

# Heating Resources

## Market Research

***Kakheti***  
*On Regional, Municipal and Basin Levels*



## Table of contents

I. Introduction .....	3
II. Research Objectives .....	4
III. Methodology and Order of Activities.....	4
IV. Duration of Usage of Heating Resources.....	5
V. Number of Households using Heating Resources.....	6
VI. Classification of Users of Heating Resources per Energy Source (firewood, natural gas, electricity, other sources .....	7
VII. Categorisation of Wintering Households based on Sociological Research .....	9
VIII. Categorisation of Wintering Households based on Statistical Data Analysis of the Usage of Natural Gas.....	9
IX. Average Volume of Necessary Firewood Material per Household .....	11
X. Total Volume of Consumed Firewood Materials .....	12
XI. Categories of Manufactured Firewood Materials Necessary for Households.....	13
XII. Generation of Firewood Material and the Supply-Demand Balance .....	14
XIII. Deficit of Heating Resources in terms of the Analysis of the Supply-Demand Balance and Potential.....	15

### Definition of Abbreviations

ADC – Austrian Development Cooperation

CENN/IUCN – International Union of Conservation of Nature

NEAP III – Georgia’s Third National Programme for Environmental Protection

Research was conducted by CENN, within the framework of the project – „Sustainable Forest Management for Rural Development”, with the financial support of the Austrian Development Cooperation (ADC).

In 2019-2021 Georgia developed ambitious plans for the development of renewable energy and energy-efficient technologies, which has already been reflected in Georgian law, National Guideline Documentation and Programmes. Implementation of changes and innovative reforms in the field of energy, environmental protection and natural resource management requires detailed analysis of the situation on both national as well as local levels.

The goal of the document is to provide basic data for central and local governments to be able to make decisions that are based on research.

The market for heating resources and the supply-demand balance was assessed on regional, municipal and basin levels.

## I. Introduction

Despite the accelerated process of inclusion of households into the national natural gas network, the majority of rural population still uses firewood for heating purposes. Heating resources of vital significance are provided to households via the so called ‘social felling’, based on one-off permission forms issued by the National Forest Agency.

The existing system supplying the population with heating resources will be significantly modified from January of 2023, with the entry into force of the new Forestry Code, regarding the prohibition of social felling. Consequently, firewood will no longer be available for rural residents to fell inside forests, having to purchase it from Forestry Farms. This circumstance increases the responsibility of the Ministry of Environmental Protection and Agriculture of Georgia, as well as the National Forest Agency to supply the population with sustainable volumes of firewood. Additionally, the responsibility of the Ministry of Economy and Sustainable Development of Georgia and local government also increases in terms of the development of alternative, available energy sources, as well as energy-efficient technologies. Quick and synchronised development of said processes is of particular relevance in times of deficit of heating resources. According to GeoStat, in 2020 the volume of consumed firewood amounted to 1.2 million m<sup>3</sup>.<sup>1</sup> According to the 2020 annual report of the National Forest Agency, the volume of firewood sold using the aforementioned permission forms amounted to 306.000 m<sup>3</sup>.<sup>2</sup> According to official statistics, deficit, thus, amounts to 75% of the market, which can only be overcome via the means of coordinated inter-agency cooperation.

Due to the prolonged period of active and unregulated felling, the supply of firewood in the areas, where forestry infrastructure was set up by the 1980s, has almost run out. Furthermore, forested areas keep retreating up the mountain streams further and further away from populated settlements. Complete degradation of forest ecosystems along the full breadth of river basins may, thus, result in irreversible ecological catastrophes, with the state having to face an energy crisis, due to the lack of availability of traditional heating resources.

Said circumstance has only been paid the appropriate amount of attention, after the assessment of the supply-demand balance and potential of heating resources conducted by the National Forest Agency and the CENN/IUCN, with the financial support of ADC. As elucidated by the outcome of the research, “only 600 000 m<sup>3</sup> of firewood materials are officially allocated to users in Georgia, with the real annual consumption amounting to over 2.4 million m<sup>3</sup>.”<sup>3</sup>

1. საქართველოს ენერჯეტიკული ბალანსი, 2020 – საქართველოს სტატისტიკის ეროვნული სამსახური ([geostat.ge](http://geostat.ge));  
6. Biofuel-and-Waste\_GEO.xlsx ([live.com](http://live.com))

2. ანგარიშები/ეროვნული სატყეო სააგენტო ([forestry.gov.ge](http://forestry.gov.ge))

3. კვლევა – სათბობი შეშის მოთხოვნა-მიწოდებისა და პოტენციალის შეფასება – Caucasus Environmental Knowledge Portal ([cenn.org](http://cenn.org))

As a result, the NEAP III determined the necessity to prepare a national programme for ensuring the supply of heating resources for the population, which will remain relevant even after the entry into force of the new Forestry Code. The formulation of specific plans both on the national, as well as local levels, is vital in terms of the substitution of illegally obtained large amounts of firewood material with ecologically sustainable, widely available heating resources. Taking into consideration that according to existing research the demand for firewood exceeds several times the sustainable supply of forest materials, it is necessary to plan complex actions, both in terms of sectoral (agriculture and forestry, energy, economy, social and educational aspects), as well as regional efforts.

The initiation of the €35 million grant project – “Supporting Forest Sector Reform in Georgia to Reduce Greenhouse Gas Emissions Due to Forest Degradation”, should be viewed as a supporting factor in terms of the implementation of the tasks outlined by the Forestry Code and the NEAP III. The initiative entails conducting events supporting the development of sustainable management and energy efficiency of Forests across 8 target municipalities, 4 of which are located in Kakheti.

International and national efforts will be effective in terms of conducting an in-depth analysis of the local context. This research paper provides a look at a wider picture necessary for the formulation of short-term, mid-term and long-term plans for supplying the population with heating resources, both in the Kakheti region, as well as in other target municipalities and individual settlements determined according to river basins.

## II. Research Objectives

The objectives of the research are as follows:

1. Determining the supply-demand balance for heating resources on three different levels:
  - Regional (Kakheti overall);
  - Municipal (Akhmeta and Gurjaani municipalities);
  - Basin (river Kisiskhevi basin, river Turdo-Kisiskhevi Basin and the river Alazani Chala basin)
2. Determining the potential of firewood supply as per Georgian law (According to the data for forest inventory) – demonstrated on the case of the Akhmeta municipality.
3. Determining the capabilities of supplying the population with legal and sustainable firewood materials according to regions, target municipalities and river basins.
4. Initiating dialogue in order to prepare recommendations – in terms of the energy sector, sustainable management of forests and natural resources, management and mitigation of natural disasters, as well as municipal and regional development.

## III. Methodology and Order of Activity

The research is based on the assessment methodology of the supply-demand balance and potential (2016, CENN/IUCN-ADC), which was conducted in participation with experts, relevant stakeholders and appropriate institutions. Meetings were held on both interagency and intra-agency (National Forest Agency, the Ministry of Environmental Protection and Agriculture of Georgia) levels in order to formulate the necessary methodology.

3 alternative methods were also developed, selecting the most suitable one for further processing and formulating several variants. The published hypotheses were based on the positive-scenario principle. In terms of methods and variants, as well as the potential margins, error preference was given to the supposition of lower probability of use of firewood (for detailed information regarding the methodology and hypotheses view annex 1).

In order to determine the existing demand for firewood the following research stages were outlined:  
Determining the duration of usage of heating resources throughout the year;

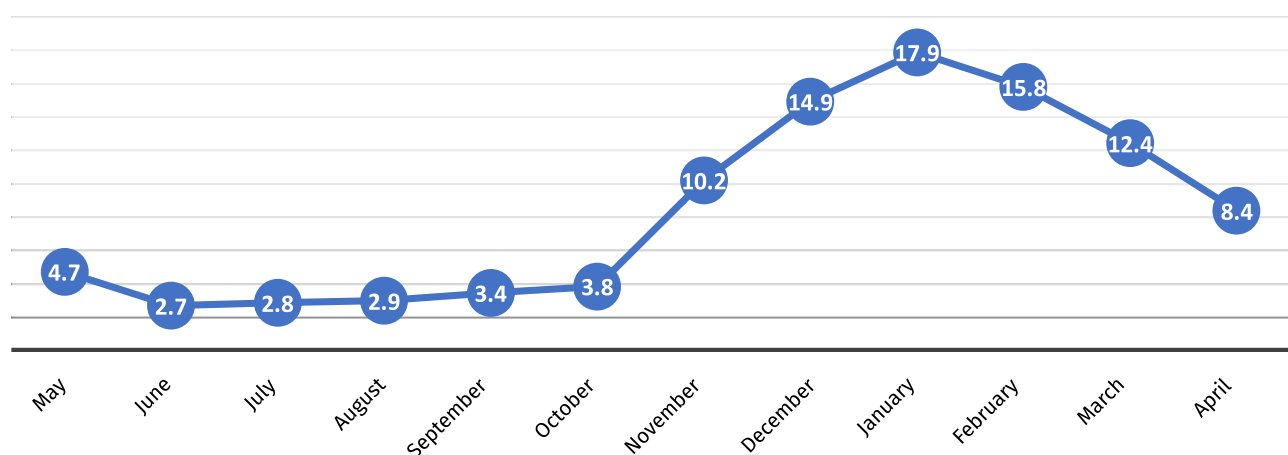
- Determining the number of households using heating resources;
- Categorising users of heating resources according to the main source of energy (firewood, natural gas, electricity or other resources);
- Determining the overall volume of consumption of firewood materials;
- Determining the origins of firewood materials;
- Determining the potential of firewood gathering;
- Analysis of the supply-demand balance and potential;
- Analysis of research outcomes on regional, municipal and river basin levels;
- Determining the potential of the volume of firewood materials necessary for annual gathering;
- Preparing sectoral and regional recommendations;
- In order to determine and re-examine the outcomes of the hypothesis and suppositions necessary for relevant calculations, in cooperation with DEPA Consulting, additional sociological survey was conducted in the Kakheti region – “Sociological Study of Consumption of Firewood and other Energy Resources in the Region of Kakheti” (view annex 1). Within the framework of said study existing practices in the Kakheti region were assessed in terms of the following aspects:
  - Redistribution of heating systems and heating resources;
  - Volume of annually consumed firewood;
  - Firewood production practices;
  - Periods of manufacture, purchasing and use of heating resources;
  - Dynamics of changes in the usage of heating systems and heating resources.

## IV. Duration of Usage of Heating Resources

The duration of usage of heating resources for domestic purposes has been determined to be 6 months a year.

The analysis of statistical data regarding annual consumption of natural gas illustrates that consumption rates start to spike from October to November, rapidly falling in April-May. In total the population of the region annually consumes just under 62.5 million m<sup>3</sup> of natural gas. The diagram below depicts monthly percentages of overall annual consumption:

**DIAGRAM IV.1. DYNAMICS OF NATURAL GAS USAGE IN THE REGION**



Said circumstance is practically also confirmed by the sociological study, which shows that the shortest period of use of heating resources amounted to 5.7 months, with the longest period amounting to 6.4 months:

**TABLE IV.1. DURATION OF USE OF HEATING RESOURCES PER MUNICIPALITY**

Municipality	Duration of use of heating resources (months)
Akhmeta	6.3
Gurjaani	6.0
Dedoplistskaro	6.4
Telavi	6.0
Lagodekhi	5.8
Sagarejo	6.3
Sighnaghi	5.7
Kvareli	6.1

Taking into consideration the aforementioned data, the active duration of the heating period has been determined to be 6 months on average, with subsequent calculations based on said number.

## V. Number of Households Using Heating Resources

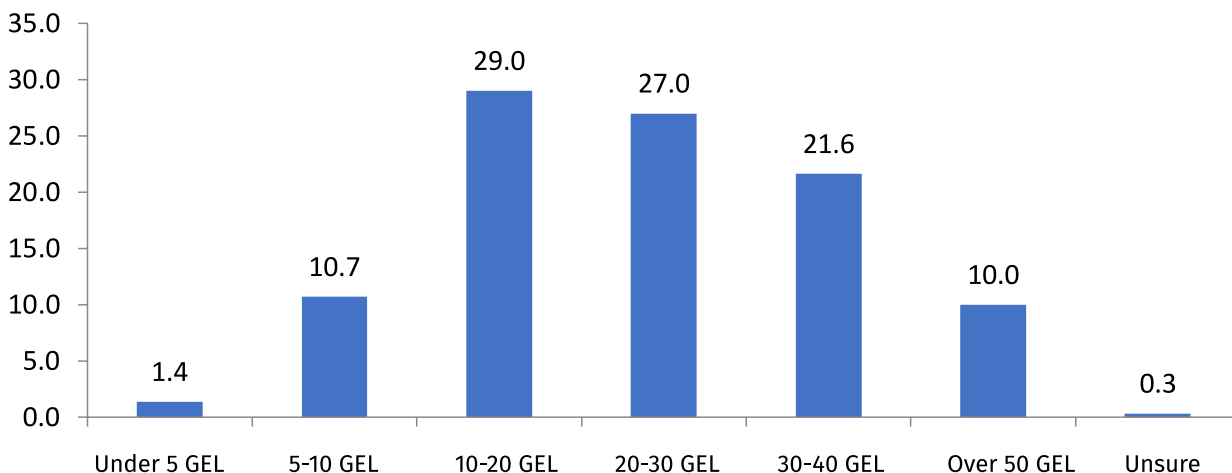
The number of wintering households was determined based on the information received from the electricity distribution company, via the means of processing statistical data concerning electricity consumption.

According to the national census conducted in 2014, population of Kakheti amounted to 318.242 people, distributed across 98.975 private households. Despite the reliability of these statistics, 7 years later the picture has changed. Migration to urban areas during winter is commonplace for a large proportion of the population of the region, which, naturally, affects the outcomes of the study.

It is, therefore, precisely why the working group formulated a special methodological approach, which determined the overall number of individuals (families/households) using the statistical data available regarding electricity consumption, as mentioned above.

According to the aforementioned approach, any household, consuming more than €5 worth of electricity monthly in the period from November to May, was considered a wintering household. This supposition was also founded upon the results of the sociological study, which showed that more than 98% of the population consumed higher quantities (above €5 worth) of electricity.

**DIAGRAM V.1. AVERAGE ELECTRICITY BILLS LAST WINTER (GEL)**



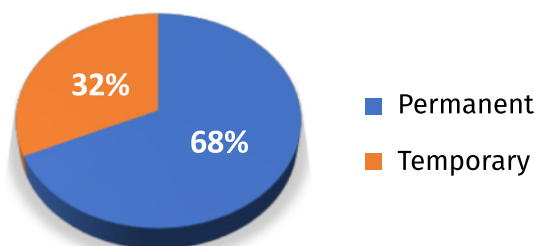
The number of wintering households was determined according to the region, target municipality and river basins.

After processing information provided by the electricity distribution company it became evident that from the 135.000 registered households in the Kakheti region, only 132.000 are active, with only about 90.000 households wintering in the region.

The rest of the 42.000 households registered in Kakheti do not regularly consume electricity during the winter, consuming less than €5 worth of electricity. Due to the fact that 32% of the registered population does not winter in the region, the 240.000 m<sup>3</sup> of firewood and equivalent materials necessary for the theoretical heating of said households is annulled completely in the data.

## VI. Classification of Users of Heating Resources per Energy Source (firewood, natural gas, electricity, other sources)

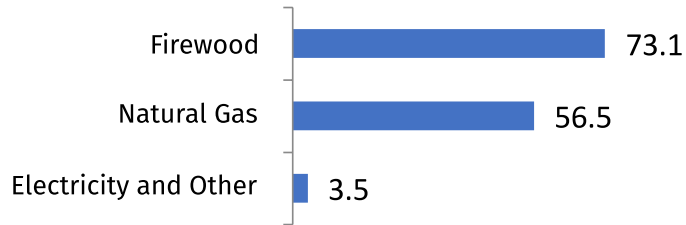
**DIAGRAM V.2. SHARE OF SEASONAL AND WINTERING HOUSEHOLDS IN THE REGION**



The classification of the consumers of heating resources was conducted based upon the main sources of heating, displaying three categories as a result, which are as follows: households that (1) only consume firewood, (2) only consume natural gas, and (3) consume both firewood and natural gas.

According to the result of the sociological study, the most widely consumed source of heating in the Kakheti region is firewood, which is consumed by 73% of the population, with the main alternative being natural gas at 56%. (view diagram VI.1).

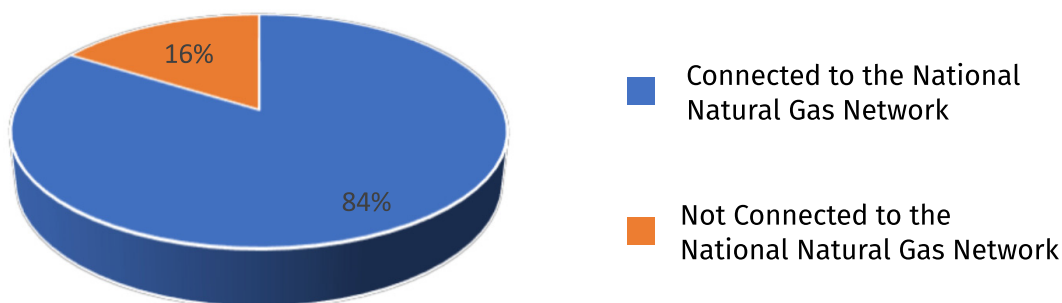
**DIAGRAM VI.1. SHARE OF HEATING RESOURCES PER REGION**



The data concerning the consumption of natural gas was processed in terms of a specific spectrum of pricing, where employed suppositions are based on the positive-scenario principle, giving preference to the probability of less consumption of firewood in terms of the potential margins of error.

Kakheti has rather high rates of connectivity of households to the national natural gas network, with 111.000 households out of the 133.000 registered having access to said service, thus, providing 84% of the local population with the alternative to firewood for heating purposes.

**DIAGRAM VI.2. PERCENTAGE OF HOUSEHOLDS CONNECTED TO THE NATIONAL NATURAL GAS NETWORK**



In order to determine the number of heating resources consumed per type of resource in the region, 4 main categories were preconceived:

1. Households using only firewood;
2. Households using both firewood, as well as natural gas;
3. Households using only natural gas;
4. Households using other sources of heating;

Said categories of households were determined according to two methods, including the Statistical Data Analysis method (view annex 2); the rest are:

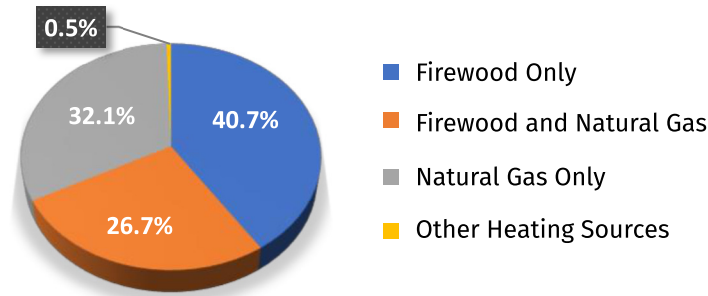
1. Categorisation of wintering households according to the percentage of use of various heating resources, based on a sociological survey;
2. Categorisation of wintering households according to the analysis of the statistical data on the consumption of natural gas.



## VII. Categorisation of Wintering Households based on Sociological Research

The survey has determined that in the target region: 40.7% of households use firewood only, 26.7% use both firewood and natural gas, 32.1% use natural gas only, with a mere 0.5% consuming other forms of heating resources;

**DIAGRAM VII.1. PERCENTAGE OF VARIOUS HEATING RESOURCES USED BY HOUSEHOLDS**



**TABLE VII.1. CATEGORIES OF USED HEATING RESOURCES**

Categories of used heating resources	Number of households
Only firewood	36,649
Both firewood and natural gas	24,044
Only natural gas	28,946
Other	467
<b>Total</b>	<b>90,105</b>

## VIII. Categorisation of Wintering Households based on Statistical Data Analysis of the Usage of Natural Gas

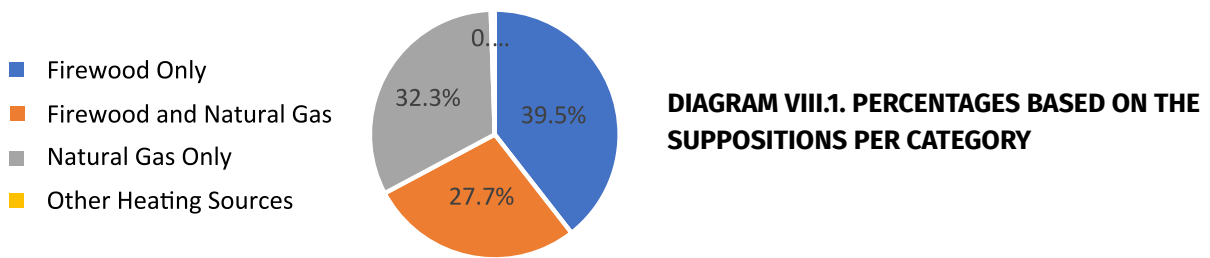
The aforementioned method of statistical analysis entails the categorisation and quantification of wintering households according to the spectrum of natural gas consumption as per expert supposition. Namely, the lower and upper margins for the cost of natural gas were determined to be ₺17 and ₺60 respectively.

The lower margin was determined according to the outcomes of the sociological study. Namely, for households connected to the national natural gas network, that exclusively consume firewood for heating purposes with monthly natural gas expenditures amounted to less than ₺17. According to this supposition, households spending ₺17-60 a month on natural gas expenses were categorised as households that consume both firewood, as well as natural gas for heating purposes.

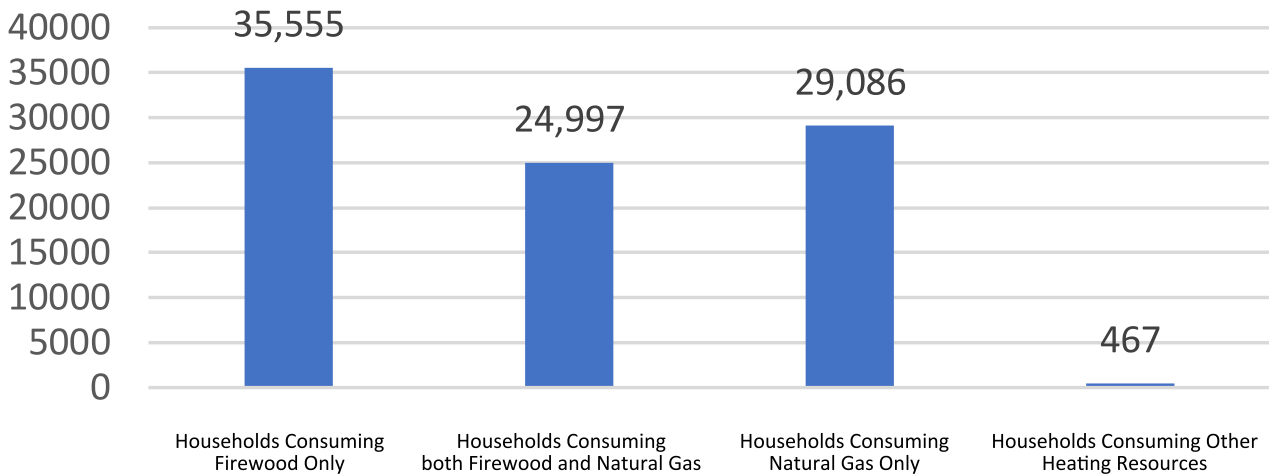
Despite the fact that the results of the sociological study showed that the average natural gas bill for households using both firewood and natural gas amounted to ₺109.5, for practical and theoretical reasons it was assumed possible to keep a household heated for ₺60 a month. In practice it is enough to heat

a household for said price, if the heating period amounts to no more than 7 hours a day, with the stove consuming – 0,5 m<sup>3</sup>/h (the recommended volume of natural gas consumption for the purposes of heating an area of 50 m<sup>2</sup> is set to 0,59 m<sup>3</sup>/h). Therefore, all households exceeding said monthly parameters were categorised as households that exclusively consume natural gas for heating purposes.

The difference between the number of overall wintering households and the number of households that fall into aforementioned categories was placed in the category of households that exclusively consume firewood.



**DIAGRAM VIII.2. QUANTITIES BASED ON THE SUPPOSITIONS PER CATEGORY**



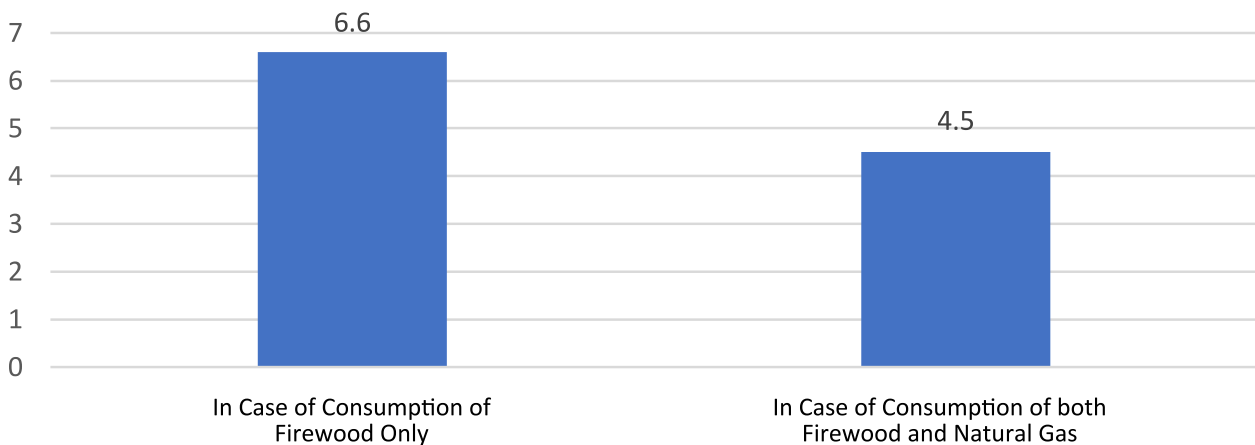
Indicators of various points of the aforementioned spectrum are in accordance with the results of the survey conducted, confirming the accuracy of the analysis of natural gas consumption.

The statistical database of natural gas consumption was processed using various, additional spectrum variations of suppositions, which, in turn, further elucidated the quality and reliability of the results of the study (view annex.2).

## IX. Average Volume of Necessary Firewood Material per Household

Said stage of the study entails the calculation of the average annual consumption of firewood per category of users of various types of heating resources. The previous stage of the study found that there are 2 main categories of firewood consumers in the region: (1) households that only use firewood, and (2) households that use both firewood as well as natural gas. The average volume of necessary firewood materials for a single household was determined via the means of conducting a sociological study.

**DIAGRAM IX.1. AVERAGE INDICATOR OF CONSUMED FIREWOOD DURING THE SEASON**



According to the results of the study, a single household using only firewood consumes on an average 6.6 m<sup>3</sup> of firewood materials over the wintering period, with households using both firewood and natural gas consuming an average of 4.5 m<sup>3</sup> over the same period. According to statute N221 of the Government of Georgia, issued on May 18th of 2021, a single household is entitled to the maximum of 7 m<sup>3</sup> of firewood over the wintering season in the lowlands and 15 m<sup>3</sup> for mountainous regions.

## X. Total Volume of Consumed Firewood Materials

The volume of annual consumption of firewood in the region was determined by multiplying the average volume of necessary firewood for the heating of a single household over the wintering period by the number of households in said region. The total annual consumption of firewood was determined via the means of both of the aforementioned methods:

**TABLE X.1. METHOD 1 (SOCIOLOGICAL):**

Type of Consumed Heating Resource	%	Number of Households	Necessary Volume of Firewood for a Single Household (m <sup>3</sup> )	Volume of Necessary Firewood Material (m <sup>3</sup> )
Households Consuming Only Firewood	40.7	36,649	6.6	241,883
Households Consuming both Firewood and Natural Gas	26.7	24,044	4.5	108,196
Households Consuming Only Natural Gas	32.1	28,946	0	0
Households Consuming Other Types of Heating Resources	0.5	467	0	0
<b>Total Number of Wintering Households</b>	<b>100</b>	<b>90,105</b>		<b>350,079</b>

**TABLE X.2. METHOD 2 (STATISTICAL):**

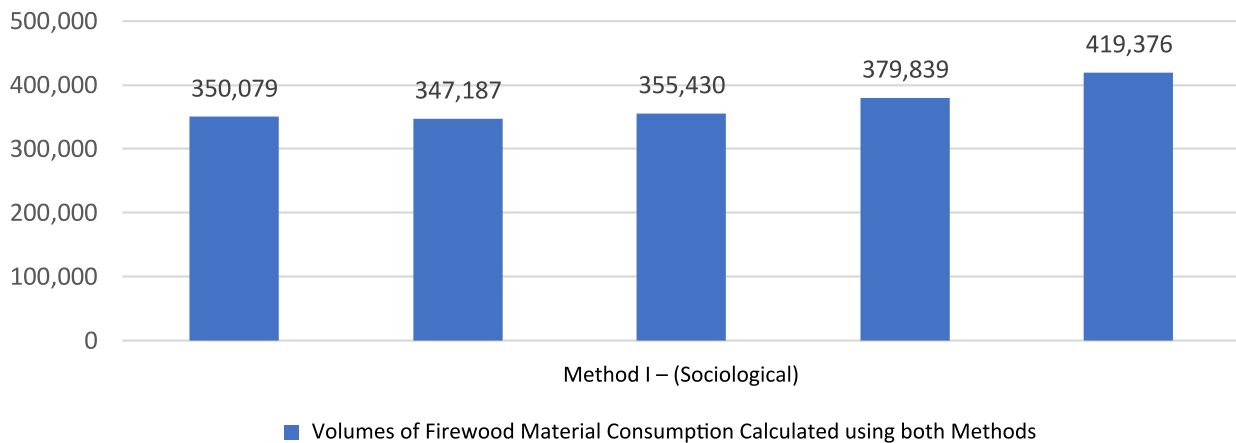
The following table provides a comparison of the relevant outcomes of the various types of suppositions.

Type of Consumed Heating Resource	Number of Households	Necessary Volume of Firewood for a Single Household (m <sup>3</sup> )	Volume of Necessary Firewood Material (m <sup>3</sup> )
Households Consuming Only Firewood	35,566	6.6	234,736
Households Consuming both Firewood and Natural Gas	24,989	4.5	112,451
Households Consuming Only Natural Gas	29,083	0	0
Households Consuming Other Types of Heating Resources	467	0	0
<b>Total Number of Wintering Households</b>	<b>90,105</b>		<b>347,187</b>

**TABLE X.3. RELEVANT RESULTS OF VARIOUS TYPES OF SUPPOSITIONS**

Category of Firewood Consuming Households	Method 1 (Sociological)	Method 2 (Statistical)			
		17-60	30-50	17-80	17-110
Firewood Volume (m <sup>3</sup> )					
Households Consuming Only Firewood	241,883	234,736	314,372	234,736	234,736
Households Consuming both Firewood and Natural Gas	108,196	112,451	41,058	145,103	184,640
<b>Total</b>	<b>350,079</b>	<b>347,187</b>	<b>355,430</b>	<b>379,839</b>	<b>419,376</b>

**DIAGRAM X.1. ANNUAL CONSUMPTION VOLUMES OF FIREWOOD FOR BOTH METHODS**

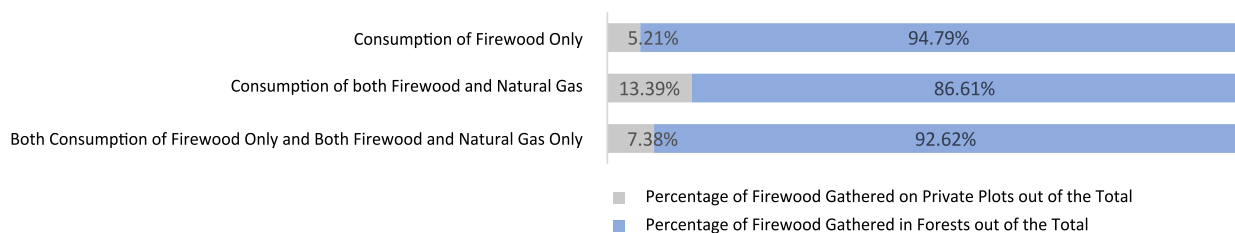


## XI. Categories of Manufactured Firewood Materials Necessary for Households

The categories of origins of necessary firewood for households were determined based on the report of the sociological study, which determined the share of firewood materials used by the population for heating purposes over the wintering season that was broken down per the source of origin. There are two main sources of firewood in the region: the national forest fund territories and privately owned, agricultural land-plots. Therefore, the origins of firewood materials were split into two categories: (1) firewood material received from the national forest fund, and (2) firewood material (including left-over materials) gathered from privately owned agricultural land-plots and its surrounding areas.

According to the sociological survey, annually around 93% of necessary firewood materials are received from the national forest fund, with the private agricultural land-plots filling in the rest.

**DIAGRAM X.1. ANNUAL CONSUMPTION VOLUMES OF FIREWOOD FOR BOTH METHODS**

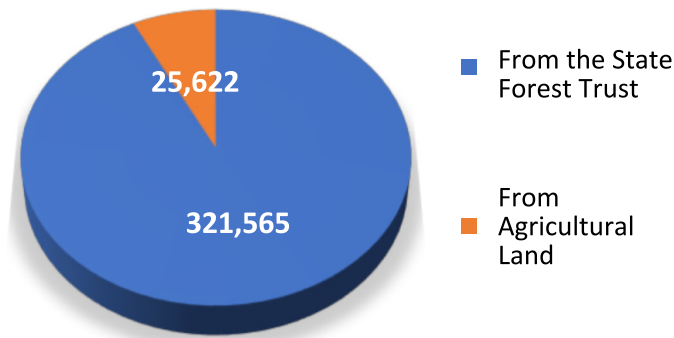


The study has shown the origin of annually consumed firewood material by categories distributed across municipalities.

## XII. Generation of Firewood Material and the Supply-Demand Balance

According to the data provided by the national forest fund (letter N1580-11-2-202104081147) the institution has distributed 85.000 m<sup>3</sup> worth of firewood material in 2019, - 63.000 m<sup>3</sup> in 2020, with 82.000 m<sup>3</sup> and 58 000 m<sup>3</sup> consumed respectively. Therefore, in 13.000 households were provided with firewood in 2019, with the institution covering firewood provisions for 9.500 households in 2020.

**DIAGRAM XI.2. CONSUMED FIREWOOD MATERIAL CATEGORISED BY ORIGIN**



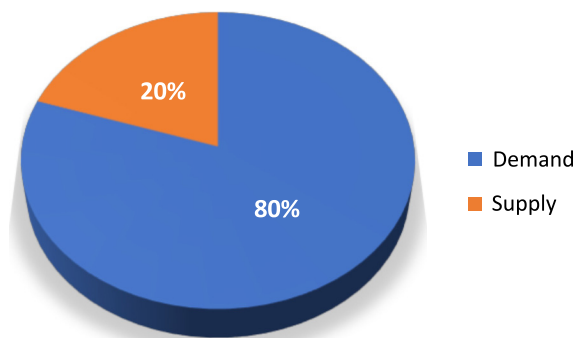
**TABLE XII.1. DISTRIBUTION OF FIREWOOD MATERIALS BY THE NATIONAL FOREST AGENCY**

Year	Volume of Consumed Forest (m <sup>3</sup> )	Number of Satiated Households
2019	81,599	13,174
2020	58,054	9,530

The share of the protected territories agency and licensed felling companies of specialised labour only amount to 4% on the market of sources of firewood. According to said data, the average volume of firewood distributed by the national forest agency per households amounted to 6.1 m. In 2019, the analysis of the supply-demand balance in 2019 showed that only 21% of the volume of consumed firewood materials was obtained legally, with the origins of the other 79% unknown. This data-set did not include the firewood materials gathered by the population on privately owned agricultural land-plots (8%)

**TABLE XII.2. EXISTING INDICATORS FOR SUPPLY AND DEMAND ON FIREWOOD MATERIALS**

Demand	Number of Satiated Households
321,565 m <sup>3</sup>	81,599



According to the data provided by the national forest fund (letter N1580-11-2-202104081147) the institution has distributed 85.000 m<sup>3</sup> worth of firewood material in 2019, - 63.000 m<sup>3</sup> in 2020, with 82.000 m<sup>3</sup> and 58 000 m<sup>3</sup> consumed respectively. Therefore, in 13.000 households were provided with firewood in 2019, with the institution covering firewood provisions for 9.500 households in 2020.

**DIAGRAM XII.1. SUPPLY-DEMAND FOR FIREWOOD MATERIALS IN 2019**

### XIII. Deficit of Heating Resources in terms of the Analysis of the Supply-Demand Balance and the Potential

One of the most key goals of this research is to determine the relation between the scales of supply and demand of the national forest fund in terms of firewood provisions provided for the population. The extraction of timber, a renewable resource from nature has to be conducted within the framework of the principle of sustainability and by pre-analysing the optimal volumes of felling, in order to keep the ecological balance in its best state, simultaneous to constant felling. This is precisely why it is of utmost significance to conduct any such activity within the frames of a preconceived action plan. Currently, there are no such plans in place, which, in turn, escalates the degradation of the ecological balance, as well as any prognostications.

The forest agency has not provided us with the specific foundations upon which they stand when operating (distributing firewood to the population). Additionally, no information was provided regarding the latest data on the stored supply of firewood material required on annual basis. Due to the absence of the aforementioned significant data, it is impossible to draw expert conclusion, or make recommendations for the improvement of the ecological balance in the region. Nevertheless, according to the findings of our study, demand for firewood seems to be rather high, exceeding the volume of said material provided by the above-mentioned state institutions, along with even the volume available in the allocated forest areas. The situation on the ground does not provide basis for optimistic conclusions.

Due to the aforementioned factors, in terms of the assessment of the supply-demand balance (thus, clearly describing the existing situation on the ground), we break down below the analysis of the data provided to us by the national forest agency and other institutions concerning the allocation of above-mentioned forested areas to the local population in the region.

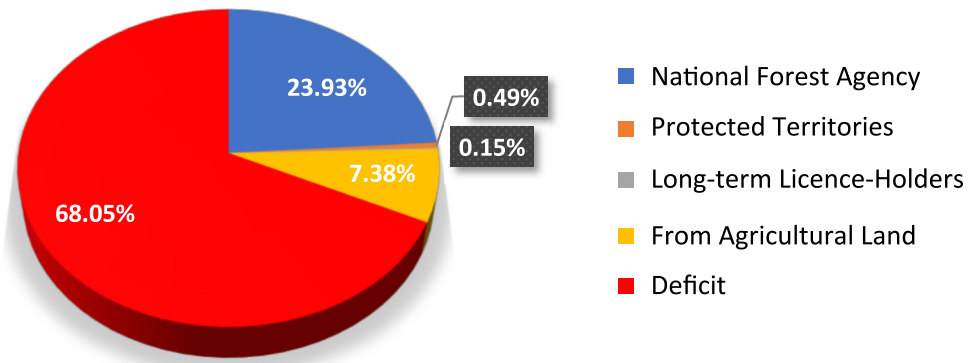
According to the information received from the national forest agency, in order to supply the population with the necessary volumes of firewood, 81.500 m<sup>3</sup> of firewood materials were distributed in 2019, with 5 000 m<sup>3</sup> used for non-heating purposes (letter N3014-11-2-202107061057). Assuming the possibility to reuse 30% of the aforementioned volume, 1.500 m<sup>3</sup> could be redistributed. Ergo, the national forest agency must have distributed a total of around 83.000 m<sup>3</sup> of firewood and firewood material.

Source	Volumes Issued (m <sup>3</sup> )
National Forest Agency	83,099
Protected Territories' Agency	1,698
Long-term Licence Owners	514
From Agricultural Lands	25,622
<b>Total</b>	<b>347,187</b>
<b>Deficit</b>	<b>236,254</b>

The protected territories agency distributed only 1.700 m<sup>3</sup> of firewood and firewood materials in the same year. Companies operating under special licences for firewood distribution provided the population with 500 m<sup>3</sup>.

**TABLE XIII.1. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**

**DIAGRAM XIII.1. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**



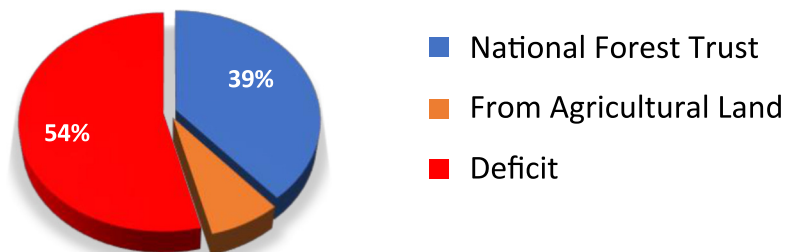
## Supply-Demand Balance on the Municipal and Basin Levels *(view detailed reports in the annex)*

### Akhmeta

**TABLE XIII.2. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**

Source	Volume (m <sup>3</sup> )
National Forest fund	17,000
From Agricultural Lands	3,242
Demand	Deficit
43,925	23,683

**DIAGRAM XIII.2. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**



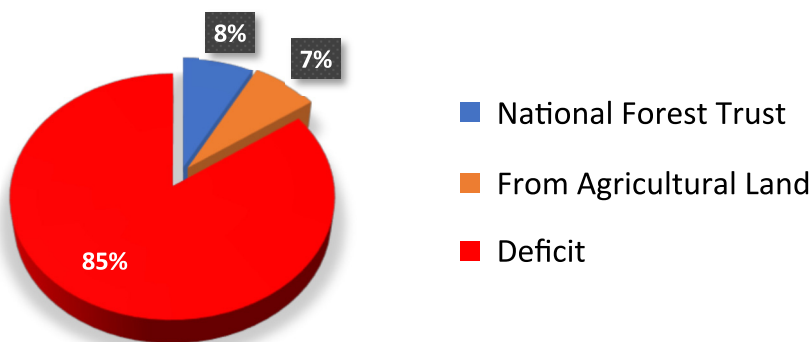


**Gurjaani**

**TABLE XIII.3. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**

Source	Volume (m <sup>3</sup> )
National Forest fund	4,000
From Agricultural Lands	3,793
Demand	Deficit
51,389	43,596

**DIAGRAM XIII.3. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**

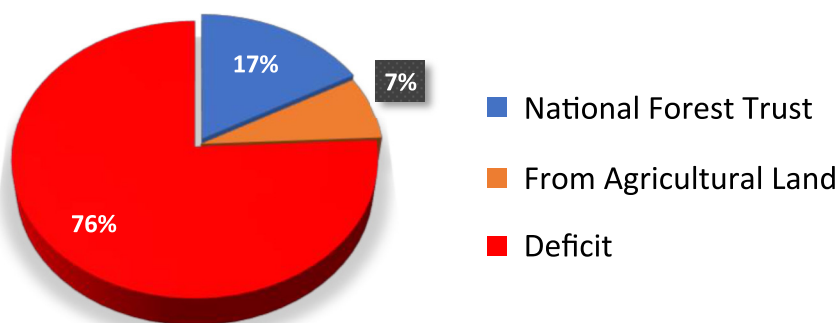


**River Kisiskhevi Basin**

**TABLE XIII.4. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**

Source	Supply-demand balance
National Forest fund	5,600
From Agricultural Lands	2,448
Demand	33,169
Deficit	25,121

**DIAGRAM XIII.4. SUPPLY-DEMAND BALANCE**

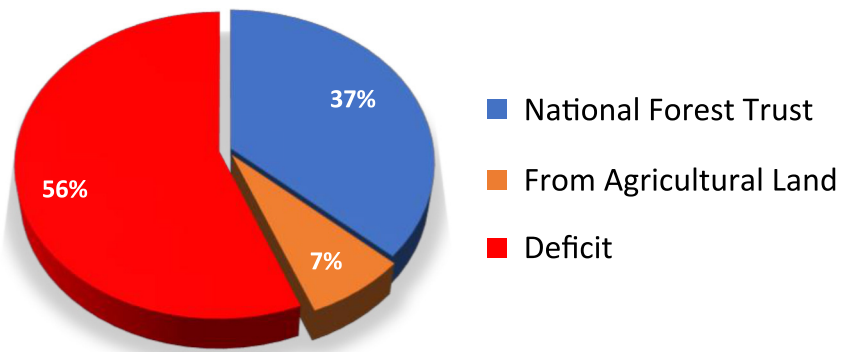


**River Kisiskhevi and Turdo Basins**

**TABLE XIII.5 VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**

Source	Supply-demand balance
National Forest fund	18,600
Form Agricultural Lands	3,747
Existing Demand	50,772
Deficit	28,425

**DIAGRAM XIII.5. SUPPLY-DEMAND BALANCE**

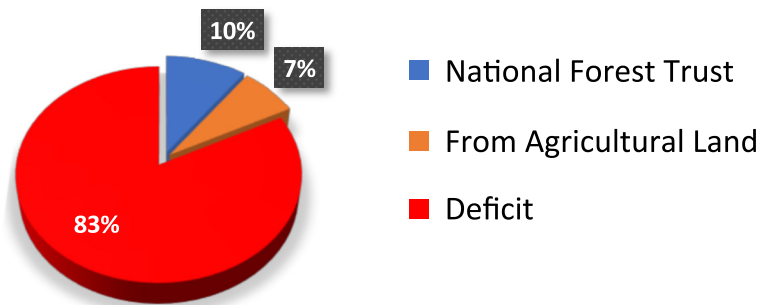


**Alazani Riverbed Villages**

**TABLE XIII.6. VOLUMES OF EXISTING SUPPLY AND DEMAND ON FIREWOOD**

Source	Supply-Demand Balance
National Forest fund	2,400
Form Agricultural Lands	1,761
Demand	23,861
Deficit	19,700

**DIAGRAM XIII.6. SUPPLY-DEMAND BALANCE**



---

# Heating Resources

## Market Research

**Kakheti**  
*On Regional, Municipal and Basin Levels*