Situational Assessment for Household Energy Needs in Georgia

UNESCAP Energy Division
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# Table of Contents

Abstract 5  
Introduction 7  
1. Country context 9  
2. Household energy use 17  
3. Industry structure of fuels used for cooking and heating 21  
4. Policy and institutional context 30  
5. Barriers to increase household access to clean fuels and technologies 40  
6. Opportunities to increase household access to clean fuels and technologies 47  
7. Recommendations 52  
Conclusion 61  
References 62  
Annexes 65
Abstract

Among the 17 Sustainable Development Goals (SDGs) is SDG7, dedicated to clean and affordable energy. The three SDG 7 targets to be achieved by 2030 are to: (a) ensure universal access to affordable, reliable and modern energy services, including access to electricity and clean fuels and technologies; (b) increase substantially the share of renewable energy in the global energy mix; and (c) double the global rate of improvement in energy efficiency. While universal electricity access is mostly within reach in the Asia-Pacific region, access to clean cooking is significantly lower, and remains a challenge across many of the countries of the region. ESCAP estimates show that approximately 21 per cent of the region’s population will remain without access to clean cooking in 2030. Therefore, there is a need for more comprehensive policies, strategies and targeted financing to achieve the SDG 7 target on universal access to clean cooking and realize its manifold benefits across health, air pollution, poverty, gender equality, climate change, and productive economic activity.

There are substantial differences in the needs of the populations among the Asia-Pacific region so there is no universal solution to replace the traditional devices used by households and reduce the pollutants they emit. Technology alone cannot solve the problem, as choices for cooking and residential heating are linked to culture and deeply rooted in tradition, local norms and customs. Effectively achieving a transition to the use of clean fuels and technologies within households can be challenging. In order to make substantial improvements in raising access rates, policies and programmes should take into account all the customs and preferences variations between households and communities. Therefore, to contextualize guidance, ESCAP has carried in-country data collection to identify opportunities and barriers for clean household energy access as well as potential policy and technological solutions. The purpose of this report is to provide deeper insight into the challenges of clean energy access and potential solutions in Georgia. The information elicited through these data collection efforts will be important for countries as they consider developing, adopting, and evaluating policies that accelerate the transition to clean fuels and technologies.

This report presents household energy needs for cooking and space heating in Georgia. While a quarter of the rural population use firewood for cooking in Georgia, 80 percent of rural households additionally rely on forestry resources for heating. Even where natural gas is accessible, households still consume firewood because of deep rooted cultural practices and the lack of affordable alternatives.

This report was drafted based on the World Health Organization (WHO) Situational Assessment and Stakeholder Mapping with the Household Energy Assessment Rapid Tool (HEART). HEART is part of the Clean Templates. Available at : https://www.who.int/tools/household-energy-assessment-rapid-tool-templates

1 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
2 Household Energy Assessment Rapid Tool (HEART)
Household Energy Solutions Toolkit (CHEST) developed by the WHO to promote clean and safe energy interventions in the home. CHEST is an analytical framework that contains tools for assessment of the current state of household energy use, air pollution and health impacts. The toolkit is intended to help professionals and policymakers implement the recommendations found in the WHO Guidelines on indoor air quality: household fuel combustion.

*Keywords:* SDG7, Energy Access, Clean Cooking, Clean Space Heating
Introduction

BACKGROUND:
Access to clean cooking in Georgia increased from 56 percent in 2006 to 88 percent in 2019. Access to clean energy for space heating on the other hand has been slower, as 80 percent of rural households still rely on forestry resources for heating. Even where electricity or natural gas is accessible, households consume firewood because of deep rooted cultural practices and the lack of affordable alternatives. However, the continued reliance on wood in rural Georgia, where 40 percent of the population is living, adds to pressure on the forests and triggers a range of environmental impacts. The little energy efficiency of buildings and the inefficient appliances used by households to heat their homes also add to the risks of fuel poverty, already raised by the depletion of biomass availability. Overall, the prospects of achieving universal access to clean fuels by 2030 remain unlikely. There is a need for more comprehensive policies, strategies and targeted financing to address the access to clean fuels and technologies for cooking and heating needs.

SCOPE: In the context of Goal 7 on achieving universal access to affordable, reliable and modern energy services, this analysis aims to build an understanding of the underlying causes or conditions that may influence household energy use in Georgia. The specific objective of this work is to provide deeper insight into the challenges of clean energy access and potential solutions. This document is structured as follows: chapter 1 sets out the background and context; chapter 2 addresses access to clean cooking and residential heating; chapter 3 describes the main market structures of fuels and technologies used by households; chapter 4 sets the policy and institutional context as it relates to improving access; chapter 5 explores the various barriers that affect programme success and sustainability; chapter 6 sets outs opportunities which can increase the effectiveness and impact of access efforts; and chapter 7 sets out recommendations.

ANALYSIS: The information elicited in the report is based on desktop research of the available literature, and interviews with key stakeholders.

POLICY RECOMMENDATIONS: To reach universal access to clean fuels and technologies, the needs and aspirations of Georgian households must be understood. Enhanced consumer research can highlight these insights, and their integration into the design of products and promotion strategies, can lead to a thriving market for clean cooking and space heating solutions. Given that clean household energy programs are cross-cutting in nature, with important co-benefits to health, forests, the climate, the environment, gender equality, and livelihoods, accelerated coordination is needed to ensure holistic policy and programs developments. Current programs

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3 Asia Pacific Energy Portal
4 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
should especially strive to maximize health gains while designing climate-relevant household energy actions.

In this end, the Government could develop a national plan to tackle indoor air pollution to ensure that the health effects of household air pollution are included in energy policies. In parallel, public institutions should play a central role in the transition to clean fuels. Access to clean energy in educational institutions to preserve the health of youths should particularly be prioritized, as firewood-based cooking stoves and space heaters, often ineffective and outdated, continue to be one of the main appliances used by public buildings in rural areas.

In addition, the New Forest Reform should play a central role to raise awareness and make improved technologies accessible. Overall, financial mechanisms are needed to encourage the private sector investment in clean cooking and heating solutions and help pull off the demand for clean energy technologies and fuels.
1. Country context

GEOGRAPHIC AND DEMOGRAPHIC STATUS

Geography

Georgia is located in the “South Caucasian” area of Asia. The country borders Russia in the North, Azerbaijan, Armenia and Turkey in the South, and the Black Sea in the West. The country has a total area of 69,700 km$^2$, with wide range of altitudes. The landscape ranges from Greater Caucasus Mountains in the north and the Lesser Caucasus Mountains in the south to the plans of the Kura River Basin in the east. The climate in Georgia varies with distance from the black sea and elevation. In total, around 20 climate zones have been identified in the literature, from humid subtropical to permafrost.\textsuperscript{5}

Georgia’s climate zones differ in terms of rainfall. In the West, winters are mild and summers are hot with considerable rain. Average annual temperatures are between 9°–14°C, with precipitation ranging from 900–2300 mm. In the east, the amount of precipitation is sparse and unpredictable, although heavy rains usually occur during mid to late spring. Annual temperatures range between 11°–13°C, with precipitations ranging from 400–600 mm per year. In general, the Alpine mountain regions are colder, with average temperatures between 2°–

\textsuperscript{5} Climate Risk Profile, Georgia, 2017, USAID
10°C and annual precipitation between 1200–2000 mm.

Georgia’s favorable climatic and natural conditions paved the way to the development of agriculture lands, that currently cover 43.4 per cent of the territory. Forests represent 43 per cent of the country, and are mainly found in mountainous areas. The variety of climatic and relief conditions brings about a diversity of forest ecosystems so that the quality of firewood used for cooking and heating may vary across regions.

Deciduous forests consisting primarily of broadleaf species such as beech, oak, hornbeam and chestnut are mainly found in lowlands and plateau, whilst at higher altitude fir and spruce are common, and in the highest mountain belt pine predominates. Forests are sources of fuel and construction materials, provide space for grazing, hunting, collection of berries, food and medicinal plants for family consumption and commercial purposes. In addition, Georgia’s forests play a central role in the reduction of green-houses gas (GHG) emissions, as they removed an average of 5,400 Gg CO$_2$eq annually from 2010 to 2013, i.e. one-third of the national emissions.

Located between the European Union and Central Asia, Georgia is a key energy transit route for energy security in the EU. In particular, the country is part of the Southern Gas Corridor where gas from Azerbaijan is supplied to Europe.

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**Population trends**

As of January 2020, Georgia had a population of 3,716,900 people, of which 52.3 per cent were women. The population of Georgia is declining, with annual population growth rate of -0.2 per cent between 2015 and 2020. Georgia’s population is also ageing, with 64.5 per cent of the population above 65 years old, 15.3 per cent between 15 and 64 years old, and 20.2 per cent below 14 years old. The proportion of females is higher above the age of 35 years, while the male population is higher in the age groups below 35. Woman-headed households are common in Georgia. The share of women-headed households amounts to 49 per cent of the population. There are on average 3.3 members within households.

Urbanization slowly increased from 53.6 per cent in 2005 to 58.2 per cent in 2020. People in rural areas are more likely to be affected by poverty than people living in urban areas. The share of the population under the absolute poverty line is 23.7 per cent in rural Georgia and 16.4 per cent in urban areas. In terms of income, rural households in Georgia earn the equivalent of 80 per cent of the average salary earned by urban households.

**CLIMATE CHANGE AND ENVIRONMENTAL CHALLENGES**

Georgia has the largest glaciated area in the Caucasus region. Hydropower generation, the source of 80 per cent of Georgia’s electricity, is partially driven by glacier-fed rivers (Inguri and
Rioni) originating in the Greater Caucasus Mountains. However, several glaciers have retreated dramatically since 1974, and river runoff is expected to decrease by 13 per cent by 2100. In addition, hydropower generation may be adversely impacted by periodic droughts. For instance, the 2000 drought reduced energy generation by 20 per cent and caused power shortages throughout the country. The intensification of extreme events also threatens to disrupt supply of energy as demonstrated by the landslide that caused major damage to the North-South gas pipeline in 2014 between the Georgia-Russia border.

The long-term overexploitation of forest resources is one of the main environmental challenges in Georgia. While the Forestry Agency estimates the consumption of 300 000 m³ to 400 000 m³ of firewood per year to be sustainable, 1.4 million m³ were consumed in 2018. The significant dependence of the local population on forests for firewood, timber and non-timber products, frequently harvested illegally rather than in allocated areas, has been a main driver of forest degradation. Forest degradation leads to soil erosion, and causes landslides and flash floods. It also results in biodiversity loss and lower CO₂ uptake. The estimated annual cost of deforestation in Georgia is between GEL 54 million and GEL 93 million ($17-29 million). Climate change also has negative but varying impacts on Georgia’s forests, according to the diversity of agro-climatic zones in Georgia. Rising temperatures lead to greater occurrence of pests and diseases in some forest areas, altitudinal shift in forest lines, increased fire hazard and occurrence of droughts. These observed impacts are expected to intensify, heightening forest degradation and decreasing carbon absorption capacity.

ECONOMIC SITUATION

Overall, Georgia pursues reforms to create a liberalized economic environment through minimal state interference, deregulation, privatization, simplified licensing and taxation, and free trade. The Government has prioritized knowledge based and innovation driven economic development and actively supports the development of the digital economy. As a result, the country is one of the most business-friendly countries in the world, ranking seventh out of 190 countries in the World Bank’s Doing Business 2020 rankings.

Despite major shocks, Georgia’s GDP has grown at an average rate of around 5.3 per cent per year between 2005 and 2019. Wholesale and retail trade, repair of motorcycle sector are the largest contributor to Georgia’s GDP (14.3 per cent), followed by the real estate sector (11.5 per cent), the manufacturing sector (10.1 per cent), and the construction sector (8.5 per cent). The agricultural sector of Georgia plays an important role in the state's economy, contributing 7 per cent of GDP while wood sector contributes 0.5 per cent of GDP. Georgia mainly exports copper ores (22.1 per cent), followed by motor cars (11.1 per cent), ferro-alloys (10.4 per cent), and mainly

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12 USAID, (2017), Climate Risk Profile, Georgia
13 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
15 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
imports petroleum gases (8.6 per cent), boring machinery for earth (7.6 per cent), petroleum and petroleum oils (6.8 per cent).\textsuperscript{18}

The unemployment rate in Georgia has reduced, from 20.7 per cent in 2010 to 11.6 per cent per cent in 2019.\textsuperscript{19} In 2019, the unemployment rate was 10.15 per cent for women and 12.8 per cent for men. However, youth unemployment is a growing concern as it amounted to 29.93 per cent for the 15-24 years old in 2019. Economic growth has been accompanied by rising living standards, and poverty rates measured as the share of the population living with less than 1.90 $ and 5.5 $ a day between 2005 and 2019 fell from 10.7 per cent to 4.5 per cent and from 25.3 per cent to 14.8 per cent, respectively.\textsuperscript{20}

However, the economy fell into recession in 2020, contracting by 6.2 per cent. The COVID-19 pandemic threatens to reverse Georgia’s past economic gains which could push poverty up by 2.8 per cent.\textsuperscript{21} Furthermore, even as the proportion of the population living below the national poverty line has been steadily decreasing, income inequality remains relatively high by regional standards. The Gini coefficient amounted to 36.4 in 2018. On average, men earned 57 per cent more than women, while households in urban areas earned on average 13 per cent more than households in rural areas.\textsuperscript{22}

\textbf{ENERGY PRODUCTION AND CONSUMPTION}

\textbf{Energy Consumption}

In 2018, Georgia’s Total Final Energy Consumption (TFEC) was 4,390 ktoe.\textsuperscript{23} Natural gas accounted for 34 per cent of the TFEC, followed by oil products (29 per cent), electricity (23 per cent), coal (7 per cent), biomass (7 per cent), and other renewables (0.4 per cent). The largest energy-consuming sector in 2018 was the transport sector (31 per cent), followed by the residential sector (28 per cent) and the industry sector (26 per cent), while the public and commercial sectors accounted for the remainder.\textsuperscript{24} In the residential sector, the largest energy source was natural gas (59 per cent), followed by bioenergy and waste (22 per cent), electricity (18 per cent), and oil (2 per cent).\textsuperscript{25}

Residential energy consumption mainly goes towards space heating (59 per cent), cooking (16 per cent), water heating (11 per cent), and other residential appliances. Despite an increasingly widespread access to gas, 80 per cent of households in rural areas consume wood for heating and a quarter also use fuelwood for cooking activities.\textsuperscript{26} In contrary to other independent states of the former Soviet Union, Georgia dismantled district heating infrastructure in the 1900s.

\textbf{Available energy resources}

Georgia has important renewable energy resource potential in hydro, wind, solar,
geothermal and biomass energy resources. According to National Renewable Energy Action Plan (NREAP), the estimated hydropower resource potential is 15,000 MW with a potential for electricity generation of 50 TWh per year, of which 22 per cent is currently being utilized. As there are between 250 – 280 sunny days per year in Georgia, the country benefits from 6,000 to 6,780 hours of annual sunlight, which corresponds to a potential of approximately 500 MW for power generation. Onshore wind energy potential is estimated at 1,500 MW, with an electricity generation potential of 4TWh per year. Georgia has significant untapped geothermal energy reserves and according to preliminary estimates the geothermal energy potential is 420 MW and thermal energy of 2.7 TWh per year. Geothermal energy could be used to supply clean energy to satisfy space heating demand and hot water for 500,000 to 1 million people, according to the Energy Sector Management Assistance Program. The NREAP further underlines that important quantity of upgraded solid biofuels (briquettes, pellets, and chips) could be produced from solid biomass residues and residential waste. The theoretical potential for biomass residues is approximately 1 million m³ of biomass residues. 90 million m³ of biogas (64 million m³ of natural gas) could be obtained from Tbilisi and Kutaisi waste disposal sites, and additional 100 million m³ of natural gas could be derived from the sewage water cleaning station of Tbilisi. The technical potential of the major biomass sources in Georgia amounts to 12.5 TWh/year, and the achievable potential stands at 3-4 TWh/year. Overall, 20 TWh could be produced from renewable energy sources in the near future saving about 7 million tonnes of conventional fuels.

Energy Production

Georgia’s installed power generation capacity in 2018 was 4,153 MW for electricity, of which 77 per cent was hydropower, and 0.5 per cent was wind.27 Other installed capacities include single cycle gas turbine (16 per cent), combined cycle gas turbine (6 per cent), and coal power plants (0.3 per cent). Among the special features in energy consumption and production is that there is a strong seasonal dependence on hydropower as the main source of electricity in Georgia. As a result, there is a mismatch between hydropower production and demand patterns where peak of consumption is in winter, while peak of hydropower generation is in summer. The electricity shortage in winter is compensated by thermal power plants and electricity imports. However, the domestic energy production satisfies less than 30 per cent of the demand and Georgia’s primary energy supply consist mostly of imports. In 2018, Georgia’s Total Primary Energy Supply (TPES) was 4,819,000 tonnes (ktoe) of oil equivalent. Natural gas accounted for 42 per cent of the TPES, followed by oil products (26 per cent), hydropower (18 per cent), coal (6 per cent), biomass (6 per cent), electricity (2 per cent), other renewables (solar and wind) (1 per cent), and crude oil (0.5 per cent) (IEA, 2020).

Energy Access

In 2019, around 100 per cent of the Georgian population was connected to the power grid.28 Yet, electricity consumption is twice as high in the capital city than in the rest of the country. Following an inventory of households permanently living in villages that remained not

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27UNESCAP, (2021), SDG7 Roadmap for Georgia
28Ibid.
connected to the power grid, the Government, with support from the USAID/Energy Program, has installed solar microgrids in 16 municipalities. Access to natural gas has substantially increased from 68 per cent in 2015 to 75 per cent in 2018, and 84 per cent in 2019. Despite the widespread access to clean fuels, a large part of the population still relies on firewood. In 2019, 88 per cent of the population primarily used clean fuels for cooking, up from 53.61 per cent in 2005.

However, around 80 per cent of rural households continue to primarily use firewood as a main fuel for heating. As a result, of Georgia’s 1.2 million households, around 500,000, continue to use traditional biomass as a fuel to meet their heating and cooking needs. In addition, wood-burning is not limited to private households. Firewood-based cooking stoves and space heaters, often ineffective and outdated, continue to be one of the main appliances used by public buildings in rural areas. On the 2,200 schools in Georgia, only 72 have central heating with electricity, and 536 use natural gas for space heating. Three hundred and seventy-seven use wood for space heating, and the heating fuels remain unknown for the other 1,215 schools.

According to the SDG 7 Roadmap for Georgia, access to clean cooking fuels and technologies will not be achieved in the current policy scenarios (97 per cent), leaving 109,000 people (32,000 households) relying on inefficient and hazardous fuels and technologies. Exposure to unhealthy levels of indoor air pollution makes the Georgian population vulnerable to respiratory diseases. In addition, firewood collection in nearby forests leads to forest degradation and, hence, increasing energy poverty.

**HEALTH SECTOR**

**Indoor air pollution**

Globally, indoor air pollution from the inefficient combustion of solid biomass and poor ventilation leads to almost four million premature deaths per year. In Georgia, as up to a quarter of the rural population continues to rely on polluting fuels for cooking, and up to 80 per cent for space heating, households remain exposed to high levels of particulate matter, where they face increased risks of cardiovascular disease, stroke, chronic obstructive pulmonary disease (COPD), and lung cancer. However, only a few studies draw attention to the negative impact of indoor air pollution in Georgia.

According to the Institute for Health Metrics and Evaluation, air pollution is the sixth most prevalent environmental risk factor for premature death and disability-adjusted life years in Georgia. The country holds third place in Europe for mortality rate attributed to indoor and outdoor air pollution, with approximately 42 people out of 100,000 die prematurely from exposure to indoor air pollution each year. The World Bank (2015) estimated that, in households using solid fuels for space heating and/or

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30 Asia Pacific Energy Portal
29 Access to clean fuels and technologies for cooking is the proportion of total population primarily using clean cooking fuels and technologies for cooking. Under WHO guidelines, kerosene is excluded from clean cooking fuels.
36 WHO, (2020), Health and sustainable development: progress in Georgia
cooking, indoor air pollution levels stand on average 30 times above the recommended level, with levels as high as 400 μg/m³. The high indoor air pollution is associated with 740 mortality cases per year in Georgia. The annual cost of health impacts induced by poor air quality is approximated to reduce the GDP from up to 4.3 per cent, compared with an alternate scenario in which clean fuels are used for household activities. In 2016, GEL 120 million ($34 million) were allocated by the state budget to treat diseases related to air pollution.

To raise awareness on the public health risks induced by indoor air pollution, the Women Engage for a Common Future and the National Centre for Disease Control and Public Health of Georgia (NCDC) under funding of the Danish International Development Agency and the European Foundation, implemented the Clear Air for Children project to assess indoor air pollution in kindergartens. According to the study, among the 11 kindergartens using wood-burning stoves, the average PM levels were unhealthy in of them. In 9 of them, there was at least one day where the air quality was considered very unhealthy or dangerous. Overall, PM levels were 2.4 times higher than in kindergartens using gas for heating. Nevertheless, 7 out of 9 kindergartens using gas also had PM levels unhealthy for sensitive groups, and 2 recorded days with unhealthy levels for the general public. This highlights that further research is needed to have a full understanding of the extent and drivers of indoor air pollution in the Georgian context.

**Burden of disease from indoor air pollution**

Similar to most countries, the burden of mortality is mainly linked to Non Communicable Diseases (NCDs) in Georgia. According to the World Health Organization (WHO), NCDs accounted for 94 per cent of all premature deaths in 2016. Ischemic heart disease, strokes, hypertensive heart diseases and lung cancers are the main causes of death and COPD is the eight main cause deaths.

From 2000 to 2014, the prevalence of cardiovascular diseases (CVD) has been steadily increasing in Georgia. In 2016, they accounted for 64 per cent of NCDs. According to official statistics, the largest share of CVD mortality is attributable to hypertension: in 2014, CVDs accounted for 54.8 per cent of hypertension, 19.7 per cent - ischemic disease and 3.8 per cent - cerebrovascular disease.

While COPD accounted for 4 per cent of all NCDs in 2016, it contributed to 75 per cent of all registered cases of lower respiratory diseases. Tobacco smoke (including passive smoking) was the main cause of COPD. Indoor air contamination, outdoor air pollution, occupational dust and chemicals represent additional risk factors. While official data indicates that COPD prevalence is quite low, almost three times lower than for the European region, a study by the “Global Alliance against Respiratory Diseases” in 2017, found the prevalence of COPD could be five times higher.

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38WECF, (2020), Indoor Air Pollution Related Health Challenges for Georgia: An Interim Study of Indoor Air Pollution in Kindergartens

In 2017, respiratory system diseases were responsible of 62 per cent of infant morbidity. Improving the health and the well-being of mothers and newborns is an important public health goal in Georgia. Therefore, a central part of the Georgian Maternal and Newborn Health Strategy is to “ensure improved coordination of interventions and to encourage the integration of service delivery within and beyond the health sector to provide a continuum of care through strong, collaborative and sustainable partnerships”. The strategy could integrate clean household fuels and technologies awareness raising, as children are particularly vulnerable from the many adverse effects from the air pollution associated with the widespread use of polluting cookstoves. Indeed, children are extremely at risk during fetal development and in their earliest years, as their lungs, organs and brains are still maturing. Children live closer to the ground, where some pollutants reach peak concentrations, and inhale more pollutants as they breathe faster than adults. In addition, they usually stay close to their mothers while the latter cook with polluting fuels and devices. Further research to assess the effects of HAP on health outcomes such as low birthweight, pneumonia and pulmonary function among children could also be further investigated.

40 WHO, (2020), Health and sustainable development: progress in Georgia
2. Household energy use

To fulfill the requirements of EU regulations and directives related to energy statistics, the National Statistics Office of Georgia conducted a survey on the energy consumption of households in 2017. This survey will be done regularly every 5 years. This section is mainly based on the results of this survey.

HOUSEHOLD FUEL USE FOR COOKING

The Household Energy Consumption Survey differentiates cooking tasks between cooking at cookers and at ovens.41

41 National Statistics Office of Georgia, (2017), Energy Consumption in Households
Current household fuel use for cooking at cookers is summarized in Figure 1. In the overwhelming majority of urban households, natural gas is the principal cooking fuel. In rural areas, households mainly use firewood and agricultural residues, followed by LPG and natural gas.

The fuel mix for cooking with ovens is slightly different than for cookers, as highlighted in Figure 2. Both rural and urban households use a higher proportion of firewood and electricity when they cook with ovens.

Despite the widespread access to electricity and natural gas, one quarter of households continue to rely primarily on polluting fuels for cooking.

**Cooking practices**

Women usually perform the majority of tasks in the household. About 46.3 per cent of tasks are performed solely by women, while 23.7 per cent are done by men, and 30 per cent are done jointly (Gender and Generation Survey, 2010). Cooking tasks are also mostly done by women, and take approximately between 2 and 3 hours per day. Wood collection on the other hand is mostly performed by intermediaries.

**HOUSEHOLD FUEL USE FOR HEATING**

Space heating demand constitutes around 57 per cent of the total residential energy demand in Georgia. Overall, there are two types of heating system in Georgia. The most widespread are individual heating facilities (88.3 per cent), that are local systems for which any types of fuel can be used. Otherwise, households use individual central heating systems relying on natural gas. In addition, about 1.2 per cent of dwellings remain without heating. The current household fuel use in individual heating facilities is summarized in Table 1.

**Table 1:** Distribution of dwellings by used energy forms in individual heating facilities (%)

<table>
<thead>
<tr>
<th></th>
<th>Natural gas</th>
<th>Firewood</th>
<th>Electricity</th>
<th>Wood waste</th>
<th>Animal waste</th>
<th>Coal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rural</td>
<td>15.1</td>
<td>78.3</td>
<td>1.8</td>
<td>3.4</td>
<td>1.3</td>
<td>0.2</td>
</tr>
<tr>
<td>Urban</td>
<td>70.7</td>
<td>17</td>
<td>10.5</td>
<td>1.5</td>
<td>0.1</td>
<td>0.1</td>
</tr>
</tbody>
</table>


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42 UNESCAP, (2020), SDG7 Roadmap
Heating practices

The heating season starts in November and ends in March. In mountainous regions the heating season lasts six months, while in the lowlands in West Georgia it lasts between 3 and 4 months. Overall energy expenditures in the winter months are twice as high as in the summer months.\(^{43}\) To reduce the burden of energy expenditures in the cold season, heating is often not turned on for 24 hours per day and households heat a smaller space than the total dwelling space. While 42.1 per cent of households lived in dwellings with total area between 51\(m^2\) and 100\(m^2\), 39.0 per cent lived in dwellings with total area of over 101 \(m^2\); meanwhile, 18 per cent of households heated areas over 51\(m^2\), most households heated areas smaller than 20\(m^2\) (42 per cent), and between 21\(m^2\) and 49\(m^2\) (40 per cent).

Dwelling characteristics

The dwelling characteristics play an important role in heat conservation. In Georgia, the majority of dwellings (76.7 per cent) were constructed in the period 1951-1990, with no insulation. Approximately 12 per cent were constructed before 1950, also without insulation. Only 2.06 per cent were constructed after 2011. It is estimated that more than 10 per cent of the building stock has exceeded its lifetime. Outdoor walls are made in stone, block or hollow brick for 81.2 per cent of rural dwellings and 48 per cent of urban dwellings. Baton, monolith and panel is used in 5 per cent of rural dwellings but 30.1 per cent of urban dwellings. Thermal insulation of rural houses has high theoretical technical potential to reduce the heat demand, hence reduce energy poverty. However, a recent study concluded that 85 per cent of houses surveyed had no roof or wall insulation, and almost one-third of the families indicated that their houses were cold and damp during the cold season.\(^{44}\) Insulation of the whole living space could lead to 60 per cent energy savings according to a baseline study from the Green Climate Fund.\(^{45}\) However, the complete insulation of an average rural house would represent a cost of GEL 15,000, (~$4,588) i.e. 3-times the annual income of an average rural household. Yet, basic insulation of some parts of the living space could already result in 30 per cent of energy saving, at a price of about GEL 5,000 (~$1,530).

At the moment, there are no standards for house construction with regard to heat conservation. However, the NEEAP (2019-2020) underlines steps to be undertaken in the coming 3-year period to develop a strategy for the upgrading of energy efficiency in the building sector. Furthermore, a gap analysis of Georgian legislation in relation to energy performance of buildings and development of Draft Energy Performance of Buildings Law is being conducted within the framework of the Danish Neighborhood Program launched by the Ministry of Foreign Affairs of Denmark and Ministry of Economy and Sustainable Development of Georgia (with assistance from the Energy Community).

\(^{44}\)Delegation of the European Union in Georgia, (2019), World Bank study supported by EU finds under-heating in Georgia leads to loss of 3.5% of GDP. Available at: https://eeas.europa.eu/delegations/georgia/65129/node/65129_zh-tw
\(^{45}\)Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, F funding Proposal
HOUSEHOLD USE FOR LIGHTING

All households rely on electricity for their lighting needs.

HOUSEHOLD FUEL USE FOR WATER HEATING

65.1 per cent of the households use individual hot water system, and 34.6 per cent use other means of hot water supply (gas cooker, electric oven, wood stove, coal stove, electric kettle, sun).46 Around 0.3 per cent of households use thermal water.

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3. Industry structure of fuels used for cooking and heating

Box 1. Difference between clean and improved solutions

A cooking or space heating stove is considered “clean” if its emissions meet WHO Guidelines. Electricity, gas, ethanol, solar, and the highest performing biomass stoves are the current available options that are considered clean. The use of kerosene and unprocessed coal is discouraged because of the associated health risks. An improved biomass cookstove (ICS) designates a stove with higher efficiency or lower emissions than a traditional stove, but usually include a wide range of performance. Most ICS models do not meet WHO Guidelines, but provide some benefits and are used as transitional solutions.

ELECTRICITY

Access

While around 99 per cent of Georgian population was connected to the power grid in 2019, only 5.7 per cent of households used electricity for cooking with cookers, and 14.9 per cent of households used electricity for cooking with ovens.47 The discrepancy between rural and urban households remains limited, as 5 per cent and 13.6 per cent of rural households use
electricity when cooking with cookers and ovens, respectively, while 6.5 per cent and 16.1 per cent of urban households use electricity for the same activities. Similarly, just 10.5 per cent and 1.8 per cent of households in urban and rural areas, respectively, use electricity for individual heating facilities.

**Plans for expansion**

Overall, the electricity sector has been marked by the transformation from a vertically integrated single-buyer structure, in the late 1990s, into a competitive model with significant private sector participation. Following the EU-Georgia Association Agreement in 2016 and the accession of Georgia to the Energy Community Treaty in 2017 as a Contracting party, Georgia is required to harmonise its legislation with the EU power sector standards by 2025. Ongoing reforms focus on the unbundling of the electricity sector in accordance with the EU energy acquis.

Overall, the promotion of electricity can improve the country’s energy security by reducing its dependence on imported petroleum products.

At the moment, only a few mountainous villages are without electricity access. The Ministry of Regional Development and Infrastructure of Georgia has been mandated to provide solar panels to municipalities that remain unconnected to the grid. Donor programs are being undertaken to provide electricity access to last-mile communities. In 2020, USAID provided solar PV systems to 178 permanent residents in 58 villages, within the framework of “PV Systems for Off-Grid houses in Georgia” program.

To meet the increasing energy demand, reduce the dependence on imported energy resources, and overcome the winter deficit, additional generation units are being developed. At the moment, there are 118 ongoing hydropower projects, of which 74 have a total installed capacity under 13 MW and 44 with capacity over 13 MW. There are also 18 wind energy projects at the feasibility study stage with a total installed capacity of 462 MW. The Imereti 1 Wind Farm (300 MW), Central Wind Farms (120 MW), Pirveli Wind Farm (110 MW) and Kartli 2 Wind Farm (100 MW) are among the largest projects.

In addition, there are 6 solar projects at feasibility and construction stages with a total installed capacity of 93 MW, of which the largest is the 50 MW Tbilisi solar farm.

The completion of individual electricity and natural gas metering is a major expected development. Smart metering will enable users to access accurate and reliable information, including real-time energy consumption. In Tbilisi the individual metering has already been completed. The metering scheme could be leveraged to promote clean fuels and provide information on the time, fuel and cost savings associated with clean energy usage.

**Reliability of service**

The transmission grid infrastructure is well-developed in Georgia. The whole territory of the country is covered with more than 3,000 km of high, medium and low voltage lines and around 100 substations. However, weather conditions lead to electricity outages and voltage fluctuations in certain regions of Georgia.

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49 Draft National Sustainable Energy Action Plan Georgia
Voltage fluctuations damage home appliances so that households even have to turn off their electric equipment to avoid extra costs during periods of bad weather. In addition, several 220-kilovolt (kV) dead-end lines threaten system stability. It is also regularly challenging to transfer the full load flow to the western part of the country, and cross-border lines are not backed-up, which risks creating an emergency in the case of an outage. Overall, substantial investments in the transmission and distribution networks are required to upgrade the reliability of the system and improve the management of disruptions caused by network constraints and supply failures. Yet, the number of outages in the electricity distribution network is decreasing. According to the National Energy Regulation Commission (2016) the average duration of power outages reduced by 33.5 per cent and the average frequency by 14 per cent between 2014 and 2015. However, it should be noted that no data was found on the absolute numbers.

According to the National Renewable Energy Action Plan (2020), the surveillance of planned and unplanned outages as well as the capacity to respond to customer complaints regarding voltage quality, disconnection, service commercial quality, new connection, capacity increase, micro power plant connection requests, etc., have been improved by the Georgian National Energy and Water Supply Regulatory Commission (GNREC).

**Price, taxation, and subsidies**

The cost for connection to transmission and distribution networks are paid by the system users. The price of electricity depends on the consumption volume, from GEL 0.14/kWh ($0.04/kWh) to GEL 0.23/kWh ($0.07/kWh). Electricity is implicitly subsided, as the inexpensive gas from which Georgia benefits as a transit country is supplied to thermal power plants at a considerably lower price than market price. The Ministry of Internally Displaced Persons from the Occupied Territories, Labour, Health and Social Affairs of Georgia (MoLHSA) provide financial aid to targeted households to mitigate the burden of energy expenditures. Since 2015, families living in the high mountainous regions receive a 50 per cent discount for up to 200 kWh of electricity consumed, while vulnerable families with 4 or more children receive cash payments. During the cold season, the municipality of Tbilisi provides cash payments to vulnerable families to cover electricity, water, waste disposal, and cleaning costs. The current structure of electricity subsidies disproportionately benefit households in the capital city. Indeed, families in Tbilisi received around GEL 530 (~ $185) of subsidies per year while families living in other municipalities received around GEL 45 (~ $15.7) per year.

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53 Ibid.
54 National Renewable Energy Action Plan
NATURAL GAS

Access
Access to natural gas has substantially increased from 68 per cent in 2015 to 75 per cent in 2018, and 84 per cent in 2019. Urban households significantly rely on natural gas to meet their cooking needs. In 2017, 77.8 per cent of urban households used natural gas for cooking with cookers, and 67.9 per cent for cooking with ovens. The proportion of rural households that use natural gas for cooking is lower, at 27.8 per cent and 19.1 per cent respectively for cooking with cookers and ovens. Similarly, urban households disproportionately use natural gas for individual heating facilities (70.7 per cent), while usage remains limited in rural households (15.1 per cent).

Plans for expansion
The development of the natural gas network is under acceleration, and the government envisions gas access for all remaining settlements by 2030. Between 2019 and 2021, 58,849 additional households across 233 settlements should be connected to natural gas. The government further envisages the gasification of 211 villages from 2021 to 2024. The necessary infrastructures will be constructed and leased to the licensed distribution companies for operation. In some mountainous regions, other decentralized autonomous systems, based on liquefied natural gas, compressed natural gas, or liquefied petroleum gas along with local renewable energy resources, are considered. In parallel, the Government is planning to convert the depleted Samgori South Dome oilfield near Tbilisi into underground gas storage facility by 2023.

The current plans for gas network expansion risk to be uneconomic. Indeed, the construction of gas distribution infrastructure is extremely difficult for remote locations, and the level of demand may not justify the cost of the extension. Besides, large-scale investments into gas infrastructure are likely to result in stranded assests in the long-term, as natural gas is a non renewable energy resource that will need to be phased out in the long term. The government’s policy to provide gas access to all settlements, including mountainous villages, may therefore need to be reviewed.

58 Draft National Sustainable Energy Action Plan of Georgia
59 https://sputnik-
Price, taxation and subsidies
As a transit country for natural gas from Azerbaijan to Turkey, and from Russia to Armenia, Georgia receives in return a certain amount of natural gas relatively cheaply. In turn, the Government of Georgia supply natural gas to the residential sector and thermal power plants at prices considerably less than market prices. Accordingly, Georgia’s household natural gas costs were the lowest in Europe in 2019, at around one-quarter the average EU residential gas price. However, this represents an implicit subsidy as the government does not pay the difference between the discounted gas price and the market price. Yet, this represents a loss of potential revenue for the government as households pay less than market price. In 2017, it was estimated that gas subsidies for the residential sector amounted to 4.6 per cent of total budget spending, i.e. 43 per cent of total government expenditures on education.

Since the creation of the Northeast Gas Transit Pipeline that runs through the mountainous village of Kazbegi and Dusheti, the Government of Georgia provides 700 m$^3$ of free gas per month to households living in these villages during the cold season. However, there were cases of free gas misuse, for instance to provide heat to greenhouses to grow vegetables. Therefore, strict restrictions have been imposed in recent years, although the above-mentioned illegal facts continue and impose a burden on the state budget. Villages near the occupation dividing line also receive cash payments in the winter as heating allowance.

Safety
Gas appliances are subject of concerns. Poor installation and the lack of regulation led to gas leaks and explosion of water heaters and stoves. For example, between 2016 and 2018, 86 people died in explosions and intoxication caused by natural gas leaks and 285 were poisoned in Tbilisi.  

LIQUIFIED PETROLEUM GAS

In 2017, 6.3 per cent of urban households used liquified petroleum gas for cooking with cookers, and 3.8 per cent for cooking with ovens. The proportion of rural households that used natural gas for cooking was higher, at 27.0 per cent and 11.6 per cent respectively for cooking with cookers and ovens. LPG is mainly used for cooking in the summer, when there is no need for heating. LPG consumption decreases in the winter, as households usually revert to firewood for cooking. LPG can be accessed through distribution points and delivery by special vehicles. 5 kg and 20 kg capacity bottles are available and they are usually filled 1-2 times per month. There are no subsidies for LPG. According to Georgian LPG Association annual report for 2020, the LPG sector is in deep crisis, because the excise tax rate on LPG was set at 300 GEL (~$92) per 1,000 kilograms, while the excise tax rate on gasoline is 500 GEL (~$153) per 1,000 kilograms. The ratio between the excise duties on gasoline and liquefied gas has led to a convergence of their selling prices. According to the EU recommendation, the amount of excise duty on LPG should be about four and a half times less than that on ethylated gas.
gasoline. As a result, LPG is less competitive than other energy sources, and the population purchase less LPG. As LPG is imported, promoting its utilization will increase import dependency on petroleum fuel in Georgia.

**BIOMASS AND FIREWOOD**

**Access**

Rural households significantly rely on firewood to meet their cooking needs. In 2017, 39.9 per cent of rural households used firewood for cooking with cookers, and 54.9 per cent for cooking with ovens. The proportion of urban households that use firewood for cooking is lower, at 9.3 per cent and 11.7 per cent respectively for cooking with cookers and ovens. Similarly, rural households disproportionately use firewood for individual heating facilities (78.3 per cent), while usage remains limited in urban households (17 per cent). In Georgia, biomass as an energy source is mainly composed by firewood (94 per cent), followed by residues from forestry (5 per cent), and residues from agriculture (1 per cent).

**Wood harvesting – social wood programme**

Since the 2000s, the social wood programme implemented to tackle energy poverty has provided affordable firewood to the rural population. Under the programme, households register as timber users to purchase fuelwood harvesting permits (so-called social tickets) from the National Forestry Agency (NFA). The social tickets are highly subsidized and allow users to harvest fuelwood in designated areas. Households in mountainous regions are allowed to harvest 10-15 m$^3$ of firewood, while other households are allowed to harvest 7 m$^3$ per year.

Logging is often carried out by intermediaries, who are unregistered yet purchased social tickets from households. Thus, their identification, the recording of their revenues and the payment of their taxes is not possible under this system. Generally, solid fuels are collected once a year and are stored in the open, sheltered places, and in the yards of households. Overall, the social wood programme was prone to an important level of informality, making it difficult to assess the exact volumes of harvested fuelwood. The absence of up-to-date forest information and the absence of sustainable forest management practices also contributed to extensive forest degradation, as annual allowable cuts were not based on the actual forest condition and growth rate. Furthermore, the cutting and transportation of firewood was often undertaken by unqualified people leading to environmental degradation. For instance, small-to medium-sized trees that could make up future harvests were often damaged. Due to the lack of suitable equipment, intermediaries were also exposed to injuries and accidents. In addition, significant forestry residues were left in the forest whereas they could be upgraded to heating fuels such as woodchips, wood pellets or briquettes that are suitable for modern heating appliances. Residue recuperation could provide around 8 PJ of material annually to produce upgraded biomass fuels.$^{64}$ In addition, trees in remote areas permitted for felling under the social-cutting quota were often overlooked in favor of more accessible trees in already degraded areas around towns and villages due to lower logistical challenges and costs. Overall, the social wood programme has put forests at high risk of degradation and deforestation as the

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$^{64}$ IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
consumption of fuelwood is estimated 4 to 8 times higher than the legal allocation by the Forest Agency.\footnote{Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, Funding Proposal}

**Reforms and plans**

Biomass will continue to play a central role in Georgia’s energy supply, as it remains a strong element to lessen the country’s energy dependence. However, there is considerable scope to modernize the bioenergy industry through upgraded biomass fuels, to enhance the sustainability of biomass supply chains, and to encourage the efficient consumption of biomass through improved heating and cooking technologies. Accordingly, the government endeavors to tackle the disorganized exploitation of this energy resource leading to the prompt degradation of Georgia’s forests. In response to the urgent need to introduce sustainable forest management practices, social logging will be phased-out and replaced by a model of sustainable use by 2023, as specified in the New Forest Code. Households, or intermediaries, will no longer be able to cut the timber in the forest. Only the forest management body, either the local representative body of National Forestry Agency or Agency of Protected Areas, will be able to harvest wood, which will be stored in business parks, commonly called business yards, from which local residents will be able to buy wood. Already 33 business yards have been established, and 22 additional business yards should be constructed by 2023. The new system will improve transparency and legality of fuelwood supply. The new Forest Code came into force on January 1, 2021, but the secondary legislation under the Forest Code have not yet been approved. The draft versions have been developed and will most likely be approved in the near future. Other measures of the New Forest Code include the establishment of a national Forest Information and Monitoring System. The education of forest workers is also addressed in the New Forest Code, with plans to provide training programs on sustainable forest management.

To address the unsustainable use of biomass, the government’s policy has been to extend natural gas access to rural areas to replace fuelwood consumption. However, in many cases, extending gas access has resulted in stranded investments because low-income households cannot afford natural gas (even at the subsidized rate) and continue to use wood instead. The Energy Strategy 2020-2030, adopted in 2019, envisages the prolongation of the gas-access policy, but also the promotion of energy-efficient equipment (wood stoves, water heaters, etc.) in wood-consuming areas.\footnote{IEA, (2020), Georgia, Energy Policy Review}

**Price, taxation, subsidies**

First, the price that households pay for firewood includes the price of the social ticket and the VAT. As firewood collection is often undertaken by intermediaries, the price can also include the fee for cutting trees, and the transportation service from the cutting zone to the residential house. However, social-cutting licenses in isolated areas are not always utilized, as illegal harvesting in the vicinity of settlements is preferred thanks to lower transportation costs. Yet, it is expected that the price of firewood should increase following the implementation of the New Forest Code.
The price the social-cutting license fee is presently similar to forest residues, which is likely to make the use of forestry residues for fuel production uncompetitive. Additional measures are required to motivate the private sector to invest in facilities that convert forestry residues into upgraded fuels.

**Pellets, briquettes and other upgraded fuels**
While the consumption of fuelwood is culturally entrenched in Georgia, the usage of biomass pellets, briquettes and other upgraded biofuels remains very low. Domestic production is approximated at around 1 per cent of all biomass fuel (by energy value). Nevertheless, about 15 000 m$^3$ of fuelwood demand was met with briquettes in 2019.

**Technologies using wood for cooking and space heating**
Firewood stoves are widely used in many regions of Georgia. Firewood heating stoves are used for cooking purposes in the winter season, with pot-holes, or/and baking oven attached. While the survey on Energy Consumption in Households (2017) informs the fuel usage of households, there are no official statistics on the different types of technologies currently in use for cooking and space heating. Nonetheless, it has been observed that open fires remain commonplace for space heating and cooking.

In addition, there are three other main types of heating stoves in Georgia. First, tin stove made of the simplest construction materials with no mechanism to control air inflow, and not airtight. The stove walls are thin, thus warm up to high temperature in a little period of time and cool down soon as well. They need to be replaced within 1-2 years and have a very low efficiency (20-25 per cent). The majority of the population uses these cheap, traditional stoves even if they last for just one or two seasons, as the capital price is the principal factor taken into account by the households. The price of this type of stove ranges between GEL 50 and GEL 70 (~ $15 - 21). Second, improved wood stoves with combustion chambers, air inlet controls, and smoke chamber are produced domestically on a small scale and in a nonstandardised manner. They can last for around 5 years and they cost between GEL 300 – 500 (~ $92 - 153. According to testing at the Georgian Technical University, their efficiency can go up to 75 per cent, which can reduce firewood consumption by two-thirds compared with basic alternatives. However, this estimation is based on laboratory tests and results can be significantly different in real household settings. Finally, more energy efficient and durable imported wood stoves can also be found in urban areas. Most of them are EU-certified and comply with requirements of the EU Eco-design Directive. Their energy efficiency is above 70 per cent. However, the demand for these improved stoves is concentrated in higher income urban areas because of their higher price. The average cost of these stoves is GEL 1,479 (~ $452), In comparison, electric and natural gas appliances for cooking and space heating cost between GEL 180 and 2,200 (~ $55 – 673).

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67 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap  
68 Ibid.  
69 Ibid.  
70 Ibid.
**BIOGAS**

Significant differences between summer and winter seasonal temperatures in the mountainous regions where livestock is developed, make the generation of biogas uneven and complicated, which is a barrier for popularization of biogas plants. Yet, about 337 biodigesters have been installed in Georgia between 2000-2006. However, many digesters did not function and did not produce the expected amount of expected gas. In 2008, the Ministry of Economic Development, Department for Regional Policy, with support from the EECG, drafted a project proposal for the installation of 10,500 biogas digesters in rural Georgia, but there has been no follow-up for the moment.

According to the National Renewable Energy Action Plan, 2019-2020, approximately 90 million m³ of biogas could be obtained from the 900,000 tonnes of waste that accumulate every year in the Tbilisi and Kutaisi waste disposal sites. Similarly, approximately 160 million m³ of biogas can be obtained every year from the sewage water cleaning station of Tbilisi (serving 1.2 million).

**COAL**

After the expansion of the natural gas network in the region where coal was used by households (Javakheti), the population switched to natural gas. Coal is no longer used for household needs.

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72 Project Idea Note for Small biodigesters for Georgia’s regions. Available at: [http://eecgeo.org/docs/Final%20PIN%20small%20biodigesters.pdf](http://eecgeo.org/docs/Final%20PIN%20small%20biodigesters.pdf)
4. Policy and institutional context

STAKEHOLDER ORGANIZATIONS
Clean household energy access often touches on the activities of different Ministries, such as Energy, Forestry And Environment, Rural Development and Social Services.

In Georgia, since the merger of the Ministry of Energy into the Ministry of Economy and Sustainable Development (MoESD) in 2017, the MoESD is responsible for state policies in the energy sector. The MoESD is jointly responsible with the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) for coordinating climate and sustainable energy-related activities at a local level. In addition, the MEPA develops and implements state policies pertaining to agriculture, forest and the environment. It oversees environmental impact assessments (including for energy sector projects) and control the use of natural resources (except for minerals, oil and gas). It is the MEPA that has overall responsibility for defining and implementing air quality policy. At the moment, the MEPA is involved in several donor-driven projects to deliver climate finance to the private sector, foster the transition to low-carbon cities, and accelerate the introduction of sustainable

73 Third National Environment Action Programme of Georgia, (2017-2020)
management practices in forests. On the other hand, the Ministry of Internally Displaced Persons from Occupied Territories, Labour, Health and Social Affairs (MoLAHS) has the mandate to develop and implement the national health care policy and strategy. The National Center for Disease Control and Public Health (NCDC) is the leading organization in the prevention and control of communicable and non-communicable diseases. To fulfill the requirements of EU regulations and directives related to energy statistics, the National Statistics Office of Georgia conducted a survey on the energy consumption of households in 2017. This survey will be done regularly every 5 years.

In addition, there are several national and international non-governmental organizations working to improve the access to clean fuels and technologies in Georgia. A comprehensive list and description of stakeholders that have an interest in clean energy access is provided in Annex 1.

With regard to energy access initiatives, there are no formal mechanism for coordination. However, the government of Georgia has established a governmental recommending body - the Climate Change Council, for implementing and tracking the effective implementation of the climate change policy. In addition, 24 municipalities are part of the Covenant of Mayors, and are therefore committed to reduce CO₂ emissions from sources located within their boundaries by up to 30 per cent by 2030, to increase the resilience to climate change, and to ensure the access to sustainable, secure and affordable energy to all. Covenant National Coordinators in Georgia are the Ministry of Economy and Sustainable Development of Georgia, the Ministry of Environmental Protection and Agriculture of Georgia.

ENERGY SECTOR POLICIES

International commitments
Following the EU-Georgia Association Agreement in 2016 and the accession of Georgia to the Energy Community Treaty in 2017, an international agreement that brings the EU and its neighbours together to create a pan-European energy market, major reforms have been undertaken to align the energy sector of Georgia with the EU requirements. The EU laws and regulations that Georgia has pledged to adopt include the 2012 EU Energy Efficiency Directive (EED), the 2010 Energy Performance in Buildings Directive (EPBD) and the 2010 Energy Labelling Directive regarding products that consume energy. Overall, the reforms underpin the liberalization and deregulation efforts that started from 2008 in Georgia’s energy sector. The Association Agreement with the EU is just one of Georgia’s international commitments. In 2015, the Government of Georgia submitted its Nationally Determined Contribution (NDC) and committed to implement the 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals. In 2021 Georgia submitted its updated Nationally Determined Contribution. Georgia fully committed to limit total greenhouse gas emissions of 35 per cent below 1990 level by 2030, and by 50-57 per cent with international support. Georgia is preparing its National Energy and Climate Plan

74 https://www.energy-community.org/regionalinitiatives/infrastructure/donors/National/GE_KfW_AFD.html
(NECP) for 2021-2030 with an outlook to 2050 to ensure consistency with long-term EU, United Nations Framework Convention on Climate Change (UNFCCC), and Energy Community policy objectives.

**Energy Efficiency and Renewable Energy**

In order to reduce the needs for energy imports, align the country with EU requirements, and reduce greenhouse gas emissions, Georgia has recently adopted new pieces of legislation with regard to energy efficiency and renewable energy. On the one hand, the National Energy Efficiency Action Plan (NEEAP) seeks to reduce the energy intensity of Georgia, currently 30 per cent above the European countries average. The law on Energy Efficiency (2020) contains various energy efficiency measures for “final energy consumption devices, including lighting, cars, pumps, engines and plant boilers” and foresees programs for “the use of alternative energy sources, including the introduction of energy-efficient stoves and solar-powered water heaters”. In this regard, quality controls of energy efficient devices should be implemented, as well as the establishment of energy performance certification schemes, training programs, awareness raising activities, and financial incentives.

The energy efficiency of appliances is one of the key tool to enhance the economic impact of energy access as providing consumers with more energy efficient devices enable them to power more devices from the same level of supply. At the same time, efficient appliances enable reduction in energy demand for the same level of service, and are therefore essential to reduce energy bills and energy poverty. In addition, with the Law on Energy Efficiency in Buildings (2020), the Government shall determine minimum requirements for energy efficiency that will apply to existing and new buildings. On the other hand, the National Renewable Energy Action Plan foresees the smooth integration of renewable energy generators into the future power market. The plan supports hydropower, solar power, wind, and geothermal heat production, as well as the active promotion of renewable solar hot water heaters as a replacement for natural gas. A complete list of relevant energy policies for household energy access is provided in Annex 2.

**Biomass related policies**

Woodfuels play an important role in the livelihoods of Georgian households, as many rely on this resource to meet their energy needs.

Until recently, there was no legal and regulatory framework to regulate the use of biomass as an energy source in Georgia, leading to overexploitation and non-durable harvesting. To tackle the unsustainable forest management practices, the Government of Georgia initiated an extensive forest sector reform in 2013. In this regard, the National Forest Concept, adopted in 2013 by the Georgian Parliament, laid down the

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76 Law of Georgia on Energy Efficiency, (2020)
Sustainable Forest Management principles (SFM). These principles have the objectives to improve the quantitative and qualitative characteristics of Georgian forests, to effectively use the economic potential of forests taking into account their ecological values, to encourage public participation in forest management, and to enhance the fair distribution of derived benefits. In 2016, the Ministry of Environment and Natural Resources Protection (MENRP), with World Bank assistance, initiated the development of a new Forest Code within the framework of the European Neighborhood and Partnership Instrument East Countries Forest Law Enforcement and Governance II program.\(^78\)

The New Forest Code, adopted by the parliament in 2020, defines the novel organizational arrangements, rights and responsibilities of forest management bodies in Georgia. First, it is expected that new forestry licenses will not be issued and social logging will be replaced by a model of sustainable use. Secondly, forest management, harvesting, and wood-related commercial activities will exclusively be regulated by the National Forestry Agency. The agency will be responsible to provide fuel wood in rural areas, and actual forestry operations will be transferred to other public agency or private companies. Therefore, the wider population will have limited access to the forests. Timber will be placed in so-called business yards, from where population will be able to buy firewood and another solid biomass (i.e. chips) from 2023. As a result, biomass will be available at transparent, equitable and competitive conditions.

In addition, the NREAP should implement policies to develop existing biomass resources and mobilize new ones, and to ensure the certification of technologies, including biomass boilers and stoves. At the moment, national standards have been drafted, but not yet approved, for solid biofuel stoves, wood-briquettes and fuel wood for non-industrial use. The NREAP endorses the development of improved management practices and supports the use of biomass residues for heating.

The State Strategy for the Development of Solid Biofuels in Georgia has been drafted in 2017 and is currently under review for government approval.\(^79\) The main goal is to accelerate the production and use of modern solid biomass residues in Georgia. The strategy considers the designation of a responsible body, the adaptation of the legal framework (taxation, tax incentives, waste management), the introduction of standards for biomass and fuels, as well as the need for appropriate manufacturing and consumption technologies.

### HEALTH SECTOR POLICIES

While in 2010, the WHO developed indoor air quality guidelines, no regulations have been integrated to date into the national legislation.\(^80\) At the moment, there are no specific laws regulating indoor air quality in Georgia.

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78 National Renewable Energy Action Plan, 2020
79 Ibid.
80 WECF, (2020), Indoor Air Pollution Related Health Challenge in Georgia: An interim study of indoor air pollution in kindergartens
The issue of indoor air pollution has nonetheless been highlighted in several recent national policy documents. The National Environment and Health Action Plan (NEHAP-2) of Georgia for the years 2018-2022 underlines objectives with regard to indoor air pollution. Drafted by the National Center for Disease Control and Public Health, the Ministry of Labour, Health and Social Affairs (MoLAHS), in collaboration with the Ministry of Environment and Natural Resources Protection (MEPA) of Georgia with technical assistance of the WHO, the NEHAP-2 sets the important objectives to assess and reduce the harmful effects of ambient and indoor air pollution on human health, and to integrate health issues in climate change adaptation and mitigation policies. To reach these objectives, the NEHAP-2 promotes the provision of health-relevant information on population exposure to air pollution and its influence on health, and the assessment of health risks due to fuels combustion (wood, gas, kerosene, etc.) for heating and cooking in households and children's educational institutions.

In addition and in response to the high burden of the Non Communicable Diseases in Georgia, for which indoor air pollution is an important risk factor, the National Centre for Disease Control and Public Health, and the Ministry of Internally Displaced Persons from Occupied Territories, Labour, Health and Social Affairs, elaborated the National Strategy and Action Plan for Non-communicable Diseases Prevention and Control 2017–2020. The aim of the strategy is “to reduce the burden of non-communicable disease related to morbidity, mortality and disability caused by preventable and manageable conditions at the national level via multi-sectoral cooperation, in order to reach the highest standards of health and productivity of population at any age and to ensure that these diseases no longer represent a barrier to health and socio-economic development”. At the moment, the plan does not include ambient and indoor air quality.

Since 2000, in order to ensure the protection of the environment, the National Environmental Action Programme (NEAP) identifies the environmental priorities of Georgia, as well as the long and medium term goals and targets. Among the goals identified in the third NEAP for 2017-2020, « clean air throughout Georgia that is safe for both human health and the environment » is of particular relevance. The targets to achieve clean air are the following: i) the reduction of air emissions through the regulation of air pollutants from various economic sectors, ii) the development of an air quality monitoring and assessment system, iii) improvement of the state system for emission inventories and the establishment of the emission projections system. Hence, in its present form the NEAP does not set targets for indoor air pollution and focus on ambient air quality. In parallel, the NEAP defines the goal to “improve the overall condition and ecological functions of forests through establishment of a sustainable forest management system in Georgia”. In this regards, the NEAP promotes the use of alternative fuel sources to reduce firewood consumption. Although, the primary objective of this measure is to improve the overall condition and ecological function of forests,
reduction of indoor air pollution can be a major co-benefit of forests reforms, that is currently overlooked.

Ambient air quality is regulated by the law of Georgia on Air Protection. The law defines the various types of anthropogenic impacts on ambient air and limits the concentration of harmful substances in ambient air. The law should be amended to include provisions on indoor air quality.

SOCIAL WELFARE PROGRAMS

Although there is not a specific program that address household air pollution and its adverse health impacts, it may be possible to leverage existing social welfare programs. Clean household energy intervention could be introduced into health programs and social assistance schemes to change the fuels used within vulnerable households the most at risk from household air pollution, as a mean of reducing poverty and vulnerability. Since 2013 the Government of Georgia has laid the foundation for public health and welfare-oriented health policy. Universal health care (UHC) was enacted in 2013 to cope with significant private spending for health, which was estimated to maintain as many as 9 per cent of the population in poverty in 2010. The aim of the program is to provide access to medical services to the population of Georgia who have no health insurance. The share of the state budget allocated to the health sector has increased substantially in recent years: from GEL 450 million in 2012 to GEL 1,092 million in 2017 (~ $272 – $419 million).

In Georgia, the social assistance and benefits schemes are mainly provided by the Ministry of Labour, Health and Social Affairs of Georgia and the Ministry of Internally Displaced Persons from the Occupied Territories, Accommodation and Refugees of Georgia. The programs work to reduce poverty and improve the lives of the poorest and most vulnerable population in Georgia. To meet these objectives, social benefits are provided to five target groups, namely: single elderly persons, single parents, persons/children with disabilities, children deprived of parental care, and poor families with children. Direct financial assistance is essentially provided in the form of subsistence allowance, subsistence subsidy, state compensation, and one-time financial assistance. Indirect financial aid includes apartment rent subsidies. The Sustainable Housing Solutions projects are also in place to provide housing to Internally Displaced Persons (IDPs). As of September 2016, residential apartments were provided to 9,664 IDPs. In order to improve the demographic situation, municipalities often give one-time or monthly allowances to families with newborn children or families with many children.

In Georgia, UNICEF works with the Government to reduce the number of children and youths living in poverty. The Child Poverty and Social Protection program strives to scale up child-sensitive cash transfers, and to provide a safe, caring and supportive

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81 World Bank, (2018), Georgia: From Reformer to Performer, A Systematic Country Diagnosis
83 Ibid.
environment to the most disadvantaged families with children. Clean household energy intervention could be introduced into these various social assistance schemes to change the fuel used for cooking and space heating, as children are particularly at risk from household air pollution. UNICEF is also working with the government on the National Youth Policy and Action Plan to tackle high unemployment and poverty rates among the youths. As programs related to the sustainable management of forests, the installation of improved biomass heating systems, or the development of supply chains for upgraded fuels, create opportunities for rural job creation, they could be further integrated into youths action plans.

PROGRAMS FOR THE PROMOTION OF IMPROVED STOVES

To cope with the lack of access to clean cooking devices and their associated negative health, environmental and socio-economic impacts, several initiatives of clean cookstove dissemination have occurred in Georgia.

**Expansion and Improved Management Effectiveness of Adjara Regions Protected Areas (implemented)**

The project, implemented between 2016 and 2017 by the Energy Efficiency Centre (EEC), in close collaboration with UNDP and the Global Environment Fund (GEF), aimed to conserve the forest ecosystems in the Adjara region. Reduction in fuel wood demand by use of alternatives fuels (hazelnut shells, solar, briquettes) was piloted in 16 households and replicated in 65 additional households. Energy efficient stoves using hazelnut shells and briquettes were introduced in schools in households, while solar thermal collectors for hot water preparation were introduced only in households. The project included an awareness raising component, with information on proper storage of fuel wood, demonstration of home weatherization measures, distribution of leaflets as fuelwood’s substitutes and energy efficient stoves. Overall, 250 families were forecasted to use hazelnut fuels by 2021 leading to 1080 tons of fuelwood saved by 2021. World Wildlife Fund (WWF) replicated the experience with hazelnut shells within WWF forestry activities (eco-corridor’s program) in Khulo district. The overall project, for which the hazelnut component is a small part, successfully increased Adjara’s protected areas coverage from 30,469 ha to 37,802 ha by the end of the four years implementation period.

**Enabling implementation of forest sector reform in Georgia to reduce GHG emissions from forest degradation (approved for funding)**

Drafted in 2018, the program has recently been approved for funding by the Green Climate Fund in 2020. The project has received additional funding from the Government of Georgia, the Public

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85 GEF, UNDP, (2018), Expansion and Improved Management Effectiveness of the Adjara Region’s Protected Areas. Impact,

Lessons Learned and Recommendations
86Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, Funding Proposal
Procurement Agency, the Swedish International Development Cooperation, the Swiss Agency for Development and Cooperation, Crystal, and potentially other MFIs or banks. GIZ shall have the oversight of the overall project. The project activities are embedded with the ongoing national forestry sector reform in Georgia and will prepare the implementation of the Sustainable Forest Management framework to the entire nation’s forests with pilots in three target regions which account for 14 per cent of the country’s forest resources. This represents 270,807 ha of forest lands, more than the 250,000 ha targeted under Georgia’s Nationally Determined Contributions. At the national level, the project will foster the deployment of energy efficient stoves (solid-fuel-based space heaters) and solid biofuel products from forest and agricultural residues. On the demand side, it will promote initial demand through energy efficiency public procurement rules and regulation, financial incentives, technical trainings, information and education campaigns. Overall, 242,000 households will be provided with information and assistance to identify and adopt EE-AF solutions. 1 million people will be reached out nation-wide via awareness raising campaign, implemented by the Environmental Information and Education Centre (EIEC) on sustainable forest management, forestry reform agenda and its effect on climate change. This may be the opportunity to discuss the co-benefits on health, women empowerment, and energy-cost-time savings. On the supply side, the project will support producers of energy efficient stoves and alternatives fuels by easing the access to finance, with investment grants or interest rates subsidies, and by providing advisory support for business development and product certification. The Georgia Forest and Rural Energy Investment Facility (GFREIF) will be formed to coordinate and scale-up public and private investment in low carbon transformation of Georgia’s forestry and rural energy sectors. To sustain the usage of improved stoves in the long run, inefficient stoves will be gradually phased out from the market and minimum energy efficiency and environmental performance standards for domestic heating appliances will be introduced. Overall, the project aims that 30 per cent of households in the three target regions should have access to efficient heat stoves and alternative fuels by the end of the project (estimated in 2030). This represents the sale of 30,730 stoves and 28,600 tonnes of alternative fuels. By doing so, the demand for fuelwood is expected to decrease by up to 50 per cent compared to the baseline. The expected mitigation impact is 16.14 million tCO₂eq over a 20-year project lifetime.

The first gender sensitive Nationally Appropriate Mitigation Action (waiting for funding)

To date, 500 Solar Water Heaters (SWH) have been installed in rural regions in Georgia. Another 100 houses have benefitted from insulation of windows and roofs and 100 obtained efficient wood stoves. SWH were constructed in a by locally trained technicians

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87 The awareness raising campaigns will be designed based on survey results to allow for well targeted messages
88 Ministry of Environmental Protection and Agriculture of Georgia, (2019), Georgia’s Second Biennial Update Report
using local materials. 69 women and 88 men have been trained in 8 community trainings, each lasting 4 days. In 2014, an evaluation of results has been made and used to make recommendations for the scale up the from 400 to 10,000 installed units.

**Nationally Appropriate Mitigation Action (Waiting for funding)**

The objective of the NAMA is to foster climate resilient, low carbon, sustainable rural development and poverty reduction through the up-scaling of Solar Water Heaters, Fuel Efficient Wood Stoves, Energy Efficient Insulation) measures in 11,500 rural households and public buildings and sustainable forest management. Replacement of existing wood stoves (average efficiency about 35 per cent) with efficient wood stoves (at least 70 per cent efficiency) will reduce firewood consumption and GHG emissions.

The project was submitted for funding to NAMA facility in 2018, however it was rejected. In the meantime, implementation happens on a small scale through support of other Donors. If the NAMA is funded in the full scale, the project aims at CO₂eq reduction by end of 2023 of at least 29.185 tCO₂eq annually and by early 2039 of at least 157.242 tCO₂eq Annually (accumulated 1,487,203 tCO₂eq ).

**OTHER RELEVANT PROGRAMS**

**Rural Energy Program**

Between 2005 and 2009, USAID funded the Georgia Rural Energy Program to increase the supply of energy in rural areas, and to improve the overall management of local energy production.

**Renewable energy and Energy Efficiency New Project**

The Energy Efficiency Centre, under funding from the BP EXPLORATION (Caspian Sea) Ltd. Georgia implemented the Renewable Energy and Energy Efficiency New Project from 2013 to 2015. Demonstrations of energy-saving technologies and practices were conducted throughout the project to raise public awareness on how these technologies contribute to economic and fuel savings. Activities included the insulation and the installation of natural gas heating in a school building, the installation of a Solar Thermal System at Rugby Sports Base, the implementation of energy efficient heating system in a kindergarten, etc.⁹⁰

**Energy Bus Project**⁹¹

With funding from BP & partners and USAID, the Energy Efficiency Centre of Georgia launched in 2009 the Energy Efficiency Programme for Georgian Communities – the Energy Bus Project. During the three years of operation, the Energy Bus visited the main cities, 57 district centers/small towns and more than 400 villages to raise awareness on the effective usage of energy.

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⁸⁹https://ge.usembassy.gov/usa-id-energy-program/
⁹⁰http://eecgeo.org/en/project_BP_new.htm
⁹¹http://eecgeo.org/en/project_energy_bus.htm
Biomass Energy and Energy Efficient Technologies

This project is part of EU’s Covenant of Mayors for Climate & Energy initiative. The project supports Municipality of Telavi with the introduction of energy efficient measures and the use of renewable energy sources in two preschools. The project also aims to promote renewable energy production through locally available biomass and the establishment of a local biomass logistic chain using vineyard pruning for heating instead of natural gas or wood.
5. Barriers to increase household access to clean fuels and technologies

TECHNOLOGY AFFORDABILITY: The cost of energy efficient technologies represents a significant up-front cost with regard to the income level of the majority of household in Georgia. Only 10 per cent of rural households have monthly earning above GEL 800 (~ $248) per month, and 68 per cent of households earn less than GEL 400 (~ $122). However, the price of natural gas individual heating ranges between GEL 600-2,500 (~ $185 – $765) and between GEL 1,700-3,900 (~ $520 – $1,195) for central heating boiler, while infrared heaters costs between GEL 200-400 (~ $60 – $120). The price of electric cooking stoves can reach up to GEL 2,200 (~ $675) and the price of natural gas cooking stove ranges between GEL 700-2,500 (~ $215 – $765). The price of an energy efficient stove using firewood (that can be used for both cooking and space heating needs) ranges between GEL 300-500 (~ $90 – $155) for a locally-produced (but non-certified) stove, and GEL 800-1,500 (~ $250 – $460) for an imported and EU-certified stove.

In contrast, the price of a conventional stove that can be combined for cooking and heating

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92 Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, Funding Proposal

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needs, using basic firewood, amounts to GEL 50-70 (~ $15 – $20). As a result, the majority of rural households cannot afford the cost of energy efficient cooking stove, space heater, let alone central heating system or thermal insulation.\textsuperscript{93}

Despite the higher purchase cost, the lifetime cost of an improved stove can be lower than traditional stove thanks to fuel savings, and reduced time spent cooking.

According to the IEA, compared to basic stove using firewood, the extra investment for an efficient stove using briquettes could be paid back in 12 to 18 months.\textsuperscript{94}

At the moment, there are no financing schemes in place to help consumers bridge the price gap between an energy efficient and a conventional stove, as banks are failing to evaluate credibility risks of low-income clients. The situation is being exacerbated by increasing restrictions on household access to bank financing. Indeed, to cope with the growing value of overdue loans, tight regulations limiting the banks’ ability to provide consumer loans have been enacted since 2019. Therefore, more widespread deployment of improved and clean technologies would require easing of restrictions to finance.

In addition to the product being very expensive, it is very novel to consumers. Therefore, additional innovative financing models could be investigated to foster behavior change and demand at the consumer level. Such support could take the form of microfinance loan schemes, conditional or unconditional cash transfers, rent to own, free trial periods, micro-franchising, consigning, instalment payments, or payments through carbon trading mechanisms.

However, the Covid-19 pandemic threatens to further increase the constraints on household budgets, as poverty is projected to increase by 5.4 percentage points in 2020 (using the national poverty line), and that unemployment rate reached 20.4 percent at the end of 2020.\textsuperscript{95} Without external support, more poor households may revert to traditional biomass for cooking, or renounce to invest in clean energy.

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\textbf{Box 2: Consumer finance}

Easing financial access to the clean cooking stove and space heating market through dedicated schemes may prove important to push demand for already financially constrained consumers. In Kenya, EcoZoom partners with microfinance institutions (MFI) to deliver end user finance.\textsuperscript{96} The company provides training on the technology, marketing support, and use the network of MFI to directly sale EcoZoom products. Mobile transactions is an option that has been tried out by LivingGoods (Uganda) to ease stove purchases.\textsuperscript{97} Costs are also reduced as Living Goods agents visit customers at their doorsteps, saving customers the money and time required to travel to shops. Equipping salesmen with mobile phones has also proven to be a cost effective management strategy, allowing them to take new orders from clients, ensure aftersales services and report their

\textsuperscript{93} Ibid.

\textsuperscript{94} IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap

\textsuperscript{95}World Bank, (2020), Georgia Country Overview. Available at: https://www.worldbank.org/en/country/georgia/overview

\textsuperscript{96} Clean Cooking Alliance, (2014). Ecozoom East Africa: Exploration of Internal Asset Finance for Cookstoves


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results to managers. In Kenya, PayGo Energy developed the Cylinder Smart Meter (CSM) to provide affordable clean cooking technologies for low-income households. The CSM is a device connected to LPG cylinders measuring gas flows as customers use it for cooking. Users can charge their account in any amount using mobile money and pay for the quantity they consume, until credit reaches zero. Carbon credits are another way to reduce the price of clean technologies. Emission reduction projects that contribute to sustainable development earn a carbon credit, that is the emission reduction equivalent of one tonne of carbon dioxide. Burn, located in Sub-Saharan Africa, leverage carbon offsets to design new cookstoves, and develop additional local sales and distribution channels. Similarly, CO₂ balance use carbon revenue to fund future stove subsidization, delivery, marketing and web development campaigns, installation and maintenance of stoves. In South Africa, PayGas provide affordable access to LPG via gas dispensing stations, where consumers can buy only what they can afford, thanks to a technology that fractions gas purchases into smaller quantities. Payments are done through a software payment platform combined with a cashless refilling station, connected to a barcode on customers’ cylinders.

**LACK OF INVESTIGATION ON INDOOR AIR POLLUTION AND HEALTH IMPACTS OF SOLID FUELS USE IN THE HOUSEHOLD:**

Reliance on inefficient and polluting fuels to meet household energy needs is directly linked to multiple respiratory conditions, resulting in a significant public health hazard. Evidence on the relationships between levels of exposure to pollution and health risk led the WHO to recommend annual average of PM2.5 under 10 μg/m³ to prevent the majority of cases of disease and associated premature deaths attributable to PM2.5. However, very limited evidence is available on the level of indoor air pollution associated with wood burning stoves in Georgia. More and better data will be needed to measure the extent of the issue and to support improvements in the design and implementation of programmes. Measuring indoor air pollution should be included in projects that consider the distribution of improved firewood appliances to reduce forest degradation, such as the Green Climate Fund project “Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation”.

While improvements to firewood space heaters and cooking stoves can bring many benefits the evidence point out that many of the improved stoves presently on the market are unlikely to reduce household air pollution to levels recommended by WHO, and to translate into health benefits. Hence, the challenge is to design fuel-efficient stoves that reduce emissions to levels that are low enough to bring about health improvements. In addition, lasting reduction in PM2.5 levels depends on how the stoves are used in practice (e.g. overloading of wood and other biomass residues into the stove), the maintenance of the stove and chimney, the type and moisture levels of firewood, and the continued use of traditional stoves and pollution from other sources. This means that even if solid biomass stoves can produce relatively low emissions and reduce indoor air pollution when used optimally in

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99 Clean Cooking Alliance, (2014), Clean Cookstoves and Fuels: A Catalog of Carbon Offset Projects and Advisory Service Providers, 2ND EDITION

100 WHO, (2015), Household air pollution and the sustainable development goals
laboratory settings, their effectiveness in real household conditions are generally less impressive. In Georgia, however, there remains very limited investigations on the actual impact of improved fuels and technologies and upgraded fuels on indoor air pollution and health, whereas there is more widespread information on the benefits of improved fuels and technologies for forest-related issues.

Therefore, current reforms and projects should strive to consider indoor air pollution to maximize health gains while designing climate-relevant household energy actions. Protection of forest and energy access initiatives could further involve the health sector, as they can induce important health co-benefits. Yet cross-sectoral initiatives to promote clean energy solutions are still lacking, and the health sector involvement in this space remains limited.

**LIMITED MARKET OUTLOOK FOR IMPROVED FIREWOOD STOVES AND ALTERNATIVE FUELS:** Although many improved stoves models do not meet WHO Guidelines, they can be used as transitional solutions as they offer some benefits. However, in Georgia, there is only a limited number of local manufacturers or technology suppliers for improved firewood appliances and alternative fuels (e.g. 15 producers of energy efficient fuelwood heat stoves and 3 briquette manufacturers). They are principally local and self-financing SMEs, with limited access to finance because of a low level of financial literacy and a lack of experience and skills with the development of new products. There are also financial barriers to invest in the equipment necessary to upgrade waste residues into fuels, as banks do not offer producers low-interest credit, leaving them with limited alternatives to taking out regular loans at high interest rates. In addition, a universal value-added tax of 18 per cent is applied to all fuels, with no distinction between fossil and renewable. The up-scaling of supply is also limited by the absence of detailed information on availability and territorial distribution of raw materials, such as unused agricultural or forest residues, as well as expertise to conduct resource assessment and develop feasible business models. The absence of testing, standardization and certification services further prevent producers to differentiate their products in comparison to cheaper but less efficient technologies. Furthermore, as the sector is at the early business planning stage, producers experience the barriers typically faced by first movers on an un-established market. The absence of effective demand impedes the scale-up of a sustainable market for energy efficient stoves and technologies, as for the moment investments in the sector do not represent a viable investment. A more comprehensive set of enabling policies, support schemes and regulations will be necessary to support the development of a self-sustaining market for improved firewood stoves and alternatives fuels.

**LOW THERMAL EFFICIENCY OF RESIDENTIAL BUILDINGS:** The effect of clean and improved space heaters on indoor temperature, fuel consumption and indoor air

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101 Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, Funding Proposal
102 Ibid.
103 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
104 Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, Funding Proposal
pollution will be small when buildings are uninsulated, as the heat will leave the room rapidly. In Georgia, a recent study concluded that 85 per cent of houses surveyed had no roof or wall insulation, and almost one-third of the families consulted indicated that their houses were cold and damp during the cold season.\textsuperscript{105} The thermal insulation of rural houses has high theoretical potential to reduce the heat demand, hence reduce energy poverty, and maximize the benefits of improved and clean space heaters. In Georgia, it was estimated that the insulation of the whole living space could reduce energy consumption by 60 per cent.\textsuperscript{106} However, the cost of retrofitting for an average house size is 3 times the annual income of an average rural household. Yet, basic insulation package for some parts of the living space could already result in at least 30 per cent of energy savings. In this regard, the Law on the Energy Performance of Buildings, adopted in May 2020, aims to improve the energy efficiency of existing and new buildings.

**LACK OF AWARENESS ABOUT CLEAN ENERGY TECHNOLOGIES AND ENVIRONMENTAL SUSTAINABILITY:** Georgian rural household have limited knowledge about energy efficiency technologies and alternative fuels. In 2014, only 20 per cent of the rural households were conscious of energy efficiency technologies while the remaining were either not sure or not aware at all.\textsuperscript{107} The evidence further suggested that low level of awareness is a key barrier to the establishment of energy efficient and alternative fuels markets. According to a review of environmental education in Georgia, the main reasons behind the lack of awareness on the negative impacts of traditional cooking and heating practices are the absence of communication and information sharing, low civic responsibility of the society, lack of motivation, and state policy.\textsuperscript{108} In general, the attitude of the population towards the environment is characterized by short-term perspectives. Where environmental damage is associated with economic benefits, environmental problems remain ignored.

**LIMITED KNOWLEDGE ON USER ACCEPTABILITY OF IMPROVED AND CLEAN TECHNOLOGIES:** How rural households use and combine energy sources and technologies to meet their household energy needs remain poorly investigated in Georgia. However, knowledge gaps on household practices and aspirations undermine the development of a sustainable and fully-functioning market for improved and clean fuels and technologies. When clean energy access initiatives fall short of individual, household or communal needs, the evidence suggests that households continue to use traditional stoves alongside the improved stoves, or even completely revert to cooking with traditional stoves. Indeed, new stoves will not necessarily be accepted by households unless their design are well-suited with traditional cooking equipment and practices.

\textsuperscript{105} Delegation of the European Union in Georgia, (2019), World Bank study supported by EU finds under-heating in Georgia leads to loss of 3.5% of GDP. Available at: https://eeas.europa.eu/delegations/georgia/65129/node/65129_zh-tw
\textsuperscript{106} Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, Funding Proposal
\textsuperscript{107} USAID, (2014), Household Energy End-Use Survey
\textsuperscript{108} Makharadze and al., (2014), Evaluation of Environmental Education in Georgia
In Georgia, this is of particular importance as heating stoves can be used for cooking purposes, with pot-holes, or/and baking oven attached. As the cold season arrives, rural households usually switch away from LPG or Natural Gas and revert to firewood for cooking, as they prefer to cook and heat with the same stove. This emphasizes that any new technology should consider both the heating and cooking practices of households. Consumer studies can contribute more widely to the understanding of consumer behaviors, and account for all the cultural variations between households and communities. Based on the results of these studies, technology customization that meet household needs will be key to maximizing the uptake and usage of modern energy services and bringing about the time and cost savings, as well as the health, gender equity and climate benefits associated with clean energy access. Community participation in stove design is of particular importance to account for the local needs and develop the sense of ownership. As the primary users of cooking stoves, future initiatives would particularly benefit from women’s involvement at all levels of research and implementation. They could especially participate in the designs of improved stoves, making them more user friendly as they have better knowledge about their needs, but also in quality assurance, research, capacity building activities, and increasing access to finance.

DEEP-ROOTED TRADITIONS: In addition to the product being very expensive, improved and clean technologies are very novel to consumers, with only few units sold currently in Georgia. According to consultations with stakeholders, the rural population is not ready to adopt and use these new technologies. The population remains conservative with regard to cooking and space heating practices, especially elderly people that represent the major part of rural population of Georgia. In the summer season, it is expected that natural gas (if supplied) or LPG will continue to be the main fuel used to meet cooking needs, while firewood will continue to be the main fuel during winter.

ELECTRICITY AND NATURAL GAS VULNERABILITY: Continued near-exclusive reliance on hydropower for power generation, along with increased import dependency could create energy security concerns in the long term, as Georgia’s water resources are particularly vulnerable to a changing climate and weather patterns. In turn, the current over-reliance on natural gas for household energy needs is putting Georgia at risk of future supply problems and price shocks. Households may use multiple stoves or revert back to firewood to cope with shortages or price variations, which attenuates positive health and climate benefits that can be realized by clean energy access interventions.

INCREASING OPPOSITION OF THE LOCAL POPULATION TO NEW HYDROELECTRIC POWER PLANTS AND RENEWABLE ENERGY PROJECTS: The success of energy access interventions strongly rely on citizen support. However, to the same extent than approval of consumers can enhance the usage of technologies, strong opposition can disrupt

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adoption of a new technology. In Georgia, the trust of local communities in hydropower technologies has been eroded by shortfalls in environmental studies and project planning that led several projects to fail. In addition, security concerns remain with regard to the construction of additional power lines, in part due to the disordered construction of houses in the 1990s that led some households to live under transmission power lines. Living near power lines were associated with health and fire risks, degraded well-being and landscape aesthetic. More inclusive procedures to guarantee robust governance and improve transparency can help identify concerns at an early stage and make it more likely that later phases of the project will advance efficiently. Similarly, additional measures to ensure that projects conform with the highest technical, environmental and social quality standards, and public awareness-raising could reduce the local opposition to new projects.

**ELECTRICITY AFFORDABILITY:** Despite high electricity access rate, the use of electricity for cooking and heating tasks has remained limited. In 2017, only 5.7 per cent of households used electricity for cooking with cookers, and 14.9 per cent of households used electricity for cooking with ovens. The discrepancy between rural and urban households remains limited, as 5 per cent and 6.5 per cent of rural and urban households, respectively, use electricity when cooking with cookers while 13.6 per cent and 16.1 per cent of rural and urban households, respectively, use electricity when cooking with ovens. Similarly, just 1.8 per cent and 10.5 per cent of households in rural and urban areas use electricity for individual heating facilities. In contrary, household energy needs are mostly fulfilled with firewood in rural areas and natural gas in urban areas.

In the near-term, electrification can only be considered part of the solution for clean household energy, as it is unlikely to become competitive with the biomass fuels used for cooking or with natural gas, which is around 3.5 times cheaper than electricity. The low price of firewood is also important to consider if households are to use electricity more. With more expensive firewood, households will be more inclined to use natural gas and electricity.

**EMPOWER WOMEN IN THE ENERGY SECTOR:** Women are energy managers in the households, they are more likely to suffer from energy poverty and are under-represented in decision making in the energy sector. Recognizing their distinctive roles and needs and empower them to equal representation, will accelerate the transitioning to a more sustainable energy sector. Gender needs to be mainstreamed in all energy / climate policies and actions that Georgia is developing in order to ensure sustainability and an equitable sector.

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6. Opportunities to increase household access to clean fuels and technologies

REDUCTION OF ENERGY POVERTY: In Georgia, energy bills represent an important share of the total household expenditure. In the winter, energy expenditure can reach up to 20-25 per cent of total expenses, up to twice as high as that in the summer months.\textsuperscript{113} In 2017, natural gas expenditures amounted to $33.1, and electricity expenditure to $16.17 per winter months, compared to $6.9 and $9.7 or natural gas and electricity respectively per summer months. Energy bills in the winter represent a heavy burden for the population.\textsuperscript{114} In 2017, almost 40 per cent of the population borrowed money from time to time to pay utility payments (8 per cent every month, 6 per cent every second month, 24 per cent less often).\textsuperscript{115} As a result, many households cannot afford to fully heat their homes in the winter season. To reduce the burden of energy expenditures in the cold season, heating is often not turned on for 24 hours per day and households heat a smaller space than the total dwelling space. A significant

\textsuperscript{113}Winrok International Georgia “Knowledge, Attitude and Behavior Baseline Survey”, 2015
\textsuperscript{114} CRRC, (2017), Caucasus Barometer
\textsuperscript{115} Ibid.
number of dwellings are underheated in Georgia. The lack of insulation combined with poor and inefficient heating technologies impede households to maintain adequate indoor temperatures at an affordable cost. Buildings largely fall short of the internationally recommended indoor temperature range for thermal comfort and human occupancy (18 – 24°C). Underheating disproportionately impact people that stay most of the day at home, who also tend to be the more vulnerable persons, e.g. pensioners and disabled persons. In 2018, underheating contributed to 4 per cent of Georgia’s deaths, with the associated economic cost approximated at 3.5 per cent of the country’s GDP. Therefore, the fuel, time and cost savings associated with improved cooking and heating stoves can contribute to reduce the burden of energy expenditures and reduce energy poverty in Georgia.

NATIONAL PRIORITIZATION OF THE SUSTAINABLE MANAGEMENT OF FOREST AGENDA: To cope with forest degradation, mainly driven by the unsustainable wood consumption of the rural population, a new forest reform foresees the establishment of a nation-wide sustainable forest management system. The reform will provide additional health, environmental, gender equity benefits by accelerating the transition away from traditional and polluting stoves. A key feature of the transformational forest reform agenda is the establishment of business yards, where fuelwood will be processed and sold to households. This new organization provides substantial scope to enhance the quality of fuelwood used by households. Controls over the moisture content of the wood or the size of the fuelwood being sold, two factors that significantly impact the burning efficiency and the emission of pollutants, will be facilitated through the business yards.

In parallel, the Green Climate Fund project “Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation”, includes a component for the development of a market for energy efficient and alternative fuels. It is the first large scale project to promote the transition away from inefficient stoves. Overall, it is expected that the project will encourage the uptake of 30,000 energy efficient heat stoves by the end of the project (~ 2030), and that an additional 28,000 households will switch to alternative fuels. The project will accelerate the growth of the energy efficient stove and alternative fuel sector by simultaneously supporting the development of supply chain and encouraging the demand through financial incentives and awareness raising. Technical assistance will also be provided to financial institutions to structure and promote such loans. Capacity building are planned for stove market surveillance to facilitate the identification of non-compliant products. Overall, the new forest reform and the associated Green Climate Fund’s project will accelerate the transition to improved technologies and fuels.

HIGH RENEWABLE ENERGY POTENTIAL: Georgia has important renewable energy resource potential in hydro, wind, solar, geothermal and biomass energy resources.

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116 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap

117 Green Climate Fund, (2020), Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, Funding Proposal
According to National Renewable Energy Action Plan (NREAP), the projected hydropower resource potential is 15,000 MW with a potential for electricity generation of 50 TWh per year, of which only 22 per cent is being utilized at present. In addition, Georgia benefits from 1,900 to 2,200 hours of annual sunlight, which corresponds to a potential of approximately 500 MW for power generation. Onshore wind energy potential is estimated at 1,500 MW, with an electricity generation potential of 4TWh per year. Besides, Georgia has significant geothermal energy reserves, with estimated energy potential of 420 MW and thermal energy of 2.7 TWh per year. According to the Energy Sector Management Assistance Program, geothermal energy could be used to meet the space heating and hot water needs of between 500,000 and 1 million households. Then, renewable electricity generation technologies are currently cheaper than gas-based generation technologies. Therefore, Georgia’s high renewable energy potential, especially in hydropower, provide the potential to meet households energy needs with clean energy, while reducing GHG emissions.

**HIGH POTENTIAL FOR UPGRADED FUELS FROM UNUSED ALTERNATIVE BIOENERGY RESOURCES:** Upgraded fuels create a range of benefits, by diversifying the domestic heating and cooking fuel supplies, easing the existing pressure on forestry resources and providing opportunities for income generating activities for the rural economy. Upgraded fuels can also reduce indoor air pollution with regard to traditional firewood, as they have a higher burning efficiency and emit less pollutants. A recent study highlighted that the climate and health benefits of pellet stoves are similar to those of gas stoves.\(^{118}\) In Georgia, substantial volumes of solid biomass and firewood residues can be used to meet households heating and cooking needs through production of upgraded solid, i.e. briquettes, pellets and chips. This includes forestry waste and agricultural waste mainly from vineyards, fruits orchards and hazelnuts. Overall, the energy potential of perennial crop residues is 1.565 TWh/year.\(^{119}\) Biogas could also be produced from the treatment of residential waste. At the moment, 900,000 tonnes of waste per year accumulate in the Tbilisi and Kutaisi waste disposal sites, which could be used to produce about 90 million m\(^3\) biogas or 64 million m\(^3\) of natural gas. Overall, the technical potential of the major biomass sources in Georgia amounts to 12.5 TWh/year, and the achievable potential stands at 3-4 TWh/year. Yet, these energy resources remain generally untapped at the moment. There are no government policy or industrial strategy to regulate or promote the use of biomass wastes and residues. This situation undermines the creation of a coordinated supply chain between the resource base and the final demand. Additional support, through a combination of financial incentives, awareness raising, and capacity-building can contribute to the creation of a sustainable market for upgraded fuel.

**POTENTIAL FOR FARMING ENERGY CROPS:** The favorable climatic conditions for the cultivation of energy crops, such as poplars, which grow well on poor-quality unused agricultural lands could be leveraged to replace

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\(^{119}\) WEG, (2015), *Assessment of Wood and Agricultural Residue Biomass Energy Potential in Georgia*
the supply of firewood with low energy content. In Georgia, the potential for poplar crop, or other energy crops is high, as the share of unused agricultural land amounts to 40 per cent of all arable land. One poplar plantation has already been established in western Georgia to provide feedstock for fuel briquette production. Employment opportunities can arise from the planting and harvesting phases.

WIDESPREAD ACCESS TO NATURAL GAS IN URBAN AREAS: Access to natural gas has substantially increased from 68 per cent in 2015 to 75 per cent in 2018, and 84 per cent in 2019. After the completion of the three-year gasification plan of the government (2019-2021), more than 90 per cent of the population will have access to natural gas. In urban areas, access to natural gas is widespread and households rely on natural gas to meet the majority of their cooking needs. In 2017, 77.8 per cent of urban households used natural gas for cooking with cookers, and 67.9 per cent for cooking with ovens. Similarly, urban households disproportionately use natural gas for individual heating facilities (70.7 per cent). As around 10 per cent of the urban population continue to cook with firewood, and 17 per cent continue to heat with firewood, natural gas infrastructure could be leveraged to accelerate the phase out of firewood in urban areas.

However, though natural gas is a cleaner fuel than other unsustainable fuels, it remains a transition fuel, which ultimately will need to be replaced by renewable energy.

MINIMUM ENERGY PERFORMANCE STANDARDS FOR THE COOKING AND HEATING EQUIPMENT: Clean and improved cookstoves and heating stoves should be standardized to ensure that only appliances with the requisite performance for fuel efficiency, emissions, safety, and durability are adopted. In order for emission standards result in a health benefits, they should be aligned with the emission reduction targets of the WHO guidelines for indoor air quality. At the moment, heating and cooking stoves as well as biomass fuels are not subject to any mandatory standards in Georgia. Therefore, they are usually of low quality, and their health, environmental, and energy performance characteristics cannot be appraised by consumers.

However, the MoESD is drafting and adopting legislation for energy efficient standards and labels of solid fuels and household appliances. The Renewable Energy Law, adopted in 2019, makes specific reference to the adequate certification of technologies, including biomass boilers and stoves, wood briquettes and fuel wood for non-industrial use. Similarly, the State Strategy for the Development of Solid Biofuels in Georgia, drafted in 2017 and currently under review for government approval, foresees the introduction of standards for biomass and fuels. The Law on the Energy Performance of Buildings, adopted in May 2020, foresees the introduction of minimum energy performance standards and provisions, the establishment of energy performance certification and the inspection of heating equipment. The NEEAP envisages a phased approach to introduction of standards and labels, with only a limited number

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120 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
122 Ibid.
of appliances subject to regulation in the first phase. The labelling agenda in Georgia corresponds to the harmonization of Georgia’s energy sector with EU regulations and directives, and in particular to the transposition of the Eco-design Directive into Georgia National Laws. To support the labelling agenda, the project “Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation” will conduct capacity building for introduction and enforcement of energy efficiency and environmental standards and labelling. Acknowledging the limited ability of the Government and the market to simultaneously adopt and implement all regulations related to the Eco-design directive, the project will focus on standards and labels of solid fuel-based local space heaters.

**OPPORTUNITY FOR CLIMATE CHANGE MITIGATION:** The potential for household energy to mitigate climate change is an important consideration. In 2015, the residential sector had the highest contribution in methane emissions, due to the significant level of wood consumption for cooking and heating activities.\(^{123}\) Besides, emissions of CO\(_2\) amounted to 1,414.94 Gg CO\(_2\)-e in the residential sector, almost equivalent to the emissions from the energy sector (1,619.51 Gg CO\(_2\)-e), and more than the emissions from the commercial and agricultural sectors combined.\(^{124}\) Therefore, the transition to more efficient use of energy to meet the cooking and heating needs of the population offers considerable potential for reducing CO\(_2\) emissions from the residential sector. The sustainable management of forest, along the dissemination of efficient appliances will also strengthen the carbon-sink capacity of national forests, maintaining their climate change mitigation and adaptation capacities.

**POTENTIAL FOR RENEWABLES-BASED DISTRICT HEATING:** District heating combined with integration of renewable energy sources can help to meet increasing urban energy needs and bring a range of benefits, including improved air quality and health, increased energy security, and reduced climate impact. At the moment, only a few countries have used their renewable resource potential in district heating. In Georgia, while district heating infrastructures were dismantled in the 1990s, there are plans to consider the ability of district heating to help meet energy objectives by 2030. In the regions of Borjomi and Akhaltsikhe, private investors are already undertaking a feasibility study for a district heating system that would involve hybrid energy including biomass, solar, geothermal, and heat pump sources.\(^{125}\) The conclusions of the feasibility studies may result in a support scheme for district heating using renewable energy sources and accelerate the transition to clean fuels and technologies.

\(^{123}\)Georgia’s Green House Gas Inventory, 1990-2015, Ministry of Environmental Protection and Agriculture of

\(^{124}\)Ibid.

\(^{125}\)National Renewable Action Plan, 2019
7. Recommendations

1. Embed the clean household energy agenda into national energy strategies to provide an overall direction for the sector

Targets for both clean cooking and space heating are required to provide a clear signal to both suppliers and consumers about the sector development trajectory. In combination with enabling policies and regulations, they will provide the stability and visibility to attract investments and the involvement of stakeholders from various sectors. Future targets and policies should focus on scaling up clean cooking fuels and technologies rather than intermediate measures (e.g. improved stoves) to ensure maximum benefits from the energy transition. During the transition to the exclusive use of clean cooking fuels and technologies, energy efficient and alternative fuels that provide some health and environmental benefits should continue to be promoted. However, to ensure that these transitional fuels and technologies are as clean as possible, their impact should be assessed to ensure that emission of harmful pollutants are as low as possible.

2. Develop a national plan to tackle indoor air pollution

While some governmental initiatives have considered indoor air pollution, there are no laws regulating indoor air quality in Georgia. Indoor air quality objectives should be integrated into the next National Strategy and Action Plan for Non-communicable Diseases Prevention and Control. The plan for 2017-2020 aimed “to reduce the burden of non-communicable disease related to morbidity, mortality and disability
caused by preventable and manageable conditions at the national level via multi-sectoral cooperation, in order to reach the highest standards of health and productivity of population at any age and to ensure that these diseases no longer represent a barrier to health and socio-economic development”, but did not include requirements for ambient and indoor air quality. Indoor air quality objectives should also be integrated into the next National Environmental Action Plan. While the previous National Environmental Action Plan (NEAP) for 2017-2020 mentioned “the need to provide clean air throughout Georgia that is safe for both human health and the environment”, the next plan could tackle indoor air pollution further with concrete objectives and targets. The health effect of energy policies should also be emphasized in the National Energy Efficiency Action Plan and the National Energy and Climate Plan. More globally, a monitoring system should be created for environmental public health tracking. EU twinning program will help in it.

Nonetheless, indoor air pollution has been included in the National Environment and Health Action Plan (NEHAP) of Georgia for the years 2018-2022. The NEHAP sets the important objective to assess and reduce the harmful effects of ambient and indoor air pollution on human health, and to integrate health issues in climate change adaptation and mitigation policy. In this regard, it is recommended that research institutions are provided with up-to-date equipment to monitor air quality. In addition, the performance of appliances should be studied in real household conditions, as even if improved solid biomass appliances can produce relatively low emissions and reduce indoor air pollution when used optimally in laboratory settings, their effectiveness in real field testing are commonly less striking. Guidelines on indoor air pollution should then be integrated into the national legislation, and a national stove certification system should be developed to phase out inefficient stoves. Overall, future health action plans should be evidence-based and include market development, finance, coordination of initiatives and timetables.

Similarly, research on the association between energy and health remains scarce in Georgia. More laboratory research and field studies are needed.

3. **Encourage multi-sectoral coordination and cooperation to ensure holistic policy and program developments**

Given that clean household energy programs are cross-cutting in nature, with important co-benefits to health, climate, environment, gender equality, and livelihoods, accelerated coordination is needed. Current programs should strive to maximize health gains while designing climate-relevant household energy actions. In addition, better coordination with social welfare programs at municipal and national levels are recommended to accelerate the transition to clean household energy. The integration of clean fuel use into housing programs could be another way to improve household access to clean energy. Maternal and child health programs could include clean household energy components to increase resilience to diseases.

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As programs related to the sustainable management of forests, the installation of improved biomass heating systems, or the development of supply chains for upgraded fuels create opportunities for rural job creation, they could be further integrated into action plans that strive to reduce youth unemployment. Coordination with the Ministry of Education could ensure that educational institutions use clean energy sources for cooking and space heating. Children should also be informed about the effects of indoor airpollutions. This can be an important near-term option to raise awareness in local communities, and to support the demand for clean fuels and technologies by addressing the wait and see attitude of households. Indeed, children can have important, although indirect, influence on purchasing decisions and behaviors within a household. Emphasizing the role of clean energy access in the pathway to a low-carbon climate-resilient economy, the government could ensure more active involvement of the Ministry of Environmental Protection and Agriculture. Overall, municipal structures responsible for clean and affordable energy could be implemented. While ambitious at this stage, a central body responsible for planning and implementation of clean household energy issues could be established and mandated to coordinate the activities across multiple areas including, but not limited to energy, health, gender, environment, forest, agriculture, and climate change.

4. Strengthen the evidence-base to meet various household needs and limit fuel stacking

When clean energy access initiatives fall short of individual, household or communal needs, the evidence suggests that households continue to use traditional stoves alongside the improved stoves, or even completely revert to cooking with traditional stoves. Market research on end-users’ needs can contribute more widely to the understanding of consumer behavior, and account for all the cultural and cooking variations between households and communities. Based on the learning of these studies, technology customization that meet household needs will be key to maximize the uptake and usage of modern energy services and bring about the time and cost savings, as well as the health, gender equity and climate benefits associated with clean energy access in Georgia. Community participation in stove design is of particular importance to cater to the local needs and develop the sense of ownership. Pilot programs to collect information on the preferences and needs of consumers, including their willingness to accept new technologies and fuels will be needed to overcome fuel stacking. As the primary users of cooking stoves, future initiatives would particularly benefit from women involvement at all levels of research and implementation.

This is of particular importance in Georgia, as most of the global research focus on countries with different climate, and user needs. The Georgian context in addition is particular, as space heating and cooking can be undertaken on the same stove, and consumption varies with the season. As the cold season arrives, rural
households usually switch away from LPG or Natural Gas and revert to firewood for cooking, as they prefer to cook and heat with the same stove. However, there has also been a lot of global research on clean cooking interventions, but there is less research on space heating. Therefore, it would be very important to understand how household practices, customs, preference may influence any program that aims to increase access to clean fuels for cooking and heating.

5. Perform assessment, monitoring and evaluation to identify barriers before scaling-up

Socio-economic benefits, time-fuel-cost savings, and household air pollution reduction from household energy use, technologies, and programs are not well covered by research activities in Georgia. Encouraging local measurements and data collection on these issues are essential to enhance the quality of the evidence on benefits of clean household energy options. This can help to detect potential barriers to adoption of improved fuels and technologies early on as well as confirm the real-life impact of clean cooking stoves and space heaters before they are brought to scale. Evidence of the benefits can further foster the involvement of stakeholders from various sectors. General information on the health effect could be used in energy communication programmes, while evidence on the related economic losses and benefits broaden ownership of energy access matters to the Ministry of Finance.

6. Prioritize access to clean energy in educational institutions to preserve the health of children

Firewood-based cooking stoves and space heaters, often ineffective and outdated, continue to be one of the main appliances used in public buildings in rural areas. Among all 2,200 schools in Georgia, only 72 have central heating and electricity heaters electricity, and 536 use natural gas for space heating, 377 use wood. The heating fuel remains unknown for 1,215 schools. According to a recent study, unhealthy levels of PM2.5 are observed in kindergartens using wood-burning stoves (around 2.4 times higher than in kindergartens using natural gas). It is urgent to improve the air quality in kindergartens and schools as children are extremely sensitive to many adverse effects of indoor air pollution in their earliest years: their lungs, organs and brains are still maturing; they also live closer to the ground where some pollutants reach peak concentrations, and they inhale more pollutants as they breathe faster than adults.

Emphasizing the fuel, cost and time savings associated with clean energy in educational institutions can also be leveraged to encourage households to adopt similar systems in their homes. The cash savings from use of clean fuels in pilot projects can even be used to support vulnerable households to purchases improved or clean stoves. Overall, demonstration projects in educational institutions can be an important near-term option to raise awareness, to cope with the wait and see attitude of households, and to support the development of a market for clean stoves.

128WECF, (2020), Indoor Air Pollution Related Health Challenges for Georgia: An Interim Study of Indoor Air Pollution in Kindergartens
7. Scale up financial mechanisms to make clean energy affordable

On the supply side, the Government can play a central role to encourage private sector investment in clean cooking solutions. This requires de-risking instruments and technical assistance to improve economic viability of the sector. On the demand side, financial incentives can help increase the demand for clean energy technology and fuels and overcome barriers such as liquidity constraints. This is of particular importance since the Covid-19 pandemic threatens to put additional pressure on household budgets: poverty is projected to increase by 5.4 percentage points in 2020 (using the national poverty line), and the unemployment rate reached 20.4 percent at the end of 2020, escalating sharply from 12 percent at the end of 2019.\textsuperscript{129} Without external support, more poor households may revert to traditional biomass for cooking or renounce their previous investments in clean energy.

As Georgia recovers from the pandemic, clean energy access should be an integral part of the recovery program and associated by EE measures, it is cost-effective and can help to reduce energy expenditures of households. Such support could take the form of microfinance loan schemes, conditional or unconditional cash transfers, instalment payments, vouchers, removing excise and value added taxes, or payment through carbon trading mechanisms. The government should also consider undertaking a review of natural gas subsidies, as the current system disproportionately benefits wealthier households and that financial support is increasingly needed for low-income households, who are the most impacted by the pandemic.

\begin{center}
\textbf{Box 3: Supplier finance}
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Supplier finance should be considered by those enterprises who may need assistance in initial operations. Start-up capital, staged payments or below market inventory loans can be important options to stimulate market entry. Other creative strategies are also possible. Micro-consignment is an option that has been utilized by SolCom (Guatemala), or Toyola (Ghana, Nigeria).\textsuperscript{130} In this case, entrepreneurs only pay for what they sell and return the surplus. Alternatively, emerging evidence suggests that results-based financing (RBF) can support the clean cookstoves and heating sector. The RBF consists of a range of public policy instruments, i.e. incentives, rewards, or subsidies, that are linked to the verified delivery of predefined results, with achievement of the result being subject to independent verification. In addition, enterprises in need of capital to grow can seek finance through related financing facilities such as the Clean Cooking Working Capital Fund, The Pilot Innovation Fund, The Women’s Empowerment Fund, launched by the Clean Cooking Alliance in the past five years.\textsuperscript{131}

8. Leverage on business yards established under the New Forest Reform to raise awareness and make improved technologies accessible

The establishment of business yards is a central part of the transition to the sustainable management of forest. Already 33 business yards have been established, and 22 additional business yards should be constructed by 2023.

\textsuperscript{129}\textsuperscript{129}World Bank, (2020), Georgia Country Overview. Available at: https://www.worldbank.org/en/country/georgia/overview

\textsuperscript{130} SNV (n.d.), Mapping Successful Cookstove Distribution Models: Eight Success Factors to Reach the Last Mile

\textsuperscript{131} Clean Cooking Alliance, (n.d.), Financing Growth in the Clean Cookstoves and Fuels Market: An Analysis and Recommendations Strengthening the Pipeline through Better Alignment of Financing with Enterprise Needs
The new system will improve transparency and legality of fuelwood supply, as households, or intermediaries, will no longer be able to cut the timber in the forest. Instead, only the forest management body, either the local representative body of National Forestry Agency or Agency of Protected Areas, will be able to harvest wood. The cut timber will be available at transparent equitable and competitive conditions in the business yards, from which the population will be able to buy firewood and other solid biomass (i.e. woodchip) from 2023. Business yards could be used as knowledge hubs to distribute information on energy efficiency and indoor air pollution, and to organize the effective promotion and dissemination of improved cookstoves. Business yards may further serve educational purposes through student trainings on topics related to forest. In addition, business yards could potentially be equipped for fuel upgrading, stoves maintenance and reparation, and collection. The private sector could also use business yards to advertise and popularize their production. In order to ensure that business yards are easily accessible by all households, delivery services or network expansion could be considered.

This new organization especially provides substantial scope to enhance the quality of fuelwood used for households, with controls over the moisture content of the wood or the size of the fuelwood being sold, two factors that significantly impact the burning efficiency and the emission of pollutants. Dry biomass, with low moisture content, has a higher energy content. Therefore, the method of stockage is important – dry, sheltered and ventilated locations are preferable. Currently, many households prefer to use wet firewood to slow the pace of combustion in lieu of more advanced combustion technologies. This hinders the combustion efficiency, produces high levels of smoke and the emission of harmful particulate matters. In a residential context, it is advisable that solid biomass fuels do not have a moisture content higher than 25 per cent. In Georgia, the moisture content of wood is well above the maximum recommended moisture content of 25 per cent, and up to twice as high. Yet, if the moisture content was reduced from 40 per cent to 25 per cent, the energy output of firewood would increase by around 40 per cent. This would imply air-drying for several months, which could be accelerated with drying equipment and could be undertaken by the forest management bodies or associated partners. Therefore, the method for firewood drying and storage should not be overlooked to improve access to clean fuels and reduce indoor air pollution. For the moment, there are no mandatory standards with regard to the quality and moisture content of firewood in Georgia. The sustainability criteria for biomass will be captured in the new recast of the Renewable Energy Directive (2020 to 2030) that is currently in Parliamentary procedure in the EU Parliament. Only upon the adoption by the Energy Community, will the new directive have to be implemented in the legal framework of every Contracting Party.

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132 IEA, (2020), Sustainable Bioenergy for Georgia: A Roadmap
9. Prioritize the cleanest fuels and technologies

The WHO Guidelines on Indoor Air Quality suggests that although improved biomass cooking stoves effectively reduce air pollution when compared to traditional stoves, many improved stoves do not meet WHO standards. To better understand the impact of clean cooking interventions on health, ESCAP recently undertook a rigorous, systematic meta-analyses of the available evidence. The review found that clean cooking interventions were associated with a reduction in chronic obstructive pulmonary disease; however, the review did not detect significant reductions in acute respiratory infections, pneumonia, blood pressure or hypertension. Due to the limited evidence of health benefits associated with improved biomass cooking stoves, programmes and policies should prioritize the cleanest fuels and technologies in terms of lowering emission.

The sustainable and efficient use of biomass has a role to play as part of a sustainable energy transition as there remain generally more affordable, but its use still presents important health challenges. When used to provide heating, biomass stoves are inadequate in homes that lack adequate insulation. Efforts should continue to support and expand access to clean fuels (Biogas, LPG, Electricity, Natural Gas,) that meet WHO standards for cooking and heating.

10. Scale up electricity supply from renewable power technologies to meet household energy needs

In 2019, around 100 per cent of the Georgian population was connected to the power grid. However, the increased number of electricity connections has not yet resulted in a significant increase in the demand for electricity in rural and urban areas. Only 5 per cent of rural households and 13.6 per cent of urban households cooked with an electric cooker in 2017, and electricity is used for space heating in only 1.8 per cent of rural households, and 10.5 per cent of urban households.

The main barrier is the price of electricity, around 3.5 times higher than that of natural gas. Nevertheless, electric cooking stoves provide the most feasible approach to provide clean cooking and close the clean cooking gap, according to the SDG7 Roadmap for Georgia. First, electric cookstoves are more efficient than other types of cooking stoves, including gas stoves. Second, encouraging electricity for clean cooking will also reduce the need for investment in natural gas energy infrastructures which is extremely costly for remote locations. As for space heating, heat pumps are associated with higher energy efficiency than natural gas boilers, and their deployment can help Georgia to achieve substantial energy savings. Indeed, heat pump technologies consume around 60 per cent less energy than natural gas boilers, and it is estimated that replacement of natural gas boilers...
in 40 per cent of households in Georgia with heat pumps would save 109 ktoe annually by 2030.\textsuperscript{138} Investment in wind and solar power should be promoted, as renewable electricity generation technologies are cheaper than gas-based generation technologies in Georgia. Increasing the share of electricity to meet household energy needs will help Georgia to achieve additional benefits by reducing natural gas imports, while increasing the renewable energy mix in the power sector will reduce the country’s vulnerability to hydropower’s seasonal variation and emission reductions in line with NDC targets. In addition, with substantial high renewable energy resources, Georgia has the potential to export 10 TWh per annum of clean electricity in 2030 by selling its electricity in neighboring countries with higher generation costs. This can provide additional income opportunities that can be leveraged to accelerate the transition to electricity for cooking and heating.

While the transmission grid infrastructure is well developed in Georgia, substantial investments are required to enhance system reliability and improve the management of disruptions caused by network constraints and supply failures. Voltage fluctuations damage home appliances to such an extent that households must sometimes turn off their electric equipment to avoid damage during periods of bad weather. Improvements in system reliability are essential to ensure adoption and sustained use at the household level. Otherwise, households may continue to use firewood alongside electricity, or even completely renounce the use of electricity to meet their household energy needs.

\textbf{11. Gradually phase out natural gas subsidies while protecting vulnerable customers}

As a transit country for natural gas from Azerbaijan to Turkey, and from Russia to Armenia, Georgia receives in return a certain amount of natural gas with a relatively low price. In turn, the Government of Georgia supplies natural gas to the residential sector and thermal power plants at prices lower than market prices. Accordingly, Georgia’s household natural gas tariffs were the lowest in Europe in 2020, at around one-quarter of the average EU residential gas price. The average household price was 0.0106 EUR/kWh (0.0129 \$/kWh) in Georgia in the second semester of 2020, compared with an average of 0.0476 EUR/kWh (0.0579 \$/kWh) within the 27 members of the European Union.\textsuperscript{139} In 2017, it was estimated that gas subsidies for the residential sector amounted to 4.6 per cent of total budget spending, equivalent to 43 per cent of total government expenditure on education. Subsidies generate significant government expenditure, as does the cost to expand gas distribution infrastructure, which is extremely difficult for remote locations. The current system also carries the risk of regressive subsidies, as households with higher income and consumption stand to benefit more than vulnerable households. The price of natural gas appliances represents significant up-front cost that low-income households cannot afford, so that mostly high-income households heat their homes and cook with natural gas.

In contrast, if residential gas tariffs were to increase steadily with consumption and above a certain threshold, benefits would be limited to only the essential portion of residential gas demand. Having a stepped tariff system would thereby also encourage energy efficiency and responsible consumption. In addition, the difficulty to compete with power produced from subsidized natural gas also undermines the development of Georgia’s renewable energy sources. At the moment, natural gas is around 3.5 times cheaper than electricity.

Targeted social assistance measures should accompany any gradual approach to phase out the subsidies. The additional funds generated with such a fiscal instrument can be used to level the playing field for renewables (with tax exemptions), fund energy efficiency measures, provide targeted subsidies to poor households, and support economic recovery in situations like the COVID-19 pandemic.
In Georgia, there has been significant progress towards all SDG 7 targets. As the country nears universal electricity access, the issue of how households can use that access better to cook and heat their homes becomes more salient. Indeed, a large part of the population still rely on traditional and polluting methods to meet their household energy needs. The adoption of clean household energy requires increased coordination at the national and local levels and a comprehensive framework to coordinate the work and leverage the expertise of different stakeholders, including the health, financial, forest, gender and environment sector. Current programs that address forest degradation and deforestation should especially strive to maximize health gains while designing climate-relevant household energy actions. In this end, the Government should develop a national plan to tackle indoor air pollution to ensure that the health effects of household air pollution are included in all policies. More and better data on indoor air pollution, as well as on the performance of cooking and heating stoves in real household and laboratory settings are necessary to significantly improve the quality of products, augment the positive impacts of access programmes and mitigate the negative ones. The government of Georgia should develop a national certification program with standards and labels for efficient technologies to ensure that cooking and heating technologies provide fuel efficiency, emissions, health and environmental benefits. In parallel, public institutions should play a central role in the transition to clean fuels. Access to clean energy in educational institutions to preserve the health of children should particularly be prioritized, as firewood-based cooking stoves and space heaters, often ineffective and outdated, continue to be one of the main appliances used by public buildings in rural areas. In addition, business yards established under the New Forest Reform should play a central role to raise awareness and make improved technologies accessible. Overall, awareness and financial mechanisms are needed to encourage the private sector investment in clean cooking and heating solutions and help pull off the demand for clean energy technologies and fuels. To enhance the uptake and usage of modern energy services more research is needed to identify the needs and preferences of Georgian households. The essential characteristics that are culturally important for communities should then be integrated into the design of products and promotion strategies. If modern solutions do not meet household needs and preferences, households will continue to use traditional stoves alongside the improved stoves, or even completely revert to cooking with traditional stoves.
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Annexes

Annex 1: Stakeholders mapping

Government agencies

Ministry of Economy and Sustainable Development of Georgia (MoESD)
The Ministry of Economy and Sustainable Development (MoESD) is responsible for policies related to the sustainable development of the country’s economy. Since the merger of the Ministry of Energy into the MoESD in 2017, it is also responsible for state policies in the energy sector. It can adopt secondary legislation related to the energy sector (through ministerial orders) and is now responsible for awarding authorization for renewable energy projects. The Ministry has overall responsibility for energy efficiency measures in the energy, industry and transport sectors.

Ministry of Environment Protection and Agriculture of Georgia (MEPA)
The Ministry of Environmental Protection and Agriculture (MEPA) develops and implements state policies pertaining to climate change, agriculture and the environment. It oversees environmental impact assessments (including for energy sector projects) and control the use of natural resources (except for minerals, oil and gas). The Ministry is also the highest executive body in charge of developing national forestry policies that it implements through the Department of Biodiversity and Forestry, the National Forestry Agency, the Agency of Protected Areas and the Department of Environmental Supervision. The Department of Biodiversity and Forestry is responsible for forest conservation, monitoring and reporting, and the National Forestry Agency is tasked with enforcing the Forest Code, which involves forest management and the supervision of biomass harvesting. In addition, the Ministry has overall responsibility for defining and implementing air quality policy. The enforcement of the defined air-quality standards and norms is the responsibility of the Environmental Supervision Department. At the moment, the MEPA is involved in several donor-driven projects to deliver climate finance to the private sector, foster the transition to low-carbon cities, and accelerate the introduction of sustainable management practices in forests.

Ministry of Internally Displaced Persons from the Occupied Territories, Labour, Health and Social Affairs of Georgia (MoLHSA)
The Ministry of Internally Displaced Persons from Occupied Territories, Labour, Health and Social Affairs has the mandate to develop and implement the national health care policy and strategy; to draft and enforce health related laws, regulations and programs; to advocate for adequate allocations from the State budget for health-care programs; and to regulate the health-care profession, health facilities and the pharmaceutical market. The Ministry also defines the maximum allowable concentrations of polluting substances for the transport sector, upon which the MoESD develops technical regulations.

National Center for Disease Control and Public Health (NCDC)
The National Center for Disease Control and Public Health (NCDC) is the leading organization in the prevention and control of communicable and non-communicable diseases. It responsible for the development of standards and guidelines, and conducts disease statistics annually.

The Georgian National Energy and Water Supply Regulatory Commission (GNERC)
The Georgian National Energy and Water Supply Regulatory Commission (GNERC) is the independent regulator of the sector. In the Energy and Water supply sectors, GNERC mission is to develop the regulatory framework and to promote a competitive environment. Of particular importance, the GNERC issues licenses in the Georgian electricity and natural gas sectors, regulate activities of licensees, importers, exporters, operators, and suppliers, resolve disputes between licensees and suppliers and regulatory authorities.
customers and monitor the overall energy market.

**Georgian Energy Development Fund (GEDF)**
The Georgian Energy Development Fund is a state-owned joint-stock company created in 2010 and reporting to the MoESD. Its mission is to develop Georgia’s renewable energy potential by identifying promising renewable energy projects and supporting their development through pre-feasibility and preliminary environmental impact assessments, and by finding investors.

**Georgian National Agency for Standards and Metrology (GNASM)**
The Georgian National Agency for Standards and Metrology develops standard in association with relevant technical committee following an application from interested stakeholders. Then, the standard is added to the register of Georgian standards.

**The Ministry of Regional Development and Infrastructure (MRDI)**
The Ministry is responsible for municipal capacity-building, which will be essential considering the new skills associated with modern heating solutions for public sector buildings.

**National Statistics Office of Georgia (GEOSTAT)**
The National Statistics Office of Georgia compiles official energy statistics. It also conducts and analyses household energy consumption surveys, which are an invaluable source of quantified information on the final consumption of biomass. The first of these was conducted in 2017, and the next is scheduled for 2022.

**Non-governmental organizations**

**Caucasus Environmental NGO Network (CENN)**
CENN is a non-governmental organization that strive to protect the environment in the South Caucasus. With the program “Strengthening and Engagement of rural women in natural resource management in South Caucasus countries”, CENN seeks the participation of women and girls in the management of natural resources. In doing so, it promotes the active engagement of women and youth through awareness raising campaigns and capacity building.

**World Experience for Georgia (WEG)**
WEG is an independent, not-for-profit think tank that inform Georgian decision-makers on energy security and economic sustainability. Of particular importance, WEG studies include an Assessment of *Wood and Agricultural Residue Biomass Energy Potential in Georgia*, the Development of Measures for Energy Efficiency and Renewable Energy Use in Multi-apartment Residential Buildings, Market Assessment of the Residential Sector. In addition, WEG conducted a research on Energy Poverty in Georgia. The report recommends the development of an official definition of Energy Poverty that shall be included in the existing legislation. According to WEG, this will act as a catalyst for the diverse attempts to tackle energy poverty.  

**Energy Efficiency Centre Georgia (EECG)**
EECG strives to support renewable energy and energy efficiency in order to improve the national energy security and minimize the negative environmental impact. EECG was presume to implement the project “Small biodigesters for Georgia’s regions” project (2008-2012), whose objective was the construction of about 10,500 small biogas digester in rural households. However, it seems that the project did not pass the proposal stage. In 2013, in association with GIZ, the center developed a CO₂ computation tool but there was no further development to the project.

**Women in Europe for a Common Future (WECF)**
WECF is a global network of 150 women’s health and environmental organizations with a historical focus on Eastern Europe and Central Asia. In 2008, WECF and its partners launched a program to adapt solar heating technologies to local needs. On the basis of this project, WECF, in cooperation with the Georgian Ministry of Environment, The Greens Movement of Georgia and other NGOs, developed a National Appropriate Mitigation Action (NAMA). Entitled «Efficient use of biomass for equitable, climate proof and sustainable rural development», the objective of the NAMA was to support the transition away 142EECG, (n.d.), Small biodigesters for Georgia’s regions, Project Idea Note

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143 EECG, (n.d.), Small biodigesters for Georgia’s regions, Project Idea Note
Situational Assessment for Household Energy Needs in Georgia

In this regard, the project promoted the up-scaling of solar water heaters, fuel efficient wood stoves, energy efficient insulation measures. 60,000 – 180,000 women and men were planned to benefit from the pilot project. A financial mechanism was planned to set up to enable access for low income households, including subsidies. The combined measures have a Greenhouse gas reduction potential of 450,000 tCO2 equivalent per year. Despite the fact that NAMA measures are included in NEEAP and INDC, and that support for implementation was solicited in 2016, 2017 and 2018, the project was only implemented on a small scale only due to lack of financial support by Energy Cooperatives, spreading the technologies semi-commercially. Measures are partly integrated in the GCF project on the Forest Sector Reform. With financial support from the Danish International Development Cooperation, WECF launched the Clean Air for Children Project in 2019 to alleviate indoor air pollution in public kindergartens and schools in three regions of the country. The project aims to change behavior and practices among local schools and kindergartens, governmental stakeholders and the general public with public awareness campaigns and trainings. Although this project focuses on public buildings, it strives to open a conversation about the adverse effects of poor indoor air quality indoors in all spaces and share practical measures, e.g., ventilation and clean technologies to improve air quality.

The Regional Environmental Centre for the Caucasus (REC Caucasus)
The REC Caucasus endeavors to develop the co-operation and the exchange of environmental information between NGOs, governments, business, local communities, and all other environmental stakeholders within the Caucasus region. It offers assistance to all environmental NGOs and aims to increase public participation in the decision-making process.

Sustainable Development and Policy Center (SDAP)
SDAP conducted various studies on energy efficiency in public and commercial buildings, funded by the Nordic Green Bank (Nefco) and DANIDA.

Sustainable Development Center (REMISSIA)
REMISSIA promotes the sustainable development of tourism in Georgia through the demonstration of renewable and energy efficiency technologies in mountainous villages. In collaboration with the Consulting Center ECOFYS (Germany) and the Energy Policy Research Center ECN (The Netherlands), REMISSIA further developed the Nationally Appropriate Mitigation Action (NAMA) Concept for Georgia’s Buildings Sector. It also performed the energy assessment of the projects to be financed through the Green for Growth Fund.

Biomass Association of Georgia
The Association is a platform that enables the exchange of knowledge, experience and information on biomass in Georgia. The dissemination of information supports the discussions around the efficient use of renewable energy sources and grow the biofuels market.

Other non-governmental NGOs, e.g. the Ecovision, Green Alternative, Georgia Environmental Outlook, Greens Movement of Georgia, are actively engaged in the protection of Georgian environment and periodically conduct related studies.

International non-governmental organizations/donors

USAID Georgia
USAID dedicates approximately $40 million annually to 50 initiatives in Georgia in support of economic growth, democratic institutions, energy security, climate change mitigation, education, and the inclusion of minority and disadvantaged people. From 2005 to 2009, it implemented the Rural Energy Program, and in 2009 it launched a newly equipped laboratory of Energy Audit and Diagnosis in the Georgia Technical University as part of the New Applied Technology and Lighting Initiative. Following the memorandum of understanding between USAID and the Ministry of Environment Protection of Georgia signed in 2012, Georgia became part of the Enhancing Capacity for Low Emission Development Strategies (EC-LEDs) project, a United States Government initiative to

144 WECF, (2019), WECF Georgia Begins New Project on Indoor Air Pollution.
145 https://www.usaid.gov/georgia
support developing countries’ efforts to accelerate sustainable economic growth while slowing the growth of GHG emissions.\textsuperscript{146} In Georgia, the EC-LEDS support efforts to increase climate change mitigation through energy efficiency and clean energy. In this regard, low Emissions Development Strategy with possible actions up to 2030 to deliver greenhouse gas reductions were developed by Winrock for 8 different sectors. The government of Georgia, in support of the USAID/Energy Program has conducted inventory of the households permanently living in the villages not connected to the power grid and installed powerful solar panels in 16 municipalities. As a result, 207 households from 87 villages have now access to electricity.

**UNDP Georgia**

UNDP assists Georgia to expand access to green solutions and to make environmental issues an integral part of development. UNDP carries out comprehensive research and collaborates with the Government, local authorities, research institutions, private sector and communities to support the adoption of sustainable policies. Accordingly, UNDP in association with Winrock International and WEG, conducted an Assessment of Wood and Agriculture Residue Biomass Energy Potential to appraise the energy potential and availability of biomass residues from forestry and agricultural activities. The research paved the way for the implementation from 2013 to 2016 of the «Promotion of Biomass Production and Utilization in Georgia» project, implemented by the Ministry of Environment and Natural Resource Protection and funded by UNDP. The objective of the project was to level-up the demand and supply for upgraded biomass fuels at the municipal level. To date, pilot biomass plants and the Association of Biomass Producers have been established. Awareness campaigns about the benefits of upgraded biomass fuels were also organized.

**Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)**

On behalf of the German Federal Ministry for Economic Cooperation and Development (BMZ), GIZ works in Georgia and the two neighboring countries, Armenia and Azerbaijan, in areas of a) sustainable economic development, b) democracy, civil society and public administration and c) environmental policy, conservation and sustainable use of natural resources. GIZ works with the south Caucasus states to enable knowledge sharing and crisis prevention between Armenia and Azerbaijan. Since 2013, GIZ has been active in the development of the Forest Sector Reform via the Integrated Biodiversity Management South Caucasus project (funded by BMZ and Austrian Development Agency) and the programme ECOserve. It is also planned that GIZ will be the implementing body of the recently approved project to support the Forest Sector Reform in Georgia.

**KfW Development Bank**

KfW Development Bank has been operating in Georgia since 1993 and is a key donor in the Georgian energy sector. On behalf of the German Federal Government, it supports projects in the energy sector, the development of municipal infrastructure, the protection of the environment and natural resources and vocational training. Activities range from the initial emergency supply to investments in efficient power generation and distribution to the promotion of renewable energies and energy efficiency.

**Denmark International Development Agency (DANIDA)**

The Danish International Development Agency promotes energy efficiency in the building sector and the integration of renewable energy in the national power grid through the "Support in the Field of Energy Efficiency and Sustainable Energy, Georgia, 2015-2019” project. The project includes energy audit schemes, energy awareness campaigns, feasibility studies, energy management systems and technical assistance for energy-efficiency projects. Technical Assistance is provided to key energy authorities in Georgia with the overall goal to achieve SDG7 and SDG13 targets, NDC emission reduction goals, and the alignment with EU energy market rules.

**World Bank Georgia**

In collaboration with the Ministry of Finance and the Ministry of Economy and Sustainable Development, the World Bank launched in 2019 a project to increase electricity supply reliability in the western part of Georgia, achieve the financial viability of the Georgian State Electrosystem (GSE), and help it access long-term commercial financing.\textsuperscript{147}

\textsuperscript{146}Winrock International, (2017), Georgia Low Emission Development Strategies

\textsuperscript{147}World Bank. Available at : https://projects.worldbank.org/en/projects-operations/project-detail/P169117
The European Bank for Reconstruction and Development (EBRD)

In Georgia, the European Bank for Reconstruction and Development (EBRD) supports the private sector competitiveness through innovation, the development of local currency and capital markets, the expansion of markets through inter-regional connectivity, access to renewable energy, resource efficiency and climate change adaptation. Through the Sustainable Energy Financial Facility for Georgia (EnergoGredit), $100 million credit line were facilitated to participating financial institutions for on-lending to energy efficiency and renewable energy investments by small and medium-sized businesses, corporate and residential borrowers, and renewable energy project developers. Borrowers could select pre-approved technologies, such as insulation, boilers, solar PV, that meet the high energy efficiency standards. The project contributed to save more than 227,630 kWh of energy per year and more than 45,830 tonnes of CO₂ emissions per year in all three Caucasus countries. Loans were provided via 3 partner financial institutions in Georgia: Bank of Georgia, Bassis bank and TBC Bank.

The Green Energy Financing Facilities (GEFF) program, with additional support from the Green Climate Fund and Austrian Federal Ministry of Finance, provides finance for households and business that invest in green technologies. The aim of the program is to deliver climate finance to the private sector for energy efficiency, renewable energy and climate resilience projects. Technical assistance, capacity buildings and gender mainstreaming activities to local financial institutions and borrowers will complement the financing activities. Overall, 27.5m tonnes of emissions are expected to be avoided.

The Green Climate Fund (GCF)

Georgia is involved in 4 projects implemented by the Green Climate Fund, of which 2 are specific to Georgia: i) Enabling Implementation of Forest Sector Reform in Georgia to Reduce GHG Emissions from Forest Degradation, and ii) Scaling-up Multi-Hazard Early Warning System and the Use of Climate Information in Georgia. Georgia is also part of the GCF Green Cities Facility project that will provide financial instruments to the private sector to foster investments in sustainable infrastructure such as district heating/cooling and low-carbon buildings. It also co-finances with EBRD, a program to deliver climate finance to the private sector at scale.

Austrian Development Agency

The Austrian Development Agency aims to improve the sustainable management of forest, raise awareness of forest protection and develop appropriate educational measures and training. It has been active in the Forest Sector Reform via the Integrated Biodiversity Management South Caucasus project, and provide funding the GEFF program via the Austrian Federal Ministry of Finance.

Winrock International

Winrock International is an U.S. nonprofit organization with agriculture, environment and social development projects in over 46 countries. In Georgia, Winrock's top priority is to accelerate the transition from dirty and inefficient electricity to clean alternatives with the aim to bring about economic development and to improve environmental and human health.

World Wide Fund for Nature (WWF), Caucasus Programme Office

The WWF is implementing the Eco-Corridor Fund for the Caucasus (ECF) to support biodiversity conservation in the diverse landscapes of Southern Caucasus. The project receives funding from the German Federal Ministry for Economic Cooperation and Development through KfW Development Bank and WWF Germany.

Annex 2. Energy policies mapping

Nationally Determined Contribution (2015)

The Association Agreement with the EU is just one of Georgia’s international commitments. In 2015, the Government of Georgia submitted its Nationally Determined Contribution (NDC) and committed to implement the 2030 Agenda for Sustainable Development and the 17 Sustainable Development Goals. Georgia plans to unconditionally reduce its GHG emissions
emissions by 15 per cent below the Business as usual scenario (BAU) for the year 2030. While forests stand at the forefront of Georgia’s NDC, with quantitative targets, there is no specific commitments related to energy. The Government committed to implement afforestation and reforestation activities on 1,500 ha of degraded lands, as well as to pilot Sustainable Forest Management (SFM) practices in one pilot area, and to assist the natural regeneration of forests through different silvicultural methods on 7,500 ha by 2030. Under external technical and financial support, Georgia conditionally committed to reforest up to a total of 35,000 hectares, to introduce the sustainable forest management of 250,000 ha, and to expand the protected areas from 0.52 million ha to 1.3 million ha (about 20 per cent of Georgia’s territory) leading to an overall carbon sequestration of up to 6 million tons of CO$_2$. In 2021 Georgia submitted its updated Nationally Determined Contribution. Georgia fully committed to limit total greenhouse gas emissions of 35 per cent below 1990 level by 2030. The emission limitation targets are based on the seven following sectors: transportation, building, energy generation and transmission, agriculture, industry, waste, and forest.

**Energy Policy of Georgia (2015)**

Short to long term strategies for the energy sector were laid down in the Energy Policy for Georgia in 2015:

- Diversification of supply sources and optimal exploration of local energy resources
- Utilization of Georgia’s renewable energy resources
- Gradual approximation and later harmonization of Georgia’s legislative and regulatory framework with the EU’s Energy acquis
- Improving energy market and energy trading mechanism
- Strengthen Georgia’s importance as a transit route in the region
- Georgia – regional platform for generation and trade of clean energy
- Develop and implement an integrated approach to energy efficiency in Georgia

- Taking into account components of environmental protection when implementing energy projects
- Improving service quality and protection of consumer interests


The National Energy Efficiency Action Plan (NEEAP) seeks to reduce the energy intensity of Georgia, currently 30 per cent above the European countries average, and to achieve Georgia's commitments under the NDC.$^{149}$ Every 3 years, the plan sets national energy saving targets to reduce the needs for energy imports, align the country with EU requirements, and reduce greenhouse gas emissions. The plan compiles a list of measures related to the energy transformation and distribution sectors, the transport sector, the industry sector, as well as the public and the building sectors. In the public and building sectors, the NEEAP aims to establish standards, norms and labelling schemes for household appliances, to improve the lighting systems in residential and commercial buildings, and to develop a national energy efficiency scheme for buildings.$^{150}$ The scheme entails the adoption of i) a legislative framework and its harmonization with European directives, ii) the establishment of a tracking system for the inventory of buildings, and iii) the completion of energy audits. The plan also outlines the following particular measures that can be implemented: i) regulations leading to improved efficient lighting systems in residential and commercial buildings, ii) pilot project for low energy public sector buildings, iii) efficient lighting systems in public buildings, iv) improvement of the energy efficiency in schools and kindergartens. Specific measures in existing private houses, multi-family apartment buildings and commercial buildings have not been considered within the current NEEA but could be revised in the coming years. With regard to the energy transformation, transmission, and distribution sectors in Georgia, the NEEAP considers large-scale investments for improvements in efficient household energy production from solar hot water heaters and biomass stoves.

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The National Renewable Energy Action Plan (NREAP) contains a set of measures to increase the share of renewables in the energy mix. The NREAP includes the active promotion of solar hot water heaters as a replacement for natural gas, and further supports hydropower, solar power, wind, and geothermal heat production. The NREAP endorses the development of improved management practices and supports the use of biomass residues for heating. The plan considers the development of feasibility studies and investments for renewable energy-based district heating and cooling. Feasibility studies are currently underway in Borjomi / Akhaltsikhe. Of particular importance, the NREAP highlights that several donors sponsored programs are expected to be implemented in the coming years to promote energy efficient wood stoves and solar hot-water heaters. In addition, the NREAP underlines that national standards have been drafted, but not yet approved, for solid biofuel stoves, wood-briquettes and fuel wood for non-industrial use.

Law of Georgia on Energy Efficiency (2020)

The Energy Efficiency policy, drafted under the assistance of the European Bank for Reconstruction and Development (EBRD), supposed to come into force in 2022, contains various energy efficiency measures for “final energy consumption devices, including lighting, cars, pumps, engines and plant boilers” and foresees programs for “the use of alternative energy sources, including the introduction of energy-efficient stoves and solar-powered water heaters”. In this regard, quality controls of energy efficient devices should be implemented, as well as the establishment of energy performance certification schemes, training programs, awareness raising activities, and financial incentives.152


The law, drafted with the assistance of EU4Energy Governance program, is coherent with the EU Energy Performance in Building Directive. It covers almost all types of buildings including individual houses, multi-story buildings, offices and hotels, and promotes the rational usage of energy resources to improve their overall energy efficiency. According to the Law, the Government shall determine minimum requirements for energy efficiency that will apply to existing and new buildings.


The Law on Energy Labelling, drafted with the assistance of the Government of Denmark, mandates the supply of standard information on the energy consumption of products available on the Georgian market. The law applies to the energy consumer products

152Law of Georgia on Energy Efficiency, (2020)
placed on the Georgian market or put into operation on the territory of Georgia, that have a significant impact on energy consumption.

**Law on Public-Private Partnerships (2018)**
Since May 2018, the legal framework for energy sector projects was reformed through the adoption of the Law on Public-Private Partnerships. The law sets the criteria for public-private projects, as well as the rules for the selection of private partners, and the guidelines for implementation and monitoring.

**Forest sector reform (2013 – to date)**
Until recently, there was no legal and regulatory framework to regulate the use of biomass as an energy source in Georgia, and its use and development were unregulated, leading to overexploitation and non-durable harvesting. To tackle the unsustainable forest management practices, the Government of Georgia initiated an extensive forest sector reform in 2013. In this regard, the National Forest Concept, adopted in 2013 by the Georgian Parliament, laid down the Sustainable Forest Management (SFM) principles. These principles have the objectives to improve the quantitative and qualitative characteristics of Georgian forests, to effectively use the economic potential of forests taking into account their ecological values, to encourage public participation in forest management, and to enhance the fair distribution of derived benefits. In 2016, the Ministry of Environment and Natural Resources Protection (MENRP), with World Bank assistance, initiated the development of a new Forest Code within the framework of the European Neighborhood and Partnership Instrument East Countries Forest Law Enforcement and Governance II program.\(^{154}\)

The New Forest Code, adopted by the parliament in 2020, defines the novel organizational arrangements, rights and responsibilities of forest management bodies in Georgia. First, it is expected that new forestry licenses will not be issued and social logging will be replaced by a model of sustainable use. Secondly, forest management, harvesting, and wood-related commercial activities will exclusively be regulated by the National Forestry Agency. The agency will be responsible to provide fuel wood in rural areas, and actual forestry operations will be transferred to other public agency or private companies. Therefore, the wider population will have limited access to the forests. The cut timber will be placed in so-called business yards, from where population will be able to buy firewood and another solid biomass (i.e. chips) from 2023. As a result, biomass will be available at transparent, equitable and competitive conditions.

**State Strategy for the Development of Solid Biofuels (Under review)**
The State Strategy for the Development of Solid Biofuels in Georgia has been drafted in 2017 and is currently under review for government approval.\(^{155}\) The main goal is to accelerate the production and use of modern solid biomass residues in Georgia. The strategy considers the designation of a responsible body, the adaptation of the legal framework (taxation, tax incentives, waste management), the introduction of standards for biomass and fuels, as well as the need for appropriate manufacturing and consumption technologies; stimulation of demand; awareness raising and enhancement of knowledge & skills; financing from financing institutions and climate funds.

**National Sustainable Energy Action Plan (under development)**
The National Sustainable Energy Action Plan (NSEAP) integrates all directions, measures and activities specified in action plans such as the NEEAP and NREAP described previously. The document identifies best practices, measures and procedures necessary to provide sustainable energy in Georgia. It will outline concrete actions for the Government and other stakeholders to be implemented in the short- and medium-term, in line with the country’s commitments.

**National Energy and Climate Plan (under development)**
Georgia is preparing its National Energy and Climate Plan (NECP) for 2021-2030 with an outlook to 2050 to ensure consistency with long-term EU, United Nations Framework Convention on Climate Change (UNFCCC), and Energy Community policy objectives. The NECP will provide a framework with bioenergy consumption targets and will outline support measures.

\(^{154}\)National Renewable Energy Action Plan, 2020

\(^{155}\)Ibid.