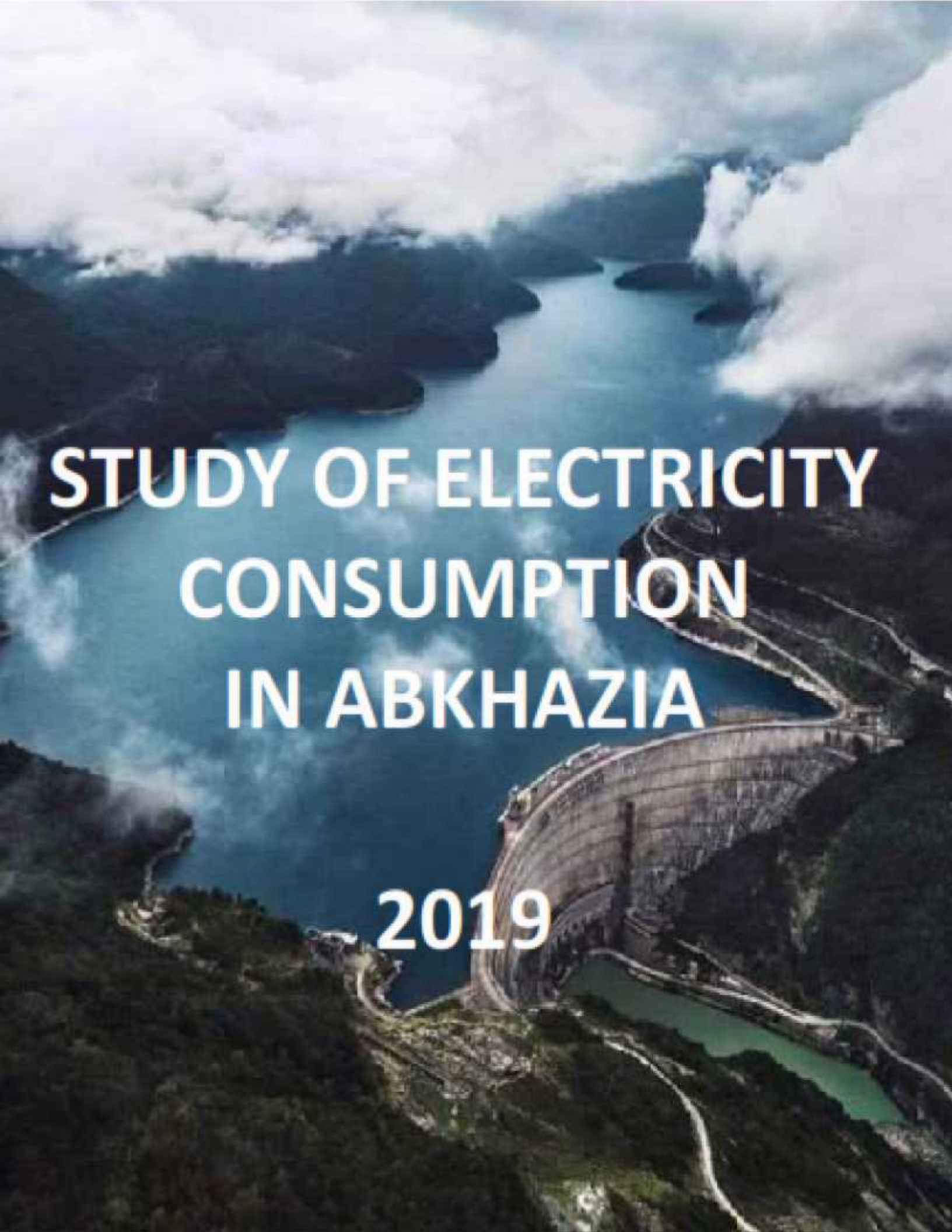
STUDY OF ELECTRICITY
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IN ABKHAZIA
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STUDY CONSULTANTS:

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The study was conducted as a part of a Tripartite Working Group on Inguri HPP (2016-2019) regarding the problem of efficient exploitation of Inguri HPP cascade in the framework of Project "Fostering Russia-Georgia Neighborly Relations through Multi Stakeholder Networking and Expert Dialogue" – Support to Istanbul Process".

The project supported by the Human Security Section of Swiss Federal Department of Foreign Affairs is being implemented by the International Center on Conflict and Negotiation (ICCN).

The project thanks all participants of the Dialogue Meetings of the Tripartite Working Group on Inguri HPP formed in 2017 in Istanbul, Turkey to study the problems of energy efficiency in Abkhazia and Inguri HPP. Virtually, for the last decades the given tripartite dialogue meetings were the first of this kind to attract the attention of general public, business and authorities to solve the problems of Inguri HPP.

Swiss Federal Department of Foreign Affairs shall not be liable for the content or opinions given in the present publication.

Contents

Electricity Consumption in Abkhazia

Introduction

In recent years, the ever-increasing electricity consumption in Abkhazia has been an acute problem for the energy sector and energy security of Georgia. Such state of affairs is the result of permanent flow-out of finances from the energy system as a whole and from Inguri HPP in particular, putting the technical and economic stability of the entire energy system of Georgia to hazard. The flow-out of unpaid electrical power from Inguri HPP and Perepadnie/Vardnili HPPs Cascade and foregone earnings significantly deteriorate the technical state of these important HPPs, what, on its turn, is an obstacle for planned rehabilitation works, ongoing repairs, etc.

Such a complicated situation leads to economic losses for Russian company InterRAO as well, the company covering the electricity deficit occurring in Abkhazia in winter months. This is done by supplying the electricity from Russia at reduced rates. This was the case in 2016-2017. Based on Russian sources and according to the Ministry of Energy of the Russian Federation, the lost revenue of InterRAO for the supply of power to Abkhazia in 2016-2017 amounted to approximately 750 million rubles.[1]

On December 25, 2017, Dmitry Medvedev, the Chairman of the Government of the Russian Federation, signed the resolution on issuing subsidies from the federal budget in favor of JSC Inter RAO in order to reimburse a certain part of the company's expenses of selling electricity in Abkhazia. This was stated in the document published on a legal information portal. According to the document, Inter RAO supplied electricity to Abkhazia in February and March of 2016 and in February to April of 2017 via Psou-Leselidze and Psou-Bzyb power transmission lines because of the limited power supply from Inguri HPP, which used to supply Abkhazia with electrical power. The resolution ordered to transfer 249.5 million rubles to Inter RAO for power supply in 2016 and 522.3 million rubles - for power supply in 2017.
As the data for 2016 suggest, the power consumption in Abkhazia was 1926 million kWh, which, if considering the census in Abkhazia in 2011 (240 thousand inhabitants), makes 8000 kWh per capita. For comparison reasons, we will note that this rate is 3.3 times more than that of Georgia.

In 2017, electricity consumption in Abkhazia exceeded 2001.8 million kWh. The fact that after the War in Abkhazia, following the negotiations, an agreement on the distribution of electricity generation by Inguri HPP and Perepadnie/Vardnili HPP in ratio of 40:60% was concluded between Abkhazia and Georgia. The

[1] "The Ministry of Energy of the Russian Federation offered Joint Stock Company Inter Rao to compensate a certain part of expenses of supplying electrical power to Abkhazia". http://www.finmarket.ru/database/news/4618464) Last seen in May of 2019.

given distribution corresponded to the estimated value of assets on different sides of the power separation line. In recent years, the mode of consumption of Abkhazia violates the given gentleman's agreement what may aggravate the conflict.

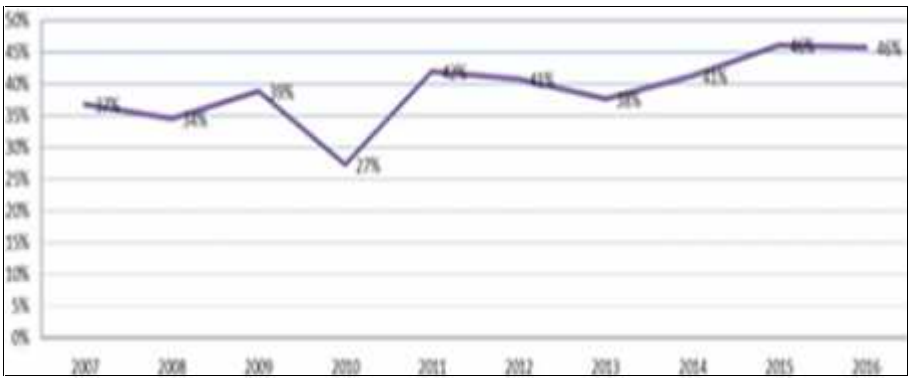


Fig. 1. Specific weight of consumption by Abkhazia in total generation of Inguri HPP and Perepadnie/Vardnili HPPs Cascade[2].

In 2017, this value increased further to reach 46.9%[3], showing an increase in the specific share of Abkhazia's consumption of energy generated by Inguri HPP and Perepadnie/Vardnili HPPs Cascade.

Research Methodology

The present survey is the first attempt to study the electricity consumption pattern in Abkhazia, as no such surveys have been conducted for very long. Information that would help study the pattern of electricity consumption in Abkhazia is not freely available. Consequently, the role of this survey was to shed the light not only on the structure of electricity consumption pattern, but also on the particular behavior of households in terms of technological and other preferences. However, the process of survey was followed by certain difficulties: the inability to monitor the group of specialists conducting the survey and the process as a whole; inability to crosscheck the results (a mandatory procedure by selecting random respondents what makes up about 10% of the sample, and by specifying the details of the survey by phone, or on-site, e.g. specifying whether the interviewer visited the respondent and other details helping avoid errors and inaccuracies).

[2] ELECTRICITY MARKET OPERATOR.
https://esco.ge/en/energobalansi/ Last seen in May of 2019.
[3] ELECTRICITY MARKET OPERATOR.
https://esco.ge/en/energobalansi/by-year-1/2017-energy-balance Last seen in May of 2019.

The study of electricity consumption in the municipal and commercial sectors of Abkhazia began in January 2018.

The process was divided into the following stages: presenting field survey questionnaires (in Russian) to the Abkhaz side, holding detailed discussions and providing clarifications regarding the questionnaires, and trainings.

The field works in Abkhazia were planned as follows: 3 researchers assigned for the residential sector and 2 researchers assigned for the commercial sector. Field works continued for 4 months. Following the specifics of the issue in Abkhazia, it was not possible to conduct a cross-check of the field works. At the next stage, the electronic database was created, implying data entry, encoding, cleaning and double-check. For double-checking of the field data in given case, the following action was taken: the group conducting the survey in the commercial sector was charged with conducting an additional research in the residential sector in the city of Sukhumi. These data provided an opportunity for indirect verification of the data and increased the total number of respondents significantly, what increased the confidence level of the results to a certain extent.

The number of respondents was 141 to study the residential sector and 41 questionnaires were filled in to study the commercial sector. The confidence level was 95%. The respondents participated in the survey following giving a voluntary informed consent and in terms of confidentiality and personal data protection.

Analysis of Results

Electricity Consumption in the Houshold Sector

To the question: when was your house built? (Fig. 2), the following answers were given:

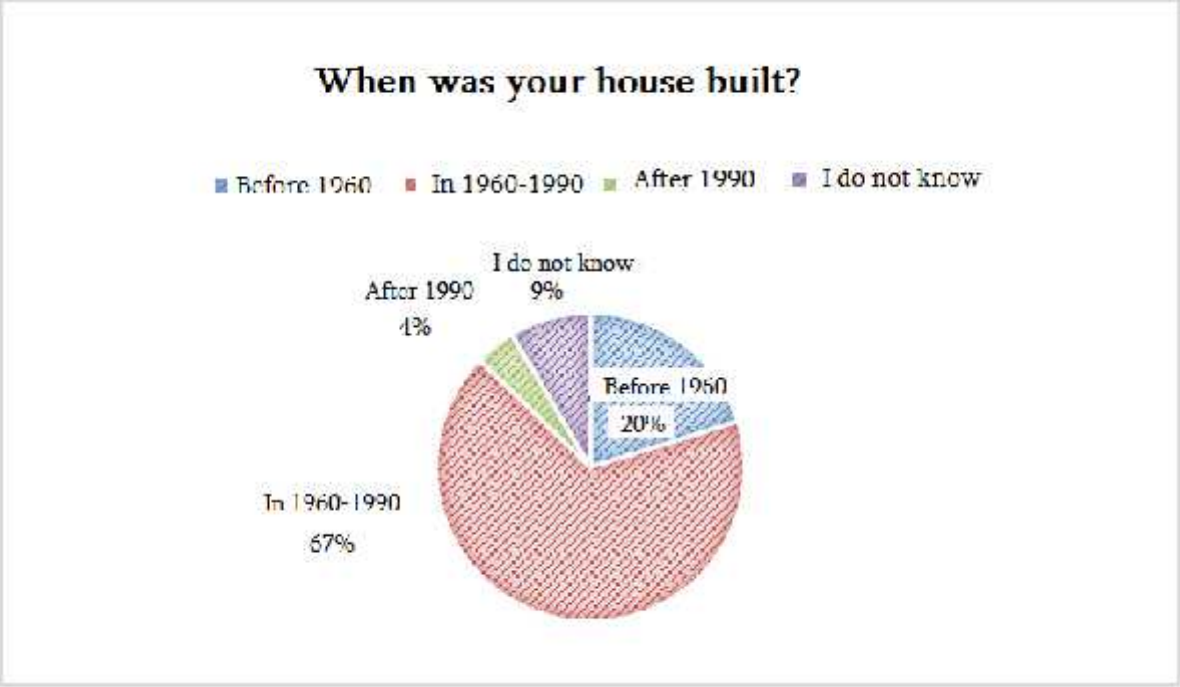


Fig. 2

It should be noted that the vast majority of the houses were built before 1990 (Fig. 2).

To the question on the questionnaire: Are you a subscriber of any natural gas supply system? (Fig. 3), the answers were as follows:

Yes 1.1%.

No 98.9%.

Error: up to 2%.

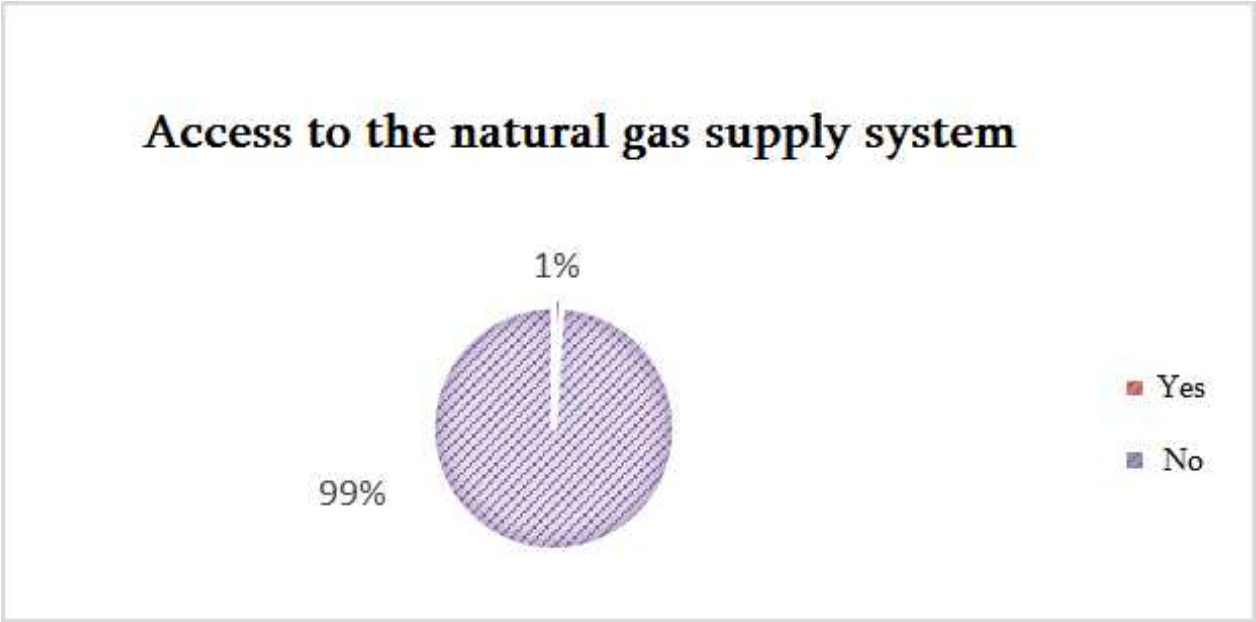


Fig. 3

The population of Abkhazia does not have access to the natural gas supply system. Therefore, a 1% positive answer is clearly a mistake (Fig. 3).

To the question: How much do you pay on average for electricity in summer? (Fig. 4), the following answers were given:

(Note - average monthly payments in summer months).

In Russian rubles:	%
0-200	31%
200-500	44%
500-1000	13%
1000 and more	3%
I do not know	10%

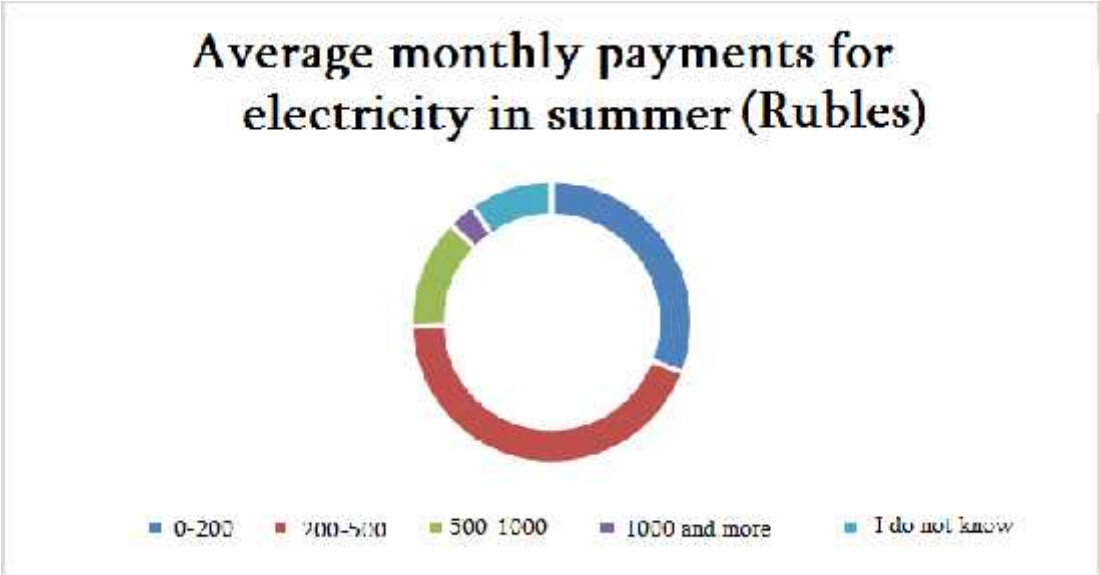


Fig. 4

To the question: How much do you pay on average for electricity in winter? (Fig. 5), the following answers were given:

(Note - average monthly payments in summer months).

In Russian rubles:	%
0-200	13%
200-500	46%
500-1000	26%
1000 and more	5%
I do not know	11%

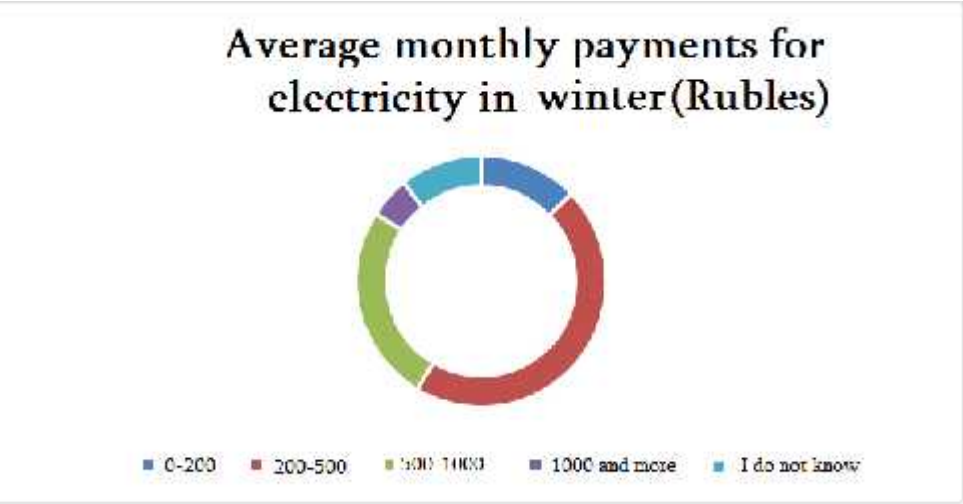


Fig. 5

To the question: Do you use liquefied petroleum gas (LPG)? (Fig. 6), 57% of the respondents in the residential sector replied positively.

Yes 57%

No 43%

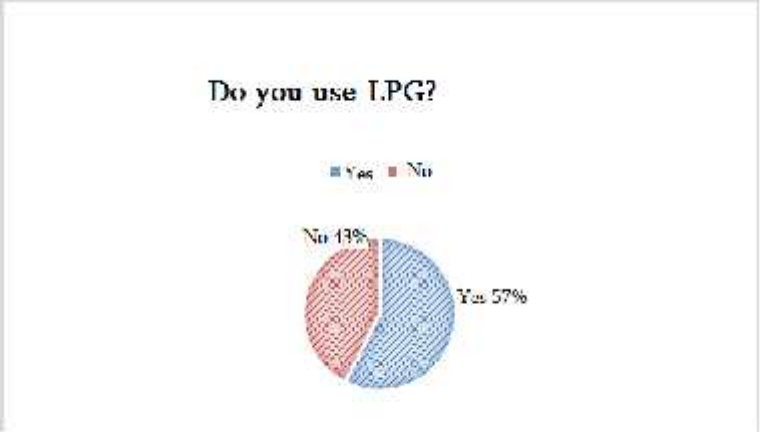


Fig. 6

Average monthly consumption of liquefied petroleum gas (LPG) (Fig. 7) is:

0-10 kg	73.6%
10-20 kg	20.8%
20 kg and more	5.6%

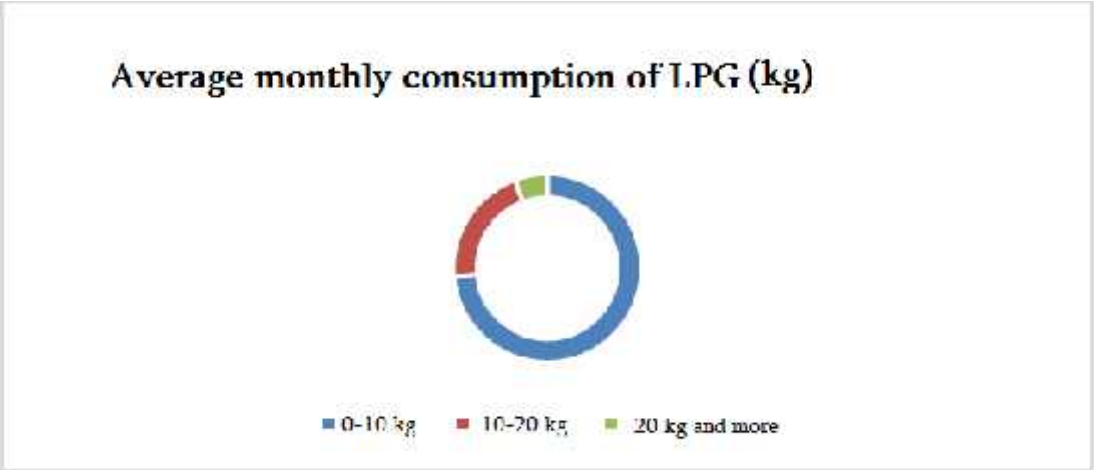


Fig. 7

To the question, if survey participants use wood (Fig. 8), 78% of respondents stated that they do not use wood, and this is not surprising, because the survey was conducted among the residents of the city of Sukhumi.

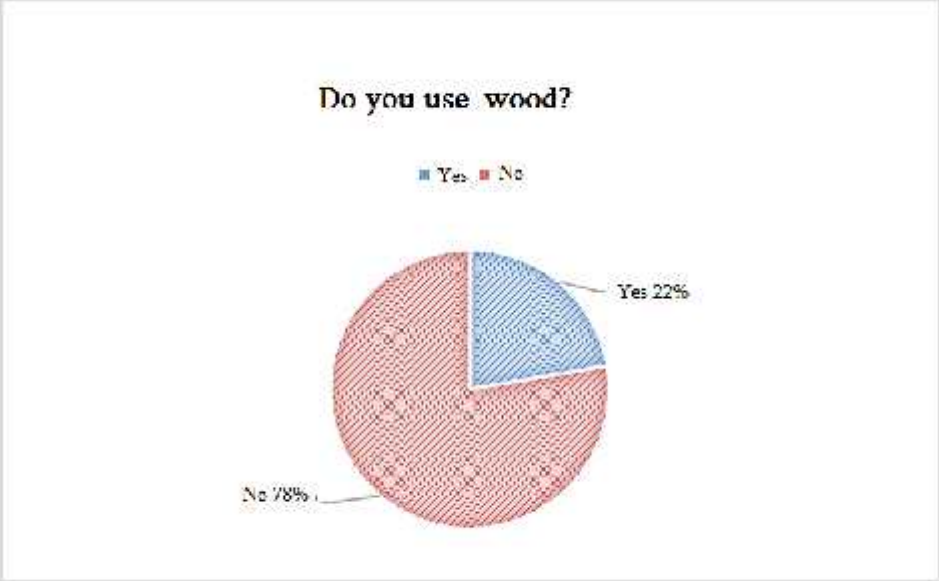


Fig. 8

85% of respondents stated that they use electricity for heating their houses.

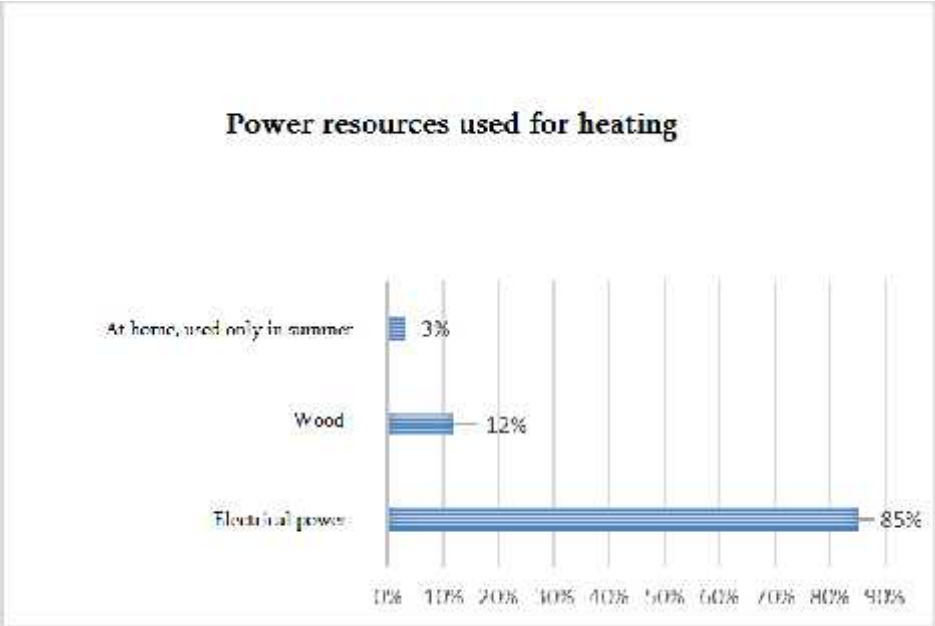


Fig. 9

If comparing the similar data from the studies conducted in Georgia, we will see that only 16.5% of urban residents use electricity for heating (Table No. 1).[4]

	Urban	Rural	Georgia
LPG	0.0%	0.2%	0.1%
Wood	95.9%	25.7%	56.2%
Gas	3.9%	57.5%	34.2%
Electricity	0.2%	16.5%	9.4%

Table No. 1.

Regarding the technologies used for heating (Fig. 10), the following answers were received:

[4] Household Energy End-Use Survey USAID Hydro Power and Energy Planning Project (HPEP) June 19, 2014.

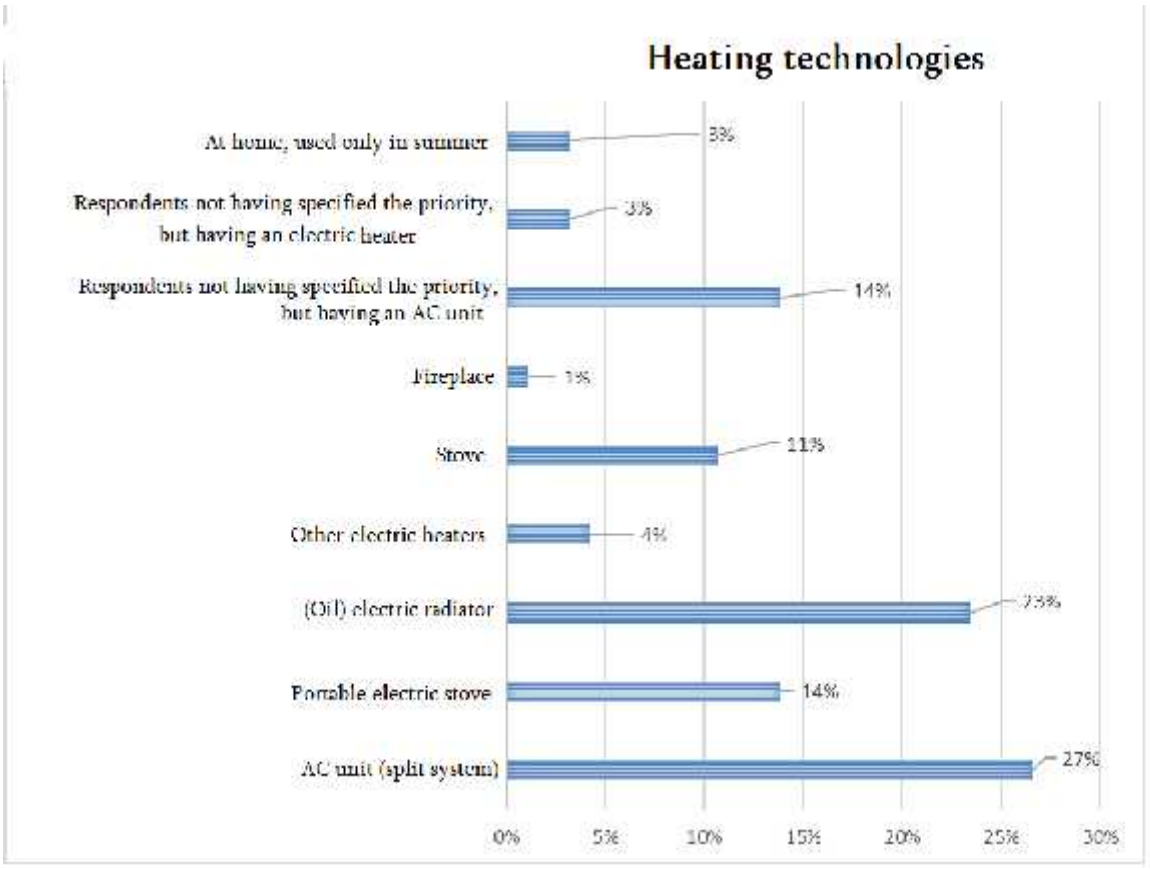


Fig. 10

To the questions about technologies used by the respondents to have hot water (Fig. 11), the following answers were given:

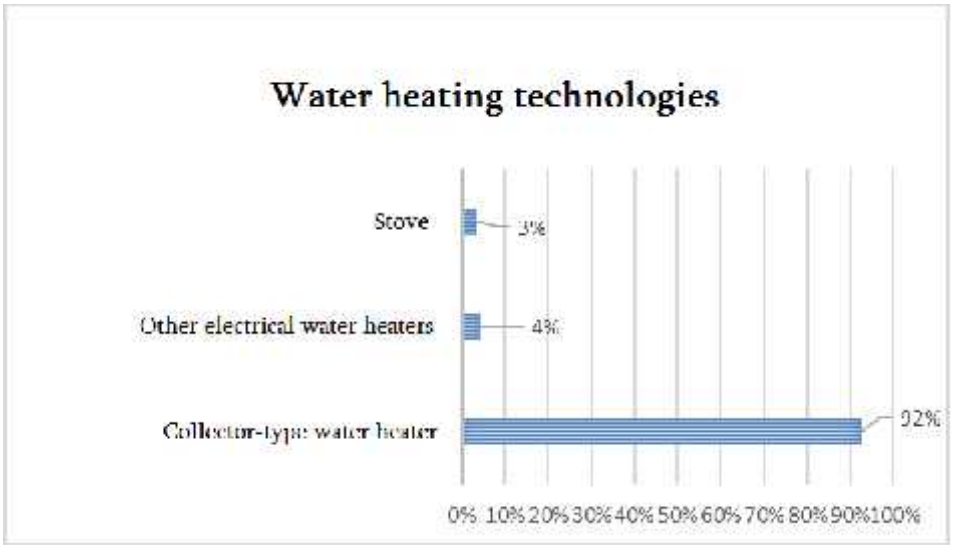
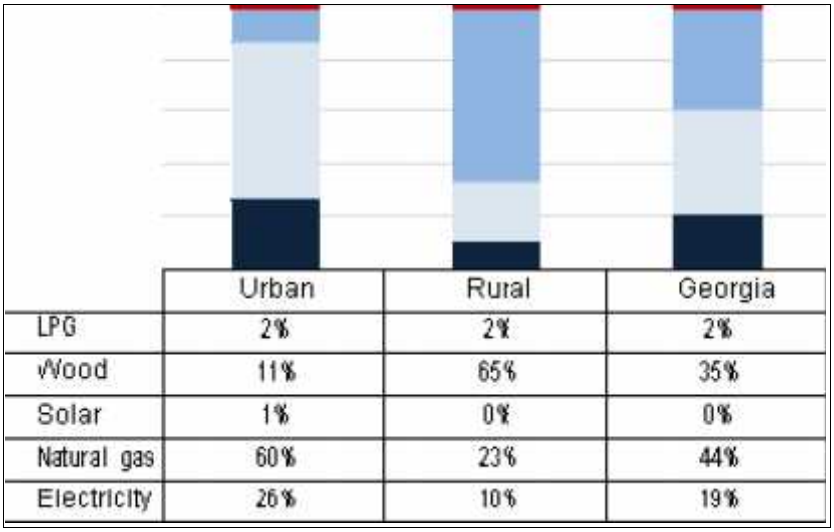


Fig. 11

The following graph (Fig. 12) shows the energy sources used for hot water supply in Georgia. 26% of urban residents use electricity for hot water supply.[5]



	Urban	Rural	Georgia
LPG	2%	2%	2%
Wood	11%	65%	35%
Solar	1%	0%	0%
Natural gas	60%	23%	44%
Electricity	26%	10%	19%

Fig. 12

Answers to the question: What kind of energy source do you use for cooking? (Fig. 13) were as follows:

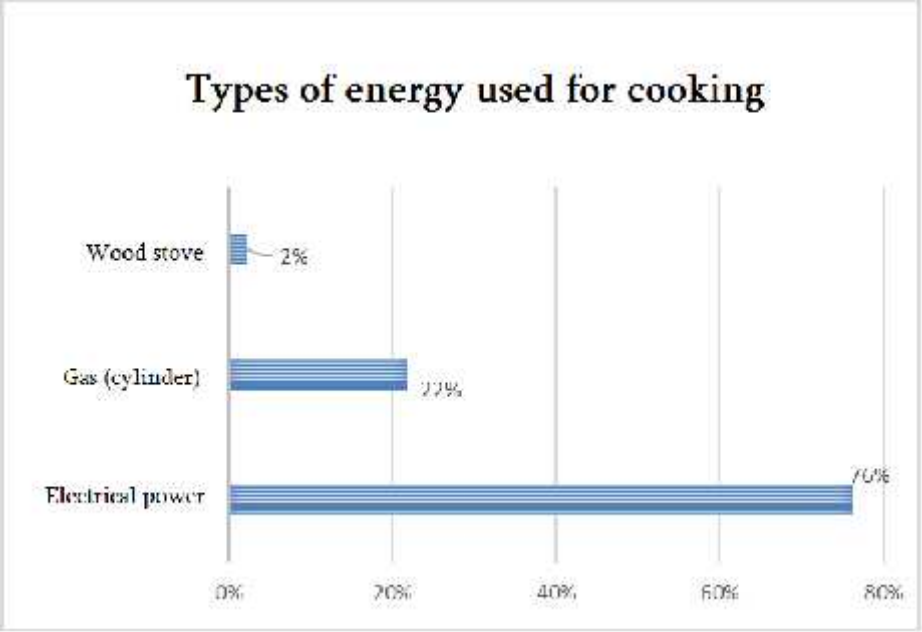
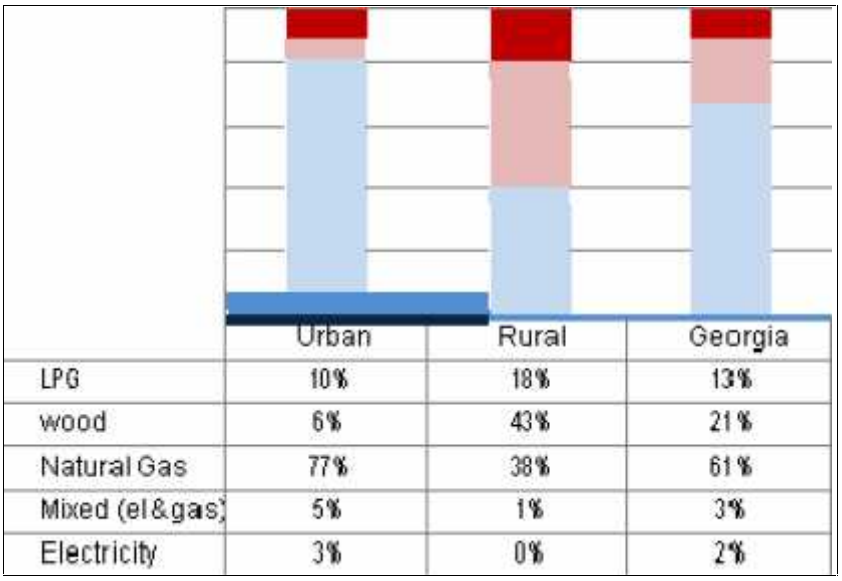


Fig. 13

[5] Household Energy end-Use Survey USAID Hydro Power and Energy Planning Project (HPEP) June 19, 2014.

The following graph (Fig. 14) shows the results of a similar survey conducted in Georgia. Only 3% of urban residents use electricity for cooking.



	Urban	Rural	Georgia
LPG	10%	18%	13%
wood	6%	43%	21%
Natural Gas	77%	38%	61%
Mixed (el&gas)	5%	1%	3%
Electricity	3%	0%	2%

To the question: Do you use cooling appliances? 76% of the respondents replied positively.

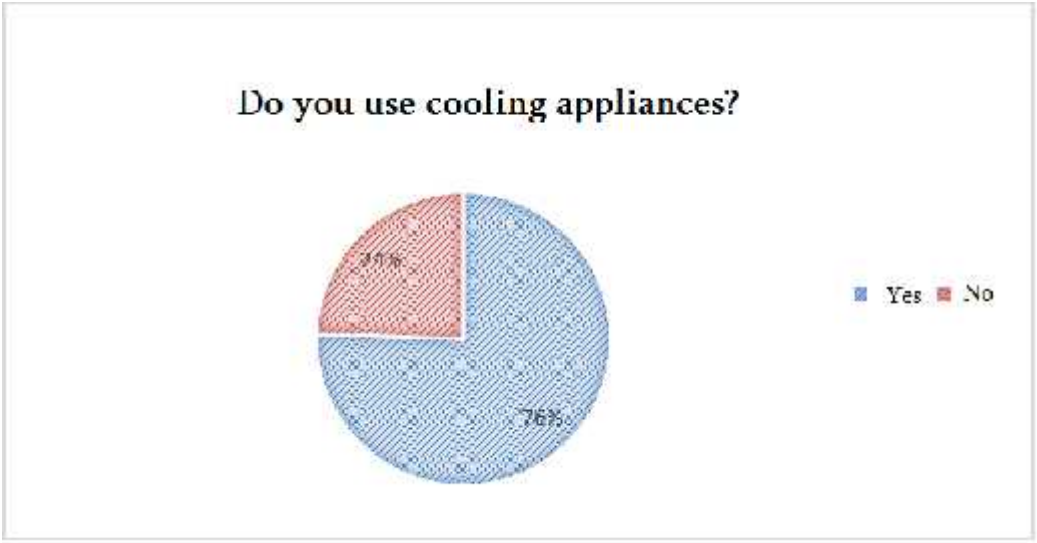


Fig. 15

Technologies used for cooling (Fig. 16) are as follows:

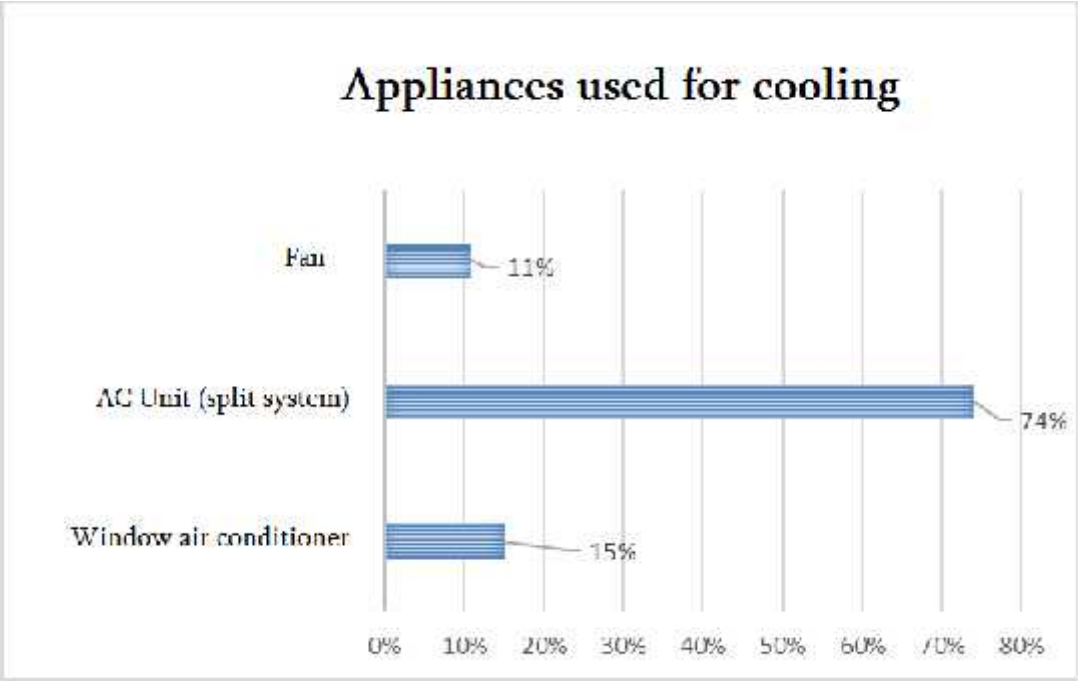


Fig. 16

To the question: How old is your car? (Fig. 17), the following answers were given:

More than 20 years old 24%,

10 to 20 years old 59%, and

17% of the cars are less than 10 years old.

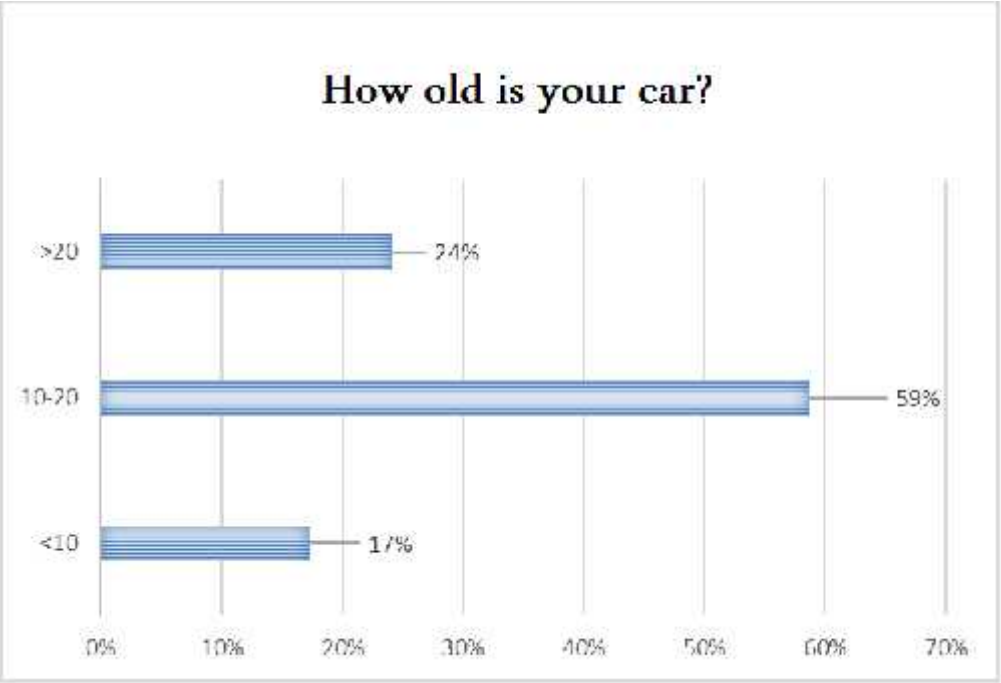


Fig. 17

The purpose of the next question was to determine: a) the kinds of energy-efficient technologies the respondents were familiar with, and b) the kinds of technologies used by the respondents in the past 12 months (Fig. 18).

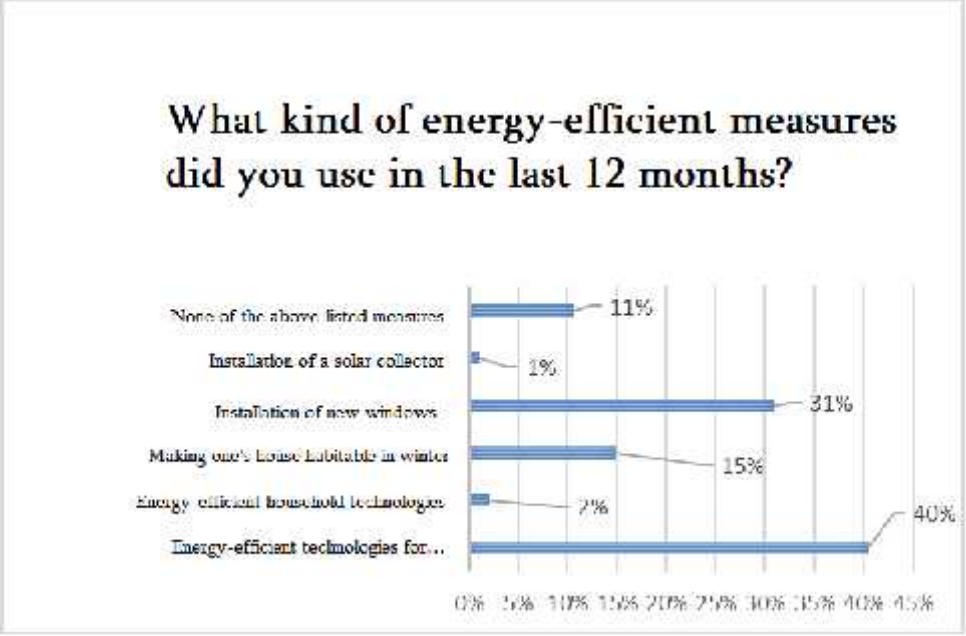


Fig. 18

To the question: How old is your refrigerator? (Fig. 19), the following answers were given:

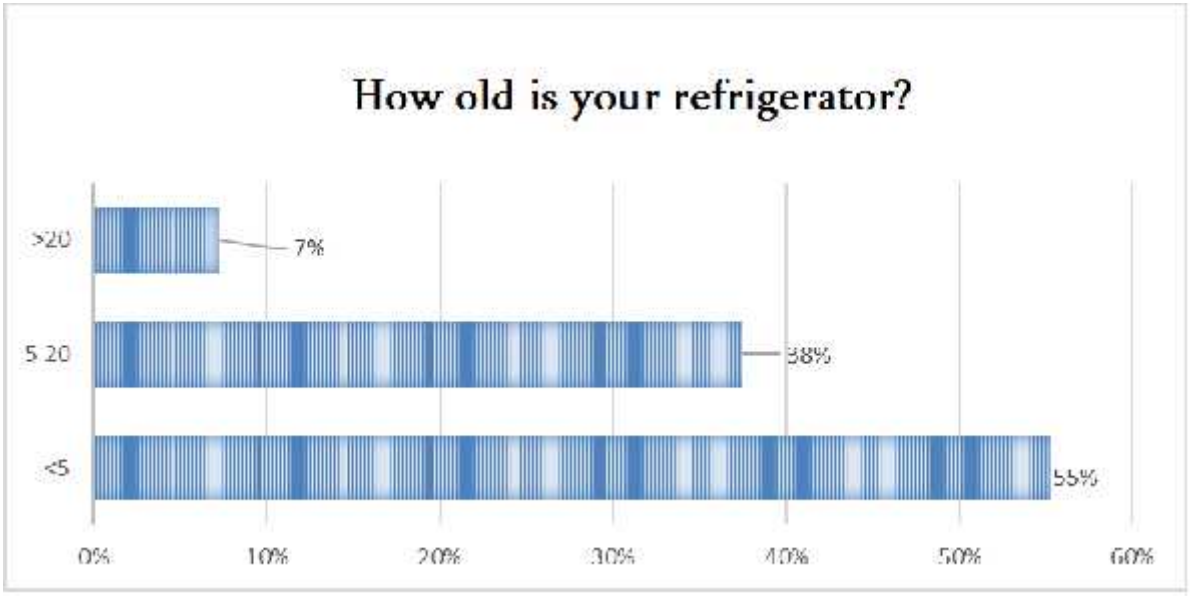


Fig. 19

The next question on the questionnaire was about the age of the washing machine of the respondents (Fig. 20).

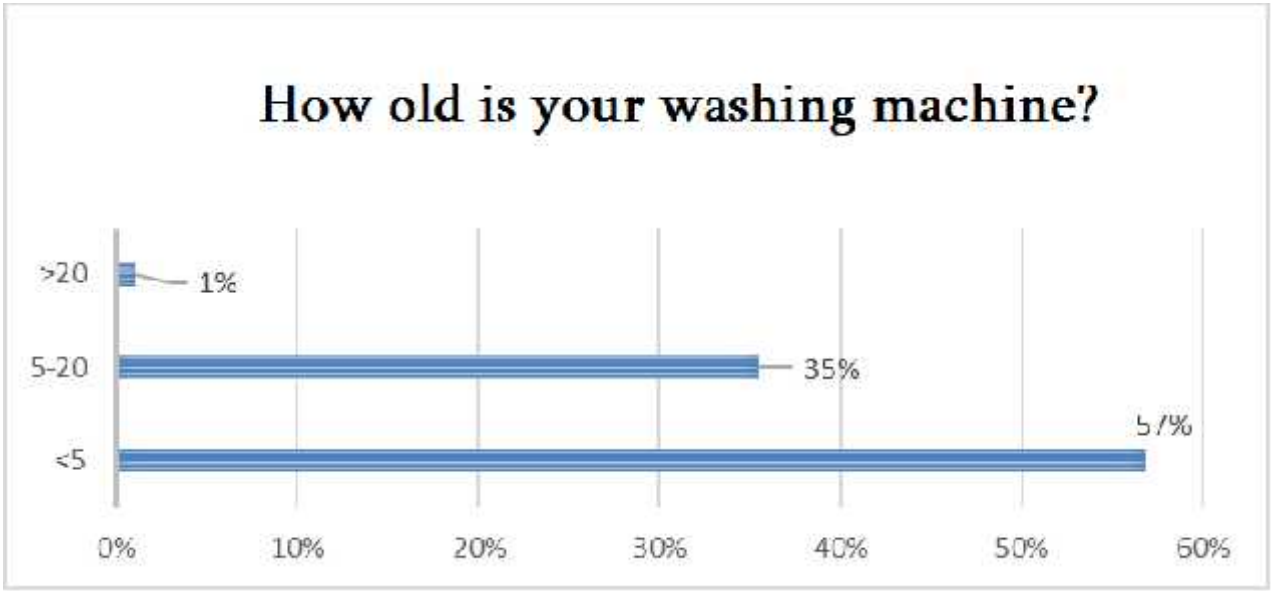


Fig. 20

It can be seen from the graph (Fig. 21) that incandescent lamps are used by 60% of residents for lighting.

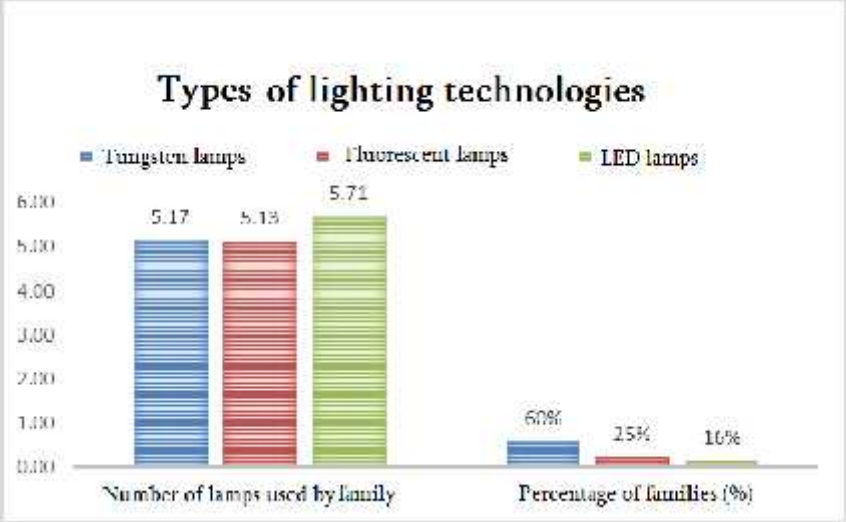


Fig. 21

The next question was about monthly household incomes (Fig. 22):

6% of families have an income of less than 11,000 Russian rubles (data as of May 2018).

49% have an income 1,000 to 33,000 Russian rubles, and

23% of families receive more than 33,000 Russian rubles a month.

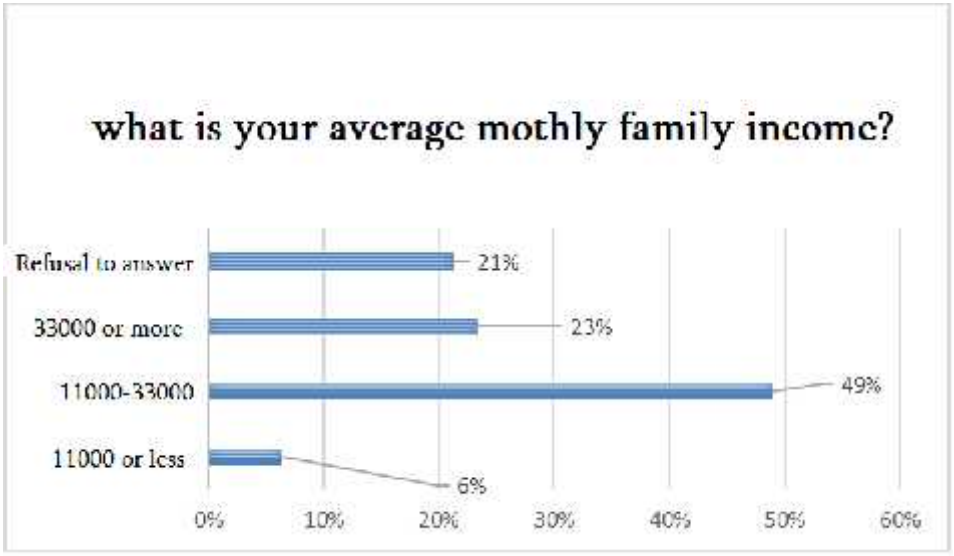


Fig. 22

The information about average monthly income of families can be used for the purposes of comparative analysis, i.e. to see how the low rate effective in Abkhazia affects the electricity consumption. High electricity consumption in Abkhazia is probably caused by this factor. In general, high financial expenses for electricity are the result of high fares and household incomes. The expenses are directly proportional to the physical volume of the consumed electricity, and basically, these three factors and their combinations determine the population's expenditure for electricity.

In any country, high electricity fare and little availability of electricity causes hardship for the part of the population with low incomes using much electricity and forced to pay much at already existing rather high tariff.

However, in Abkhazia, where the fare for local population is very low (0.4 Russian rubles) making approximately $ 0.0063, the electricity payment system and the question of the installation of meters are not regulated. Consequently, the percentage ratio of collection of payments for the consumed electricity is very low (<50%) what, on its turn, leads to an uncontrolled increase in electricity consumption.
If comparing the electricity tariff for the population in Abkhazia and, for example, in Tsalenjikha Region (according to EnergoPro), we will see that the electricity tariff in Tsalenjikha Region of Georgia is almost 11 times higher than the current tariff in Abkhazia. Besides, for example, the electricity tariff for the population in Krasnodar Krai of Russia is 4.48 Russian rubles per kWh, which is 10 times the current tariff in Abkhazia.

To analyze the conformity of the household incomes and electricity tariffs, one can use purchasing power for electricity as an index. Purchasing power shows how much energy (kWh) the households can buy with their average monthly incomes.

Let us compare the purchasing power of electricity of the population: the families (households) in Abkhazia, in Tsalenjikha Region, and for example, in Krasnodar Krai of Russia. Based on such a comparison, we can judge about the access to electricity by average monthly income in the three regions. This characteristic shows how much electricity can be purchased by families (households) with given average monthly incomes in the considered regions. Average monthly income in Krasnodar Krai is approximately 35,000 rubles. A family (household) in Krasnodar Krai can buy 7812.5 kWh of electricity a month.
In 2017, in Georgia (according to Geostat), 46.7% of families (households) have an average monthly income in cash 101 to 400 lari. This was the income of 35.9% of urban residents and of 61.6% of rural residents. 24.3% of families have higher incomes of 401-800 GEL. 26.9% of urban families and 20.8% rural families have such income. Relatively fewer families (13.6%) have a monthly income of 801-1500 GEL, and 5.9% of families receive more than 1,500 GEL a month.

Assuming that the average monthly income of an average household in Tsalenjikha region is 400 GEL, a family (household) can purchase approximately 3076 kWh of electricity a month.

As for Abkhazia, assuming that the average monthly income of a family (household) is 8,000 Russian rubles, at the rate of 0.4 rubles, a family (household) per kWh can buy approximately 20,000 kWh of electricity.

Such an assessment allows judging about the purchasing power of electricity and the volumes of electricity that residents of the regions in question can potentially acquire. This indicator also shows significant and obvious discrepancies between household incomes (in Abkhazia) and electricity tariffs at which the population pays the cost of electricity. Such a discrepancy fails to meet socially oriented tariff policy for the population; moreover, this factor becomes one of the main obstacles to the economic development of Abkhazia making it urgent to make significant adjustments to the electricity tariff.

On the one hand, the use of electricity for heating, hot water supply and for cooking and on the other hand, an unnaturally low tariff, as well as unsolved issue of accounting, lead to very high electricity consumption by the population of Abkhazia. In fact, inefficient electric stoves and hot water electrical installations are main factors resulting in high electricity consumption by the population of the Republic.

If considering a large number of categories of those people enjoying social benefits effective in Abkhazia, the reasons for unnaturally high electricity consumption will become clear.

Electricity Consumption in the Commercial Sector

The participants in the given Project gathered thorough information about the commercial sector of Abkhazia. At the meetings with private owners, a questionnaire was filled out, which covered the general information about buildings and structures (their size, year of construction, etc.), as well as address, contact person and contact information. The questionnaire also incorporated the information about the electricity consumption in past years and current rates of energy.

Specific electricity consumption was determined by the ratio of the total energy consumed to the heated area.

As part of the study, the information regarding the economic situation was also studied. Those who pay the cost of receipts may be interested in investing in energy-saving measures, as it is possible to obtain economic benefits precisely after the implementation of such energy-efficient measures.

The questionnaire provided access to important information: on the reconstruction of the building in the past two years.

The information on the equipment and technical appliances installed in the buildings was gathered. This data well reflects the potential opportunities existing at the facility from the angle of energy conservation. The project participants completed 41 questionnaires for buildings of various purposes, including: 18 hotels, 8 restaurants, 7 stores and 8 other facilities (bakery, gas station, television, advertising agency, etc.). According to the data obtained from hotels and boarding houses, the specific electricity consumption ranges from 17 to 2214 kWh/m^2, while the basic daily expenditure for annual specific electricity consumption is 180 to 153 kWh/m^2 for low-rise buildings and up to 149 kWh/m^2 for high-rise buildings.

The effective electricity tariff for commercial consumers in Abkhazia is the lowest tariff in Europe, if not worldwide, what in the given situation has a significant impact on the financial interests of business owners, who are not motivated to take any energy-efficient measures.

Scanning

At the stage of problem identification and analysis, signs of positive dynamics were observed, since the owners of some objects and companies are much interested in the project of profitable reconstruction in view of introducing energy-saving measures evidencing that the process may be continued. They understand that in the near future, the electricity tariff will be revised and payments for the consumed energy will become obligatory, and consequently, the introduction of energy-efficient technologies will be appropriate.

Inguri HPPs Cascade

Abkhazia consumes electricity generated by Inguri HPPs cascade, providing unrestricted power supply to Abkhazia without any financial payments. At the same time, the operation, maintenance and overhaul, as well as minor and major repairs of the HPP are fully compensated by the consumers of Georgia and the state budget. It can be said that Georgia subsidizes the consumption of electricity by Abkhazia, as mentioned above, including costs, as well as import of electricity.

In accordance with Inguri HPP tariff plan, the cost of electricity supplied to Abkhazia in one year is 36 million Georgian lari. However, if taking into account the growing electricity consumption in winter months

and its replacement with energy generated by thermal power plants and imported energy, the expenses of the Georgian side for Inguri hydroelectric station, as for the peak station, are much higher, while constant rehabilitation work further increases these costs. On their turn, these expenses have an impact on the electricity tariff.

It should be noted that since 2001 to date, important rehabilitation works have been completed at Inguri HPP, with its first phase completed in 2014.

And finally, after many years, Inguri HPP will be able to achieve its installed design capacity. These works needed huge financial expenses. Presumably, it was the invested amounts having significantly changed the initial distribution pattern of assets, which at the initial stage became the basis for the ratio of the distribution of the generated electricity between the Georgian and Abkhaz sides.

Planned Rehabilitation Work of Inguri HPP since 2021

- Rehabilitation of the Derivational Tunnel.
- Cleaning the reservoir from sludge.
- Reconstruction of the seal of the gates of the deep spillway of the arch dam.
- Installation of new F5m disk valves (5pcs) in turbine pipelines.
- Replacement of electrical appliance 500/220/100.
- Rehabilitation of gates and their lifting devices on the dam for water transfer from old Inguri riverbed to Gali reservoir.
- Stabilization of the landslide section of the right bank of the offshore channel of SGPP-1 (Steam Gas Power Plant 1).
- Rehabilitation of locks and lifting mechanisms of SGPP-2.
- Rehabilitation of access tunnels to the engine room and pressure derivation.
- Road rehabilitation (24 km).
- Rehabilitation of the power network of the dam.

The budget for rehabilitation work is 35.450 million Euros.

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View of the problem by the Abkhaz side:

"It should be noted that Inguri HPP is operated in the post-conflict reality, in terms of unsettled relations between Abkhazia and Georgia. The absence of an agreement regarding the jurisdiction over the station and its balance sheet attribution between the parties allows different interpretations, which to a certain extent, contributes to the incident with Inguri HPP for more than a quarter of a century. The Georgian side almost completely covers all expenses for the maintenance and reconstruction of the Plant. The station control modules are located in Abkhazia. However, the Abkhaz side does not take any substantial material share in the maintenance and reconstruction of the Plant. Abkhazian power engineering specialists provide any official comments regarding this issue extremely rarely. Moreover, the population has no understanding of the real state of affairs and challenges in the energy sector. With such state of affairs, it is extremely important to provide outreach regarding the rational consumption of electricity."

View of the problem by the Georgian side:

"As the Abkhaz side notes correctly, "The Georgian side almost completely covers all expenses for the maintenance and reconstruction of the Plant." For many years now, the electricity needed by Abkhazia has been consumed in much greater volumes than stipulated by the agreement between the Georgian and Abkhaz parties (60:40 % shares in the generation of Inguri HPPs cascade, respectively). This was repeatedly mentioned both, in the scientific papers and during numerous speeches for the past three years. Such an explanation does not change the fact that Inguri HPP is still the only hydroelectric power station in the world not receiving almost 50% of the cost of generated electricity, the reason for which is the non-payment for the electricity consumed by the Abkhaz side generated by Inguri HPPs cascade. Overall, the dialogue is assessed as a positive and promising format for subsequent discussions of topical issues of the energy sector of Abkhazia, including other issues raised regarding Inguri HPPs cascade."