance, %

	2010-2011 heating season	Before assistance
Not satisfied	9.4	51.3
Partially Satisfied	50.3	46.8
Fully Satisfied	40.3	1.8

Table 2.4. Satisfaction from heating conditions in HHs of Yerevan, in 200-2011 and before assistance, %

	2010-2011 heating season	Before assistance
Not satisfied	3.6	61.4
Partially Satisfied	41.8	38.6
Fully Satisfied	54.6	-

Table 2.5. Satisfaction from heating conditions in HHs of Marzes, in 2010-2011 and before assistance, %

	2010-2011 heating season	Before assistance
Not satisfied	17.2	37.7
Partially Satisfied	61.7	58.0
Fully Satisfied	21.1	4.3

Table 2.6. Disadvantaged of heating options depending on the level of satisfaction, %, multiple response

	No disadvantage	Dry air	Inequal distribution of heat	Inconvenient placement	Expensive	Other
Not satisfied	10.9	4.3	13.0	17.4	39.1	47.8
Partially Satisfied	47.2	0.8	8.9	6.5	35.8	22.0
Totally Satisfied	85.3	-	1.0	2.5	10.7	6.1

3. Preferences of Heating Options and Reasons

Table 3.1. Disadvantages of used heating options, broken down per Yerevan and Marzes, multiple responses, %

	Armenia	Yerevan	Marzes
No disadvantage	59.8	67.9	49.5
Dry air	0.8	-	1.8
Insufficient heat	6	5.0	7.3
Inequal distribution of heat	9.6	0.7	20.9
Apartment gets dirty	1.2	1.4	0.9
Air is not clean	2.4	3.2	1.4
Heater is inconveniently stationed	5.8	2.1	10.5
Not safe	2.6	3.2	1.8
Expensive	25.4	26.1	24.5
Other	2	0.4	4.1
Don't know	2.4	-	5.5

Table 3.2 Level of HH satisfaction from heating option per disadvantages of each option, %

	Dissatisfied	Partially satisfied	Tottaly satisfied
No disadvantage	10.9	47.2	85.3
Dry air	4.3	0.8	0.0
Insufficient heat	13.0	8.9	1.0
Inequal distribution of heat	32.6	10.2	4.1
Apartment gets dirty	4.3	1.2	0.5
Air is not clean	4.3	3.7	0.5
Heater is inconveniently stationed	17.4	6.5	2.5
Not safe	2.2	4.1	1.0
Expensive	39.1	35.8	10.7
Other	4.3	2.8	0.0
Don't know	10.9	0.8	2.5

Table 3.3 Level of HH satisfaction depending on the preference on heating options in Armenia, %

	Dissatisfied	Partially satisfied	Tottaly satisfied
The current option is adequate	27.9	73.2	89.2
Electric equipment or electric heater	2.3	0.8	-
Wood oven	2.3	-	-
Individual heat boiler	51.2	17.6	8.8
Local-collective heat boiler	4.7	3.3	0.5
Centralized heating	9.3	2.1	1.5
Air conditioner	-	0.4	-
Other	-	1.3	-

Table 3.4 Level of HH satisfaction depending on the preference on heating options in Yerevan, %

	Dissatisfied	Partially satisfied	Tottaly satisfied
The current option is adequate	50.0	86.1	97.4
Electric equipment or electric heater	10.0	-	-
Wood oven	10.0	0.9	-
Individual heat boiler	20.0	8.7	2.6
Local-collective heat boiler	-	2.6	-
Centralized heating	10.0	0.9	-
Air conditioner	-	0.9	-
Other	50.0	86.1	97.4

Table 3.5 Level of HH satisfaction depending on the preference on heating options in Marzes, %

	Dissatisfied	Partially satisfied	Totally satisfied
Current option is adequate	21.2	61.3	60.5
Electric equipment or electric heater	-	1.6	-
Firewood furnace	3.0	-	-
Individual heating boiler	-	1.6	-
Local-collective heating boiler	60.6	25.8	30.2
Centralized heating	6.1	4.0	2.3
Air conditioner	9.1	3.2	7.0
Other	-	2.4	-

Table 3.6 Preferred heat options of HHs, multiple responses, %

	Marzes	Yerevan	Armenia
Current option is adequate	55.6	90.9	75.9
Electric equipment or electric heater	1.0	0.4	0.6
Gas heater	0.5	-	0.2
Firewood furnace	1.0	0.7	0.8
Individual heating boiler	31.7	5.8	16.8
Local-collective heating boiler	3.9	1.1	2.3
Centralized heating	4.9	0.7	2.5
Air conditioner	-	0.4	0.2
Other	1.5	-	0.6

Table 3.7 Factors for preferences of heating options, multiple responses, %

	Armenia	Yerevan	Marzes
Sufficient heat	66.4	87.0	60.7
Secure	53.3	30.4	59.5
Clean	44.9	21.7	51.2
Affordable	13.1	21.7	10.7
Other	5.6	-	7.1

Table 3.8 Breakdown of preferred heating options per advantages thereof, %

	Safe	Clean	Affordable	Sufficient heat	Other
Individual heating boiler	59.3	49.4	8.6	69.1	2.5
Local-collective heating boiler	20.0	40.0	40.0	60.0	10.0
Centralized heating	70.0	40.0	-	60.0	20.0
Other	-	-	50.0	50.0	16.7

Table 3.9 Reasons for not using the preferred heating option, multiple responses, %

	Armenia	Yerevan	Marzes
Scarcity of financial resources	49.5	69.2	46.5
Technical difficulties	17.2	7.7	18.6
Lack of suppliers	7.6	11.5	7.0
Other	25.8	11.5	27.9

Table 3.10 Reasons for not using the preferred heating option broken down per preferred options, multiple responses %

	Lack of financial resources	Difficulty of technical solutions	No supplier	Other
Total	94.2	32.7	14.4	3.8
Individual heating boiler	98.7	39.2	3.8	44.3
Local-collective heating boiler	70	20	60	50
Centralized heating	100	10	60	90
Other	60	0	0	40

4. Heated Area and Average Temperatures

Table 4.1 Average duration of heating season this winter and before assistance, months

	2010-2011 heating season	Before assistance
Armenia	4.2	3.8
Yerevan	3.6	2.9
Marzes	5.1	5.0

Table 4.2 Average temperatures in the apartment in January 2011 and before assistance, C⁰

	Average temperature, Armenia	2010-2011 heating season	Before assistance
Armenia	17.7	16.9	13.8
Yerevan	18.4	17.0	12.4
Marzes	16.9	16.8	15.8

Table 4.3 Levels of apartment heating per settlements, %

	2010-2011 heating season			Before assistance		
	Yerevan	Marzes	Armenia	Yerevan	Marzes	Armenia
Whole apartment heated	41.4	20.4	32.3	13.6	14.6	14.0
More than the half of the apartment, but not entirely	33.2	27.3	30.6	8.2	27.7	16.6
Less than the half of the apartment	6.8	28.2	16.1	6.1	25.8	14.6
Only very necessary parts of the apartment	18.6	22.7	20.4	68.9	26.3	50.5
Not heated	-	1.4	0.6	3.2	5.6	4.3

5. Heating Expenditures and Satisfaction Thereof

Table 5.1 Payments of HHs for heating and level of satisfaction from the heating conditions per settlements, %

	Dissatisfied	Partially satisfied	Totally satisfied
		Armenia	
Less than 5,000 AMD	11.1	65.7	23.1
5,001-10,000 AMD	14.3	76.6	9.1
10,001-15,000 AMD	16.9	72.3	10.8
15,001-20,000 AMD	16.9	67.5	15.6
20,001 AMD and above	30.6	63.9	5.6
		Yerevan	
Less than 5,000 AMD	4.8	70.2	25.0
5,001-10,000 AMD	10.9	79.0	10.1
10,001-15,000 AMD	12.2	78.0	9.8
15,001-20,000 AMD	5.3	73.7	21.1
20,001 AMD and above	18.8	75.0	6.3
		Marzes	
Less than 5,000 AMD	33.3	50.0	16.7
5,001-10,000 AMD	21.4	71.4	7.1
10,001-15,000 AMD	21.4	66.7	11.9
15,001-20,000 AMD	20.7	65.5	13.8
20,001 AMD and above	40.0	55.0	5.0

Table 5.2 Expenditures on heating and hot water, this winter and before assistance, %

	Before assistance	2010-2011 heating season
Dissatisfied	34.2	23.8
Partially satisfied	63.5	55.6
Totally satisfied	2.3	20.6
Average monthly payments for heating and hot water (AMD)	8,413	10,556

Table 5.3 Level of HH satisfaction from expenditures on heating and hot water, this winter and before assistance, %

	Armenia		Yerevan		Marzes	
	2010-2011 heating season	Before assistance	2010-2011 heating season	Before assistance	2010-2011 heating season	Before assistance
Dissatisfied	16.3	39.4	9.3	30.5	25.6	39.4
Partially satisfied	70.6	57.1	75.6	68.1	63.8	57.1
Totally satisfied	13.2	3.4	15.1	1.4	10.6	3.4

6. Illnesses due to Inadequate Heating

Table 6.1 Cases of illnesses due to insufficient heating or dirt because of heating, %

	Armenia	Yerevan	Marzes
Insufficient heating	37.8	36.4	39.5
Heating polluition	5.4	0.7	11.4

Table 6.2 Frequency of illness cases due to heating condition in comparison to the previous winter, %

	Had cases of illnesses	Less frequently	Same frequency	More frequently
Below 15 C°	65.8	14.7	67.6	17.6
15-19 C°	36.5	21.6	31.2	47.2
20 C° and above	34.2	30.4	13.0	56.5