GEORGIA'S SECOND BIENNIAL UPDATE REPORT

Under the United Nations Framework Convention on Climate Change

2019

Georgia's Second Biennial Update Report

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Convention on Climate Change

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The Second Biennial Update Report of Georgia to the UNFCCC was prepared by a large group of decision makers, experts and other stakeholders, representing: The Ministry of Environmental Protection and Agriculture of Georgia and its LEPL Environmental Information and Education Centre; The Think Tank "World Experience for Georgia"; Ilia State University; independent national and international experts.

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Georgia's Second Biennial Update Report has been developed by the Ministry of Environmental Protection and Agriculture of Georgia with the funding of the Global Environmental Facility and support of the United Nations Development Programme in Georgia within the framework of the project "Development of Georgia's Second Biennial Update Report and Fourth National Communication to the UNFCCC".

FOREWORD

In a first quarter of the 21st century, the signs of climate change have been revealed in dramatic consequences in Georgia. The Caucasus Mountain-dwelling population have been experienced in the catastrophic climate-related events, including flash floods and mudslides instigated by accelerating glacial melting, resulting huge economic losses for the region.

The IPCC special report on the impacts of global temperature rise of 1.5 °C above pre-industrial levels and related global greenhouse gas emission pathways published prior to COP24 represents a strong signal for the urgent need to enhance the global response to the threat of climate change and to achieve sustainable development.

Furthermore, in the 14th edition of the Global Risks Report 2019 the Failure of climate change mitigation and adaptation has moved to 2nd place among the five most significant global risks in terms of likelihood. Hence, this is the momentum of the joint action through the collaboration of different social groups, private and public sectors towards combating the global warming and the fulfilling the Paris Agreement goals.

The year of 2019 is called an updating period for the Nationally Determined Contribution (NDC). After the ratification of the Paris Agreement and taking into account the outcomes of COP24, Georgia develops the NDC document with more ambitious commitments complemented with the fairness principles.

Georgia's 2nd Biennial Update Report complemented with the 5th National Greenhouse Gas Inventory report presents transparently: (1) the trends in domestic emissions for 25 year period, (2) the mitigation measures have been taken to limit the GHG emissions, and support received and needs demonstrating the closing the gaps in the implementation of the Paris Agreement.

I'm pleased to present this report, describing the existing gaps and needs that give all of us an assignment to meet our climate related commitments in emission limitations and advancement in climate resilience in order to build a sustainable environment for our children and future generations.

Levan Davitashvili
Minister of Environmental Protection and Agriculture

ABBREVIATIONS

AA - EU-Georgia Association Agreement

AD - Activity Data

AWDS - Animal Waste Disposal Site

BOD - Biological Oxygen Demand

BTC - Baku-Tbilisi-Ceyhan oil pipeline

BUR - Biennial Update Report

CCC - Climate Change Council

CDM - Clean Development Mechanism

CER - Certified Emission Reductions

COD - Chemical Oxygen Demand

COP - Conference of Parties (of the UNFCCC)

CRF - Common Reporting Format

DCFTA - Deep and Comprehensive Free Trade Area

DNA - Designated National Agency

DOC - Degradable Organic Carbon

EBRD - European Bank of Reconstruction and Development

EEC - Energy Efficiency Center

EF - Emission Factor

EIA - Environmental Impact Assessment

EIEC - Environmental Information and Education Centre

EU - European Union

FAOSTAT - Food and Agriculture Organization Statistics Office

FBUR - First Biennial Update Report

FEWS - Fuel-efficient wood stove

GAM - Global Average Method

GDP - Gross Domestic Product

GEF - Global Environment Facility

GEOSTAT - National Statistics Office of Georgia

GHG - Green House Gases

GNERC - Georgian National Energy and Water Supply Regulatory Council

GPG - Good Practice Guidelines

HPP - Hydro Power Plant

IEA - International Energy Agency

INDC - Intended Nationally Determined Contribution

IPCC - Intergovernmental Panel on Climate Change

KfW - German Development Bank

LEDS - Low Emission Development Strategy

LEPL - Legal Entity of Public Law

LRT - Light Rail Transport

LULUCF - Land Use, Land Use Change and Forestry

MCF - Methane Correction Factor

MEPA - Ministry of Environmental Protection and Agriculture of Georgia

MRV - Measurement Reporting and Verification

MSW - Municipal Solid Waste

NAMA - Nationally Appropriate Mitigation Action

NEAP - National Environmental Action Programmes

NEEAP - National Energy Efficiency Action Plan

NG - Natural Gas

NSMGP - North-South Main Gas Pipeline

QA/QC - Quality Assurance and Quality Control

SCP - South Caucasus gas Pipeline

SDG - Sustainable Development Goals

SEAP - Sustainable Energy Action Plans

SNC - Second National Communication

SWH - Solar water heater

TG-MRV - Technical Group on MRV

TNA - Technology Needs Assessment

TNC - Third National Communication

Chemical Compounds

CO_2 - Carbon dioxide

CH_4 – Methane

N_2O - Nitrous oxide

CFCs - Chlorofluorocarbons

HFCs – Hydrofluorocarbons

UNDP - United Nations Development Programme

UNFCCC - United Nations Framework Convention on Climate Change

USAID - United States Agency for International Development

WEG - Think Tank "World Experience for Georgia"

WREP - Western Route Export Pipeline

PFCs – Perfluorocarbons

SF_6 - Sulphur Hexafluoride

CO – Carbon monoxide

NOx – Nitrous oxides

SO_2 - Sulphur dioxide

NMVOC - Non-Methane Volatile Organic Compounds

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Government Structure

Georgia is a democratic republic, where the president is the head of state, and Parliament is a supreme legislature. The executive branch, the government, consists of the Prime Minister and 11 ministers. The Ministry of Environmental Protection and Agriculture is responsible for the development and implementation of national climate change policy, as well as co-ordination of international climate change negotiations. The other ministries are also involved in elaboration of climate change strategies and data collection at the national level, focusing on local and global problems.

Population and Social Conditions

Population of Georgia numbered 3.73 mln by January 1, 2018. For the last 10 years (2008-2018), the number of populations is declining on average by 0.3% annually. The life expectancy is 73.5 years in the country. About 21.9% of Georgian population was under the absolute poverty line in 2017. In 2018 unemployment rate was 12.7% in Georgia

Education

To date, the urgency of climate change issues has received more attention comparing to the previous years. In this regard, the level of education, either on directly or indirectly related to climate change matters has been appeared to the programs in universities, secondary schools and other educational activities.

Geography and Climate Change Impact

Georgia is located in the mountainous region of the South Caucasus, Southeast Europe, which covers an area of 69.7 square kilometers. The territory has a complex terrain — almost 2/3 of them are mountainous, as well as a large variety of climatic zones. Natural disasters occur in Georgia on a very large scale and with a high frequency due to difficult geological and geographical conditions. The frequency of natural disasters has increased in the recent past, and this increase is considered to be a consequence of the effects of global climate change, combined with human activities, such as deforestation, overgrazing, etc.

In this regard, the Government of Georgia has published the National Strategy for Disaster Risk Reduction of Georgia since 2017–2020. The goal of the strategy is to create a unified disaster risk reduction system (DRR), increase disaster preparedness and response capabilities at the national and local levels, and enhance the effectiveness of responding to potential threats.

Natural Resources

Georgia is distinguished with its biodiversity. The country has sea, lakes, rivers, glaciers, forests, wetlands and semi deserts too. Fauna of Georgia demonstrates the confluence of elements of European, Central Asian and African fauna. There are around 100 mammal species, more than 330 bird species, about 48 reptile species, 11 amphibian species, and 160 fish species known in Georgia. Georgia is rich in fresh water resources, which is due to its mountainous relief. Georgia is also one of the richest countries with mineral waters. There are 734 glaciers in Georgia with the total surface area of 511 km^2. In half a century, the number of glaciers has decreased by 13%, while the total surface area has reduced by 30%. Forests cover almost 40%

of the land area. Along with ecological function, forests play an important energy and economic role in Georgia. They provide Georgian population with wood and timber. 8-12% of Georgian energy demand is covered by fuelwood.

Economy

Georgia is a transition economy, which replaces Soviet command economy with market based economic principles. The economic parameters have improved after the economic collapse of 90-ies due to implementation of series of reforms. In 2000, Parliament of Georgia ratified the protocol of World Trade Organization (WTO) membership, in 2014 Georgia and the EU signed an Association Agreement that includes membership in the Deep and Comprehensive Free Trade Area (AA/DCFTA). Consequently, many legislative acts have been improved and brought in compliance with European Union legislation.

2018-2020 program of the Georgian government indicates the major sectors that determine economic growth of the country. These are energy, environment protection, agriculture, transport, tourism, and communication and information technologies.

Gross domestic product (GDP) in current prices and GDP per capita of Georgia was 37,874 mln GEL (15,087 mln USD dollars) and 10,231 GEL (4,047 USD dollars) respectively in 2017. During the last 8 years, average real growth of GDP was 4.6% in 2010-2017.

Climate Change and the Country Development Priorities

Georgia is actively involved in international endeavor of climate change mitigation. In 2015, country presented 'Intended Nationally Determined Contribution' (INDC) document to the UNFCCC secretarial and voluntarily took the obligation to reduce GHG emissions unconditionally by 15% (with additional 10% of conditionality) compared to the business as usual (BAU) scenario. After the ratification of the Paris Agreement (2017), the country announced that it would present more ambitious Nationally Determined Contribution (NDC) by 2020. In this regards, the Ministry of Environmental Protection and Agriculture elaborates 'Climate Action Plan.'

Institutional Framework of National Communication and Biennial Update Report Preparation

The Government of Georgia is a responsible body to UNFCCC. The Ministry of Environmental Protection and Agriculture elaborates and implements the policies in climate change. The structural unit of the ministry is the Department of Environment and Climate Change and its subunit is a Climate Change Division. Along with other functions, the Division is responsible for coordination of National Communication of Georgia and a Biennial Update Report preparation, cooperation with interested parties, coordination of periodic compilation of inventory report and its submission to the Convention secretariat.

Georgia's Second Biennial Update Report has been developed by the Ministry of Environmental Protection and Agriculture of Georgia with the funding of the Global Environmental Facility and support of the United Nations Development Programme in Georgia within the framework of the project "Development of Georgia's Second Biennial Update Report and Fourth National Communication to the UNFCCC". The Project started its operations in July 2017. Finalization and submission of the second BUR was slightly delayed due to technical reasons, mainly the transition from revised 1996 IPCC guidelines to IPCC 2006 guidelines for National GHG Inventories, has enlarged the QA/QC assignment load that consequently resulted in the extension of the two-year submission timeframe for the second BUR.

National Greenhouse Gas Inventory

Georgia has conducted the Fifth National Inventory of anthropogenic emissions by sources and removal by sinks of greenhouse gases (GHG) along with the Second Biennial Update Report to UNFCCC over the period of 2014-2015. The GHG Inventory is compiled according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, including emissions and removals of six direct greenhouse gases: CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, and four indirect gases: CO, NOx, NMVOC and SO_2. According to the Common Reporting Format (CRF) of the IPCC Methodology, the inventory covers five sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Land use, Land- Use Change and Forestry (LULUCF) and Waste. The results were recalculated for the following years 1990, 1994, 2000, 2005, 2010-2013 in all sectors, due to the use of IPCC 2006 guidelines.

In Accordance to the UNFCCC reporting guidelines on annual inventories[1], the Global Warming Potentials (GWP) provided by the IPCC in its Second Assessment Report ("1995 IPCC GWP Values") based on the effects of GHGs over a 100-year time horizon have been used for expressing GHG emissions and removals in CO_2 eq. For the compilation of the inventory, IPCC Inventory Software Ver 2.54 (released on 6 July 2017)[2] and excel based worksheets were used.

Climate Change Mitigation Policy and Measures

On September 25, 2015, Georgia submitted a document "Intended Nationally Determined Contributions" (INDC) to the secretariat of the UNFCCC. After the ratification of Paris Agreement (June 7, 2017), Georgia announced that it would submit an updated, nationally determined contribution (NDC) document by 2020. For this purpose, Ministry of Environmental Protection and Agriculture of Georgia with the technical assistance of GIZ develops "Climate Action Plan 2021-2030" which will be ready by 2020. By the preliminary estimates, Georgia undertakes an unconditional responsibility that greenhouse gas emissions will not exceed 66% of the 1990 levels (32,143 Gg of CO_2 eq.) by 2030, and in case of financial and technological support this figure will be reduced by 8% (4,317 Gg CO_2 eq.).

In 2017, Georgia started to develop national indicators and targets for Sustainable Development Goals, which are closely related to reduction of greenhouse gas emissions.

On July 1, 2017, Georgia became a full member of the European Energy Community; this requires approximation the country's national legislation with the EU energy acquis, within the strictly defined timeframe. In terms of climate change mitigation, the commitments taken to promote energy efficiency and renewable sources of energy are important. The Ministry of Economy and Sustainable Development of Georgia, in partnership with other stakeholders, is preparing laws and national action plans on energy efficiency and renewable energy that will be submitted to the Government and Parliament for discussion and further authorization.

In 2016, the EU-Georgia Association Agreement has entered into force, which emphasizes the necessity of collaboration in the following areas: climate change mitigation, adaptation to climate change, emissions trading, integration of climate change in industrial policy and clean technology development. The Agreement underlines the inevitability of cooperation in the process of transferring the technologies based on the Low

[1] Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention, III B.
[2] https://www.ipcc-nggip.iges.or.jp/software/index.html

Emission Development Strategies (LEDS), Nationally Appropriate Mitigation Action (NAMA) and Technology Needs Assessment.

Working on the Low Emission Development Strategy (LEDS) for Georgia started in 2013 and the draft version of the document submitted to the Ministry in 2017. The mission of the strategy is: (a) to ensure integrated complex approach for long-term sustainable development; (b) to take into account the national development goals and circumstances; (c) to facilitate transformational development; (d) to help the country to accomplish international obligations undertaken regarding climate change and (e) to help the country to obtain funding from state and private sources. The strategy is not officially approved.

Georgia is actively engaged in NAMA projects preparation and implementing process. Within the framework of this initiative, NAMA on Adaptive Sustainable Forest Management in Borjomi-Bakuriani Forest District was carried out already; one project is under implementation - Efficient use of biomass for equitable, climate proof and sustainable rural development and Low Carbon Buildings in Georgia[3]. The project is implementing on a low scale due to the lack of financial support.

Besides strategies at a national level, local strategic documents are as well important, for instance, Sustainable Energy Action Plan (SEAP) elaborated by municipalities within the framework of Covenant of Mayors – the initiative of European Union. Covenant of Mayors was joined by 23 towns/municipalities of Georgia, and they undertook the obligation to reduce greenhouse gas emissions in a range 20%-30% by 2020 and by 2030 respectively. 11 municipalities have already submitted SEAPs, which suggests emissions reduction mainly from transport, public and domestic sectors.

Georgia as a Non-Annex I country to UNFCCC is eligible to participate in only one of the three mechanisms defined by the Kyoto Protocol, such as the Clean Development Mechanism (CDM). In Georgia, 7 CDM projects are registered and the forecasted reduction rate is 1.84 mln.t of CO_2 eq annually.

Detail information on climate change mitigation measures by sectors are provided in relevant chapter below.

Support Received and Needs

Georgia has received significant assistance from donors during the last 8 years in climate change field. Since 2017, the project "Preparation of the Fourth National Communication and the Second Biennial Update Report of Georgia to UNFCCC" has been implementing with financial support of the Global Environmental Fund (GEF). The purpose of the project is to assist the country in preparation for the Fourth National Communication and the Second Biennial Update Report of Georgia to the Conference of the Parties. The project is being implemented by UNDP in Georgia, the full budget of which is 1.2 million US dollars, from where 852,000 US dollars are GEF grant; the rest part is contribution of the government. In the chapter – support received are listed the donor funded projects providing financial, technical, and capacity building support.

Measurement, Reporting and Verification

The MRV chapter provides a brief update of the experience of Georgia with MRV since the submission of BUR1, the proposed revised design of domestic MRV system in the country, respective institutional arrangements and the implementation plan. The chapter also provides an analysis of the identified existing

[3] NAMA Registry - http://www4.unfccc.int/sites/nama/SitePages/Country.aspx?CountryId=66

gaps on the road towards the establishment of a sustainable MRV system and the required support for overcoming them.

There have been significant developments related to the design of the domestic measurement, reporting and verification (MRV) system in Georgia since the release of its First Biennial Update Report on Climate Change (BUR1) in 2016. Further studies were conducted, and recommendations provided for a more detailed assessment of the MRV, specifically the institutional arrangements, legal setup, and overall design of the system.

Most of the relevant work was conducted by GIZ under the project "Information Matters: Capacity Building for Ambitious Reporting and Facilitation of International Mutual Learning through Peer-to-Peer Exchange". Through these activities, the necessary elements to develop the MRV system were further analyzed in detail and preparation of the necessary legal documents for institutionalizing the MRV system was drafted. Additionally, it was proposed by various stakeholders to integrate a monitoring and evaluation system for adaptation activities in the national MRV system to allow more efficient tracking of the progress of Georgia towards achieving its goals under the Paris Agreement, providing a new and more comprehensive approach for an MRV system in Georgia and in preparation for the application of the Enhanced Transparency Framework.

Georgia also joined, during the reported period, the Capacity Building Initiative for Transparency (CBIT) funded under the sixth period of the Global Environmental Facility (GEF-6) through the "Georgia's Integrated Transparency Framework for Implementation of the Paris Agreement" project. CBIT support is expected to be used to create the necessary reporting structures to allow municipal level data to be incorporated directly into the country's national GHG inventory system, thereby feeding into Georgia's climate policies and targets.

Georgia has already gained some experience with MRV, especially through the implementation of seven registered CDM projects and three NAMA included in the UNFCCC NAMA registry. Some experience has also been gained through the work of Georgia under the Covenant of Mayors where participating municipalities have estimated their GHG emissions baseline, developed sustainable energy action plans, as well as MRV methodologies to capture the effects of the proposed mitigation actions. Experience was also gained through the development of the national inventory system although no experience exists in relation to the MRV for Support. Finally, the GIZ studies and consultations with stakeholders emphasized the need to incorporate a monitoring and evaluation system for adaptation in the overall MRV system in the country, with the establishment of a tracking system for adaptation activities as the first step, which is going to be covered also under the BUR2.

The Georgian domestic MRV system is proposed to be designed in a holistic manner and in line with the existing UNFCCC Guidelines, covering not only greenhouse gas (GHG) emissions, but also sustainable development goal (SDG) co-benefits of the implemented mitigation activities, tracking of adaptation activities and MRV for financial flows for climate change mitigation and adaptation. The system not only reflects the current vision of the Georgian Government on MRV design and implementation, but is also designed in a manner that allows Georgia to track its progress towards achieving its nationally determined contributions (NDC) and implement the Enhanced Transparency Framework requirements.

Under BUR2 a new MRV system covering GHG inventory preparation and operation, mitigation and adaptation actions, and support is proposed building upon the existing institutional structure, as well as the work conducted under GIZ and other projects. The process will be led by a Climate Change Council (CCC) proposed to be established under the Office of the Prime Minister of Georgia with three additional support units that are to be established in within the CCC: GHG Inventory Unit, Mitigation and Adaptation Unit, and Support Unit. Within each of the three units, a Quality Manager Officer should be appointed to be responsible for performing quality checks of the data and reports received from different entities.

The Ministry of Environmental Protection and Agriculture will serve as a coordinating entity of the MRV system and its work will be supported by a technical group for MRV which will be in charge of the development of special templates, methodologies, and standards is essential for a functional MRV system and requires special technical expertise.

The establishment of a fully functional and operational MRV system is proposed to take place over a period of three years, following the establishment of a legal framework, actual operationalization of the MRV system and establishment of a feedback mechanism to support the further improvement of the MRV system and its adjustment to the evolving requirements under the UNFCCC.

Chapter 1 National Circumstances

1.1. Government Structure

Georgia is a democratic republic with authority and power divided between legislative, executive and judicial branches. The head of the state is a president. The parliament is supreme legislature of Georgia and has 150 members. The executive branch, the government, is composed of a prime minister and ministers. Prime minister is a head of the government. Currently, 11 ministries are functioning in Georgia's government[4]. Two separate judicial branches manage judiciary: Constitutional Court of Georgia and Common Courts. Common Court comprises three stages: City Court, Court of Appeals and Supreme Court[5].

More than 20% of Georgian territory is occupied by Russia (Specifically, the Autonomous Republic of Abkhazia and Tskhinvali Region[6]). The territory consists of 2 autonomous republics (Autonomous Republic of Adjara and Abkhazia), 64 municipalities and 5 self-governing cities[7].

The Ministry of Environmental Protection and Agriculture, which was created through merger of the Ministry of Environment and Natural Resources Protection with the Ministry of Agriculture in 2017, is responsible for elaboration and implementation of the climate change policy. The Ministry has an Environment and Climate Change Department with its Climate Change Division.

Other ministries also involved in creation of Climate Change policies, strategies and data processing at a national level are the following: the Ministry of Economy and Sustainable Development, the Ministry of Finance, the Ministry of Education, Science, Culture and Sport, the Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs, the Ministry of Regional Development and Infrastructure, etc. along with the National Statistic Office of Georgia.

1.2. Population and Social Conditions

Population of Georgia numbered 3.7 million by January 1, 2018, where the share of urban population was 58%, while rural population counted for the rest 42%. By January 1 2018, 48% of the population was male, while 52% were female and the age range of 20-65 years amounts to 60% of total population[8]. The life expectancy is about 73.5 years in the country.

Subsistence minimum for the average household was 292.3 GEL in 2018, while average monthly incomes and expenditures per household were 1,111 GEL and 1,093 GEL respectively in 2017. About 21.9% of Georgian population was under the absolute poverty line in 2017. Gini coefficient by total consumption expenditure was 0.4 in 2017. In 2018 unemployment rates was 12.7% in Georgia[9].

[4] Government of Georgia - www.gov.ge
[5] Constitution of Georgia
[6] Ministry of Foreign Affairs www.mfa.gov.ge
[7] National Agency of Public Registry www.napr.gov.ge
[8] GEOSTAT - Excluding the population of occupied territories of Abkhazian autonomous Republic and Tskhinvali region.
[9] National Statistics Office of Georgia (GEOSTAT) – www.geostat.ge

1.3. Education

There are few climate change related educational programs in Georgia. In secondary education level subjects such as Geography and Public Education includes the themes of ecologic problems and climate change. At the high education level, at some extent, Georgian universities address the climate related matters in their curricula. The Ivane Javakhishvili Tbilisi State University has integrated some climate themes in its Bachelor and Master programmes. The Georgian Technical University has conducted three conferences on environmental concerns including climate change in 2018. In 2016, a short certification course "Climate Change and Sustainable Development" was established at Ilia State University, for students, public servants and journalists, by a think-tank 'World Experience for Georgia' (WEG) under funding of Heinrich Boell Foundation. Course on climate change policy is taught in the master's programme of Environmental Management and Policy at Georgian Institute of Public Affairs (GIPA). The program was created with support of the Ministry of Environmental Protection and Agriculture of Georgia and German International Cooperation Society (The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)). Regarding the informal and non-formal education, LEPL Environmental Information and Education Centre of the Ministry of Environmental Protection and Agriculture of Georgia permanently conducts lectures, seminars, trainings and various activities to support environmental education and awareness raising on climate change. Climate change issues are also presented in the guidelines and publications developed by the Centre as an additional material used for different target groups.

1.4. Geography and Climate Change Impacts

Georgia is located in the mountainous south Caucasus Region, southeast part of Europe. The area of the country is 69.7 sq. km. The territory is distinguished with difficult terrain - almost 2/3 of it is mountainous. Geographically, Georgia consists of western and eastern parts. Western Georgia is characterized with subtropical climate, while there is a dry continental climate in Eastern Georgia. Changes in annual average, maximum and minimum temperatures and annual level of precipitation for last years are provided in the Table below.

Table 1 - Annual Average, Maximum and Minimum Temperature and Annual Level of Precipitation In 2015, Annual Average Temperature and The Level of Precipitation During the Last 25 Years.

Station	**2015**						**1990-2015**	
	Average Temp. (C^0)	Max.Temp. (C^0)		Min.Temp. (C^0)		Precipitation (mm)	Average Temp. (C^0) Difference	Precipitation (mm) Difference
Akhaltsikhe	10.5	38.6	31-Jul	-13.6	20-Dec	480.2	1.6	29.6
Ambrolauri	12.8	40.0	1-Aug	-7.4	20-Dec	848.6	1.8	-155.3
Bolnisi	13.6	37.5	16-Aug	-6.2	10-Jan	519.6	0.8	50.6
Gori	12.4	36.8	1-Aug	-10.6	10-Jan	587.3	1.5	132.5
Mta-Sabueti	7.7	32.0	1-Aug	-12.8	10-Jan	1231.3	0.9	28.7
Pasanauri	9.2	34.0	16-Aug	-13.9	11-Jan	1009.5	1.0	167.0
Poti	15.8	34.5	3-Aug	-2.8	20-Dec	2252	1.6	178.0
Kobuleti	-	36.5	21-May	-5.2	10-Jan	2583.8	-	396.8
Kutaisi	16.1	42.2	31-Jul	-2.0	9-Jan	1085.1	1.9	-360.7
Tbilisi	14.4	38.5	5-Aug	-7.2	10-Jan	588.5	0.9	189.6
Telavi	13.2	38.2	16-Aug	-8.5	10-Jan	837.4	0.8	104.3

Zugdidi	15.2	36.6	10-Aug	-4.9	9-Jan	1631.7	1.5	-39.2

In Georgia, average temperature has risen by 1.3 ^{0}C and the level of precipitation has increased by 60 mm in the last 25 years (1990-2015).

Research on climate change conducted in the country predict that the average annual temperature will increase by 3.5 ^{0}C compared to the current indicator by the end of the century. At the same time, the level of precipitation will decrease in the western part of Georgia by 6% and by 14% in the eastern part. [10]

The climate change impact has already observed in Georgia. The frequent natural disasters caused or intensified by the climate change phenomena in the country are landslides, mudflows, floods, flash floods, droughts, forest fires, avalanches and strong winds. They result substantial economic losses for Georgia including damages of arable land, infrastructure and threat to people's lives.

A frequency of natural disasters has increased in the recent past, and this increase is considered a consequence of the effects of global climate change as well as human activities, such as deforestation, overgrazing of pastures, etc.

Government of Georgia has published National Disaster Risk Reduction Strategy of Georgia 2017-2020. The purpose of the strategy is to establish the unified disaster risk reduction (DRR) system, improve disaster preparedness and response capabilities at national and local levels, and to increase response efficiency to possible threats[11].

1.5. Natural Resources

Georgia is distinguished with its biodiversity. Because of climatic differences, the flora of Western and Eastern Georgia presents the big variety. In non-coniferous zones of Eastern Georgia, there is arid and semi-arid climate, the green vegetation is less profound. As for Western Georgia, because of its humid climate, it is distinguished with its dense forests. Fauna of Georgia demonstrates the confluence of elements of European, Central Asian and African fauna. There are around 100 mammal species, more than 330 bird species, about 48 reptile species, 11 amphibian species, and 160 fish species known in Georgia[12].

Georgia is a rich country with its underground and above ground water resources including the fresh and mineral water, which is due to its mountainous relief. The country has almost all types of mineral waters and over 2 thousand mineral and thermal springs which are used for treatment and rehabilitation of patients with different diseases.

There are 734 glaciers with a total surface area of 511 km^2. The volume of ice reserved in the glaciers is 30 km^3, 5% of which participates in annual water cycle. Measurements reveal that 94% of the glaciers have retreated, 4% exhibited no overall change and 2% have advanced. The mean retreat pace is 8m/year, and maximum retreat speed is up to 38m/year. In half a century, the number of glaciers has decreased by 13%, while the total surface area has reduced by 30%. The research shows that tongues of some glaciers have incurred on average 150-200 ablations[13] during the last 60-70 years. The main reason behind it is the

[10] FBUR 2016
[11] National Disaster Risk Reduction Strategy of Georgia 2017-2020, www.gov.ge
[12] Government of Georgia www.gov.ge
[13] Ablation –Glacier mass reduction as a result of melting, evaporation and mechanic demolition.

reduction in precipitation and average temperature increase. In case of Global Warming, it is estimated that total melting of the glaciers will take place by 2160. Glacier melting is a serious problem for water resource accessibility[14].

Forests cover almost 40% of the land area. Along with ecological function, forests play important energy and economic role in Georgia. They provide Georgian population with wood and timber. 8-12% of Georgian energy demand is covered by fuelwood. Wood is mainly used for heating, water heating and cooking by the rural population[15]. Except "social" and illegal cuts for fuel, forests are cut for commercial timber under National Forestry Agency and owners of long-term licenses for timber production[16].

Along with an increase in annual average temperature, the area of forest diseases spreading is moving forward to high mountainous regions, which may cause catastrophic damage to relict and endemic species[17].

1.6. Economy

Georgia is a transition economy, which replaces the Soviet command economy with market based economic principles. The economic parameters have improved after the economic collapse of 90-'s due to implementation of series of reforms. In 2000, the Parliament of Georgia ratified the protocol of World Trade Organization (WTO) membership, in 2014 Georgia and the EU signed an Association Agreement that includes membership in the Deep and Comprehensive Free Trade Area (AA/DCFTA). Consequently, many legislative acts have been improved and brought in compliance with European Union legislation.

Gross domestic product (GDP) in current prices and GDP per capita of Georgia were 37,846.6 million GEL (15,165 million USD dollars) and 10,231 GEL (4,079 USD dollars) respectively in 2017. During the last 8 years, the average growth rate of real GDP was 4.8% in 2010-2017[18].

Georgia took important steps in terms of investment environment improvement. Georgia has moved from 16th to 9th place in doing-the-business rating of the World Bank in 2018 and thus entered the top 10 list.[19] The information about other indicators and ratings is presented in the table below.

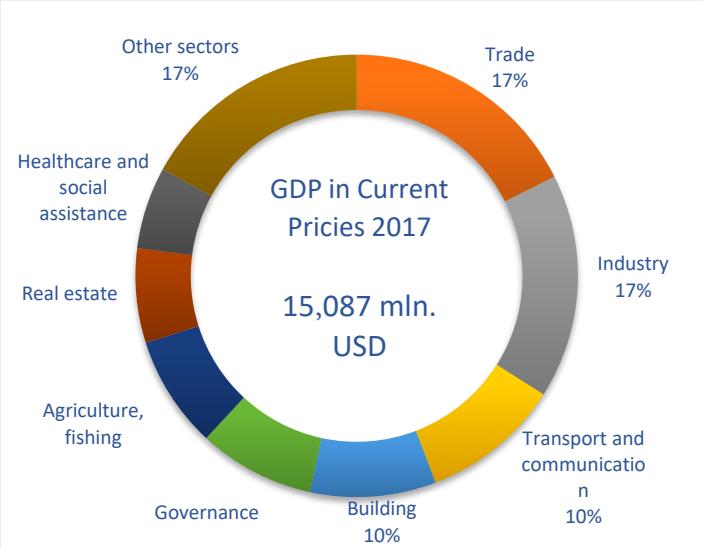

Figure 1 - Sectoral Structure of Gross domestic Product of Georgia 2017 year (GEOSTAT)

[14] WEG-Climate Change and Sustainable Development 2016
[15] „Eliminating the forest energy crisis by sustainable use of biomass" Policy Recommendations, WEG – CENN, 2016
[16] In 2006-2012, timber production licenses (less than 5) were issued for, 5, 10 and 20 years. State Audit Office www.sao.ge
[17] Climate Change and Sustainable Development, publication, www.weg.ge
[18] National Statistics office of Georgia - www.geostat.ge
[19] Ministry of Economics and Sustainable Development of Georgia www.economy.ge

Table 2 - Georgia in International Ratings

Indicator	Place	Number of Countries	Source
Ease of Doing Business (2018 year)	9	190	The World Bank[20]
Index of Economic Freedom (2018 year)	16	180	The Heritage Foundation[21]
World Economic Freedom (2015 year)	8	159	Fraser Institute [22]
Transformation Index BTI (2018 year)	42	129	German Bertelsmann Stiftung Fund [23]
Global Competitiveness Index (2017-2018 years)	67	137	World Economic Forum[24]
Global Innovation Index (2017 year)	68	127	Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO, an agency of the United Nations)[25]
Human Development Index (2015 year)	70	185	United Nations Development Programme [26]

The 2018-2020 program of the Georgian government indicates the major sectors that determine economic growth of the country. These are energy, agriculture, transport, tourism, and communication and information technologies.

The main purpose of energy policy is ensuring energy security of the country and energy independence with gradual reduction of demand on imported energy and development of local resources. Hydropower development is a high priority of the sector. Other renewable energy sources (sun, wind and geothermal energy) are in early stage of development in Georgia, however the country has a potential to enhance these renewables.

In agriculture sector, the government intends to develop climate-smart agriculture, including assurance of food security, adaptation to climate change, and support of climate change mitigation.

As Georgia is an important transit country, the government actively supports maritime, railway and aviation sector development by converging Georgian transport legislation with European directives. Road transport provides 42 % of total transportation. In the last years, the number of cars working on natural gas was steadily increasing. In addition, hybrid and electric cars are becoming increasingly popular because of their fuel-efficiency and state support. In 2016 the number of hybrid cars was increased four times compared to the previous year and amounted to 5.7% of total vehicle imports.

Tourism is a high priority sector in Georgian economy. The number of visitors is increasing every year, which increases the national income from this sector. The government of Georgia plans to refine highway

[20] World Bank www.worldbank.org
[21] The Heritage Foundation www.heritage.org
[22] Fraser Institute www.fraserinstitute.org
[23] German Bertelsmann Stiftung Fund www.bti-project.org
[24] World Economic Forum www.weforum.org
[25] Cornell University, INSEAD, and the World Intellectual Property Organization (WIPO, an agency of the United Nations) www.globalinnovationindex.org
[26] United Nations Development Program www.undp.org

infrastructure, intensify marketing activities, expand protected territories, develop various types of tourism and make Georgia a four-season tourism country.

1.7. Climate Change and the Country Development Priorities

The climate change related measures have been presented in various prioritized international agreements. A separate chapter is devoted to climate change obligations in the Association Agreement (AA) signed by Georgia and the European Union in 2014. Association Agreement underlines the need of collaboration in the process of climate change mitigation, adaptation, emissions trading, etc. Consequently, it sets the necessity of cooperation for elaboration such national documents as the country's 'Low Emission Development Strategy' (LEDS) and Nationally Appropriate Mitigation Action (NAMA) documents.

Since 2017 Georgia has become the member of Energy Community, with an obligation to elaborate the National Energy Efficiency Action Plan and the National Renewable Energy Action Plan (NREAP). The both plans would consist of activities for mitigation climate change in terms of energy efficiency and development of renewable energy sources.

The strategy 'Georgia 2020' along with other priority issues, pays attention to the importance of climate change mitigation and adaptation measures, supporting energy efficiency and development of environmentally friendly technologies. Mitigation and adaptation to climate change are also underlined in the 'Agriculture Development Strategy of Georgia 2015-2020'. The strategy considers implementation of climate smart agriculture practice. The 'Tourism Strategy of Georgia' also reflects the sustainable development goals for tourism. One of the priorities of the strategy is the development of Eco-Tourism.

The program Greening Economies is implemented in Eastern Partnership Countries (EaP GREEN), including Georgia, with the support of European Union and other donors (OECD, UNECE, UN Environment, UNIDO). The goal of the program is transferring to green economy, particularly achieving economic growth that excludes environment degradation and natural resource exhaustion.

Along with the national priorities and programmes, the local strategy documents such as Sustainable Energy Action Plans (SEAPs) have been developed within the EU Initiative Covenants of Mayors by municipalities.. Currently, 23 municipalities have joined the Covenant of Mayors, which took an obligation to reduce their greenhouse gas emissions in a range 20-30% by 2020 and by 2030.

1.8. Institutional Framework of National Communication and Biennial Update Report Preparation

Georgia joined United Nations Framework Convention on Climate Change (UNFCCC) in 1994 and the parliament ratified the Kyoto Protocol in May 28, 1999 with the resolution N 1995. The government of Georgia approved the Paris Agreement with the resolution N 96 on February 21, 2017.

Before 2010, the main reporting mechanism for non-Annex I countries to the UNFCCC, including Georgia, was National Communication and its GHG inventory. According to the 16th conference of the parties in Cancun (2010 year) and decisions N1/CP.16, and 1/CP/17 made in Durban in 2011, after 2014 every country must represent biennial independent and complete report about trends in greenhouse gas emissions and planned climate change mitigation activities.

The government of Georgia is a responsible body to UNFCCC. The Ministry of Environmental Protection and Agriculture elaborates and implements the policy in climate change[27]. The structural unit of the ministry is the Department of Environment and Climate Change and its subunit is a Climate Change Division. Along with other functions, the office is responsible for coordination of National Communication of Georgia and a Biennial Update Report preparation, cooperation with interested parties, coordination of periodic compilation of inventory report and its submission to the Convention secretariat.

There is an independent non-commercial legal entity under public law of Georgia, an Environmental Information and Education Centre, in the structure of the Ministry of Environmental Protection and Agriculture. One of the functions of this entity is creation of a unified environmental database and support of its publicity. The Centre has prepares National Greenhouse Gas Emissions Inventory report under the first and second BURs with an assistance of independent experts.

In order to fulfil the commitments under the UNFCCC, Georgia has prepared and submitted three National Communications and the First Biennial Update Report with an independent report of GHG inventory.

- Initial National Communication - 10 August, 1999 year;
- Second National Communication - 2 October, 2009 year;
- Third National Communication - 24 February, 2016 year;
- First Biennial Update Report - 18 July, 2016 year.

The Ministry of Environment Protection of Georgia prepared the third National Communication in 2012-2015 and introduced it to the UNFCCC in 2016[28]. The third National Communication was created with the support of the Global Environment Facility (GEF) and the United Nations Development Program (UNDP) National director of the project appointed by the Ministry of Environment Protection was responsible for project implementation. The director was also accountable to the executive council. The council was a major decision-making body. It was comprised of representatives of the project organizational committee (Policy and Security Committee (PSC)) from the line ministries, the project National Director and the UNDP. Moreover, Project Management Unit (PMU) was established including the project manager and manager's assistant, who supervised daily work of the project. For preparation of separate chapters of the Third National Communication, workgroups were created that involved experts selected by the UNDP in a competitive process. Georgian Office of the UNDP supervises and monitors the project.

Georgia started preparing Biennial Update Reports in 2015. Currently, the Second Biennial Update Report and the Fourth National Communication Document are in preparation. The Climate Change office of the Ministry of Environmental Protection and Agriculture leads and coordinates the report preparation. UNDP Georgia operates as an implementing agency for the Global Environment Fund (GEF) project and assists Georgia during the whole program implementation, also monitors and supervises the project on behalf of GEF. The Environmental Information and Education Centre, non-government organizations and experts competitively selected by the UNDP compile separate chapters of BUR. An executive council was formed at the initial phase of the project. The council consists of the representatives of the Ministry of Environmental Protection and Agriculture, the Ministry of Economy and Sustainable Development, UNDP, GIZ, NGOs and The Greens Movement. The council makes important decisions about the project, reviews and submits the work plans and changes in the budget; it is responsible for timely implementation and the quality of the project.

[27] The resouliton of Government of Georgia – on approval the statute of Ministry of Environment Protection and Agriculture of Georgia ,N112, 6 March, 2018.
[28] Georgia's National Communications in UNFCCC - www.unfccc.int

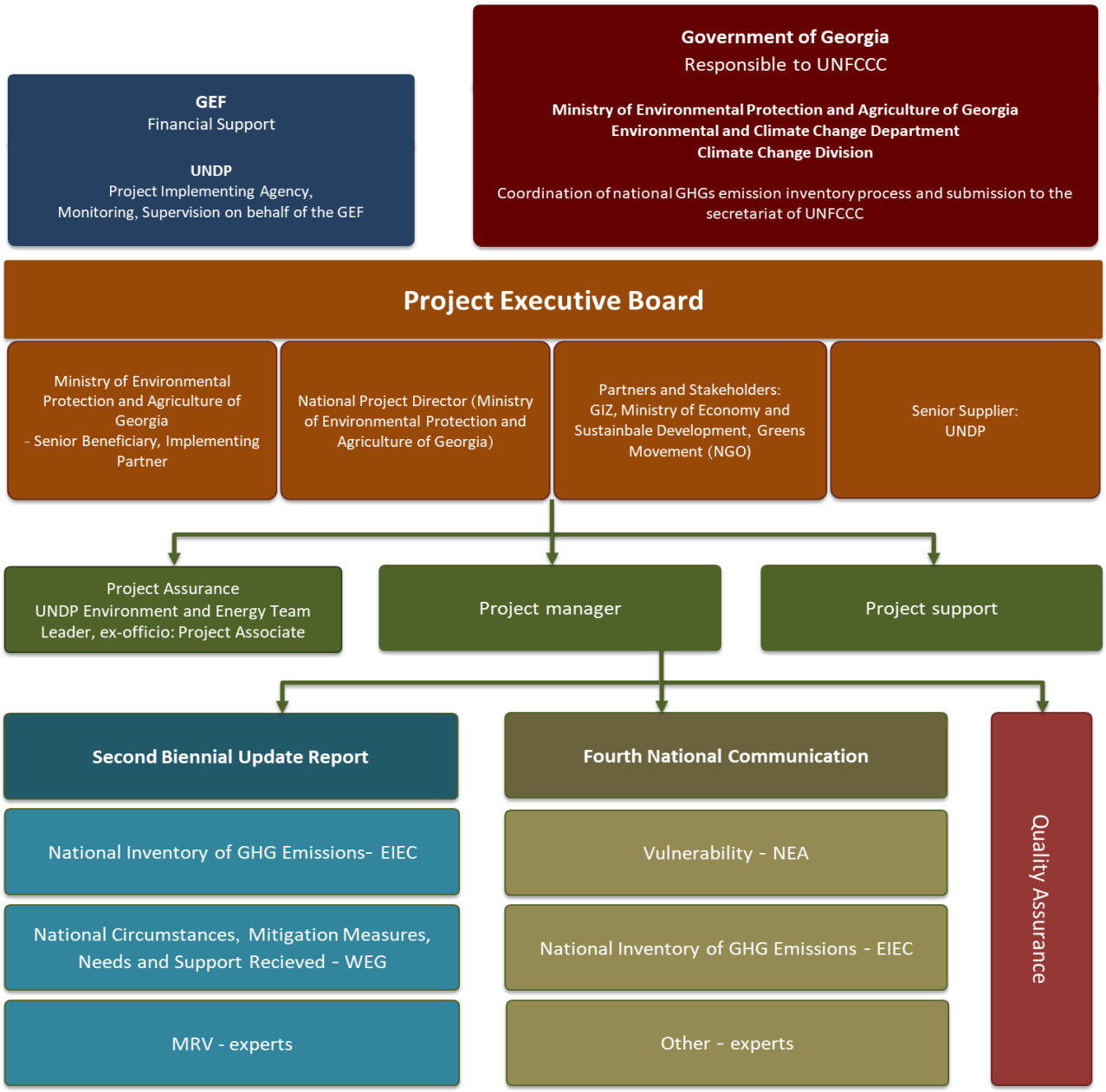

Figure 2 - Institutional Frame of Implementation Second Biennial Update Report and Fourth National Communication

The main data sources for the NCs and BURs are the National Statistics Office of Georgia (GEOSTAT) and the National Environment Agency. In accordance to the Memorandum on Cooperation signed in 2014 between the MEPA and the GEOSTAT, the GEOSTAT provides statistical data to the Ministry. Based on Resolution N502 of the Government of Georgia of August 18, 2014 and the General Administrative Code of Georgia, the National Environmental Agency provides the available information free of charge to the Ministry.

Local independent experts and international experts in the framework of the UNDP/UNEP Global Support Program for the NCs and BURs carry out quality control of the data and ensure quality of the final account.

The LEPL Environmental Information and Education Centre is an implementing entity of the project - "Harmonization of Information Management for improved Knowledge and Monitoring of the Global Environment in Georgia" (supported by the UNDP and the GEF). The main output of the project is setting up Environmental Information and Knowledge Management System. The similar inventory program adapted to the UNFCCC requirements is integrated into the system.

Chapter 2 National Greenhouse Gas Inventory

2.1 Overview

Georgia presents its Fifth National Inventory of anthropogenic emissions by sources and removal by sinks of greenhouse gases (GHG) in the Second Biennial Update Report to the UNFCCC over the period of 2014-2015. The GHG Inventory has been compiled according to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, including emissions and removals of six direct greenhouse gases: CO_2, CH_4, N_2O, HFCs, PFCs and SF_6, and four precursors: CO, NOx, NMVOC and SO_2. According to the Common Reporting Format (CRF) of the IPCC Methodology, the inventory covers five sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Land Use, Land-Use Change and Forestry (LULUCF), and Waste. The results have been recalculated for the following years 1990, 1994, 2000, 2005, 2010-2013 in all sectors, since the country has changed GHG estimation methodology.

According to the UNFCCC reporting guidelines on annual inventories[29], the Global Warming Potentials (GWP) provided by the IPCC in its Second Assessment Report ("1995 IPCC GWP Values") based on the effects of GHGs over a 100-year time horizon was used for expressing GHG emissions and removals in CO_2 eq.s. For the compilation of the inventory, IPCC Inventory Software Ver 2.54 (released on 6 July 2017)[30] and excel based worksheets were used.

In Georgia, the first GHG inventory was performed based on the 1980-1996 data, as part of the preparation of the First/Initial National Communication (FNC, during 1997-1999). The Second National Communication (SNC, during 2006-2009) comprised the period of 1997-2006. The 2007-2011 GHG inventory was performed as part of the Third National Communication (TNC, during 2012-2015). The First Biennial Update Report (FBUR, during 2015-2017) of Georgia to UNFCCC comprised the period of 2012-2013. The 2014-2015 GHG inventory was prepared for the Second Biennial Update Report (SBUR, during 2018-2019) of Georgia to UNFCCC.

2.2 Institutional Framework of the National GHG Inventory

The Fifth NIR has developed under the project: "Development of Georgia's Fourth National Communication and Second Biennial Update Report to the UN Framework Convention on Climate Change". The Climate Change Division of the Ministry of Environmental Protection and Agriculture has coordinated the report preparation.

The LEPL Environmental Information and Education Centre of the Ministry of Environmental Protection and Agriculture has prepared the Fifth NIR with the assistance of independent international and local experts. During the inventory preparation one of the major data provider was the National Statistics Office of Georgia.

[29] Guidelines for the preparation of national communications from Parties not included in Annex I to the Convention, III B.
[30] https://www.ipcc-nggip.iges.or.jp/software/index.html

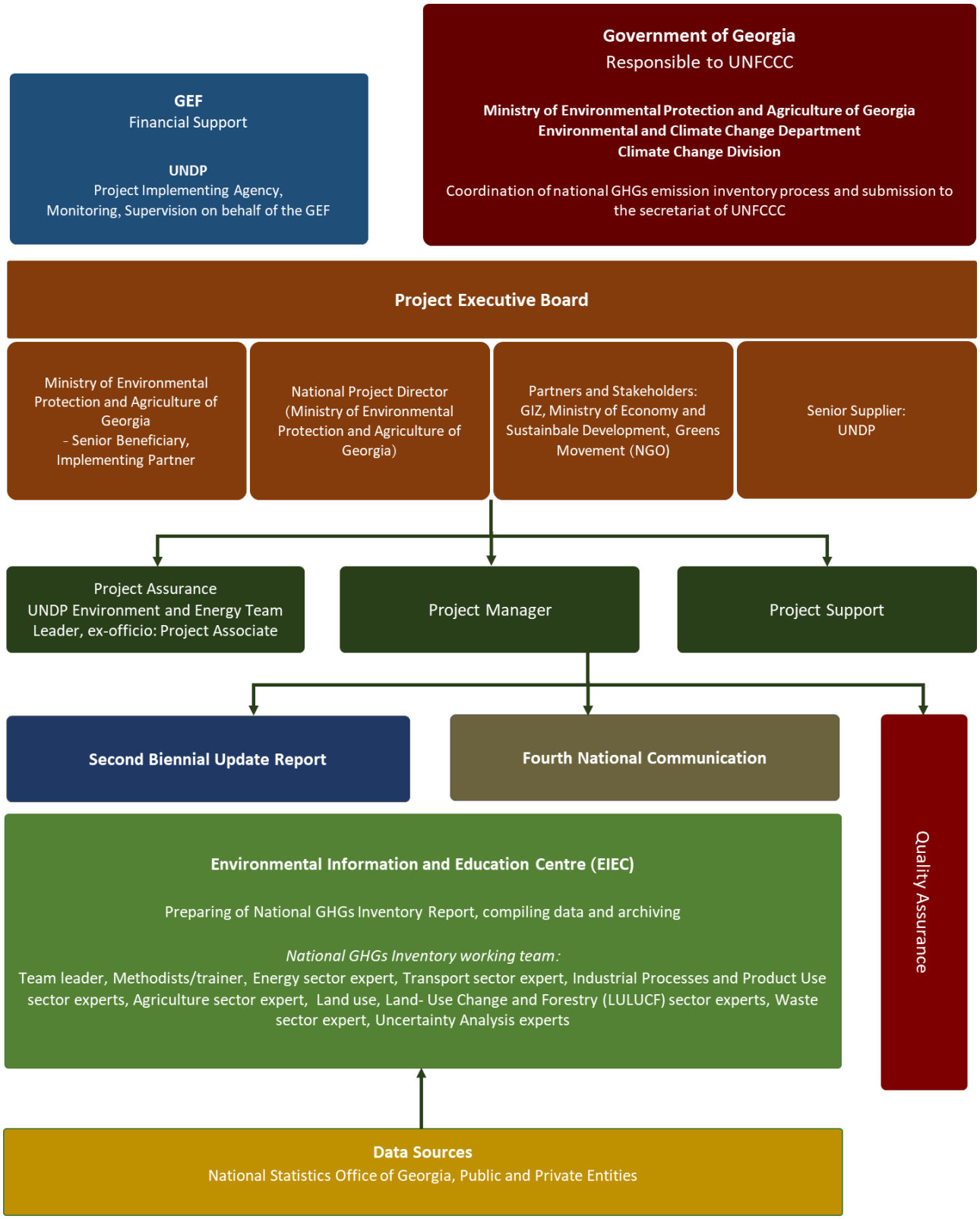

Figure 3 - Institutional Framework of the National GHG Inventory in Georgia

2.3 Key Source Categories

This sub-chapter provides the analysis of key source/sink of GHG emission/removals in Georgia for the period 1990-2015, for absolute values of emissions/removals (level analysis), as well as for the trends.

For the identification of key source/sink categories, the share of individual categories (converted to CO_2 eq.) in total emissions/removals is calculated according to absolute level of emissions/removals (level

assessment). Following the calculation of percentage contribution of each source/sink category, they are summed in descending order of magnitude, adding up to 95% of the sum of all key categories.

According to the trend assessment method, a source/sink category is considered a key category if they significantly contribute to the total trend of national emissions and removals. Thus, a key source-category would include a source-category for which the difference between the total inventory trend and the source category trend, according to the source-category "level" in the base year, is significant.

The current inventory was conducted for the 1990-2015 period. Hence, 1990 has been used as a base year for the trend assessment. The derived results were arranged in a descending order and cumulative totals were calculated. The sources of which the cumulative total is equal to, or higher than 95% of the overall emission (in CO_2 eq.) were determined to be a key source-category in terms of the trend. The identified key source-categories are presented in Table below.

Table 3 - Key Source-Categories of Georgia's GHG Inventory According to Level and Trend Assessment Approaches

IPCC Category Code	IPCC Category	GHG	Level Assessment 1990	Level Assessment 2015	Trend Assessment 1990-2015	Reason to Select as Key- category
1A3b	Road Transportation - Liquid Fuels	**CO_2**	8%	**19%**	**0.06**	**Level, Trend**
1B2	Fugitive Emissions from oil and natural gas transmission and distribution	**CH_4**	12%	**11%**	**0.15**	**Level, Trend**
4A	Enteric Fermentation	**CH_4**	4%	**9%**	**0.02**	**Level, Trend**
1A4b	Residential - Gaseous Fuels	**CO_2**	6%	**8%**	**0.07**	**Level, Trend**
1A1	Electricity and Heat Production - Gaseous Fuels	**CO_2**	10%	**8%**	**0.14**	**Level, Trend**
6A	Solid Waste Disposal Sides	**CH_4**	1%	**5%**	**0.02**	**Level, Trend**
1A2	Manufacturing Industries and Construction - Solid Fuels	**CO_2**	8%	**5%**	**0.11**	**Level, Trend**
1A3b	Road Transportation - Gaseous Fuels	**CO_2**	0%	**4%**	**0.02**	**Level, Trend**
2A1	Cement Production	**CO_2**	1%	**4%**	**0.01**	**Level, Trend**
4D1	Direct Soil Emissions	**N_2O**	2%	**4%**	**0.03**	**Level, Trend**
2B1	Ammonia Production	**CO_2**	1%	**3%**	**0.01**	**Level, Trend**
2C2	Ferroalloys Production	**CO_2**	0%	**2%**	**0.01**	**Level, Trend**
1A4a	Commercial/Institutional - Gaseous Fuels	**CO_2**	1%	**2%**	**0.01**	**Level, Trend**
1A1	Heat Production and Other Energy Industries - Solid Fuels	**CO_2**	2%	**2%**	**0.03**	**Level, Trend**
4B	Manure Management	**N_2O**	1%	**2%**	**0.00**	**Level**
2B2	Nitric Acid Production	**N_2O**	0%	**1%**	**0.00**	**Level**
1A2	Manufacturing Industries and Construction - Gaseous Fuels	**CO_2**	5%	**1%**	**0.07**	**Level, Trend**
1A3c	Other Transportation	**CO_2**	0%	**1%**	**0.00**	**Level**
4D3	Indirect Soil Emissions	**N_2O**	1%	**1%**	**0.01**	**Level, Trend**
6B2	Domestic Waste Water Handling	**CH_4**	1%	**1%**	**0.00**	**Level**
2F	Consumption of Halocarbons and Sulfur Hexafluoride (Refrigeration and Air Conditioning Equipment)	**HFC**[31]	0%	**1%**	**0.003**	**Level**
1B1	Fugitive Emissions from Solid Fuel Mining and Transformation	**CH_4**	2%	**1%**	**0.02**	**Level, Trend**

[31] Baseline year for HFC is 2001.

4B	Manure Management	**CH_4**	0%	**1%**	**0.00**	**Level**
1A4b	Residential	**CH_4**	0%	**1%**	**0.00**	**Level**
1B2	Fugitive Emissions from Oil Extraction	**CH_4**	0%	**1%**	**0.00**	**Level**
1A4b	Residential - Liquid Fuels	**CO_2**	2%	**0%**	**0.03**	**Level, Trend**
1A4a	Commercial/Institutional - Liquid Fuels	**CO_2**	2%	**0%**	**0.03**	**Level, Trend**
1A2	Manufacturing Industries and Construction - Liquid Fuels	**CO_2**	5%	**0%**	**0.07**	**Level, Trend**
2C1	Cast Iron and Steel Production	**CO_2**	4%	**0%**	**0.07**	**Level, Trend**
1A1	Electricity and Heat Production - Liquid Fuels	**CO_2**	18%	**0%**	**0.30**	**Level, Trend**

Table 4 shows the results of key source-categories of Georgia's GHG inventory for 1990 and 2015 years including LULUCF sector.

Table 4 - Key Source-Categories of Georgia's GHG Inventory According to Level and Trend Assessment Approaches (Including LULUCF)

IPCC Category Code	IPCC Category	GHG	Level Assessment 1990	Level Assessment 2015	Trend Assessment 1990-2015	Reason to Select as Key- category
5A	Forest Land	**CO_2**	12%	**21%**	**0.08**	**Level, Trend**
1A3b	Road Transportation - Liquid Fuels	**CO_2**	6%	**12%**	**0.04**	**Level, Trend**
5C	Grassland	**CO_2**	5%	**10%**	**0.03**	**Level, Trend**
5B	Cropland	**CO_2**	6%	**7%**	**0.05**	**Level, Trend**
1B2	Fugitive Emissions from Oil and Natural Gas Transmission and Distribution	**CH_4**	9%	**7%**	**0.11**	**Level, Trend**
4A	Enteric Fermentation	**CH_4**	3%	**5%**	**0.02**	**Level, Trend**
1A4b	Residential - Gaseous Fuels	**CO_2**	5%	**5%**	**0.05**	**Level, Trend**
1A1	Electricity and Heat Production - Gaseous Fuels	**CO_2**	8%	**5%**	**0.10**	**Level, Trend**
6A	Solid Waste Disposal Sides	**CH_4**	1%	**3%**	**0.01**	**Level, Trend**
1A2	Manufacturing Industries and Construction - Solid Fuels	**CO_2**	6%	**3%**	**0.08**	**Level, Trend**
1A3b	Road Transportation - Gaseous Fuels	**CO_2**	0%	**3%**	**0.01**	**Level, Trend**
2A1	Cement Production	**CO_2**	1%	**3%**	**0.01**	**Level, Trend**
4D1	Direct Soil Emissions	**N_2O**	2%	**2%**	**0.02**	**Level, Trend**
2B1	Ammonia Production	**CO_2**	1%	**2%**	**0.01**	**Level, Trend**
2C2	Ferroalloys Production	**CO_2**	0%	**1%**	**0.01**	**Level, Trend**
1A4a	Commercial/Institutional - Gaseous Fuels	**CO_2**	0%	**1%**	**0.00**	**Level**
1A1	Heat Production and Other Energy Industries - Solid Fuels	**CO_2**	2%	**1%**	**0.02**	**Level, Trend**
4B	Manure Management	**N_2O**	1%	**1%**	**0.00**	**Level**
2B2	Nitric Acid Production	**N_2O**	0%	**1%**	**0.00**	**Level**
1A2	Manufacturing Industries and Construction - Gaseous Fuels	**CO_2**	4%	**1%**	**0.05**	**Level, Trend**
1A3c	Other Transportation	**CO_2**	0%	**1%**	**0.00**	**Level**
4D3	Indirect Soil Emissions	**N_2O**	1%	**1%**	**0.01**	**Level, Trend**
6B2	Domestic Waste Water Handling	**CH_4**	0%	**1%**	**0.00**	**Level**

2F	Consumption of Halocarbons and Sulfur Hexafluoride (Refrigeration and Air Conditioning Equipment)	**HFC**[32]	0%	**1%**	**0.002**	**Level**
1B1	Fugitive Emissions from Solid Fuel Mining and Transformation	**CH_4**	1%	**0%**	**0.02**	**Trend**
1A4b	Residential - Liquid Fuels	**CO_2**	2%	**0%**	**0.03**	**Level, Trend**
1A4a	Commercial/Institutional - Liquid Fuels	**CO_2**	1%	**0%**	**0.02**	**Trend**
1A2	Manufacturing Industries and Construction - Liquid Fuels	**CO_2**	4%	**0%**	**0.05**	**Level, Trend**
2C1	Cast Iron and Steel Production	**CO_2**	3%	**0%**	**0.05**	**Level, Trend**
1A1	Electricity and Heat Production - Liquid Fuels	**CO_2**	14%	**0%**	**0.22**	**Level**

2.4 GHG Emission Trends 1990-2015[33]

Greenhouse gases (CO_2, CH_4, N_2O, HFCs and SF_6) emission trends for 1990-2015, without consideration of the LULUCF sector, are provided in Table below in Gg CO_2 eq. In 1990, these emissions totaled 45,606 Gg in CO_2 eq. Due to the breakup of the economic system of the Soviet period, emissions started to fall sharply. In 2015, GHG emissions amounted 17,588 Gg. CO_2 eq.

During this inventory GHG emissions and removals calculated using 2006 IPCC guidelines for 2014 and 2015 and recalculated results for the following years 1990, 1994, 2000, 2005, 2010, 2011, 2012, 2013. For other years, GHG emissions and removals were interpolated using Compound Annual Growth Rate. Exception is the IPPU sector where GHG emissions were recalculated for all previous years.

Table 5 - GHG Emission Trends in Georgia During 1990-2015 (Gg CO_2 eq.) excluding LULUCF

Gas/Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
CO_2	34,098	25,829	18,931	13,763	10,257	8,991	7,923	6,929	6,091	5,506	4,874	4,607	4,636
CH_4	9,049	7,076	5,623	4,547	3,742	3,740	3,742	3,748	3,759	3,774	3,793	3,836	3,879
N_2O	2,459	2,173	1,880	1,664	1,418	1,477	1,562	1,601	1,642	1,752	1,813	1,741	1,813
HFC-134a	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.11	0.46
HFC-125	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.05	0.19
HFC-143a	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.06	0.20
HFC-32	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	NO	0.00	0.01
SF_6	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE	NE
Total	**45,606**	**35,078**	**26,434**	**19,974**	**15,417**	**14,208**	**13,227**	**12,279**	**11,492**	**11,031**	**10,479**	**10,184**	**10,329**

Gas/Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
CO_2	4,667	4,739	4,760	5,236	5,761	6,198	6,316	7,027	8,918	9,341	8,732	9,609	10,277
CH_4	3,923	3,968	4,013	4,068	4,130	4,197	4,272	4,353	4,849	5,237	4,511	4,505	5,088
N_2O	1,838	1,862	1,901	1,885	1,846	1,810	1,776	1,773	1,732	1,877	2,139	2,041	2,084
HFC-134a	1.46	2.43	4.59	4.69	5.31	7.81	12.84	26.41	30.54	56.77	65.07	68.38	77.83
HFC-125	0.64	1.42	2.33	2.22	2.14	3.09	4.07	12.86	17.31	19.06	21.33	30.71	37.61

[32] Baseline year for HFC is 2001.
[33] The discrepancies may appear in total values due to rounding effect.

HFC-143a	0.47	0.99	1.73	1.53	1.45	2.71	3.61	13.91	14.54	15.01	15.24	16.94	17.98
HFC-32	0.07	0.17	0.27	0.27	0.26	0.30	0.39	0.89	1.82	2.14	2.62	4.52	5.97
SF_6	NE	NE	NE	NE	NE	NE	NE	0.22	0.25	0.27	0.28	0.30	0.32
Total	**10,431**	**10,574**	**10,682**	**11,198**	**11,745**	**12,219**	**12,385**	**13,206**	**15,563**	**16,548**	**15,487**	**16,276**	**17,591**

2.5 Emission Trends by Sectors

Emission trends by sectors over 1990-2015 are provided in the Table below. As it can be seen from the table, energy is the dominant sector, and it accounts for more than half of total emissions over the entire period, excluding LULUCF. Following the breakup of the Soviet Union, the contribution of the agricultural sector in total emissions grows gradually, and it ranks second over the period 1990-2015. IPPU and Waste sectors are on the third and fourth places in ranking, excluding LULUCF.

In Georgia, the LULUCF sector had a net sink of greenhouse gases during 1990-2015. The sink capacity of the LULUCF sector fluctuates between (-2,525) Gg CO_2 eq and (-6,850) Gg CO_2 eq. Without consideration of the LULUCF sector, in 2015 greenhouse gas emissions in Georgia totaled 17,589 Gg in CO_2 eq., and 13,707 Gg CO_2 eq when taking this sector into account.

Table 6 - GHGs Emission Trends by Sectors in 1990-2015 (Gg CO_2 eq.)

Sector	**1990**	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**
Energy	36,698	27,476	20,580	15,421	11,560	10,210	9,030	7,998	7,094	6,302	5,609	5,564	5,520
IPPU	3,879	3,038	1,705	776	414	447	535	504	502	710	725	439	591
Agriculture	3,925	3,492	3,108	2,766	2,463	2,548	2,636	2,727	2,822	2,920	3,021	3,043	3,065
Waste	1,105	1,073	1,041	1,011	978	1,003	1,026	1,050	1,074	1,099	1,124	1,138	1,153
LULUCF (Net removals)	(6,839)	(6,819)	(6,793)	(6,763)	(6,730)	(6,482)	(6,231)	(5,970)	(5,690)	(5,377)	(5,007)	(4,989)	(4,952)
Total (excluding LULUCF)	**45,607**	**35,079**	**26,434**	**19,974**	**15,415**	**14,208**	**13,227**	**12,279**	**11,492**	**11,031**	**10,479**	**10,184**	**10,329**
Total (including LULUCF)	**38,768**	**28,260**	**19,641**	**13,211**	**8,685**	**7,726**	**6,996**	**6,309**	**5,802**	**5,655**	**5,472**	**5,195**	**5,377**

Sector	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
Energy	5,477	5,436	5,396	5,796	6,226	6,689	7,187	7,722	9,758	10,443	9,034	9,665	10,874
IPPU	699	846	957	1,136	1,314	1,383	1,106	1,443	1,794	1,872	1,892	2,035	2,058
Agriculture	3,087	3,109	3,132	3,042	2,956	2,872	2,790	2,712	2,649	2,859	3,186	3,201	3,271
Waste	1,167	1,182	1,199	1,223	1,249	1,275	1,303	1,330	1,362	1,375	1,375	1,377	1,388
LULUCF (Net removals)	(4,899)	(4,834)	(4,758)	(4,719)	(4,629)	(4,455)	(4,145)	(3,612)	(5,073)	(3,811)	(4,737)	(2,498)	(3,882)
Total (excluding LULUCF)	**10,431**	**10,574**	**10,684**	**11,198**	**11,745**	**12,219**	**12,385**	**13,208**	**15,563**	**16,549**	**15,487**	**16,278**	**17,591**
Total (including LULUCF)	**5,532**	**5,740**	**5,926**	**6,479**	**7,116**	**7,764**	**8,240**	**9,595**	**10,490**	**12,738**	**10,750**	**13,780**	**13,707**

In the Table below GHG emissions and removals from LULUCF sector are provided in Gg CO_2 eq..

Table 7 - GHG Emissions and Removals from LULUCF sector (Gg CO_2 eq.)

Source	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Emission (GG CO_2 eq.)	3,557	3,554	3,558	3,566	3,577	3,595	3,622	3,664	3,729	3,833	3,998	3,961	3,944
Removal (GG CO_2)	10,396	10,374	10,351	10,329	10,307	10,077	9,853	9,633	9,419	9,209	9,004	8,950	8,896
Net removals	**(6,839)**	**(6,819)**	**(6,793)**	**(6,763)**	**(6,730)**	**(6,482)**	**(6,231)**	**(5,970)**	**(5,690)**	**(5,377)**	**(5,007)**	**(4,989)**	**(4,952)**

Source	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Emission (GG CO_2 eq.)	3,943	3,955	3,978	4,079	4,232	4,469	4,843	5,439	3,687	5,081	4,092	5,982	4,598
Removal (GG CO_2)	8,842	8,789	8,736	8,798	8,861	8,924	8,987	9,051	8,760	8,892	8,830	8,480	8,480
Net removals	**(4,899)**	**(4,834)**	**(4,758)**	**(4,719)**	**(4,629)**	**(4,455)**	**(4,145)**	**(3,612)**	**(5,073)**	**(3,811)**	**(4,737)**	**(2,498)**	**(3,882)**

2.6 Indirect Greenhouse Gases and Sulphur Dioxide

Tables below show direct and indirect GHG emissions by sectors and sub-sectors for 1990 and 2015.

Table 8 - Direct and Indirect GHG Emissions by Sectors and Sub-Sectors in 1990 (Gg)

Greenhouse Gas Sources and Sink Categories	CO_2 Emissions (Gg)	CO_2 Removals (Gg)	CH_4 (Gg)	N_2O (Gg)	NOx (Gg)	CO (Gg)	NMVOCs (Gg)	SOx (Gg)
Total National Emissions and Removals for 1990	**37,918**	**10,755**	**434**	**10**	**109**	**406**	**61**	**39**
1. Energy	**30,368**	**0**	**295**	**0**	**104**	**354**	**60**	**38**
A. Fuel Combustion (sectoral approach)	30,294		9	0	104	354	60	38
1. Energy Industries	13732		0.41	0.087	36.46	3.43	0.99	9.03
2. Manufacturing Industries and Construction	7,535		0.45	0.07	20.65	6.37	0.98	16.52
3. Transport	3,744		0.99	0.186	35.06	237.63	44.84	1.56
4. Other Sectors	5,283		6.71	0.102	11.37	106.78	13.01	11.09
5. Other	NE		NE	NE	NE	NE	NE	NE
B. Fugitive Emissions from Fuels	73.8		286.29		NE	NE	NE	NE
1. Solid Fuels			32.22		NE	NE	NE	NE
2. Oil and Natural Gas			254.08		NE	NE	NE	NE
2. Industrial Processes	**3,730**	**NA**	**NA**	**3**	**5**	**1**	**2**	**1**
A. Mineral Products	572				NE	NO	0.25	0.53
B. Chemical Industry	C		NO	3	4.99	1.0	NO	0.007
C. Metal Production	C		0.04	NO	0.003	NO	0.002	0.003
D. Non-Energy Products from Fuel and Solvent Use	0		NO	NO	NO	0.006	0.03	NO
E. Electronic Industry	NO		NO	NO	NO	NO	NO	NO
F. Product Uses as Substitutes for ODS								
G. Other Product Manufacture and Use	NO		NO	NO	NO	NO	NO	NO

	H. Other (please specify)	NO		NO	NO	NO	NO	2	NO
3. Agriculture				**86.13**	**6.83**	**NE**	**NE**	**NE**	**NA**
	A. Enteric Fermentation			77.11					
	B. Manure Management			9.02	1.21			NE	
	C. Rice Cultivation			NO				NO	
	D. Agricultural Soils			NE	5.61			NE	
	E. Prescribed Burning of Savannahs			NO	NO	NO	NO	NO	
	F. Field Burning of Agricultural Residues			NE	NE	NE	NE	NE	
	G. Other			NO	NO	NO	NO	NO	
4. Land-use Change and Forestry		**3,472.53**	**10,395.93**	**3.45**	**0.04**	**0.27**	**49.84**	**NA**	**NA**
	A. Changes in Forest and Other Woody Biomass Stocks	658.83	7,117.3						
	B. Forest and Grassland conversion	13.2	NE	3.45	0.04	0.27	49.84		
	C. Abandonment of Managed Lands		NE						
	D. CO_2 Emissions and Removals from Soil	2,800.5	3,278.6						
	E. Other	NE	NE	NE	NE	NE	NE		
5. Waste				**49.91**	**0.18**	**NE**	**NE**	**NE**	**NE**
	A. Solid Waste Disposal on Land			26.60		NE		NE	
	B. Waste-water Handling			23.31	0.18	NE	NE	NE	
	C. Waste Incineration					NE	NE	NE	NE
	D. Other			NO	NO	NO	NO	NO	NO
6. Other		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo items									
	International Bunkers	**608.6**		0.004	0.017	NE	NE	NE	NE
	Aviation	608.6		0.004	0.017	NE	NE	NE	NE
	Marine	NE		NE	NE	NE	NE	NE	NE
	CO_2 Emissions from Biomass	**2,149**							

Table 9 - Anthropogenic Emissions of HFCs, PFCs and SF6 in 1990 (Gg)

Greenhouse Gas Source and Sink Categories	**HFCs (Gg)**				**PFCs (Gg)**			**SF_6 (Gg)**
	HFC-23	**HFC-134**	**HFC-125**	**HFC-143a**	**CF4**	**C2F6**	**Other**	
Total National Emissions and Removals 1990	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
1. Energy								
A. Fuel Combustion (sectoral approach)								

		1. Energy Industries								
		2. Manufacturing Industries and Construction								
		3. Transport								
		4. Other Sectors								
		5. Other								
	B. Fugitive Emissions from Fuels									
		1. Solid Fuels								
		2. Oil and Natural Gas								
2. Industrial Processes			**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
	A. Mineral Products									
	B. Chemical Industry									
	C. Metal Production		NO	NO	NO	NO	NO	NO	NO	NO
	D. Non-Energy Products from Fuel and Solvent Use									
	E. Electronic Industry		NO	NO	NO	NO	NO	NO	NO	NO
	F. Product Uses as Substitutes for ODS		NO	NO	NO	NO	NO	NO	NO	NO
	G. Other Product Manufacture and Use		NA	NA	NA		NA	NA		NO
	H. Other (please specify)									
3. Agriculture										
	A. Enteric Fermentation									
	B. Manure Management									
	C. Rice Cultivation									
	D. Agricultural Soils									
	E. Prescribed Burning of Savannahs									
	F. Field Burning of Agricultural Residues									
	G. Other									
4. Land-use Change and Forestry										
	A. Changes in Forest and Other Woody Biomass Stocks									
	B. Forest and Grassland Conversion									
	C. Abandonment of Managed Lands									
	D. CO_2 Emissions and Removals from Soil									
	E. Other									

5. Waste									
	A. Solid Waste Disposal on Land								
	B. Waste-water Handling								
	C. Waste Incineration								
	D. Other								
6. Other (please specify)			**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo Items									
	International Bunkers								
		Aviation							
		Marine							
	CO_2 Emissions from Biomass								

Table 10 - Direct and Indirect GHG Emissions by Sectors and Sub-Sectors in 2015 (Gg)

Greenhouse Gas Sources and Sink Categories	**CO_2 Emissions (Gg)**	**CO_2 Removals (Gg)**	**CH_4 (Gg)**	**N_2O (Gg)**	**NOx (Gg)**	**CO (Gg)**	**NMVOCs (Gg)**	**SOx (Gg)**
Total national emissions and removals for 2015	**14,591**	**9,094**	**271**	**6**	**58**	**678**	**45**	**16**
1. Energy	**8,616**	**0**	**103**	**0**	**50**	**267**	**44**	**15**
A. Fuel Combustion (sectoral approach)	8,602		7	0	50	267	44	15
1. Energy Industries	1619		0.03	0.007	3.41	0.45	0.11	0.01
2. Manufacturing Industries and Construction	1,058		0.09	0.01	4.08	1.90	0.25	5.23
3. Transport	4,062		1.89	0.195	39.11	179.14	33.01	1.30
4. Other sectors	1,863		5.13	0.07	3.82	85.28	10.23	8.62
5. Other	NE		NE	NE	NE	NE	NE	NE
B. Fugitive Emissions from Fuels	14		96.04		NE	NE	NE	NE
1. Solid Fuels			5.94		NE	NE	NE	NE
2. Oil and Natural Gas			90.10		NE	NE	NE	NE
2. Industrial Processes	**1,660**	**NA**	**NA**	**0.83**	**5**	**2**	**1**	**1**
A. Mineral Products	759				NE	0.004	0.15	0.49
B. Chemical Industry	C		NO	C	4.73	1.74	1.04	0.01
C. Metal Production	C		0.66	NE	0.01	0.0003	0.01	0.01
D. Non-Energy Products from Fuel and Solvent Use	11		NO	NO	NA	NA	0.02	NA
E. Electronic Industry	NO		NO	NO	NO	NO	NO	NO
F. Product Uses as Substitutes for ODS								
G. Other Product Manufacture and Use	NO		NO	C	NO	NO	NO	NO
H. Other (please specify)	NO		NO	NO	NO	NO	NO	NO

3. Agriculture				**75.73**	**5.42**	**NE**	**NE**	**NE**	**NA**
	A. Enteric Fermentation			70.11		-			
	B. Manure Management			5.62	1.07			NE	
	C. Rice Cultivation			NO				NO	
	D. Agricultural Soils			NE	4.36			NE	
	E. Prescribed Burning of Savannahs			NO	NO	NO	NO	NO	
	F. Field Burning of Agricultural Residues			NE	NE	NE	NE	NE	
	G. Other			NO	NO	NO	NO	NO	
4. Land-use Change and Forestry		**4,315**	**9,094**	**28.30**	**0.35**	**2.20**	**409**	**NA**	**NA**
	A. Changes in Forest and Other Woody Biomass Stocks	1,095	6,742						
	B. Forest and Grassland conversion	3,220	410	28.30	0.35	2.20	409		
	C. Abandonment of Managed Lands		NE						
	D. CO_2 Emissions and Removals from Soil	NE	1,943						
	E. Other	NE	NE	NE	NE	NE	NE		
5. Waste				**63.33**	**0.19**	**NE**	**NE**	**NE**	**NE**
	A. Solid Waste Disposal on Land			42.57		NE		NE	
	B. Waste-water Handling			20.76	0.19	NE	NE	NE	
	C. Waste Incineration					NE	NE	NE	NE
	D. Other			NO	NO	NO	NO	NO	NO
6. Other		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo items									
	International Bunkers	**214.7**		0.002	0.006	NE	NE	NE	NE
	Aviation	214.7		0.002	0.006	NE	NE	NE	NE
	Marine	NE		NE	NE	NE	NE	NE	NE
	CO_2 Emissions from Biomass	**1,866**							

Table 11 - Anthropogenic Emissions of HFCs, PFCs and SF6 in 2015 (Gg)

Greenhouse gas source and sink categories	**HFCs (Gg)**				**PFCs (Gg)**			**SF6 (Gg)**
	HFC-23	**HFC-134**	**HFC-125**	**HFC-143a**	**CF4**	**C2F6**	**Other**	
Total national emissions and removals 2015	**0.009**	**0.060**	**0.013**	0.009	**NE**	**NE**	**NE**	**0.319**
1. Energy								
A. Fuel Combustion (sectoral approach)								
1. Energy Industries								

		2. Manufacturing Industries and Construction								
		3. Transport								
		4. Other Sectors								
		5. Other								
	B. Fugitive Emissions from Fuels									
		1. Solid Fuels								
		2. Oil and Natural Gas								
2. Industrial Processes			**0.009**	**0.060**	**0.013**	0.009	**NE**	**NE**	**NE**	**0.319**
	A. Mineral Products									
	B. Chemical Industry									
	C. Metal Production		NO	NO	NO	NO	NO	NO	NO	NO
	D. Non-Energy Products from Fuel and Solvent Use									
	E. Electronic Industry		NO	NO	NO	NO	NO	NO	NO	NO
	F. Product Uses as Substitutes for ODS		0.009	0.060	0.013	0.009	NE	NE	NE	NE
	G. Other Product Manufacture and Use		NA	NA	NA		NA	NA		0.319
	H. Other (please specify)									
3. Agriculture										
	A. Enteric Fermentation									
	B. Manure Management									
	C. Rice Cultivation									
	D. Agricultural Soils									
	E. Prescribed Burning of Savannahs									
	F. Field Burning of Agricultural Residues									
	G. Other									
4. Land-use Change and Forestry										
	A. Changes in Forest and Other Woody Biomass Stocks									
	B. Forest and Grassland Conversion									
	C. Abandonment of Managed Lands									
	D. CO_2 Emissions and Removals from Soil									
	E. Other									
5. Waste										
	A. Solid Waste Disposal on Land									

	B. Waste-water Handling								
	C. Waste Incineration								
	D. Other								
6. Other (please specify)		**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Memo Items									
	International Bunkers								
		Aviation								
		Marine							
	CO_2 Emissions from Biomass								

2.7 Energy

In 2015, greenhouse gas emissions from the energy sector amounted 10,874 Gg CO_2 eq., which is about 62% of Georgia's total GHG emission (excluding LULUCF). It is considerably lower compared to the contribution of this sector in 1990 (80%). Compared to 1990, the total GHG emissions of the sector decreased by 70%, while they increased by 94% relative to 2000.

Table 12 - Energy Sectoral Table for 1990 and 2015

Categories	1990 Emissions (Gg)			2015 Emissions (Gg)		
	CO_2	CH_4	N_2O	CO_2	CH_4	N_2O
1 - Energy	30,368.23	294.84	0.44	8,616.92	103.21	0.29
1.A - Fuel Combustion Activities	30,294.35	8.55	0.44	8,602.83	7.17	0.29
1.A.1 - Energy Industries	13,731.86	0.41	0.09	1,619.51	0.03	0.01
1.A.2 - Manufacturing Industries and Construction	7,534.96	0.45	0.07	1,058.14	0.09	0.01
1.A.3 - Transport	3,744.54	0.99	0.19	4,062.32	1.89	0.20
1.A.4 - Other Sectors	5,282.99	6.71	0.10	1,862.87	5.17	0.07
1.A.4.a - Commercial/Institutional	1,076.52	0.45	0.01	409.86	0.12	0.00
1.A.4.b - Residential	3,688.24	6.01	0.09	1,414.94	5.04	0.07
1.A.4.c - Agriculture/Forestry/ Fishing/Fish Farms	518.23	0.24	0.00	38.07	0.01	0.00
1.B - Fugitive Emissions from Fuels	73.88	286.29	0.00	14.09	96.04	0.00
1.B.1 - Solid Fuels	62.20	32.21	0.00	11.48	5.94	0.00
1.B.2 - Oil and Natural Gas	11.68	254.07	0.0002	2.62	90.10	0.00004
1.B.2.a - Oil	11.41	7.09	0.00	2.49	1.76	0.00
1.B.2.b - Natural Gas	0.27	246.98	0.00	0.13	88.34	0.00

A significant fall in GHG emissions in the 1990s is due to the breakup of the Soviet Union and fundamental changes in the economy of the country. However, the national economy started increasing after 2000 and the average annual growth of real GDP amounted to 7.6 % before 2008. During 2008-2009, economic growth of Georgia slowed down due to the Russian-Georgian war. Again, from 2010, the real GDP of the country started increasing by 4.9% on average until 2015[34].

In 2010, hydro generation reached its maximum, while the generation from thermal power plants was the lowest in the past decade. From 2011 emissions in the energy sector increased mainly due to the increased thermal power generation and improvement of the economic situation. The table below shows the CO_2 eq. of emissions in the energy sector.

[34] GEOSTAT – Real Growth of GDP.

Table 13 - Greenhouse Gas Emissions from the Energy Sector (Gg, CO_2 eq.)

Source-Category	1990	1994	2000	2005	2010	2011	2012	2013	2014	2015
1A Fuel Combustion	**30,611**	**10,032**	**4,508**	**4,123**	**6,035**	**7,586**	**8,086**	**7,436**	**8,176**	**8,842**
1A1 Energy Industries	13,767	4,088	1,447	1,200	560	1,274	1,379	1,000	1,534	1,622
1A2 Manufacturing Industries and Construction	7,565	2,153	688	303	910	1,652	2,031	1,477	1,026	1,064
1A3 Transport	3,823	1,419	945	1,537	2,601	2,583	2,690	3,380	3,757	4,163
1A4 Other sectors (commercial/Institutional, residential, agriculture/ forestry/ fishing)	5,456	2,373	1,427	1,084	1,964	2,076	1,986	1,579	1,859	1,993
1B Fugitive Emissions from Fuels	**6,087**	**1,527**	**1,102**	**1,273**	**1,686**	**2,173**	**2,357**	**1,600**	**1,488**	**2,032**
1B1. Solid fuels	739	82	3	2	119	157	188	180	133	137
1B2. Oil and natural gas	5,348	1,445	1,099	1,271	1,567	2,016	2,169	1,420	1,355	1,895
Total from Energy Sector	**36,698**	**11,559**	**5,610**	**5,396**	**7,721**	**9,759**	**10,443**	**9,036**	**9,664**	**10,874**

As it can be seen from the table, a large share of emissions from the energy sector is due to fuel combustion (81% in 2015) and the remaining 19% is caused by fugitive emissions. Among emission source-categories, the highest growth relative to 2000 was in fugitive emissions from the transformation of solid fuel (3 Gg in 2000, 137 Gg in 2015), which is due to the intensification of coal mining works in recent years. During 2000-2015, GHGs emissions from the industry and transport sectors increased about 1.6 and 4.4 times respectively. In the transport sector, GHG emissions increased due to the growing auto-park and a majority share of second-hand cars in the park. In Georgia, the number of motor vehicles in 2002-2016 period increased from 319,600 to 1,126,470[35]. From 2006, the development of energy transit pipelines (South Caucasus Gas Pipeline, Baku-Tbilisi-Erzurum oil Pipeline) through Georgia required additional gas and diesel for the pipeline operation.

In 2015, the following source categories had the largest shares, in total GHG emission from the Energy Sector: Transport – 38%, Other Sectors – 18%, Oil and Natural Gas – 17%, Energy Industries – 15%, Manufacturing Industries and Construction – 10%. CO_2 emissions in 2014-2015 were calculated using Reference and Sectoral approaches for different types of fuel.

The 1990, 1994, 2000, 2005, 2010-2015 inventory provides emissions from the International Aviation Bunkers. Data on jet kerosene consumption was provided by IEA (1990, 1994, 2000, 2005), the Ministry of Energy of Georgia (2010-2012) and GEOSTAT (2013-2015). Data on international marine bunker fuel (diesel and fuel oil) consumption is available for only 1994 year. CO_2, CH_4 and N_2O emissions from the source category are 167 Gg, 0.015 Gg, and 0.004 Gg respectively.

2.8 Industrial Processes and Product Use (IPPU)

The GHG Emissions from IPPU sector cover emissions from the following categories: Mineral Products (2A), Chemical Industry (2B), Metal Production (2C), Non-Energy Products from Fuels and Solvent Use (2D), Product Uses as Substitutes for ODS (2F) Other Product Manufacture and Use (2G) Other Industries such as paper, drinks and food production (2H).

Table 14 - Emissions from the Industrial Processes in Georgia in 1990-2015

Years	1990	1991	1992	1993	1994	1995	1996	1997	1998
Total CO_2 eq. Emissions from Mineral Productions (Gg)	572	357	211	110	45	32	48	42	84

[35] Ministry of Internal Affairs, 2016

Total CO_2 eq. Emissions from Chemical Productions (Gg)	672	646	440	391	252	321	406	356	307
Total CO_2 eq. emissions from Metal Industry Emissions (Gg)	2635	2035	1053	276	116	94	81	106	111
Total CO_2 eq. emissions from Non-Energy Products from Fuel and Solvent Use (Gg)	0	0	0	0	0	0	0	0	0
total CO_2 eq. emissions from Product Uses as Substitutes for ODS (Gg)	NO	NO	NO	NO	NO	NO	NO	NO	NO
Total CO_2 eq. emissions from Other Product Manufacture and Use (Gg)	0	0	0	0	0	0	0	0	0
Total emissions CO_2eq. (Gg)	**3879**	**3038**	**1705**	**776**	**414**	**447**	**535**	**504**	**502**
Years	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**
Total CO_2 eq. emissions from Mineral Productions (Gg)	138	143	146	161	161	188	226	332	521
Total CO_2 eq. emissions from Chemical Productions (Gg)	510	536	221	369	424	466	522	582	577
Total CO_2 eq. emissions from Metal Industry Emissions (Gg)	62	46	71	61	111	187	200	214	207
Total CO_2 eq. emissions from Non-Energy Products from Fuel and Solvent Use (Gg)	0	0	0	0	0	0	0	0	0
total CO_2 eq. emissions from Product Uses as Substitutes for ODS (Gg)	NO	NO	0	1	3	5	9	9	9
Total CO_2 eq. emissions from Other Product Manufacture and Use (Gg)	0	0	0	0	0	0	0	0	0
Total emissions CO_2eq. (Gg)	**710**	**725**	**438**	**591**	**699**	**846**	**957**	**1136**	**1314**
Years	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	
Total CO_2 eq. emissions from Mineral Productions (Gg)	585	328	413	625	625	639	752	759	
Total CO_2 eq. emissions from Chemical Productions (Gg)	548	533	614	666	681	675	670	710	
Total CO_2 eq. emissions from Metal Industry Emissions (Gg)	235	224	362	438	473	465	482	438	
Total CO_2 eq. emissions from Non-Energy Products from Fuel and Solvent Use (Gg)	0	0	0	0	0	9	10	11	
Total CO_2 eq. emissions from Other Product Manufacture and Use (Gg)	0	0	0	0	0	0	0	0	
total CO_2 eq. emissions from Product Uses as Substitutes for ODS (Gg)	14	21	54	64	93	105	121	140	
Total emissions CO_2eq. (Gg)	**1383**	**1106**	**1443**	**1794**	**1872**	**1892**	**2035**	**2058**	

Only non-energy industrial activities related emissions are considered in this sector. Furthermore, the chapter includes information on emissions of indirect GHGs such as non-methane volatile organic compounds (NMVOCs), carbon monoxide, nitrogen oxides.

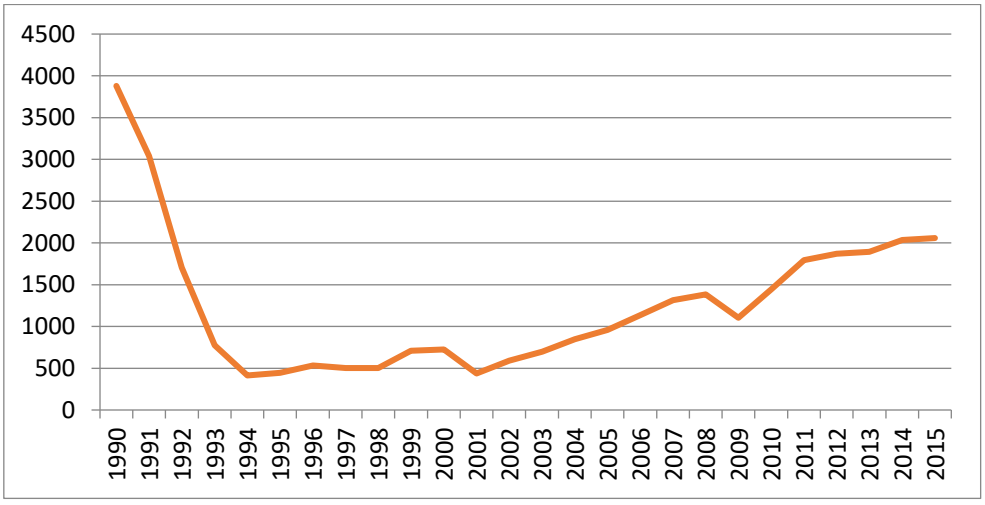

Figure 4 - IPPU sector emissions CO_2eq. (Gg) 1990-2015

The emissions have significantly declined after 1990 for next four years from the IPPU Sector. In 1994 the emissions dropped by 89 % comparing to the 1990 level and reached its lowest level for the whole time series period 414 Gg of CO_2 eq. Another drop of emissions was recorded for the years of 2000-2001. The emissions for a year period were declined by 60 % and reached 439 Gg of CO_2 eq. (only 6 % higher than the lowest level recorded in 1994). The emissions have increased between 2001 and 2007 by approximately 17 % for per year. The emissions have also declined from 2008 to 2009 due to the economic crisis in Georgia caused by the war. The emissions increased between 2009 and 2015 by approximately 11 % for per year. The largest upturn was recorded in 2009-2011 from 1106 Gg to 1794 Gg of CO_2 eq. Afterwards, the emissions steadily increased by 10 %. At the end of the period the emissions have reached 2058 Gg of CO_2 eq. 53 % of the value calculated for the year of 1990.

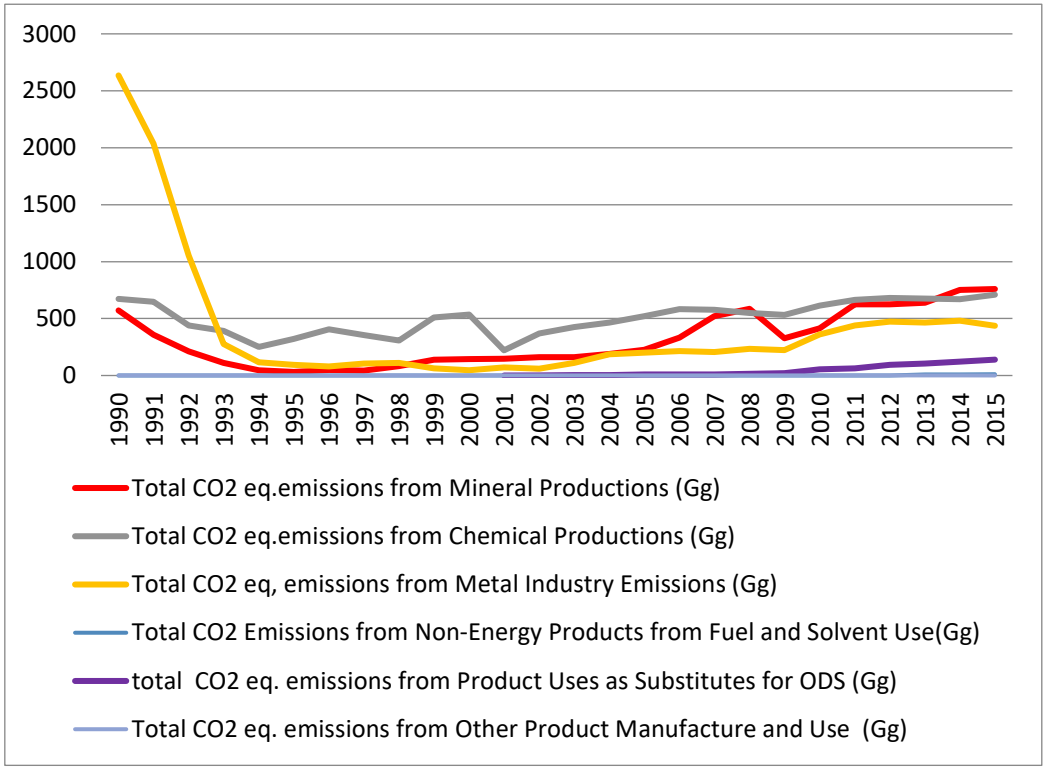

Figure 5 - IPPU sub-sector emissions CO_2 eq. (Gg) 1990-2015

As it can be seen from the figure, a large share of emissions in the IPPU sector was from the Metal Industry in 1990 approx. 68% of total sectoral emissions. In 2015 the same value reached only 21% with the third place within the sub-sectors after the Mineral and Chemical industries. Contrary to the Metal industry the emissions from the Mineral and Chemical industries have been increased comparing to the level of 1990. The emissions from the Mineral Industry were 25% higher than in 1990. The same value for the Chemical Industry reached 5% difference.

Furthermore, there are three other categories *Non-Energy Products from Fuel and Solvent Use*, *Product Uses as Substitutes for ODS*, and *Other Product Manufacture and Use* characterized by the minor emissions. In 2015 the emissions from the Product Uses as Substitutes for ODS category reached the 7% of the total sectoral emissions. The other two contribute with the less than one per cent share.

2.9 Agriculture

The agriculture sector of Georgia as source of GHG emissions comprises four subcategories: Enteric fermentation; Manure management; Agricultural Soils; and Field Burning of Agricultural Residues. The other IPCC subcategories of rice cultivation, prescribed burning of savannas, and "other" are not specific for Georgia and therefore are not considered. Manure management refers to all emissions from Animal waste management systems (AWMS), in particular from anaerobic lagoons, liquid systems, solid storage, and dry lot, "used for fuel" and "other systems". Emissions from daily spread and animal waste dropped on the soil during grazing on grasslands ("pasture range and paddock") are reported under subcategory "agricultural soils".

The GHG emissions from the agricultural sector are summarized in the tables below. It clearly shows that methane (CH_4) emissions from enteric fermentation are the largest source of methane within this sector while the largest source of nitrous oxide (N_2O) is "Agriculture soils".

Table 15 - Methane Emissions from Agriculture Sector in Gg (thousand tons)

Source	1990	1994	2000	2005	2010	2011	2012	2013	2014	2015
Enteric fermentation	77.11	51.83	62.93	64.66	56.42	56.36	59.76	63.62	68.09	70.11
Manure management	9.02	5.20	6.25	6.38	4.44	4.42	5.03	5.24	5.47	5.62
CH_4 total in Gg	**86.1**	**57.0**	**69.2**	**71.0**	**60.9**	**60.8**	**64.8**	**68.9**	**73.6**	**75.7**

Table 16 - Nitrous Oxide Emissions from Agriculture Sector in Gg

Source	1990	1994	2000	2005	2010	2011	2012	2013	2014	2015
Manure management	1.21	0.80	0.98	1.00	0.86	0.86	0.91	0.97	1.03	1.07
Agricultural soils	5.62	3.28	4.08	4.29	3.77	3.57	3.92	4.65	4.31	4.36
Direct soil emissions	3.53	2.07	2.56	2.70	2.35	2.24	2.45	2.90	2.70	2.73
Synthetic fertilizers	*1.19*	*0.61*	*0.93*	*0.91*	*0.99*	*0.85*	*0.97*	*1.27*	*1.00*	*0.98*
Organic N fertilizers applied to soils	*0.46*	*0.29*	*0.34*	*0.35*	*0.30*	*0.30*	*0.32*	*0.34*	*0.36*	*0.37*
Crop residue decomposition	*0.20*	*0.13*	*0.13*	*0.21*	*0.07*	*0.10*	*0.09*	*0.13*	*0.114*	*0.12*
Pasture range and paddock	*1.68*	*1.04*	*1.15*	*1.23*	*1.00*	*0.99*	*1.07*	*1.16*	*1.23*	*1.26*
Indirect soil emissions	2.08	1.21	1.52	1.59	1.41	1.33	1.47	1.75	1.61	1.62
Atmospheric deposition	*0.34*	*0.20*	*0.24*	*0.25*	*0.23*	*0.21*	*0.24*	*0.27*	*0.26*	*0.26*
Nitrogen leaching & run off	*1.74*	*1.01*	*1.28*	*1.34*	*1.19*	*1.12*	*1.23*	*1.48*	*1.35*	*1.36*
N_2O total in Gg	**6.83**	**4.08**	**5.06**	**5.29**	**4.62**	**4.43**	**4.83**	**5.61**	**5.34**	**5.42**

2.10 Land Use, Land-Use Change and Forestry (LULUCF)

The greenhouse gas inventory for the LULUCF sector covers the following source/sink categories: 1) Forest land (5A); 2) Cropland (5B); 3) Grassland (5C); 4) Wetlands (5D); 5) Settlements (5E) and 6) Other land (5F). Emissions and removals have been estimated for three source/sink categories: forestland, cropland and grassland. Compared to other categories these are the key source-categories in Georgia and also the necessary data are available for carrying out the calculations, that allows obtaining the annual parameters for greenhouse gases emissions and removals to determine the trend of annual changes.

The calculations of emissions and removals in the LULUCF sector have been carried out by using default values of Emission Factors (Tier I approach), which according to the methodological explanations of IPCC guidelines correspond to the climatic conditions of Georgia. In the table below carbon dioxide, emissions and removals for each source/sink category are given and also the total values for the years 1990, 1994, 2000, 2005 and 2010-2015 years.

Table 17 - Carbon Stock Changes and Net CO_2 Emissions and Removals in the LULUCF Sector

Year	Forest lands		Croplands				Grasslands		Net emission/absorption	
			Perennial crops		Arable lands and hay lands					
	Thousand tC	Gg CO_2	Thousand tC	Gg CO_2	Thousand tC	Gg CO_2	Thousand tC	Gg CO_2	Thousand tC	Gg CO_2
1990	**1761.42**	**-6458.52**	**735.0**	**-2695.0**	**155.5**	**-570.4**	**-763.8**	**2800.5**	**1888.12**	**-6923.09**
1994	**1738.46**	**-6374.37**	**659.3**	**-2417.6**	**211.3**	**-774.7**	**-767.2**	**2813.0**	**1841.86**	**-6753.50**
2000	**1683.80**	**-6173.94**	**432.5**	**-1586.0**	**130.9**	**-480.3**	**-766.5**	**2810.8**	**1480.70**	**-5429.24**
2005	**1608.02**	**-5896.07**	**317.1**	**-1162.7**	**174.5**	**-639.7**	**-766.5**	**2810.8**	**1333.12**	**-4888.10**
2010	**1579.11**	**-5790.08**	**252.0**	**-924.4**	**326.7**	**-1198**	**-766.5**	**2810.8**	**1391.31**	**-5101.48**
2011	**1657.78**	**-6078.52**	**178.5**	**-654.5**	**323.6**	**-1186.7**	**-766.5**	**2810.8**	**1393.38**	**-5109.06**
2012	**1590.24**	**-5830.89**	**262.5**	**-962.5**	**325.2**	**-1192.2**	**-766.5**	**2810.8**	**1411.44**	**-5175.29**
2013	**1574.78**	**-5774.20**	**273.0**	**-1001.0**	**297.7**	**-1091.4**	**-766.5**	**2810.8**	**1378.98**	**-5056.26**
2014	**1539.91**	**-5646.32**	**189.0**	**-693.3**	**294.5**	**-1079.8**	**-766.5**	**2810.8**	**1256.91**	**-4608.66**
2015	**1533.03**	**-5621.10**	**231.0**	**-847.0**	**298.9**	**-1095.9**	**-766.5**	**2810.8**	**1296.43**	**-4753.57**

CO_2 emissions and removals from Living Biomass in Commercial Forest Lands are given in the Table below.

Table 18 - Carbon Stock Changes and CO_2 net Emissions from Living Biomass in Commercial Forest Lands in Georgia

Year	commercial forest land, ha	Carbon gains, thousand tons C	Carbon losses thousand tons C	Net carbon stock change, thousand t of C	Carbon dioxide net emissions/removals, Gg CO_2
1990	2156748	1941.09	-179.68	1761.42	-6458.52
1994	2155748	1940.22	-201.75	1738.46	-6374.37
2000	2150017	1892.09	-208.29	1683.80	-6173.94
2005	2148860	1891.02	-283.00	1608.02	-5896.07
2010	2147548	1889.81	-310.70	1579.11	-5790.08
2011	2143529	1886.95	-229.17	1657.78	-6078.52
2012	2115904	1837.51	-247.26	1590.24	-5830.89
2013	2115818	1837.43	-262.65	1574.78	-5774.20
2014	2108586	1829.36	-289.46	1539.91	-5646.32
2015	2107978	1828.82	-295.79	1533.03	-5621.10

Emissions of other GHGs as a result of forest fires are given in the table below.

Table 19 - Greenhouse Gas Emissions as a Result of Forest Fires in Commercial Forest land of Georgia

Year	Greenhouse gas emission 10^{-3} Gg			
	CH_4	CO	N_2O	NO_X
1990	3.45	49.84	0.04	0.27
1994	1.01	14.56	0.01	0.08
2000	17.21	248.63	0.21	1.34
2005	5.27	76.05	0.06	0.41
2010	60.12	868.37	0.73	4.68
2011	1.42	20.48	0.02	0.11
2012	55.05	795.19	0.67	4.28
2013	12.81	185.01	0.16	1.00
2014	85.12	1229.45	1.04	6.62
2015	28.30	408.80	0.35	2.20

2.11 Waste

The GHG inventory from waste sector covers emissions from the following categories only: Solid Waste Disposal, Domestic and Industrial Waste Water Handling.

The treatment of waste has become a serious environmental concern and continues to be an important environmental challenge for Georgia. There is no monitoring system of waste management practices in Georgia so that information on waste generation, composition and disposal is not readily available. Therefore, data on amounts of wastes generated annually, waste types, disposal and utilization are practically absent. Very limited data are scattered among different agencies. These data are not digitized and accessible to different users. Comprehensive waste inventories have not been conducted yet.

The centralized sewage system exists in 45 towns in Georgia. About 80% of the population is connected to sewerage, indicating high network penetration by international standards. The systems are, however, in poor condition. The plants are typically 25-40 years old; some are yet unfinished, and most are not maintained. Most of the wastewater treatment plants cannot provide sewage treatment with high efficiency. Actually, none of the existing plants is actually providing biological treatment since the technical facilities are out of order.

The estimated GHG emissions from the waste sector are given in table below.

Table 20 - GHG emissions from Waste Sector in Thousand Tons

Gas/Source	**1990**	**1994**	**2000**	**2005**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**
CH_4 / Solid Waste Disposal Sides	558	663	764	824	881	891	893	894	895	894
CH_4 / Domestic Waste Water Handling	226	219	190	182	183	183	181	181	182	183
CH_4 / Industrial Waste Water Handling	139	39	115	133	178	193	193	195	194	206
N_2O / Domestic Waste Water Handling	57	54	53	54	55	55	55	56	57	58
CO_2eq emissions from Waste sector	980	975	1122	1193	1297	1322	1322	1326	1328	1341

2.12 Uncertainty Assessment

Uncertainty estimates are an essential element of a complete inventory of greenhouse gas emissions and removals. The uncertainty analysis of Georgia's fifth national GHG inventory is based on the Tier 1 approach and covers all source-categories and all direct greenhouse gases. The year of 2015 was taken for the uncertainty assessment as the last year, and 1990 as the base year. The uncertainty estimation for the activity data and emission factors was based on typical values of the IPCC and on experts' judgment. A detailed description and calculations of Uncertainties are given in the Tables 6-1, and 6-2. In Annex. The results revealed that the level of emissions' uncertainty (percentage uncertainty in total inventory) is within 30.85%, and the uncertainty trend – 13.26%. The highest uncertainty assessments have fugitive emissions from solid fuel, oil and gas extraction and indirect emissions from agriculture, as well as nitrous oxide emissions from manure management. Uncertainty is also relatively high in case of nitrous oxide emissions from Commercial/institutional services, residential, agriculture, fishing and forestry.

2.13 Quality Assurance and Quality Control

To ensure a high quality of GHG inventories, the team preparing the Georgian NIR guaranteed the transparency, completeness, consistency, comparability and accuracy of the information used by establishing a separate system for Quality Assurance and Quality Control (QA/QC).

The QC is carried out through a system of routine technical activities that monitor and maintain the quality of the inventory, while it is being prepared. The QC activities are carried out by the team of experts involved during the preparation of the NIR and also by the project coordinator during the compilation and preparation of the NIR of Georgia.

The QA is a system of planned review procedures implemented by staff members who are not directly involved in preparing the NIR. Independent third parties are responsible for reviewing the sectorial and national inventories.

To fulfill QA procedure/activities of the inventory preparation process in October 3, 2018 a service agreement between UNDP Georgia and Ilia State University was signed.

The main goal of this assignment was to further fostering institutional and technical capacity building process specifically for conducting verified GHG inventories in future by assisting the local institutions, both financially and technically, to provide QA procedures for the NIR. The objective of this agreement was to implement quality assurance (QA) procedures for the National GHG Inventory being prepared by the EIEC.

Following a voluntary request by the Ministry of Environmental Protection and Agriculture (MEPA) of Georgia, desk review of NIR was conducted in January 2019, in the context of the Information Matters project, managed by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). The review was conducted by an expert group composed out of 3 experts from Ricardo Energy & Environment, one expert from GIZ and one expert from FAO in accordance with the "UNFCCC guidelines for the technical review of greenhouse gas inventories from Parties included in Annex I to the Convention." The review team conducted its review based on sectoral reports for the energy, IPPU, waste, agriculture and LULUCF sectors provided by Georgia. This project has been providing support to Georgia to strengthen its in-country capacities for enhanced reporting under the United Nations Framework Convention on Climate Change (UNFCCC) since July 2016.

More specific information on QA procedures related to individual categories is provided in the QA/QC chapter of the NIR.

2.14 Recalculation of GHG Emissions and Possible Improvements for Future Inventories

During the preparation of inventory GHG emissions and removals were calculated using 2006 IPCC guidelines for 2014 and 2015 and recalculated results for the following years 1990, 1994, 2000, 2005, 2010, 2011, 2012, 2013. For other years, GHG emissions and removals were interpolated using Compound Annual Growth Rate. Exception is the IPPU sector where GHG emissions were recalculated for all previous years. Main sources of difference in recalculated results are updated activity data, net calorific values, Emission Factors. For the next inventory GHG emission and removal estimates will be recalculated for all remaining years 1991-1993, 1995-1999, 2001-2004, 2006-2009 in each sector.

Table 21 - GHG Emissions and Removals by Sectors for 1990-2015 Period (2006 IPCC Methodology)

Sector	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Energy	36,698	27,476	20,580	15,421	11,560	10,210	9,030	7,998	7,094	6,302	5,609	5,564	5,520
IPPU	3,879	3,038	1,705	776	414	447	535	504	502	710	725	439	591
Agriculture	3,925	3,492	3,108	2,766	2,463	2,548	2,636	2,727	2,822	2,920	3,021	3,043	3,065
Waste	1,105	1,073	1,041	1,011	978	1,003	1,026	1,050	1,074	1,099	1,124	1,138	1,153
LULUCF (Net removals)	(6,850)	(6,828)	(6,799)	(6,765)	(6,726)	(6,493)	(6,252)	(5,997)	(5,720)	(5,407)	(5,033)	(5,014)	(4,976)
Total (excluding LULUCF)	**45,607**	**35,079**	**26,434**	**19,974**	**15,415**	**14,208**	**13,227**	**12,279**	**11,492**	**11,031**	**10,479**	**10,184**	**10,329**
Total (including LULUCF)	**38,757**	**28,251**	**19,635**	**13,210**	**8,688**	**7,715**	**6,975**	**6,282**	**5,771**	**5,624**	**5,446**	**5,170**	**5,353**

Sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Energy	5,477	5,436	5,396	5,796	6,226	6,689	7,187	7,722	9,758	10,443	9,034	9,665	10,872
IPPU	699	846	957	1,136	1,314	1,383	1,106	1,443	1,794	1,872	1,892	2,035	2,058
Agriculture	3,087	3,109	3,132	3,042	2,956	2,872	2,790	2,712	2,649	2,859	3,186	3,201	3,271
Waste	1,167	1,182	1,199	1,223	1,249	1,275	1,303	1,330	1,362	1,375	1,375	1,377	1,388
LULUCF (Net removals)	(4,923)	(4,857)	(4,782)	(4,742)	(4,651)	(4,477)	(4,166)	(3,633)	(5,069)	(3,836)	(4,836)	(2,525)	(4,076)
Total (excluding LULUCF)	**10,431**	**10,574**	**10,684**	**11,198**	**11,745**	**12,219**	**12,385**	**13,208**	**15,563**	**16,549**	**15,487**	**16,278**	**17,589**
Total (including LULUCF)	**5,508**	**5,717**	**5,903**	**6,456**	**7,094**	**7,742**	**8,218**	**9,574**	**10,494**	**12,713**	**10,651**	**13,753**	**13,513**

Table 22 - GHG Emissions and Removals by Sectors for 1990-2015 Period (1996 IPCC and GPG)

Sector	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
Energy	36,587	28,815	19,395	11,246	7,445	4,790	7,585	9,018	5,057	5,183	5,925	5,466	5,006
Industrial processes	5,383	4,084	2,245	1,068	543	520	703	810	744	1,070	1,096	748	1,058
Agriculture	3,985	3,525	3,242	2,703	2,386	2,461	2,954	3,124	2,790	2,991	2,802	3,025	3,214
Waste	1,232	1,011	1,020	1,024	1,020	1,028	1,030	1,033	1,034	1,043	1,041	1,045	1,049
LULUCF (Net removals)			(7,091)	(6,564)	(6,637)	(882)	(1,392)	(4,930)	(4,592)	(6,415)	(6,088)	(6,156)	(5,523)
Total (excluding LULUCF)	47,187	37,436	25,902	16,040	11,394	8,799	12,272	13,985	9,625	10,287	10,864	10,284	10,326
Total (including LULUCF)	47,187	37,435	18,811	9,477	4,757	7,917	10,880	9,055	5,033	3,872	4,776	4,128	4,804

Sector	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
Energy	5,449	6,144	5,786	8,301	8,378	7,849	7,216	7,458	9,413	10,083	9,386
Industrial processes	1,220	1,452	1,810	2,138	2,890	2,822	2,749	1,853	3,013	3,379	3,296
Agriculture	3,331	3,120	3,460	3,115	2,651	2,552	2,604	2,403	2,353	2,502	2,732
Waste	1,051	1,052	1,054	1,073	1,083	1,086	1,097	1,226	1,243	1,260	1,265
LULUCF (Net removals)	(6,361)	32,893	(4,893)	(5,173)	(4,098)	(4,190)	(4,441)	(3,869)	(4,208)	(4,073)	(4,124)
Total (excluding LULUCF)	11,051	11,767	12,110	14,628	15,002	14,309	13,667	**12,939**	**16,022**	**17,224**	**16,679**
Total (including LULUCF)	4,690	44,661	7,217	9,454	10,904	10,119	9,225	**9,070**	**11,814**	**13,151**	**12,555**

Chapter 3 Climate Change Mitigation Policy and Measures

3.1 State Policy and Programs Towards Climate Change

In 2010, Georgia joined the Copenhagen accord and declared that "Georgia will take steps to achieve measurable, reportable and verifiable deviation from the baseline scenario supported and enabled by finance, technology and capacity building." On September 25, 2015, Georgia submitted a document "Intended Nationally Determined Contributions" (INDC) to the secretariat of UNFCCC[36]. After the ratification of Paris Agreement (June 7, 2017), Georgia announced that it would submit an updated, nationally determined contribution (NDC) document by 2020. For this purpose, Ministry of Environmental Protection and Agriculture of Georgia with the technical assistance of GIZ develops "Climate Action Plan 2021-2030" for 2020.

On July 1, 2017, Georgia became a full member of the European Energy Community[37]; this requires approximation the country's national legislation with the EU energy acquis, within the strictly defined timeframe. In terms of climate change mitigation, the commitments taken to promote energy efficiency and renewable sources of energy are important. The Ministry of Economy and Sustainable Development of Georgia, in partnership with other stakeholders, is preparing laws and national action plans on energy

[36] https://www4.unfccc.int/sites/submissions/INDC/Submission%20Pages/submissions.aspx
[37] Energy Community. www.energy-community.org

efficiency and renewable energy that will be submitted to the Government and Parliament for discussion and further authorization. A legislative initiative on the energy performance of buildings is under preparation, and it will support the development of nearly zero energy buildings in the country.

In 2016, the EU-Georgia Association Agreement has entered into force, which emphasizes the necessity of collaboration in the following areas: climate change mitigation, adaptation to climate change, emissions trading, integration of climate change in industrial policy and clean technology development. The Agreement underlines the inevitability of cooperation in the process of transferring the technologies based on the Low Emission Development Strategies (LEDS), Nationally Appropriate Mitigation Action (NAMA) and Technology Needs Assessment (TNA).

Working on the Low Emission Development Strategy (LEDS) for Georgia started in 2013 and the draft version of the document submitted to the Ministry in 2017. The mission of the strategy is: (a) to ensure integrated complex approach for long-term sustainable development; (b) to take into account the national development goals and circumstances; (c) to facilitate transformational development; (d) to help the country to accomplish international obligations undertaken regarding climate change and (e) to help the country to obtain funding from state and private sources. The draft strategy is not officially approved.

Georgia is engaged in NAMA projects preparation and implementing process. Within the framework of this initiative, NAMA on Adaptive Sustainable Forest Management in Borjomi-Bakuriani Forest District was carried out already; one project is under implementation - Efficient use of biomass for equitable, climate proof and sustainable rural development and Low Carbon Buildings in Georgia[38]. The project is implementing on a low scale due to the lack of financial support.

Besides strategies at a national level, local strategic documents are as well important, for instance, Sustainable Energy Action Plan (SEAP) elaborated by municipalities within the framework of Covenant of Mayors – the initiative of European Union. Covenant of Mayors was joined by 23 towns/municipalities of Georgia, and they undertook the voluntary commitment to reduce greenhouse gas emissions in a range 20%-30% by 2020 and by 2030. Ten towns and one municipality have already submitted SEAPs, which suggests emissions reduction mainly from transport, public and domestic sectors[39].

There are various supporting programs and projects contributing climate change mitigation in Georgia:

To promote renewable energy sources in Georgia Deloitte Consulting Overseas, with financial support of USAID, implemented 3-year (2010-2012) Hydropower Investment Promotion Project (HIPP) and 2-year (2013-2014) Hydro Power and Energy Planning project (HPEP). The key objectives of the projects were to assist the Government of Georgia in improving the energy security of the country; support private sector to develop small and medium hydro power plants; to promote cross-border and competitive trade with clean electricity. In 2018, USAID's four-year energy program commenced which will promote energy market and institutional development in the country, and attracts investments, integrating energy renewable sources into the network.

To define a Priority Investment Programme for the public buildings in Georgia, which is to be financed through NEFCO loans and co-financed though E5P Grant facility feasibility study of energy efficiency improvements in public buildings and use of renewable energy was conducted during 2016-2017. During the study 25 public buildings were identified. The main objective of the project is to reduce consumption of fossil fuels (coal, gas and oil) used for cooling and heating, electricity and thereby indirectly contributes reduction of fossil fuels and GHG emissions.

[38] NAMA Registry - http://www4.unfccc.int/sites/nama/SitePages/Country.aspx?CountryId=66
[39] Covenant of Mayors - www.covenantofmayors.eu

Tbilisi municipality prepared sustainable urban transport strategy 2015-2030. The strategy covers the following main areas: (i) Urban master plan, (ii) Quality of life, competitiveness, economic growth and tourism attractiveness, (iii) Urban morphology, urban regeneration, mixed land use and local identity, (iv) Topography, natural and artificial barriers, (v) Universal accessibility, social and gender equity, (vi) Innovative financing mechanisms and increased private sector participation, (vii) Transit oriented development, increased density and mixed land-use along mass transit corridors and stations.

Georgia's National Road Safety Strategy with its action plan was adopted in 2017. The strategy includes the following measures: introducing lower speed limits on motorways, expecting to decrease in injury crashes and save fuel consumption; developing and improving of National Video Surveillance System and "Contactless Patrol" system; arrangement of average speed control sections on the roads; establishing a regional training center for raising professional competence; installing street lights within the East-West Highway Improvement projects. For effective implementation of the strategy and its action plan development of secondary legislation and regulations will be prepared in near future.

In order to contribute to the successful implementation of the forest reform in Georgia project - Sustainable Forest Governance in Georgia has been implementing since 2012. The main objectives of the project are: (1) Developing National Forest Policy implementation tools and mainstreaming forestry priorities in relevant sectors' policy documents; (2) Modernization of Forest Management Practices, based on the best international experiences; (3) Supporting forest management decentralization.

Ltd. United Water Supply Company of Georgia implements international projects supporting the emission reductions from the wastewater sector. In 2011, the investment project supported by ADB covered the water supply and treatment matters. At the end of the project the cities of Poti, Anaklia, Mestia, Zugdidi, Ureki, Gudauri, Marneuli will be equipped with water treatment facility. The EIB will support Kutaisi city to build the water treatment facility.

3.2 International Market Mechanisms

Georgia as a Non-Annex I country to the UNFCCC, is eligible to participate in only one of the three mechanisms defined by the Kyoto Protocol, such as the Clean Development Mechanism (CDM). The CDM was determined by Article 12 of the Kyoto Protocol, within the framework of the Convention; according to which: "The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3."

In Georgia, 7 CDM projects are registered and the forecasted reduction rate is 1.84 mln.t of CO_2 eq. annually[40].

[40] Clean Development Mechanism

Table 23 - CDM Projects, Registered in Georgia

Registration date	Project title	Reduction ($tCO_2eq./year$)	CERs issued
April 6, 2007	Landfill Gas Capture and Power Generation Project in Tbilisi	72,700	Approved
Sept 21, 2009	Leak Reduction in Above Ground Gas Distribution Equipment in the KazTransgaz-Tbilisi Gas Distribution System- Tbilisi, Georgia	339,197	3,391,972 CER (2008-2018)
Oct 10, 2012	Leak Reduction in Above Ground Gas Distribution Equipment in 'Socar Georgia Gas' gas distribution system, Georgia	173,651	1,070,816 CER (2012-2018)
Oct 17, 2012	Georgia: Refurbishment of Enguri Hydro Power Plant	581,715	285,376 CER (2013-2014)
Nov 1, 2012	Adjaristskali HPP project	391,956	Approved
Dec 21, 2012	Gudauri HPP project	22,891	Approved
May 17, 2013	Dariali HPP project	259,229	1,036,916 CER (2015-2018)

3.3 Implemented, Ongoing and Planned Mitigation Measures

Table 24 - Implemented, Ongoing and Planned Mitigation Measures in Georgia

N	Description of the Mitigation Action					Information on Methodologies and Assumptions	Measures Envisaged to Achieve that Mitigation Action	Information on the Progress of Implementation		
	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
Energy sector										
1	Energy sector, CO_2, CH_4, N_2O	**Hydro Power development in Georgia.** The Action aims to increase share of clean energy in electricity generation mix and utilize domestic renewable energy sources.	Technology development	There is no official target of HPP development pace; however, the former Ministry of Energy has signed MoUs with more than 100 potential HPP projects. Some projects are on a feasibility study stage and some are under construction. Each project has its specific deadline. Total capacity of all projects being available is more than 4 GW.	•Generation of electricity by newly constructed HPPs (MWh) •Relevant GHG emission reduction (t CO_2 eq.)	**Methodology**: Emission reduction (t CO_2 eq.) = Generated El. By HPP (MWh)xGrid emission factor (t CO_2 eq./MWh) Grid emission factors by years 0.088 t CO_2 eq./MWh (2017), 0.089 t CO_2 eq./MWh (2016), 0.118 t CO_2 eq./MWh (2015), 0.109 t CO_2 eq./MWh (2014), 0.095 t CO_2 eq./MWh (2013), 0.137 t CO_2 eq./MWh (2012), 0.118 t CO_2 eq./MWh (2011), 0.037 t CO_2 eq./MWh (2010). EF was calculated based on the share of TPP in total domestic generation for a specific year (ESCO).	NA	**Implemented (2010-2017).** 2010: 3 new small HPPs (4.11 MW) with average annual generation 8.67 GWH in 2010-2017; 2012: 4 new small HPPs (8.6 MW) with average annual generation 31 GWH; 2013: 5 new small HPPs (32.1 MW) with average annual generation 95.15 GWH; 2014: 6 new HPPs (126.02 MW) with average annual generation 477.65 GWH; 2015: 2 new HPPs (4.95 MW) with average annual generation 17.58 GWH; 2016: 6 new HPPs (162 MW), annual generation 410.5 GWH; 2017: 3new HPPs (186.6 MW), annual generation 8.7 GWH (Shuahevi HPP (178.7MW) was in a testing mode	NA	105 Gg CO_2 eq. annually

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	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
2	Energy sector, CO_2, CH_4, N_2O	**Programme: Energocredit** The Action aims to provide cheap credit lines for energy efficient and renewable energy installations.	Financial measure	Supporting sustainable energy projects development in Georgia. Through Energocredit, the EBRD provides USD 20 million to local financial institutions in Georgia, for on-lending to both local businesses and individuals implementing energy efficiency measures and renewable energy projects.	Energy savings, energy production from renewable and clean energy sources (MWh), GHG emission reductions (t CO_2 eq.).	Energocredit has provided data for CO_2 emissions savings from financed projects. Internal methodology was used by Energocredit team for each individual project.	NA	**Implemented (2010-2016)**. Energycredit financed 48 corporate projects (food, trade, cement, real estate - hotels, hospital, buildings development) and 31 500 residential projects.	USD 63.11 million disbursed by participating Financial Institutions to sub-borrowers	From 2016 annual GHG emission reduction is about – 168 Gg CO_2 eq.
3	Energy sector, CO_2, CH_4, N_2O	**Construction of combined cycle gas power plant.** The Action aims to reduce fuel expenditures for generation of electricity. Construction and decommissioning of new Gardabani CCGTP with efficiency 54% (vs. 31-33% efficiency of existing TPPs).	Technology development. Gardabani CCGT investment cost is 230 mln USD. Funding provided by Georgian Oil and Gas Corporation and Partnership Fund.	There is no target concerning pace of CCGT development, however, decommissioning of inefficient TPPs and their gradual replacement with efficient ones is part of proposed measures under NEEAP and LEDS strategy	Electricity generation by new CCGT (MWh)	Initial expectation was that the new PP will gradually replace inefficient one. However, in order to satisfy growing electricity demand (especially in winter months) inefficient old units have not been decommissioned yet. However, it should be noted that their generation significantly decreased after decommissioning of the new CCGT.	NA	**Implemented (2013-2015)**. In 2015 the plant has been decommissioned and was in a testing regime, after 2015 is started generation with the full capacity.	Gardabani CCGT generates the largest share of electricity, while the most inefficient units (Tbilsresi and G-Power) generate 3-4 times less than they used to generate before Gardabani CCGT. 2016: Mtkvari 816.8 GWh; Tbilsresi 166.2 GWh; G-Power 69.9 GWh, Gardabani 1166.2 GWh;	In 2016 CCGT saved 95.8 Gg CO_2 eq.

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									2017: Mtkvari 743 GWh, Tbilsresi 244.3 GWh, Gardabani 1171.1 GWh, G-Power 49.7 GWh.	
4	Energy sector, CO_2, CH_4, N_2O	**Renewable (Solar) energy introduction in the country.** The Action aims to support using clean energy and to reduce greenhouse emissions by installing Photovoltaic (PV) system that will be connected to the grid.	Technology development. Government of Japan provided 480 mln. Japanese yen (Approximately USD 4.8 mln).	Installed capacity of Solar photovoltaic systems - 352 KW (367 MWh). Annual GHG emission reduction 33 tons of CO_2 eq./y.	Electricity generation by solar PV (MWh), CO_2 emission reduction (t CO_2 eq.).	Methodology: Emission reduction (t CO_2 eq.) = Generated El. By RES (MWh)xGrid emission factor (t CO_2 eq./MWh). Grid emission factor - 0.088 t CO_2 eq./MWh was used for 2017. EF was calculated based on the share of TPP in total domestic generation for a specific year (ESCO).	NA	**Implemented (2015-2016).** Solar PV systems were installed at Tbilisi International Airport and Ilia State University in 2016 and started generation from July. The organizations are responsible for PV system maintenance and operation.	NA	In 2017, GHG emission reduction - 39 t CO_2 eq. (438 MWh) in the Tbilisi international airport, 2 t CO_2 eq. (17.5 MWh) in the Ilia State University.
5	Energy sector, CO_2, CH_4, N_2O	**Construction of the first Wind Power Plant (WPP) in Georgia** The Action aims to increase share of alternate energy	Technology development. Budget - 31 mln. USD (70% loan, 30% mobilized by the company parters LLC ''Qartli Wind Farm).	Installed capacity 20.7 MW. Projected annual generation 88 GWh	Electricity generation by WPP (MWh), CO_2 emission reduction (t CO_2 eq.).	Methodology: Emission reduction (t CO_2 eq.) = Generated El. By RES (MWh)xGrid emission factor (t CO_2 eq./MWh). Grid emission factor - 0.088 t CO_2 eq./MWh was used for 2017. EF was calculated based on the share of TPP in total domestic generation for a specific year.	NA	**Implemented (2016).** 20.7 MW installed capacity wind power plant was constructed in Kartli.	NA	Generation: 2016-9 GWh (792 t CO_2 eq.); 2017-87.8 GWh (7,726 t CO_2 eq.)

N	Description of the Mitigation Action					Information on Methodologies and Assumptions	Measures Envisaged to Achieve that Mitigation Action	Information on the Progress of Implementation		
	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
6	Energy sector, CO_2, CH_4, N_2O	**Promotion of Biomass Production and Utilization in Georgia.** The Action aims to promote sustainable production and utilization of upgraded biomass fuels in heating applications in the municipal services sector of Georgia.	Policy support/ technology development	The direct GHG reduction 47.8 Gg CO_2 over 20 years of investment lifetime, resulting from the replacement of fossil fuel heaters and boilers in municipal buildings in Tbilisi with upgraded biomass boilers (at least 10 boilers).	Number of pilot projects supported by the project, estimated GHG emissions reduction (t CO_2 eq.)	Estimation of indirect GHG reduction results from scaling up of the production of upgraded biomass fuels (woodchips, briquettes, pellets) and their utilization for heating by municipal entities in Tbilisi and potentially, in other parts of Georgia including Samegrelo region (bottom up approach). For top-down approach a GEF causality factor of 60% has been assumed. Top-down approach assesses indirect GHG impacts by estimating the combined market potential for the proposed approach or technology within 10 years after the project lifetime	NA	**Implemented (2013-2017).** The National Strategy of upgraded biomass and respective action plan has been developed and has already gone through pubic discussions with the key stakeholders. The document is now pending adoption in the government. Biomass Association of Georgia has been established, however, since the market is still undeveloped sustainability of the association is mainly ensured by in-kind contributions from founders and Governing Board members.	NA	Cumulative indirect GHG reduction benefits of the project is estimated in the range of 143 Gg CO_2 (for bottom up assessment) to 546 Gg CO_2 (for to-down assessment).
7	Energy sector, CO_2, CH_4, N_2O	**Support to Energy Efficiency and Sustainable Energy in Georgia.** The programme aims: 1) Formulation of New National Energy Efficiency Building Code; 2) Legislation on Labelling of energy related products and its delegated acts; 3) Methodology for monitoring and reporting, which is compliant with national and EU	Policy support/capacity building	Energy efficiency measures are demonstrated in min. 60.000 m2 public buildings.	Implemented measures to support implementation of Energy Efficiency Directive in Georgia	Information on methodology, assumptions and mitigation potential for the whole components of the project was not provided by the implementing organizations.	10 Energy Audits are in process.	**Under implementation (2015-2019).** Progress in component #2: Danish Ministry of Foreign affairs provided finance to demonstrate energy efficiency measures in minimum 60 000 m2 of buildings in selected municipalities; Training sessions have been conducted in Tbilisi and in Kutaisi; 92 buildings have been identified for energy audits; 4 energy audits have been carried out by trainings participants, 10 are in process; The programme is funded by DANIDA (Danish Government).	The second engagement supports the demonstration of energy efficient building design in practice through energy renovation of public buildings and associated awareness raising campaigns and	NE

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	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
		standards and 4) National grid code regulation and standards that enable electricity from renewable energy sources to feed into the national power grid.						Component 1 "Energy Efficiency and Sustainable Energy in Georgia is being implemented by Niras; Component 2 "Energy efficiency Demonstration Project" is being implemented by NEFCO	training of energy auditors.	
8	Energy sector, CO_2, CH_4, N_2O	**Finance and Technology Transfer Centre for Climate Change (FINTECC)**. The Action aims to support companies to implement advanced climate technologies that reduce greenhouse gas emissions and/or increase climate resilience by providing grants and technical assistance in the context of an EBRD investment.	Technology development/ financial support. About 90 mln. USD of investments and 1.8 mln. USD of grants were provided by EBRD.	loans are issued based on available funding and requested amounts. The programme is international and includes several countries. There are nonspecific targets for Georgia	Number of supported projects, energy savings and CO_2 emissions reduction (t CO_2 eq.)	FINTECC supports both existing businesses with replacement of inefficient appliances as well as establishment of a new business. While for existing businesses estimation of energy and CO_2 emissions saving is straightforward, for a new one this requires certain methodology. Estimation is based on internal methodology used by FINTECC team.	The programme will provide technologies for energy efficiency, renewable energy, water efficiency and materials efficiency.	**Under implementation (2016-2019).** 4 projects are at an early stage of development and 4 are completed. FINTECC offers up to 25 per cent grant cover for the cost of eligible climate technologies; offers technical assistance including feasibility studies and resource efficiency audits that help optimize project preparation and implementation. Although FINTECC works with a broad range of climate technologies, their incentive grants focus on those with low market penetration in participating countries.	NE	In total for 8 completed and ongoing projects estimated savings are 7,500 tons of CO_2 eq. emissions per year.

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	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
9	Energy sector, CO_2, CH_4, N_2O	**Energy Efficiency improvements in public buildings and use of renewable energy**. The Action aims to improve capacity of Municipal Development Fund in energy efficiency projects implementation.	Technology development/capacity building. The total investment for the project is EUR 5.14 million co-financed by NEFCO, E5P and the Ministry of Foreign Affairs of Denmark.	Renovate 27 public buildings in selected municipalities with total floor area of 70 000m2. Energy savings are targeted to be 5,529 MWh/y including suppressed demand (without it the savings would be 7385 MWh/y), 1.206 Gg of CO_2 annually.	Number of renovated buildings and floor area (m^2). Energy savings in MWh/year and CO_2 emission reductions (t CO_2 eq.).	Actual energy consumption of the selected buildings was calculated, however, during the study suppressed demand was identified. Baseline consumption (excluding suppressed demand) was calculated to have reference number for emission and energy saving calculations. It is assumed that suppressed demand share is 34%.	NA	**Under implementation (2018-2020).** The project is based on results of feasibility study described under Mitigation Action #3. NEFCO and the Ministry of Finance of Georgia have signed loan and E5P grant agreements aimed at financing energy efficiency measures as well as introducing renewables and alternative sources of energy supply in public buildings in Georgia. NEFCO acts as implementing agency. NIRAS will implement the demonstration project.	NE	The CO_2 reduction impact of the project is likely to be between 1.1-1.4 Gg CO_2 per year. The difference depends on whether the baseline is estimated from the current consumption or includes the potential future consumption due to the existence of the suppressed demand.
10	Energy sector, CO_2, CH_4, N_2O	**Efficient use of biomass for equitable, climate proof and sustainable rural development.** The objective of the NAMA is to foster climate resilient, low-carbon, sustainable rural development and poverty reduction in an inclusive way through building capacities and enhancing cooperation between stakeholders for promoting the use and up-scaling of Solar Water Heaters (SWH), Fuel Efficient Wood	Project/ technology development/ capacity building	Installation of SWH and FEWS and implement EEI measures in 11,500 households in 6 rural areas of Georgia.	Number of solar water heaters installed, number of replacements of inefficient stoves and number of insulated houses.	11,500 rural households and public buildings use on average about 9 m3 of firewood for heating, cooking and hot water, in total 103,500 m3 from which 57% is non-renewable. Wood average density is 685 kg/m3, calorific value 14.8 MJ/kg and GHG emission factor (0.112 $kgCO_2/MJ$) Baseline emissions are estimated as: 67,045 t CO_2 = 103,500 m3 X 0.57 X 685 kg/m3 X 14.8 MJ/kg X 0.112 $kgCO_2/MJ$. Replacement of existing wood stoves (average efficiency about 35%) with efficient wood stoves (at least 70% efficiency) will reduce firewood consumption and GHG emissions by 26,073 tones. Installation of solar	Energy Cooperatives are under implementation.	**Planned.** The project was submitted for funding to NAMA facility in 2018, however it was again rejected. On a small-scale implementation happens through support of other Donors. More than 642 SWHs have been installed since 2012. Detailed monitoring showed that each SWH mitigates on average 1 ton of CO_2eq per year, using suppressed demand, a Gold Standard approved methodology. 91 families replaced their inefficient stoves with energy efficient stoves, and 50 houses have been insulated.	NE	If the NAMA is funded in the full scale the transformation of the rural domestic energy sector towards increased efficiency, solar and biomass from sustainably managed forests aims at CO_2 eq reduction by end of 2023 of at least 29.185 t CO_2eq annually (accumulated 67,070 tCO_2eq) and by early 2039 of at least 157.242 tCO_2eq annually (accumulated 1,487,203 tCO_2eq). By

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	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
		Stoves (FEWS), Energy Efficient Insulation (EEI) measures in rural households and public buildings and sustainable forest management.				Collectors will reduce firewood consumption by 67%.				Early 2039 there will be an accumulated impact of a 37,95% improvement compared to BAU.
11	Energy sector, CO_2, CH_4, N_2O	**The first gender-sensitive Nationally Appropriate Mitigation Action (NAMA).** The Action aims to improve living conditions, reduce energy poverty and environmental degradation in a rural community in Georgia. Access to affordable low-cost solar water heating solutions as a basis for the first gender sensitive Nationally Appropriate Mitigation Action (NAMA) -a case study.	Technology development/capacity building	Installations of 20 000 SWH and 15 000 energy efficient stoves and 15 000 thermal insulations.	Number of installations, CO_2 reduction (t CO_2 eq.)	WECF provided emissions reduction estimates based on their internal methodology	NA	**Planned.** Case study completed; NAMA is waiting for funding. 500 SWH installed in rural regions in Georgia. Another 100 houses installed insulation of windows and roofs and 100 obtained efficient wood stoves. SWH were constructed in Georgia by locally trained specialists using local materials. The efficiency and the benefits of solar applications have been monitored and tested by WECF and partners. In Georgia, in total 69 women and 88 men have been trained in 8 community trainings, each lasting 4 days.	Since 2009, 400 solar water heaters have been installed and are monitored by locally trained men and women, using local materials.	In 2014, evaluation of results has been made. These findings and lessons learned have been used to formulate recommendations for how to scale up the results from 400 to 10,000 installed units, ensuring the same social and gender equality benefits. These recommendations were used for the design and implementation of a "gender-sensitive NAMA".
12	Energy sector, CO_2, CH_4, N_2O	**DeCouncil ing of inefficient old thermal power plants (TPP).** Tbilsresi (270 MW) from 2019, Mtkvari (300 MW) from 2021.	Face out non-climate friendly technology	To deCouncil 570 MW capacity of inefficient gas turbines.	Natural gas saving in TPPs (m3), GHG emission reduction (t CO_2 eq.).	Methodology: GHG emission reduction=Natural gas annual saving x carbon content x 44/12. IPCC 2006 guideline. NCV of Natural gas - 35 TJ/mln.m3, Carbon content - 15.3 kg/GJ.	NA	**Planned**. DeCouncil ing process has not been started yet, however, planned dates for deCouncil ing are stated in approved then year network development plan for 2018-2028, developed by GSE.	NA	NA

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	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
						Assumption: those inefficient TPPs will be substituted with efficient ones or even by RES.				
13	Energy sector, CO_2, CH_4, N_2O	**Solar Power Plant.** The Action aims to construct the first Solar Power Plant (5 MW) in Georgia in Sagarejo region, village Udabno.	Technology development	Installed capacity – 5MW, projected annual generation - 6.9 GWh	Annual generation (MWh/y) and GHG emission reduction (t CO_2 eq.)	Methodology: Emission reduction (t CO_2 eq.) = Generated El. By RES (MWh)xGrid emission factor (t CO_2 eq./MWh) Once solar PP will be built, annual generation will be multiplied with relevant grid emission factor. Current emission reduction is estimated based on 2017 grid emission factor.	Construction permit is to be issued by the end of 2018-2019. Construction works will start afterwards.	**Planned.** Georgian Energy Development Fund conducted the tender for construction of SPP and the company Solar Power Georgia won the tender.	NE	Estimated GHG emission reduction - 607 tons of CO_2 eq.
14	Energy sector, CO_2, CH_4, N_2O	**NAMA for energy efficient refurbishment in the public building sector in Georgia.** The Action aims to carry out activities that not only boost refurbishment in the public sector but will reduce currently existing barriers to energy efficiency throughout Georgia's entire building sector, especially the residential sector.	Technology development / Capacity building	Annual GHG emission savings of 750 to up to 1,500 t CO_2 eq.	Number of buildings renovated and area (m^2), energy savings (MWh) and relevant GHG emission reduction (t CO_2 eq.).	Using results obtained through audits carried out by signatories to the Covenant of Mayor's process that are supported by ENPI software and expert judgements indicate that the emission reduction potential per m2 of public buildings varies between 15 and 25 kg CO_2eq, this would result in higher emission savings of 750 to up to 1,500 tCO_2eq.	The second phase of the NAMA is a pilot phase.	**Planned.** The NAMA proposal has been developed and submitted, however, the funding for it has not been approved yet. The first phase of the NAMA is a readiness programme to build capacity in the Georgian government and municipalities to plan and implement energy efficient renovation programmes.	refurbishment in the public building - 50,000-60,000 m^2	In case of the NAMA is implemented and considering targets 50,000-60,000 m2 which represents around 0.035 to 0.042% of Georgia's building sector, corresponding to around 850 to 1,020 t CO_2 eq. and applying the potential savings of 30% around 250-300 t CO_2 eq. can be saved through the piloting phase.

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15	Energy sector CO_2, CH_4, N_2O	**Development of Solar renewable energy in high mountainous areas in Georgia** The Action aims to equip the households with the renewable energy sources in high mountainous areas.	Technology development / Capacity Building	Each PV 1.5 kWh capacity	172 households will be equipped with PVs and relevant GHG emission reduction (t CO_2 eq.).	The inventory of the villages don't have an access to electricity is done through the USAID/Energy Program. Moreover, the program will provide the monitoring of technology installations and capacity building for utilization of the PVs in daily life.	Solar Technology installation.	The inventory in east part of the country has been completed. The inventory in west part of the country is in progress. The inventory process is planned to be end in 2019.	More than 200 households will use electricity produced from renewable sources.	Estimated GHG emission reduction - 700 tons of CO_2 eq.
Transport sector										
1	Transport Sector, CO_2, N_2O	**Urban mobility - Expansion of the metro system in Tbilisi**. This measure involves the expansion of the Tbilisi metro system to add one additional station.	Infrastructure development. Project budget - 31.2 mln EUR (ADB).	The distance increase of the route is 1.5 km and it is expected that the extension will add 4.4 million passengers per year to the metro network.	Length of the route (km). Number of passengers traveled. GHG emission reduction (t CO_2 eq.)	Final energy savings were calculated based on modal shift from personal cars to metro, using values of energy consumption per 1000 passenger-km. Primary energy consumption in the BAU and EE case were then calculated using conversion efficiencies for diesel and gasoline (1:1). Assumed a typical passenger will travel 6.4 km (based on statistical data for # of passengers and passenger-km - pkm) - resulting in 28.16 million passenger-km shifting to the metro – assuming a shift from personal car use.	NA	**Implemented (2017).** New metro line Vazha Pshavela completed in 2017. Metro passenger ridership was increased 6-8 percent per day.	NE	Estimated annual GHG emission reduction 3,294 tones CO_2eq for 2030

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2	Transport Sector, CO_2, N_2O	**Baku-Tbilisi-Kars Railway Project.** It is recognized as one of the most important projects among the 100 global projects worldwide. Rail transport will substitute road transportation of freight. The Baku-Tbilisi-Kars project is intended to complete a transport corridor linking Azerbaijan to Turkey and therefore Central Asia and China to Europe by rail.	Infrastructure development. Georgia took a 1 billion USD loan from Baku's State Oil Fund (SOFAZ) for the project implementation.	The line is intended to transport an initial annual volume of 6.5 million tones, rising to a long-term target of 17 million tones. The new railway line will have the capability to transport all kinds of cargo. the Project is expected to transport over 1 million passengers.	length of the railway constructed (km), GHG emission reduced (t CO_2 eq.).	Monitoring of tone-km per year in freight as reported by Georgian Railway LLC.	New Railway Connection Line Project envisages the rehabilitation, reconstruction and construction of 180 km railway line which consists of Marabda-Akhalkalaki reconstruction/rehabilitation site with operational length of 153km and the Akhalkalaki-Kartsakhi section with new 27 km construction site.	**On-going (2008-2019).** As of 2018, approximately 80% of construction works has been completed. On December 11, 2015 LLC "Marabda-Kartsakhi Railway" and Georgian branch of "Azerbaijan Railway" jointly organized a test run of a freight train on the Marabda-Akhalkalaki railway section. In late 2015, a goods train took only 15 days to travel from South Korea to Istanbul via China, Kazakhstan, Azerbaijan, and Georgia—considerably less time than a journey by sea.	NE	Estimated annual GHG emission reduction - 23 Gg CO_2eq for 2030.

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3	Transport Sector, CO_2, N_2O	**Tbilisi Railway Bypass Project.** According to the General Plan for Perspective Development of Tbilisi, the measure will save energy by increasing the capacity for freight transport - resulting in switching from heavy goods vehicles on the road to railways using electricity.	Infrastructure development. 65% (213 mln. USD) of total budget has already spent.	No specific quantitative goal. Increasing the railway line capacity; Reduction of travel time; switching to more efficient mode of public transport.	Increasing the railway line capacity (t/km); Reduction of travel time (hours); GHG emission reductions (t CO_2 eq).	The energy savings will occur due to more efficient mode of transport on a per ton-km basis. Georgian Railway LLC will monitor freight load (tone-km per year) and corresponding energy saving.	The municipality also envisages installing a double track light rail passenger system ("Eurotram" type) for the greater Tbilisi agglomeration area.	**On-going (2008-2019).** Currently, an independent management expert is performing feasibility study for the most recent scenarios of the completion of the Bypass project discussed with the Government. The Group extended construction contract with the main third-party construction companies to allow for the final decision to be made with regards to the project.	Expected annual primary energy saving are estimated: 10 GWh by 2020, 65 GWh by 2025, 79 GWh by 2030.	Annual GHG savings: 2.9 Gg CO_2 eq by 2020, 18.8 Gg CO_2 eq by 2025, 23.1 Gg CO_2 eq by 2030.
4	Transport Sector, CO_2, N_2O	**Expansion and Modernization of Georgian Railways**. The initial project is divided in two main parts: construction of a new railway line starting from Khashuri to Molity with the construction of 3 tunnels.	Infrastructure development. Project budget: 147.384 mln EUR.	The ongoing works on the Modernization Project are designed to increase the possible throughput capacity of the rail line to 48 million tons annually, with potential to increase capacity to 100 million tons.	Increase of throughput capacity of the rail line (mln. tons/y). GHG emission reduction (Gg CO_2 eq).	The measure will save energy by switching from private vehicles on the road to railways using electricity. Georgian Railway LLC. will monitor freight and passenger load and corresponding energy saving.	Construction works on the double-track of the railway tunnel connecting Kvishkheti-Zvare, the design length of which is 8,350 meters, are actively being carried out.	**On-going (2011-2019).** Currently, the 78% of the overall works are fulfilled. The parts of the project which were concerned with the modernization of the rail infrastructure along the line and the construction of three tunnels with a total length of 2,095 meters have already been completed.	NE	Estimated annual GHG emission reduction 46.2 Gg CO_2 eq by 2030

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5	Transport Sector, CO_2, N_2O	**Urban mobility - Improvement of buses**. The Action aims to introduce of new CNG and electric buses in Tbilisi and in Batumi.	Technology development. Tbilisi Municipality took 27.5 mln EUR loan from EBRD for CNG and electric buses.	Introduction of new 143 CNG busses in Tbilisi and 40 electric busses in Batumi.	GHG emission reduction (t CO_2 eq.)	Final energy consumption savings were calculated by calculating the energy saved on a per-unit basis of replacing diesel buses with an eq., efficient CNG-fueled bus. The total final energy consumption savings were calculated based on total market penetration (# of replacement buses) over time. Primary energy consumption savings were assumed to be the same as final energy consumption savings.	NA	**On-going (2015-2025).** 143 MAN CNG Buses have been introduced in Tbilisi, in 2017. Additional 100 buses will be added in Tbilisi in 2019. 40 new electric buses have been introduced in Batumi in 2018.	NE	Estimated annual GHG emission reduction - 277 Gg CO_2 eq. (Tbilisi, Batumi)
6	Transport Sector, CO_2, N_2O	**Biodiesel production in Georgia** - "Biodiesel Georgia" Ltd. The action aims to reduce GHG emissions by using biodiesel instead of oil diesel	Technological development	From 2020, the annual reduction of greenhouse gas emissions - 475 tones CO_2 eq.	GHG emission reduction (t CO_2 eq.)	Using 1 ton of biodiesel instead of 1 ton of oil diesel can save 2.67 t CO_2 emissions to the atmosphere. From 2020, 15 tons of biodiesel is to be produced monthly.	From 2019 entire Tbilisi will be covered in the first 6 months and then, by the end of the year. From the autumn of 2019, the productivity will reach 12 tons per month, and from 2020 - 15 tons per month.	**Ongoing.** In July 2018, LTD "Biodiesel Georgia" www.gbd.ge was opened. Following the test regime, the plant reached 10 tons of biodiesel production per month. Products are sold in the company "Frego" petrol stations, as 10% additive to mineral biodiesel, brand name “B10 Biodiesel”	In Tbilisi, 10 gas stations were supplied with it in the test mode.	NE
7	Transport Sector, CO_2, N_2O	**Urban mobility - Improvement road infrastructure and**	Technology and Infrastructure development	Annual GHG emission reduction 41,7 Gg CO_2 eq. by 2030	Energy saving (TJ/y), GHG emission	Energy savings were calculated in a top-down manner (using LEAP model), where for each	**On-going (2016-2020).** Tbilisi: Establishment of a Traffic Lights Management Centre for efficient traffic light electronic management;		NE	NE

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		traffic management within cities (Tbilisi, Kutaisi, Batumi, Rustavi, Zugdidi, Gori). Sustainable Energy Action Plans (SEAPs).			reduction (t CO_2 eq)	municipality a BAU scenario was created using baseline information on the vehicle fleets, population, etc. and assumptions of growth. Savings were then assumed as a percentage of the BAU energy consumption.	Implementation of green wave systems to reduce waiting time on the crossroads and to improve traffic flow; Install new traffic lights to organize traffic and ensure safety. Kutaisi: Maintain central roads and rehabilitation of new/secondary and internal roads, installing new traffic lights to organize traffic and ensure safety, adjusting the city transport system to the bypass road. Batumi: Creation of a traffic signal control centre, restricting private vehicle traffic, development of a 4-step transport model (already operational). Rustavi: Reconstruction of 31,000 m2 of roads; establishing of traffic light management centre, installing sensors on traffic lights, revoking traffic lights on the roads with intensive traffic, creating "Green waves" of traffic lights; Zugdidi: Construction of additional bridges to reduce driving times; Gori: Improvement of traffic signs, setting up new traffic lines, construction of a new streets to reduce traffic in the center and on Tskhinvali highway.		
8	Transport Sector, CO_2, N_2O	**Vehicle improvement - Technical inspection of vehicles.** The Action aims to introduce of an inspection regime for all types of road vehicles which would be linked with vehicle registration – in line with Directive No 2009/40/EC on	Policy measure	Technical inspection of all vehicles in Georgia	Number of inspected vehicles. GHG emission reduction (t CO_2 eq)	Energy savings will result from improved energy performance due to improved maintenance of the vehicle fleet. Final energy consumption savings were calculated by reducing the total amount of energy consumed by road vehicles. Assumptions: For the entire market of road transport (passenger vehicles &	2021 - limiting the speed for motor vehicles (Directive 92/6/EEC) for vehicles engaged in national transport; 2020 - labeling of tires with	**On-going (2017-2022).** 2018 – Introducing road worthiness tests for road transport (Directive 2009/40/EC); 2017 - limiting the speed for certain categories of motor vehicles (Directive 92/6/EEC) for new vehicles and for vehicles engaged in international transport; 2017 – introducing maximum	For the entire market of road transport (passenger/freight vehicles), increase in fuel efficiency of 0.5% per year starting in 2018 and going up to 3.0% in 2023 –	Annual reduction of GHG emission is estimated -220 Gg CO_2 eq by 2030.

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		Roadworthiness tests for motor vehicles and their trailers. The measure will improve safety, efficiency and environment impact of the vehicles.				Freight vehicles), increase in fuel efficiency of 0.5% per year starting in 2018 and going up to 3.0% in 2023 – then staying at this level.	respect to fuel efficiency and other essential parameters (Regulation 1222/2009/ EC).	Authorized dimensions (Directive 96/53/EC);	Then staying at this level.	
Industrial sector										
1	Industrial sector (clinker production) CO_2	**Changing clinker production method** from wet to dry in Heidelberg Cement factory in Kaspi. The action aims to reduce energy consumption in clinker production by 30-50%	Technological	Annually, 130 Gg CO_2 eq. greenhouse gas emission will be reduced, under the conditions of 2017 production volume.	Energy saving (GJ/t), GHG emission reduction (Gg CO_2 eq)	When using a wet method in the clinker production process, 30-50% more energy is needed to evaporate water. The introduction of technology reduces energy consumption from 5.82 GJ/t to 3.4 GJ/t - clinker. Local emission factor 0.66t CO_2/t clinker with wet method, 0.48t CO_2/t clinker with dry method.	NA	**In progress (2016-2018).** The project in Kaspi factory began in 2016 and it will end in 2018. Currently, the clinker mixing, the installation the vertical tower for the homogenization and the chimney have been completed; as well as the rotating furnace elements and various completing equipment have been imported.	NE	Through the introduction of new technology, greenhouse gas emissions are to be reduced from 476 Gg to 346 Gg each year, taking into account production volume in 2017.
2	Industrial sector (clinker production) CO_2	**The use of energy received in the process of clinker cooling** in Heidelberg Cement Kaspi factory for the process of drying clinker components and in mills	Technological	Annually, 2.9 Gg CO_2 eq. greenhouse gas emission will be reduced, under the conditions of 2017 production volume.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	The introduction of technology reduces energy consumption by 5.1 terajoules, which is eq. to 1.4 mln. kWh. Emission factor for electricity produced from natural gas is 0.202 kg of CO_2 eq./kWh	The installation of a new rotating furnace and smoke pipe is currently in process.	**In progress (2016-2018).** The project started in Kaspi factory in 2016 and will be accomplished in 2018. The installation works of vertical tower and other auxiliary equipment for dry mixing of clinker components are almost complete.	NE	Through the introduction of new technology, greenhouse gas emissions are to be reduced by 2.9 Gg, taking into account production volume in 2017.

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3	Industrial sector (clinker production) CO_2	**Changing clinker production method from wet to dry** in Heidelberg Cement factory in Rustavi. The action aims to reduce GHG emissions through the introduction of new technology	Technological	Annually, 71Gg CO_2 eq. greenhouse gas emission will be reduced, under the conditions of 2017 production volume.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	Using the wet method in clinker production, 30-50% more energy is needed to evaporate water. Technology implementation shall reduce energy consumption from 5.82 GJ/t to 3.4 GJ/t- clinker. Local emission factors: 0.66 t CO_2/t clinker by wet method, 0.48 t CO_2/t clinker – dry method.	Today, the equipment and technological devices for further installation corresponding to the factory capacity are studied.	**Planned (from 2020).** The project will start in Rustavi factory after 2020.	NE	Through the introduction of new technology, greenhouse gas emissions are to be reduced from 260 Gg to 189 Gg, taking into account production volume in 2017.
4	Industrial sector (ferroalloys production), CO_2	**Modernization of arc furnaces in ferroalloys factory "Georgian Manganese".** Existing 9 arc furnaces are completely replaced with the new ones, and the filtration system is being changed as well. The action aims to reduce electricity consumption by 2% annually.	Technological. Project budget is 8 million US dollars.	Annual greenhouse gas emission will decrease to 9 Gg CO_2 eq.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	2% of annual electricity consumption by the enterprise will be saved. The emission reduction coefficient while energy saving is 0.104 kg CO_2 eq. / kWh. The Emission factor of Network (Ministry of Energy of Georgia, 2017)	NA	**In progress (2015-2020).** The project started in the factory in 2015. Nowadays, one furnace has been completely upgraded.	Currently, an overhaul of only one furnace has been completed	Annual emissions are reduced by 1 Gg CO_2 eq.
5	Industrial sector (food production), CO_2	**Milk factory "Amirani" – energy efficiency measure.** The Action aims to replace water electric-heater with plate high-speed heat exchanger.	Technological. The project budget is 1,100 Euros.	This measure can save up to 27 MWh/year heat energy annually.	Energy saving (MWh/y), GHG emission reduction (Gg CO_2 eq)	Methodology: Emission reduction (t CO_2 eq.) = Energy saving (MWh)xEmission factor (t CO_2 eq./MWh). Emission factor for electricity produced from natural gas is 0.202 kg of CO_2 eq./kWh	NA	**In progress and is to be ended in 2018.** The audit has been carried out in the factory, funded by UNIDO and it evaluated potential savings in specific figures.	NE	Estimated annual greenhouse gas emission reduction 0.005Gg CO_2 eq.

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6	Industrial sector (chemical production), CO_2	**Use of the heat from the technological process in "Rustavi Azot".** The Action aims to use of steam obtained during cooling of an ammonia contact device for generation of electricity in 9 MW turbines.	Technological. 5.6 million US dollars are required to implement the project.	Installed capacity 9 MW	Annual electricity generation (MWh). Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	In the future, the emission reduction coefficient is 0.104 kg / kWh CO_2 eq. The Emission factor of Network (Ministry of Energy of Georgia, 2017). 9MW x 7000 h/year = 63 000 MWh/year	NA	**Planned (from 2020).** The project will start after the year 2020 at the factory Rustavi Azot. The internal audit was carried out in the factory and the quantity of possible savings in specific figures is assessed.	NE	Through the introduction of the technology, greenhouse gas emissions are to be reduced to 6.5 Gg CO_2 eq.
7	Industrial sector (chemical production), CO_2	**Replacement of existing furnaces with modern, efficient furnaces and rehabilitation of steam distribution networks in ammonia production in "Rustavi Azoti"** The action aims to replace and rehabilitate steam distribution networks in ammonia	Technological. 0.98 Million US dollars are required to implement the project.	Saving up to 12 million m3/y natural gas and 120 GWh eq. heat energy.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	Methodology: Emission reduction (t CO_2 eq.) = Energy saving (MWh)xEmission factor (t CO_2 eq./MWh). Emission factor for electricity produced from natural gas is 0.202 kg of CO_2 eq./kWh	NA	**Planned (from 2020).** The project will start after the year 2020 at the factory Rustavi Azot.	NE	Estimated annual greenhouse gas emission reduction 24Gg CO_2 eq.
8	Industrial sector (chemical production), CO_2	**Modernization of compressors used in ammonia production in "Rustavi Azoti"**. The Action aims to replace of old high-pressure compressors with modern highly effective compressors.	Technological. 10 million US dollars are required to implement the project.	170 GWh of electricity will be saved annually	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	Emission reduction coefficient, due to energy saving, is 0.104 kg CO_2 eq / kWh (energy network/grid emission factor, Ministry of Energy of Georgia, 2017)	NA	**Planned (from 2020).** The project will start after the year 2020 at the factory Rustavi Azot. The internal audit is carried out in the factory and the quantity of possible savings in specific figures is assessed.	NE	Estimated annual GHG emission reduction 17.6 Gg CO_2 eq.

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9	Industrial sector (chemical production), CO_2	**Adjustment of the frequencies of electric drives in the water supply system and in the water-cooling tower in Rustavi Azot**i, Action aims to save power through the control of the pump rotation speed	Technological. 0.275 Million Euros are required to implement the project.	Annual electricity consumption saving 6,750 MW/yr, comprising 24% of annual consumption.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	While saving electricity, the emission reduction coefficient is 0.104 kg CO_2 eq / kWh the Network/grid emission factors, (the Ministry of Energy of Georgia, 2017).	NA	**Planned (from 2020).** The project will start after the year 2020 at the factory Rustavi Azot. The UNIDO- financed audit is carried out in the factory and the quantity of possible savings in specific figures is assessed.	NE	Estimated annual GHG emission reduction 0.7 Gg CO_2 eq.
10	Industrial sector (iron/steel production), CO_2	**Energy efficiency measure in Rustavi Metallurgical Factory**. Before placing the raw material in arc furnace, pre-heating the scrap at the expense of the exhaust gas heat.	Technological	Saving 100 kWh electricity per t of liquid metal.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	The emission reduction coefficient is 0.104 kg CO_2 eq/kWh, the network emission factor, (the Ministry of Energy of Georgia, 2017)	NA	**Planned.** At present the study of technology implementation is underway	NE	Annual greenhouse gas emission reduction 3.4 Gg CO_2 eq.
11	Industrial sector (food production), CO_2	**Energy efficiency measure in wine and cognac factory Capital Club LTD**. The Action aims to return of condensate in the steam boiler and implementing a locked cooling system for alcohol condensation with water.	Technological. The project budget is 37000 Euros.	Annual energy saving up to 562 MWh/y.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	Methodology: Emission reduction (t CO_2 eq.) = Energy saving (MWh)xEmission factor (t CO_2 eq./MWh). Emission factor for electricity produced from natural gas is 0.202 kg of CO_2 eq./kWh	NA	**Planned (from 2019).** Audit, financed by UNIDO, was carried out and the amount of possible savings in specific figures is assessed.	NE	Estimated annual greenhouse gas emission reduction 0.113 Gg CO_2 eq.

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12	Industrial sector (food production), CO_2	**Replacement of amortized steam boilers (БКЗ-25) in Agara Sugar Factory with modern energy efficient boilers.**	Technological. 0.35 Million Euros are needed to implement the project.	Saving up to 49,000 MWh/y heat energy, which is 35% of the current consumption.	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	Methodology: Emission reduction (t CO_2 eq.) = Energy saving (MWh)xEmission factor (t CO_2 eq./MWh). Emission factor for electricity produced from natural gas is 0.202 kg of CO_2 eq./kWh	NA	**Planned (from 2020).** Audit, funded by UNIDO in the factory evaluated potential savings in specific figures.	NE	Estimated annual greenhouse gas emission reduction 9.8 Gg CO_2 eq.
13	Industrial sector (food production), CO_2	**Milk factory "Atinati" - energy efficiency measure**. The Action aims to accumulate of 50 ° C water from the cooling process of pasteurized and ready-made cottage cheese with its further use.	Technological. Project budget-2,000 Euros	Saving 238 MWh heat energy annually	Energy saving (GJ), GHG emission reduction (Gg CO_2 eq)	Methodology: Emission reduction (t CO_2 eq.) = Energy saving (MWh)xEmission factor (t CO_2 eq./MWh). Emission factor for electricity produced from natural gas is 0.202 kg of CO_2 eq./kWh	NA	**Planned (from 2020).** Audit in the factory, funded by UNIDO evaluated potential savings in specific figures.	NE	Estimated annual greenhouse gas emission reduction 0.048 Gg CO_2 eq.
Waste sector										
1	Waste sector, CH_4	**Development Waste Management Technologies in Regions.** The Action aims to promote the integrated system of household waste management in Kakheti region and Adjara AR.	Development/ improvement technology; capacity building. The project budget is 4 million US dollars (USAID).	No specific quantitative goal	Percentage of waste; Amount of composted waste (t/y)	International experience and methodology were used to study waste composition and pilot composting.	Composting grounds have been arranged, composting of food waste from educational institutions is being carried out.	**In progress (2013-2019).** The morphology of waste was studied, the guidelines were developed and pilot composting took place, awareness raising measures were conducted. Vocational Institute was selected in Kakheti, University - in Batumi. Implementing body is CENN.	NE	NE

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2	Waste sector, CH_4	**Implementation of an integrated system for household waste management in Imereti, Racha-Lechkhumi and Lower Svaneti regions.** The Action aims to construct of regional waste landfill and transfer stations for non-hazardous wastes.	Development/ improvement of technology; capacity building. 26 million Euros: 20 million EUR loan (KfW), 2 million EUR grant (KfW), 4 million EUR contribution from Georgia.	Recovery and use of landfill gas 240 million m3 Number of jobs created = 47 (including Transfer Stations Staff)	Reduction of methane emissions (t CH4), creation of (number) additional jobs.	The first 2 years - flaring of landfill gas; from the 4th year on the active gas, flow starts and it is possible to use it for the next 10-50 years. Landfill lifecycle - 50 years; approximate 50% efficiency of gas gathering; 240 million m3 landfill gases (methane and CO_2) is expected during 50 years that comprises 120 million m3 methane equal to 2.13 million tons of CO_2 eq.. The amount of methane supplied to the flare is 4205 t/year = 5.9 mln m3/year (0.717 kg methane/m^3).	NA	**In progress (2018-2019).** The EIA has been developed. Around 480 million m3 landfill gas is formed during the active landfill time (50 years).	NE	Estimated annual GHG emission reduction 92.730 t CO_2 eq.

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3	Waste sector, CH_4	**The construction of a new landfill in Adjara, recovery and use/utilization of the landfill gas.** The project aims: 1. Construction of regional landfills and transfer stations with European standards for non-hazardous wastes, the creation of an integrated waste management system. 2. Closing of existing landfills, recovery and use of gas from them (installation of the flare stack, at the initial stage with, subsequent production of electricity). Donor: EBRD, Implementing entity: Hygiene Ltd.	Development/ improvement of technology; capacity building. Project Budget is 7 Million EUR (EBRD) and 4.5 million GEL from the Government of Adjara AR.	Recovering 80% of the biogas from the landfill	Reduction of methane emissions (t CH4), creation of (number) additional jobs.	Calculation of pollutant emissions from the solid waste landfill is performed by a method "calculation of pollutant emissions from solid household polygon". Complete period of gas emission from organic waste on the landfill was estimated as 70 years; assuming the amount of produced methane is 840,681 t/y. and 710,992 t/y. CO_2. The biogas collection coefficient is 0.8 on average i.e. 80% of the biogas will be recovered. The remaining 20% of biogas may be emitted from the entire surface of the landfill, which means that there will be 168 t/y of methane emissions;	The activities are scheduled to begin from 2019. It is expected to enter into operation in 2020 for 33 years. At the initial stage, gas burning (in flare) will occur. With the increase of gas amount, the usage (recovery) of it and energy production will commence, that can be provided to landfill administrative buildings and/or local residents.	**In progress (2018-2020).** The preliminary social-economic justification project was made; the Environmental Impact Document (EIA) was developed; the Ministry of Economy and Sustainable Development has issued the construction permit involving environmental conditions.	NE	Estimated GHG emission reduction 15.129 Gg CO_2 eq. 27 people will be employed.

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4	Waste sector, CH_4	**Methane recovery and use on existing landfills under operated by the "Solid Waste Management Company of Georgia" in Rustavi and Kutaisi** (The action aims - installation of the flare stack, at the initial stage, with possible subsequent production of electricity).	Development/ improvement of technology; capacity building	GHG emissions reduction from the landfill by 59% using gas flare.	Reduction of methane emissions (t CH4), creation of (number) additional jobs.	The atmospheric dispersion model gasSim2 was used for calculations.	For Rustavi: installing a flare stack for the landfill by 2019; for Kutaisi – from 2020; burning the gas at the initial stage. With the increase in the amount of gas: it can be provided to landfill administrative buildings and/or local residents, or it can be used for generating the electricity for the purpose of supplying it to the neighboring inhabitants.	**In progress (2018-2020).** The preliminary social-economic justification project was made; the Environmental Impact Document (EIA) was developed, the construction permit from the MoESD was received. The active emission of gas has started on Rustavi landfill, a tender announcement on installing a flare stack is under preparation (for Rustavi) and is planned to be prepared for Kutaisi.	NE	For Rustavi: GHG emissions throughout life cycle is estimated 249 Gg CO_2 eq. Without a gas burning device (flare) the emission is equal to 30 Gg CO_2 eq. In Kutaisi: the amount of landfill gas and its energy potential on Nikea landfill (Kutaisi) has not been studied yet.

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	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
5	Waste sector, CH_4	**Methane recovery and use at Tbilisi municipal landfill** (installation of the flare stack, at the initial stage, with subsequent generation of electricity). The action aims to reduce the methane (CH4) emissions through its utilization	Development/ improvement of technology; capacity building;	Annual GHG emission reduction 51,129 t CO_2 eq. from biogas use, while from burning at the flare – by 45,015 t CO_2 eq	Reduction of methane emissions (t CH4), creation of (number) additional jobs	Assumptions: The full potential of biogas emission is 581 mln m3. Biogas density is 1,25 kg/m3. In 75 years, 80% will be extracted. The methane gas density is 0,717 kg/m3. The methane content in biogas is about 53% in weight, and 50% in volume, the remaining 20% of biogas can be emitted	The works are to begin in 2019 and supposedly the landfill be put in operation in 2020. The active generation of the biogas begins after 2-4 years of operation, and after the amount is assessed, the technology of its application (e.g. for energy production) will be identified.	**In progress.** The preliminary social-economic justification project was made; then the Environmental Impact Document EIA was developed (Environmental Impact Assessment), the construction permit from the MoESD has been received, where environmental conditions are integrated.	The full potential of gas production is 581 million m3 for 75 years. Out of it, about 290.5 million m3 is to be methane. 80% of biogas will be collected, which is equal to 6.2 million m3/yr biogas, where methane is 3,1 million m3 /yr = 2223 t/y.	Consequently, the methane (CH4) emissions per year will be reduced by 2,223 t (= 2223 * 23 = 51,129 t CO_2 eq) after methane utilization, and during the period of burning in the flare - 45,015 t CO_2 eq. a year.

N	Description of the Mitigation Action					Information on Methodologies and Assumptions	Measures Envisaged to Achieve that Mitigation Action	Information on the Progress of Implementation		
	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
6	Waste sector, CH_4	**Construction of WWTPs and biogas utilization projects in Zugdidi, Poti, Ureki, Anaklia, Mestia, Telavi, Kutaisi and Tskhaltubo**. According to the project, the biogas emitted by anaerobic decay will be collected in the gas tank. There will also be installed a gas flare, where burning of biogas will take place. The action aims to collect/reduce biogas emission from anaerobic decay.	Development/ improvement of technology; capacity building	The quantitative target indicator is to be determined later.	Unorganized, burnt in flare stack and reduced methane emissions (t CH_4)	Methodology: flare burning of the produced methane; calculation of quantitative and qualitative indicators of emissions is done using the reported method. The total amount of unorganized methane emission to the Atmosphere is assumed to be 3,2 t/y with all WWTP.	**Ongoing.** Most of the wastewater treatment plants (WWTP) are under construction. According to the project, the biogas emitted through anaerobic decay in the Zugdidi and Poti WWT plants will be collected in the gas tank, a gas flare will be installed there as well, where burning of excess biogas will occur, and no other biogas saving/recovery equipment is planned for the rest of the plants, since the biogas emission is expected to be low and does not justify high investment costs required for the gas utilization equipment.		NE	NE
7	Waste sector, CH4	**Exploration of the possibility of composting from biodegradable waste**, The Action aims to select appropriate methods of composting and compost production.	Development/ improvement of technology; capacity building	The quantitative target indicator is to be determined later.	Results of research on composting possibilities and selected specific methods; Number of composts made; Reduced GHG Emissions.	Research of the possibilities of composting biodegradable waste, receiving compost by its processing and thus reducing greenhouse gas emission. Specific methodology is to be determined after studying the current situation.	NA	**In progress (2018).** In Marneuli there were selected and installed containers in the agrarian market, selected local residents (3 multi-stored houses), kindergartens and ritual halls/restaurants.	Depends on the particular method of composting. Tentatively the composting plant will compost 120 t biodegradable wastes annually.	NE

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	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
8	Waste sector, CH_4	**Methane recovery and burning/utilization on new landfills in Kakheti and Samegrelo-Upper Svaneti regions.** The Action aims to introduce of Integrated Household Waste Management System. Construction of non-hazardous waste landfills and transfer stations, closing existing landfills.	Development/ improvement of technology; capacity building. Project budget - 38 million Euros. Of that: 30 million Euros - loan (KfW), 2 million Euros - technical assistance grant, the rest – contribution from Georgia.	Annual GHG emission reduction 18.9 Gg CO_2 eq.	Reduction of methane emissions (t CH4), the amount of produced electricity (kWh), creation of (number) additional jobs	Methodology: Rettenberg formula ("Gas Formation Management Manual", Trier, 1995). Assumptions: Total amount of waste = 1 080,000 t; the share of organic carbon throughout the life cycle of the landfill C = 250 kg/t, T = 30 ° C, half-life decay parameter k = 0.04. During the entire operation of the landfill (45 years), 290 million m3 gas is generated.	The construction activities are to be started in 2019. Gas generation begins after 1 year. After 5 years the gas conversion engine will be installed.	**Planned.** The preliminary social-economic justification project was made, and then the social and natural environmental impact assessment document – EIA was developed; submission of the document for environmental decision-making and construction permits is planned to be completed by 2018;	NE	The gas converter engine will be installed and at least 290 m3/h biogas will be recovered and utilized/consumed, that, in case of 50% methane and 0.71 t/1000 m3 density amounts to is approximately 901.842 t methane per year (145 m3/h * 0.71 t/m3 * 24 * 365) that is 18.9 Gg CO_2-eq.
9	Waste sector, CH_4	**Methane recovery and burning/utilization on new landfills in Samtskhe-Javakheti, Mtskheta-Mtianeti and Inner Kartli regions.** The Action aims to introduce of Integrated Household Waste Management System. Construction of non-hazardous waste landfills and transfer stations, closing existing landfills. Implementing entity: "Solid Waste Management Company of Georgia".	Developing/improving technology; capacity building. The project budget is 42 million Euros. Of that: 30 million Euros - loan, 2 million Euros - technical assistance grant, 10 million Euros - capital grant (KfW and EBRD).	The quantitative target indicator is to be determined after EIA preparation.	Reduction of methane emissions (t CH4), creation of (number) additional jobs.	Methodology: methodology of calculation of greenhouse gases (reduction of GHG in 2030 compared to BAU scenario). Assumptions: A company for utilization is in place/exists; entering into operation in 2023; landfill life cycle 50 Years; presumably 50% efficiency of gas gathering(recovery);	**Planned.** The preliminary research document/feasibility study will be developed, followed by the EIA; to obtain Environmental Decision and Construction Permit, the documents submission is planned from 2020, putting into operation – from 2023. The first two years - burning on the flare; starting from the 4th year, the active gas generation starts and continues for 10-50 years.		NE	NE

N	Description of the Mitigation Action					Information on Methodologies and Assumptions	Measures Envisaged to Achieve that Mitigation Action	Information on the Progress of Implementation		
	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
10	Waste sector, CH_4	**Construction of regional landfill in Lower Kartli.** The Action aims to introduce of Integrated Household Waste Management System. Construction of non-hazardous waste landfill and transfer stations, closing existing landfill. Methane recovery and utilization.	Developing/improving technology; capacity building. Project budget-7 million Euros loan, 3 million euros capital grant and 1.1 million Euros - technical assistance grant (EBRD).	Reduced methane emissions using gas flaring by 2023 (for 3 years of operation) 823 t CO_2 eq/yr, by the year 2029 - 36,442 t CO_2 eq/yr	Reduction of methane emissions (t CH4), creation of (number) additional jobs.	Generating biogas during the life cycle of the landfill and its capacity was calculated based on the following assumption: 35,000 - 65,000 tons of waste a year, for 2019-2039 years total - 1,390,000 m3 biogas; Composition of typical municipal waste (17.5% paper / textile, 1% garden residue, 30% food waste, 1% tree/straw, 50.5% inorganic); Typical standard expected factors – Methane Conversion Factor (MCF) = 1, Degrading Organic Waste Fraction (DOCf) = 0.77.	**Planned.** Construction is expected to start from 2019, operating from 2020 for 20 years and post-closure treatment for 30-year term. A preliminary/feasibility study with EBRD assistance is planned.		NE	NE
Agriculture sector										
1	Agriculture sector, CO_2, CH_4, N_2O	**Rehabilitation of pastureland; Sustainable Management of Pastures in Vashlovani Protected Area (VPA).** The action aims to avoid CO_2 emission due to improved sustainable management of summer pastures	Policy / Regulation/ pilot project	4,064 ha of degraded pastures in the VNP territories are rehabilitated	GHG emission reduction (t CO_2)	CO_2 emissions reduction as a result of vegetation loss and soil degradation avoided due to improved sustainable management of summer pastures. IPCC 2006 guidelines Number of t CO_2 eq. emissions sequestered or avoided over 20-year period after project completion	NA	**The project was implemented in 2014-2017.**	NE	296,662 t CO_2 emissions sequestered or avoided over 20-year period after project completion

N	Description of the Mitigation Action					Information on Methodologies and Assumptions	Measures Envisaged to Achieve that Mitigation Action	Information on the Progress of Implementation		
	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
2	Agriculture sector, CO_2, CH_4, N_2O	**Prohibit of crop residue burning** The action aims to avoid wheat residue (straw) field burning and reduce CO_2 emission	Policy / Recommendation	Main goal of the policy is to prohibit of wheat residue (straw) field burning on 29,000 ha in Dedoplistskaro District of Georgia	Area (in ha) with avoided crop residues burning, reduction of GHG (Gg CO_2 eq) and other gases, harmful particles emissions.	According to the methodology, only methane and nitrous oxide emissions are considered. In the case of carbon dioxide, it is considered that the emitted carbon dioxide will be absorbed by plants the following year.	NA	**In progress (since 2015).** It is not prohibited by law, but farmers do not apply straw burning practice in the fields.	NE	Implementing and enforcing a ban on burning results in approximately 21,800 tons of CO_2eq (CH4- 15.800 tons of CO_2eq and N2O- 6,000 tons of CO_2eq) avoided emissions over 20 years.
Forestry and Land Use Sector										
1	LULUCF, CO_2, CH_4, N_2O	**Adaptive Sustainable Forest Management in Borjomi-Bakuriani Forest District (NAMA).** The action aims biodiversity conservation, forest restoration-reforestation, forest protection, through capacity building of the staff working in the forestry field.	Policy instrument /Capacity building / reforestation. Project budget - 2 mln EUR (1.5 mln EUR by Austrian Ministry of Agriculture and Forestry, 0.5 mln EUR Georgian government co-share).	Introduction of Sustainable forest management practice in 45,000 ha of forest	Restored area (ha) of forest. GHG emission reduction (Gg CO_2 eq.)	Stock-Difference Method (IPCC 2006 on AFOLU) is applied; biomass conversion and extension factor for growing stock (according to IPCC) is used to calculate the current standing stock of aboveground biomass.	NA	**Implemented (2013-2015).** Sustainable forest management practice has been implemented in 45,000 ha of forest, 60 ha forest has planted, 4.3 ha has reforested (forest fire land), 4.3 ha natural reforestation - average 70% survival rate of plants.	NE	Estimated annual GHG emission reduction - 8.7 Gg CO_2 eq. by 2030

N	Description of the Mitigation Action					Information on Methodologies and Assumptions	Measures Envisaged to Achieve that Mitigation Action	Information on the Progress of Implementation		
	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
2	LULUCF, CO_2, CH_4, N_2O	**Restoration of forest burnt by forest fires in armed conflict between Russia-Georgia in 2008.** The project also promoted agriculture, tourism and environmental education to boost economy and improve livelihoods.	Capacity building/ reforestation. Budget-1.5 mln Euros provided by Finnish government.	Reforestation of approximately 100 ha	Restored area of forest (ha)	Assuming 1 ha forest cultivation in Western Georgia (in 2010) will accumulate: 2011-6.6 t CO_2; 2012-15.3 t CO_2; 2013-25.8 t CO_2; 2014-36.6 t CO_2; 2015-47.4 t CO_2; 2016-58.4 t CO_2; 2017-69.6 t CO_2; 2018-81.2 t CO_2; 2019-93.4 t CO_2; 2020-106.4 t CO_2;	NA	**Implemented (2011-2015).** During 2015-2017 105 ha forest was restored, and for 159.3 ha area, the forest restoration project was developed.	NE	Estimated annual GHG emission reduction - 11 Gg CO_2 eq. by 2020
3	LULUCF, CO_2, CH_4, N_2O	**Establishment of Javakheti Protected area in Georgia.** Area includes mostly high mountains and wetland territories (CO_2 sink).	Policy instrument / Development. Project budget - 2.25 mln. EUR provided by KFW.	To establish 16,614 ha protected area in Javakheti region.	Creating a protected area (ha), GHG emission reduction (Gg CO_2 eq.)	2013 Supplement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories: Wetlands (Methodological Guidance on Lands with Wet and Drained Soils, and Constructed Wetlands for Wastewater Treatment).	NA	**Implemented (2010-2011)**. Javakheti protected area 16,614 ha has been established, infrastructure and legislative bases were created.	NE	23.5 t CO_2 will be saved per year in case of not drying out 1 ha area. Total territory of peat soil of Javakheti Protected Area is 547 ha. Total annual GHG emission reduction estimates - 12.8 Gg CO_2 eq.
4	LULUCF, CO_2, CH_4, N_2O	**Sustainable management of pastures in Georgia to demonstrate climate change mitigation and adaptation benefits and dividends for local communities.** The action aims Georgia to demonstrate climate change mitigation and adaptation benefits and dividends for local communities.	Capacity building / Improvement. Project budget - 1.39 mln. EUR was provided by EU/UNDP.	The project goal is to rehabilitate 4.064 ha of degraded pastures in Vashlovani PA, 300 ha migratory routes, Introduce sustainable pasture management practices.	Area restored / Area under sustainable pasture management - ha	It's assumed that from 4300 ha of degraded pastures, an average of 10.2 Gg of CO_2 emissions per year takes place.	NA	**Implemented (2013-2016).** 4,000 ha of degraded pastures and 300 ha of sheep migratory routes have been fully rehabilitated.	NE	Estimated annual GHG emission reduction - 10.2 Gg CO_2.

N	Description of the Mitigation Action					Information on Methodologies and Assumptions	Measures Envisaged to Achieve that Mitigation Action	Information on the Progress of Implementation		
	Sectoral & GHG coverage	Name and Objective of the Mitigation Action	Nature of action (e.g. status and budget)	Quantitative goal(s)	Progress Indicators			Progress of implementation and Underlying steps taken	Estimated outcomes	Estimated GHG emission reductions
5	LULUCF, CO_2, CH_4, N_2O	**Expansion and Improved Management Effectiveness of the Adjara Region Protected Areas.** The action aims Improving management of the protected areas and sequestrate CO_2 emissions	Capacity building/ development. 1.3 mln USD provided by GEF, and is implementing by APA.	Improving management of the protected areas in Adjara region.	Area of protected forest increased (ha), fuel wood consumption reduction (m3/y)	1 ha of forest accumulates 0.73 t C, in case of changing status it will accumulate 0.87 t C (3.2 t CO_2). Machakhela forest area - 7174 Ha	NA	**Under implementation (2014-2018).** Increased protected area / Area under sustainable management: - established the Machakhela National Park (an area of 8,733 ha.), established an appropriate governance structure (i.e. NP Management Board), completed an in-depth ecological and resource use inventory, and defined the detailed management zoning.	NE	On average, 22.9 Gg CO_2 will be sequestered annually.
6	LULUCF, CO_2, CH_4, N_2O	**Million Trees Project.** The Action aims planting trees in Tbilisi Municipality.	Reforestation. 2 mln. GEL was spent from Tbilisi Municipal budget.	To plant 1 million trees in Tbilisi Municipality.	Number of trees planted	On average, one tree captures 0.002 t C (0.007 t CO_2) per year (expert assessment).	NA	**Implemented (2012-2015)**. 650,000 trees planted.	NE	Estimated annual GHG emission reduction 4.5 Gg CO_2 eq.
7	LULUCF, CO_2, CH_4, N_2O	**Development of Green Spaces**; The Action aims planting Trees/Plants in Tbilisi. SEAP Tbilisi 2011-2020.	Development	Annual GHG emission reduction - 3.5 Gg CO_2 by 2021	Number of trees planted/ Area of green zones managed-ha	The CO_2FIX V 3.1 model was used to calculate CO_2 emission sequestration and carbon stocks as a result of reforestation and afforestation.	NA	**Under implementation (2011-2020).** Development of Green Spaces: Creation of "Environmental Islands", Conjunction of Mziuri and Tbilisi Zoo: Rehabilitate the Khudadovi Forest to a 66.5 ha; Turtle Lake Area: 29.2 ha of forest was rehabilitated; Planting Trees/Plants: 170,000 green plants were planted in different areas of the city;	According to Tbilisi SEAP monitoring report (2015) Green cover (afforested) in Tbilisi has been increased by 8,125 ha, due to Forest parcels incorporated into city limits.	Total amount of the actual stored carbon has been increased from 413 190.6 TC (2011) to 439 298.5 TC (2014), giving + 26107.9 TC of carbon storage increase in green Biomass. This number is by + 5027.9 TC more than planned changes in SEAP (2011).

3.4 Potential Mitigation Measures

Table 25 - Potential Mitigation Measures for Georgia

N	Sectors, Gas	Mitigation Action	Nature of Action	Quantitative goal	Progress indicators	Methodology/Assumptions	Additional information
Energy sector							
1	Energy sector, CO_2, CH_4, N_2O	Development of smart metering regulatory framework	Policy measure	NE	Smart metering regulatory framework is in place	NE	Regulatory framework is a necessary prerequisite for switching from traditional meters to smart meters. Smart meters support demand side management and help to save peak consumption, thus requiring less generation of the most expensive and less efficient units.
2	Energy sector, CO_2, CH_4, N_2O	Energy efficient lighting system in public buildings	Technology development	replacement of incandescent bulbs with energy efficient bulbs in public buildings – increasing over time to cover 100% of public buildings by the end of 2020 – covering a useful area of approximately 987,000 m2	Useful area covered (m2)	GHG emissions reductions are calculated based on the average grid emissions factor of 0.350 tones CO_2eq per MWh (NEEAP).	It is estimated that the measure requires 0.519 mln euro and saves about 1,4 Gg CO_2 eq. annually. The project idea was developed in NEEAP, which was not adopted by the government yet.
3	Energy sector, CO_2, CH_4, N_2O	Improvement of energy performance of schools	Technology development	retrofitting / insulation of the all exterior properties of the school building envelope including part of the windows and installation of efficient end-use systems for 11 schools per year	Number of renovated schools, energy (GJ) and emissions savings (Gg CO_2 eq.)	GHG emissions reductions are calculated based on the average grid emissions factor of 0.350 tones CO_2eq per MWh (NEEAP).	It is estimated that the measure implementations will cost 20 mln Euros, and saves 18.8 Gg CO_2 eq. annually by 2030.The project idea was developed in NEEAP, which was not adopted by the government.

4	Energy sector, CO_2, CH_4, N_2O	Energy efficient lighting system for street lighting	Technology development	Replacing 132,000 lights	Number of replaced bulbs or share of replaced technology, energy (GJ) and emissions savings (Gg CO_2 eq.)	GHG emissions reductions are calculated based on the average grid emissions factor of 0.350 tones CO_2eq per MWh (NEEAP).	The project idea was developed in NEEAP, in perspective of allocating 3.598 mln EUR. In a condition of project implementation period will be 3 years. It was estimated that annual GHG emission reduction would be 62 Gg CO_2 eq. by 2030.
5	Energy sector, CO_2, CH_4, N_2O	Increase of HPP generation share	Technology development	Annual GHG emission reduction -389 Gg CO_2 eq.	Increased share of HPP generation that is due to improved dispatch and transmission network (not due to new HPPS), emission reduction (Gg CO_2 eq)	According to the projected balance under the Ten-Year Grid Development Plan of Georgia, the share of generation from hydropower plants in 2025-2026 varies between 83%-86%. Within the framework of the low emission, development strategy a target was set that hydropower stations will provide at least 85% of the country's internal consumption by 2030.	The project idea was developed in EC-LEDS. Since the strategy has not been adopted by the government the measure was included in "potential measures" list. Required costs are not estimated. The measure includes optimization of dispatch and strengthening transmission network to increase share of electricity generated by existing HPPs.
Transport sector							
1	Transport Sector, CO_2, CH_4, N_2O	Kutaisi Airport Connection Project - Railway development. The length of the new rail line to be constructed, that will connect Georgian Railway with Kutaisi airport, is about 3 km.	Infrastructure development	NE	Number of passengers traveled	Monitoring of number of passengers traveled by rail.	A feasibility study has already been performed and construction works are planned to start in near future.
2	Transport Sector, CO_2, CH_4, N_2O	The Urban Cable Car Master Plan	Policy measure	10 cable cars are planned to install in Georgia	Number of cable cars installed	NA	The current study (started in November 2015) focuses on urban cable cars with the objective to define a long-term development strategy for cable car systems in Georgian towns and cities, prioritize needs and develop an investment program. The output of this study – the Urban Cable Car Master Plan – should provide the Georgian government with all the necessary information to develop a public investment strategy in the medium term. The study was finalized in 2016.
3	Transport Sector, CO_2, CH_4, N_2O	Overground Metro Samgori-Lilo	Infrastructure development	The new over ground trains will serve over 260,000 people daily.	Number of people travelled daily	Monitoring of number of passengers traveled by metro.	In the first phase, 6 completely new trains will run on this particular route. In the beginning, the waiting period will be 10 minutes. However, in the following years we will reduce the intervals and increase the number of trains

Industrial Sector							
1	Industrial sector (cement production) CO_2	In cement production at Heidelberg Kaspi cement plant, replacement of clinker with limestone up to 5%	technological	The introduction of technology reduces energy consumption by 5% compared to the current	Enhancement of energy efficiency and reduction of greenhouse gas emissions (Gg CO_2 eq.)	0.95 x 0.48 t CO_2/t clinker by dry method	5% of limestone costs will be added to the production costs, but, instead, the same amount of clinker costs would be reduced. The process is to be studied to prevent deterioration of cement quality.
2	Industrial sector (cement production) CO_2	In cement production at Heidelberg Kaspi cement plant, replacement of clinker with zeolite	technological	The introduction of technology reduces energy consumption by 5% compared to the current	Enhancement of energy efficiency and reduction of greenhouse gas emissions (Gg CO_2 eq.)	0.95 x 0.48 t CO_2/t clinker by dry method	5% of material costs will be added to the production costs, but, instead, the same amount of clinker costs would be reduced. The process is to be studied to prevent deterioration of cement quality.
3	Industrial sector (cement production) CO_2	Limestone substitution for clinker production by fly ash or steel slag addition	technological	The introduction of technology reduces CO_2 emissions by 30% compared to the current	Enhancement of energy efficiency and reduction of greenhouse gas emissions (Gg CO_2 eq)	Fly ash has the ability to replace the Clinker in Portland Cement by 30-50%. 0.7 x 0.48 t CO_2 / t Clinker with dry method.	Used material costs will be added to the production costs, but, instead, the same amount of clinker costs would be reduced. The process is to be studied to prevent deterioration of cement quality.
4	Industrial sector (cement production) CO_2	Removal of CO_2 in the production of ammonia by chemical absorption	technological	By 2030 reduces by 517 Gg.	reduction of greenhouse gas emissions (Gg CO_2 eq)	The introduction of technology will reduce CO_2 emissions by 55%, as 55% of the total amount of gas consumed in ammonia production is not used for energy purposes in chemical processes. 1.5 t CO_2 /t ammonia (IPCC 1996)	Planned from2020. Investment costs 12 million euros. Annual savings 5 million euros. It requires a low interest rate loan or grant co-financing.
5	Industrial sector (cement production) CO_2	Selective non-catalytic reduction at the primary reformer	technological	The introduction of technology will reduce CO_2 emissions up to 30-70% by 2030. NOx will be reduced in gas and therefore eq. greenhouse gas emissions reduce.	reduction of greenhouse gas emissions (Gg CO_2 eq)	This process is a measure to reduce nitrogen oxides already formed in the flue-gas, for which ammonia injection is used. It is operated without a catalyst at a temperature of between 850 and 1100 °C. 6.75 kg N2O/t HNO3. To convert nitrous oxide N2O to CO_2 eq. 310 ratio is used	The event will be additionally studied. Preparation of personnel to correctly implement the technology.

6	Industrial sector (cement production) CO_2	Use of oxidative alternative catalysts in ammonia production	technological	The introduction of technology will reduce CO_2 emissions up to 30-50% by 2030. 1.57-2.6 Gg. NOx will be reduced in gas and therefore, this reduces eq. greenhouse gas emissions.	reduction of greenhouse gas emissions (Gg CO_2 eq)	Alternative oxidation catalysts produce up to 80 - 90 % less N2O than platinum-based catalysts. 6.75 kg N2O/t HNO3. To convert nitrous oxide N2O to CO_2 eq. 310 ratio is used	Project budget 1.5-2 mln US dollars. The event will be additionally studied. Preparation of personnel to correctly implement the technology.
7	Industrial sector (ferroalloys production) CO_2	Recuperation of energy from arc furnaces in ferroalloys production	technological	Implementation of the technology will reduce CO_2 emissions by 7.2Gg annually	Enhancement of energy efficiency and reduction of greenhouse gas emissions (Gg CO_2 eq)	The introduction of technology reduces energy consumption by 13.5% compared to current situation. With the introduction of technology 70 GWh power generation is achieved per year. The emission reduction coefficient due to saving electricity is 0.104 kg / kWh. Network Emission Factor for Georgia, Ministry of Energy (2017)	Arc furnace, which produces carbon monoxide rich off-gas (70-90% CO), can be combined with air in its steam boiler and generated steam, can be transferred to a turbine for electricity generation. The off-gases should be cleaned up in wet scrubber before being used as secondary fuel. Project budget of 16 million US dollars.
8	Industrial sector (steel/iron production) CO_2	The use of internal regeneration in iron/steel production and rolling in the continuous cycle of hot molds. 1. Heating air using the heat gained from exhaust air, which is supplied to gas burners in the combustion process.2. the continuous cycle of the hot cast through a methodical furnace for rolling	technological	Greenhouse gas emissions will be reduced by 0.4 Gg in the first version, by 3 Gg- and in the second one	Enhancement of energy efficiency and reduction of greenhouse gas emissions (Gg CO_2 eq)	The introduction of the first variant of technology reduces energy consumption by 10% and the second by 70-80%. The natural gas used in technology will be reduced, which will consequently reduce the greenhouse gas emissions by 0.202 kg per KWh of thermal energy generated.	Project budget of 0.3 million US dollars. The event is to be additionally studied to ensure the effectiveness of technology through continuous process modes.

Waste sector							
1	Waste sector, CH_4	Introduction of separation on the source of household waste in municipalities (paper, plastic, glass, metal).	technological/ policy development	By 2020: Recycled Glass-20%, Paper-30%, Plastic-30%, Metal-70%. By 2030: Recycled Glass-80%, Paper-80%, Plastic-80%, Metal-90%.	Methane reduction (Gg CH4), number of new jobs, recycled glass (t), paper, plastic and metal quantities (t).	Reduction of greenhouse gases by 2030 in comparison to the BAU scenario through recycling. Assumptions: There are appropriate enterprises for paper, glass etc. recycling.	1. Implementation of the practice of separation by the sources of glass, paper, plastic and "other waste" 2. Developing fiscal measures for fiscal encouragement; 3. Preparation/implementation of the return system for alcoholic and non-alcoholic beverage bottles and tins; 4. Creating a paper collection system and strengthening capacities of processing facilities. Project Budget: 1. Establishment of separation in pilot municipalities - 2.5 million EUR; 2. Fiscal Encouragement for separation - 100,000 EUR; 3. The introduction of the system of return of bottles by the manufacturers - 250,000 EUR; 4. Introduction of paper collection system - 200,000 EUR
2	Waste sector, CH_4	Reduction of biodegradable wastes in landfills - composting of biodegradable waste from the production of wine, agricultural activities and organic fraction of municipal waste.	technological	Quantitative targets are based on composting masses and methods, which will later be specified.	Compost value; emission reduction (Gg CO_2 eq).	Composting of biodegradable wastes instead of placing them on the landfill will reduce methane emissions from landfills.	Implementation of pilot projects 1. Composting of biodegradable waste from municipalities- 200,000 euros; 2. Composting of the biodegradable waste of wine producing -150 000 euros; Composting of biodegradable agricultural wastes - 250,000 euros.
Agricultural sector							
1	Agricultural sector CO_2, CH_4, N_2O	Construction of Biogas Power Plant and Organic Fertilizer Unit. Production of biogas from manure and agricultural residues, installation of biogas engine (1 MW Biogas Power Plant) and supply generated electricity (about 6 million kWh) to grid. Supply thermal Energy through recovery of Biogas engine waste heat.	Technology development	Greenhouse gas emission reduction- 624 t CO_2 eq.	Installed Biogas power plant and Organic Fertilizer Unit	Grid Emission factor 0.104 kg CO_2 eq/kWh (Ministry of Energy, Georgia, 2017)	6 million kWh electricity supplied to grid. due to replacement of fossil fuel-based electricity GHG emissions are reduced by about 2 thousand tons of CO_2
Forestry and land use							
1	LULUCF, CO_2, CH_4, N_2O	Planting of Soil Protection Forests on Eroded Slopes and Establishment of Forest Nurseries in Upper Svaneti	reforestation/ capacity building	To plant forest on 23.3 ha territory, re-establish plant nursery in Svanety region.	Reforested Area (ha)	GHG emission/sink estimates according to IPCC guidelines	Estimated annual CO_2 sink of 4.4 Gg after ten years of planting. Total cost of the project - 46,161 USD.

Chapter 4 Support Received and Needs

4.1 Support Received

Georgia has received significant assistance from donors during the last 8 years in climate change field. Since 2017, the project "Preparation of the Fourth National Communication and the Second Biennial Update Report of Georgia to UNFCCC" has been implementing with financial support of the Global Environmental Fund (GEF)[41]. The purpose of the project is to assist the country in preparation for the Fourth National Communication and the Second Biennial Update Report of Georgia to the Conference of the Parties to fulfill the obligations under the Convention 1/CP.16 (paragraph 60), 2/CP.17 Decision (paragraph 41) and its Annex III. The project is being implemented by UNDP in Georgia.

Below are listed the donor funded projects providing financial, technical and capacity building support. As of 2018, Georgia has not received any technology support from donors and partner countries.

[41] Development of Georgia's Fourth National Communication and Second Biennial Update Report to the UNFCCC, total budget is 1.2 mln. USD (852,000 USD grant provided by GEF, and the rest of it is Georgia's in-kind contribution).

Table 26 - Support Received

Year	Sector	Project	Objective of support (Mitigation Adaptation Cross-cutting, Other)	Type of support (Financial, Capacity building, technical support)	Financial instrument and amount of support	Donor/ Implementing agency
2014-2016	Cross-sectoral	Georgia's First Biennial Update Report	To assist Georgia in the preparation of its BUR1 for the fulfillment of the obligations under the United Nations Framework Convention on Climate Change (UNFCCC).	Financial	352,000 USD (Grant), 64,000 USD (Co-financing)	GEF/UNDP
2015-2018	Cross-sectoral	Harmonization of Information Management for Improved Knowledge and Monitoring of the Global Environment in Georgia	Develop individual and organizational capacities in the Ministry of Environment and Natural Resources Protection, and the Environmental Information and Education Centre for improved monitoring of environmental impacts and trends for elaboration of collaborative environmental management.	Financial/Technical/Capacity building	1.25 million USD GEF (Grant), 1.3 million USD (Co-financing)	GEF/UNDP
2016-2018	Cross-sectoral	Green Climate Fund (GCF) Readiness Programme in Georgia	Developing National Capacities and Mechanisms for Accessing, Allocating and Monitoring of GCF Climate Finance Resources in Georgia	Capacity building, technical support	287,000 USD (Grant)	GCF/GIZ
2016-2019	Cross-sectoral	Information Matters: Capacity Building for Ambitious Reporting and Facilitation of International Mutual Learning through Peer-to-Peer Exchange	To strengthen in-country capacities for enhanced reporting under the United Nations Framework Convention on Climate Change (UNFCCC).	Capacity building, technical support	131,207 EUR (Grant)	BMU/GIZ
2016-2019	Cross-sectoral	Vertically Integrated Climate Policies (VICLIM)	To support the achievement of Georgia's nationally determined contributions (NDCs) by improving the cooperation between national and sub-national actors (municipalities and cities) in mitigation related policy making, planning and project implementation	Capacity building, technical support	131,000 EUR (Grant)	BMU/GIZ
2017-2021	Cross-sectoral	Capacity Development for climate policy in the countries of South East, Eastern Europe, the South Caucasus and Central Asia, Phase III	Support project countries to integrate their climate mitigation goals into national development strategies and, hence, into budgetary planning and regulative frame conditions	Capacity building, technical support	Total grant 10.1 million EUR, for Georgia: 1.2million EUR	BMU/GIZ

Year	Sector	Project	Objective of support (Mitigation Adaptation Cross-cutting, Other)	Type of support (Financial, Capacity building, technical support)	Financial instrument and amount of support	Donor/ Implementing agency
2018-2025	Cross-sectoral	Scaling-up Multi-Hazard Early Warning System and the Use of Climate Information in Georgia	Reducing the climate risk to Georgia's communities by supporting infrastructure and their livelihoods.	Financial/Technical/Capacity building	27.1 million USD GCF (Grant), 43.2 million USD (Co-financing)	GCF/UNDP
2010-2011	Energy	Telasi Rehabilitation Project	To improve the quality and reliability of supply and reduce losses in the electricity distribution network.	Financial	25 million USD (Loan)	EBRD
2010-2013	Energy	Black Sea Energy Alliance – Georgia	To expand the Georgian power transmission system by around 260 kilometers of new high voltage power lines (500 kV) from Gardabani and Zestaponi to a new substation in Akhaltsikhe, near the Turkish border.	Financial	25 million EUR Grant, 75 million EUR (Loan)	kfW,EIB,EBRD&NIF
2011-2014	Energy	Pharavani HPP	To build the first green field 85 MW hydro power plant in Georgia.	Financial	92 million USD (Loan), 5 million USD (Equity)	EBRD/IFC
2011-2015	Energy	Promotion of Biomass Pellet Production and Utilization in Georgia	To promote sustainable production and utilization of upgraded biomass fuels in heating applications in the municipal services sector of Georgia, thereby reducing dependence on fossil fuels and avoiding GHG emissions.	Financial/Technical/Capacity building	1 million USD (Grant), 4.5 million USD (Co-financing)	GEF/UNDP
2014-2016	Energy	Dariali HPP	To develop, construct and operate Dariali HPP, a 108 MW hydroelectric power plant to be located on the Tergi river in north-eastern Georgia.	Financial	80 million USD (Loan)	EBRD
2014-2017	Energy	Shuakhevi HPP	To develop, construct and operate Shuakhevi HPP, a 87 MW hydroelectric power plant to be located on the Adjaristskali river in south-western Georgia.	Financial	247.5 million USD (Loa)n, 34 million USD (Equity)	IFC, ADB&EBRD
2014-present	Energy	Transmission Grid Strengthening Project	To provide reliable power transmission to the southwestern part of the grid, upgrade electricity exchange systems, and provide economically efficient, environmentally, and socially sustainable electricity sector planning.	Financial	60 million USD (Loan)	The World Bank, IBRD&IDA

Year	Sector	Project	Objective of support (Mitigation Adaptation Cross-cutting, Other)	Type of support (Financial, Capacity building, technical support)	Financial instrument and amount of support	Donor/ Implementing agency
2014-present	Energy	GEORGIA - Jvari-Khorga Interconnection	To (i) Strengthen the reliability and stability of the Georgian transmission network; (ii) Pave the way for investments in more hydropower production in northwest Georgia; and (iii) Improve capacity and reliability of the electricity system supplying areas of significant demand growth.	Financial	47 million EUR (Loan), 8 million EUR (Investment grant)	KfW, EBRD & NIF
2015-present	Energy	Georgian Low Carbon Framework	To develop, construct and operate renewable energy generation projects in Georgia and to support the government strategy to foster low carbon generation, cover the country's seasonal winter demand and to support private ownership in the energy sector.	Financial/Technical/Capacity building	120 million USD (Grant)	EBRD
2016-2033	Energy	GCF-EBRD Sustainable Energy Financing Facilities	Deliver climate finance to the private sector at scale through Partner Financial Institutions across 10 countries.	Financial	68 million USD Grant, 1.317 billion USD (Loan for 10 countries)	GCF/EBRD
2017-present	Energy	Enguri HPP Climate Resilience Upgrade	To make improvements to Enguri HPP to alleviate critical power shortage in Georgia at a low cost and to enhance the environmental benefits of the Enguri Hydro Power Plant facility. Specifically, to increase the availability of non-polluting renewable energy in the country and to improve operational safety of the Enguri power facility.	Financial/Technical	28 million EUR (Loan)	EBRD
2017-2022	Energy	Geeref Next	Catalyzing private sector investment for renewable energy and energy efficiency projects across the developing world.	Financial	15 million USD GCF (Grant), 250 million USD (GCF) and 30 million USD (EIB) (Equity for 30 countries)	GCF/EIB
2017-present	Energy	Extension of the Georgian Transmission Network	To provide grid infrastructure for promotion of net integration of hydropower plants (HPPs), Increase transmission capacities, including cross-border trade and improve security of energy supply of Georgia.	Financial	9.9 million EUR (Loan with Grant Component)	NIF/kfW

Year	Sector	Project	Objective of support (Mitigation Adaptation Cross-cutting, Other)	Type of support (Financial, Capacity building, technical support)	Financial instrument and amount of support	Donor/ Implementing agency
2018-present	Energy	Nenskra HPP and Portage	To develop and construct a hydro power plant with the total installed capacity of 280 MW on the Nenskra and Nakra rivers in the Svaneti region in north-western Georgia.	Financial	451.6 million USD (Loan), 15 million, USD (Equity)	EBRD, EIB & Korean Development Bank
2018-present	Energy	The Norwegian Kingdom Grant to Georgia in Energy Sector	To promote development of renewable energy sources, develop a normative base and prepare qualified personnel	Financial/Technical	4 million USD (Grant)	The Norwegian Kingdom
2013-2017	Transport	Green Cities : Integrated Sustainable Transport in the City of Batumi and the Adjara Region	To promote sustainable transport in the City of Batumi and Region of Adjara	Financial/Technical	853,000 USD (Grant), 10.6million USD (Co-financing)	GEF/UNDP
2009-2014	LULUCF	Establishment of Javakheti National Park in Georgia	To protect globally important staging and breeding ground for migratory and resident bird species, of which several are listed as endangered in the IUCN Red Data Book.	Financial	2.25 million EUR (Grant)	BMZ, KFW / WWF Germany, Agency of Protected Areas
2010-2015	LULUCF	Restoration of forest burnt by forest fires in armed conflict between Russia-Georgia in 2008.	To restore forest burnt by forest fires in armed conflict between Russia-Georgia in 2008.	Financial	1.5 million EUR (Grant)	Government of Finland, UNDP / LEPL NFA
2012-2014	LULUCF	Preparation of Management Plan for Tusheti Protected Landscape	To create the care plan for the protected landscape area Tusheti, and furthermore, to create the guidelines for creation of the general care plan.	Financial	107,000 USD (Grant)	Czech Development Agency / Agency of Protected Areas
2012-2016	LULUCF	Sustainable management of pastures in Georgia to demonstrate climate change mitigation and adaptation benefits and dividends for local communities	To rehabilitate 4,064 ha of degraded pastures, about 300 ha of migratory route and introduce and implement sustainable pasture management practices among farmers and sheep-breeders in the Vashlovani Protected Areas.	Capacity building / Financial	1.390 million USD (Grant)	EU, UNDP / Agency of Protected Areas

Year	Sector	Project	Objective of support (Mitigation Adaptation Cross-cutting, Other)	Type of support (Financial, Capacity building, technical support)	Financial instrument and amount of support	Donor/ Implementing agency
2014-2015	LULUCF	Adaptive Sustainable Forest Management in Borjomi-Bakuriani Forest District	To improve sustainable management of forests, adaptation to climate change, promotion of co-benefits (such as biodiversity protection, poverty alleviation and improving the livelihood and resilience of local communities) with full stakeholder participation in Central Georgia" and to improve the livelihood of people by supporting the sustainable development and conservation of forest ecosystems in Georgia.	Capacity building / Financial	2 million EUR (Grant)	Austrian State Funding / LEPL National Forestry Agency
2014-2017	LULUCF	Expansion and Improved Management Effectiveness of the Achara Region Protected Areas	To enhance the management effectiveness of Protected Areas to conserve forest ecosystems in the Achara Region.	Capacity building / Financial	1.323 million USD (Grant)	GEF / UNDP
2015-present	LULUCF	Sustainable Forest Governance in Georgia Phase II	To develop National Forest Policy implementation tools and to mainstream forestry priorities in relevant sectors' policy documents; To modernize Forest Management Practices, based on the best international experiences and to support forest management decentralization.	Capacity building / Financial	1 million EUR (Grant)	ADA / CENN
2013-present	Agriculture	Enhancing Resilience of Agricultural Sector in Georgia (ERASIG)	Improve water availability, farmland productivity and smallholders' income through investments in climate-resilient farming systems and VC technologies.	Financial/Technical	5.4 million USD (Grant), 27.5 million USD (Co-financing)	GEF/International Fund for Agricultural Development
2018-present	Agriculture	Generating Economic and Environmental Benefits from Sustainable Land Management for Vulnerable Rural Communities of Georgia	To develop and strengthen sustainable land management (SLM) practices and build capacity at municipal scale for their application for the protection of natural capital in Georgia. Farmers apply sustainable land management and climate smart agricultural practices in support of food security and resilience on 10,000 ha of pilot plots.	Financial/Technical/Capacity building	1.5 million USD GEF Grant, 4.7 million USD Co-financing	GEF/UNEP & REC Caucasus

4.2 Financial, Technical, Technological and Capacity Building Needs

Georgia faces different financial, technical, technological and capacity building needs in order to fulfil the commitments under the United Nations Framework Convention on Climate Change and 'Paris Agreement' and to take sustainable mitigation measures in different sectors. It is still needed to continue technical and financial support to prepare National Communications and Biennial Update Reports, which will assist institutional capacity building and integration of climate change issues in national policy and strategies.

Based on the consultations with representatives of public, private, non-governmental organizations and independent experts, barriers and shortcomings of effective implementation of climate change mitigation measures have been revealed, the most important of which are:

- Despite some progress since the submission of the first BUR there is still a room for improvement in coordination on climate change issues among public entities on the one hand and among general public, private and non-governmental organizations on the other hand;
- There is a limited successive nature among projects and experience sharing;
- Lack of assigned staff in public entities, responsible for integration of climate change issues in sectoral policy and strategic plans;
- Fragmented legislative and institutional framework on climate change issues;
- Lack of domestic financial resources for climate change measures;
- Lack of coordinated cooperation among public agencies in communication with donor organizations and international financial institutions on climate change related fundraising;
- Lack of involvement of research and academic institutions in climate change issues;
- Low awareness of public entities involved in the process on climate change issues;
- Limited public awareness, resulting in absence of public demand on climate change actions;
- Lack of educational courses and programs on climate change issues;
- Low level and pace of development and implementation of climate friendly and sustainable technologies; Adverse environment (trade, customs, financial legislative framework), absence of consulting, the base of spare parts and services.

A part of these problems is expected be solved after creation of the Climate Change Committee[42] with appropriate mandates and resources. The committee will help the public, private and non-governmental sectors and academia to integrate climate change issues in their policies and strategic plans, also will support coordinated cooperation with donors and financial institutions, improvement of legislation, increase of public awareness on climate change issues, development and implementation of clean technologies etc.

In 2012, with the financial support of GEF and the United Nations Environment Program (UNEP) and technical assistance from Risoe Center, the Ministry of Environmental and Natural Resources protection of Georgia prepared a Technology Needs Assessment (TNA) document. Within the framework of the project, assessment of the needs of the climate change mitigation technologies for Georgia was conducted. Priority fields and desirable technologies have been identified in accordance with development priorities and the potential for greenhouse gas reduction. The market chain of the selected technologies introduction and related barriers were analyzed. Action plans and pilot project idea proposals were introduced to implement

[42] The Ministry of Environment Protection and Agriculture has initiated the process of the Climate Change Committee formation, a working draft of the Committee's Regulations is on the stage of preparation and discussion.

relevant technologies with a limited capacity. However, due to the above-mentioned problems, no significant changes have been observed in the field of technology transfer and development.

More specifically, the existing sector-related barriers and the need for adequate financial, technical and capacity building are shown in the table below.

Table 27 - Financial, Technical, Technological and Capacity Building Needs

Sector	Barriers and Gaps	Needs	Type of needs *(financial(F), technical(T), capacity building(CB))*	Status of the needs
Cross-Cutting	Lack of software and knowledge needed to analyze long-term forecasting and mitigation measures for greenhouse gas emissions	Establish training programs on the assessment of the effect of long-term forecasting and mitigation measures of greenhouse gas emissions, as well as, their cost-benefit analysis in academic and research institutes. Purchasing and implementing models for forecasting.	F, T & CB	Identified in the BUR1 and still valid
Cross-Cutting	Lack of knowledge-experience required to prepare proposals and financial reports in accordance with the requirements of financial instruments of the convention	Technical assistance and capacity building of local private, public and non-governmental organizations to study and explore new financial mechanisms	CB & T	Identified in the BUR2
Cross-Cutting	Non-existence courses and teaching programs on climate change in universities and schools	Creation of curriculum / syllabus of training programs and courses on climate change, preparation and retraining of relevant personnel	CB	Identified in the BUR1 and still valid
Cross-Cutting	There are no national/plant specific emission factors, hampering the inventory of GHGs by using high-level methodologies.	Preparation and certification of relevant qualified staff for conducting data collection, audits and monitoring. Promote the introduction of appropriate training programs. Determining the national/plant specific emission factors.	CB & T	Identified in the BUR1 and still valid
Cross-Cutting	Deficiency of qualified personnel needed for the identification of clean and energy efficient/climate sensible technologies. Absence of relevant educational and professional vocational training programs	Facilitate the preparation of training programs for the deployment of climate friendly technologies	F, T & CB	Identified in the BUR1 and still valid
Energy	Lack of local financial resources for the introduction of clean technologies. There is no a long-term and concessionary credit line in the country	Development of an institution like National Energy Efficiency Fund, which provides stable and long-term credit to both physical and legal entities	F & T	Identified in the BUR1 and still valid
Transport	For the effective planning of mitigation measures in the transport sector, the relevant statistical data are lacking. The National Statistics Office has limited financial and human resources	Collect and analyze relevant data for energy efficiency indicators in the transport sector. Mobilize additional financial and human resources for the National Statistics Office	F & T	Identified in the BUR1 and still valid

Sector	Barriers and Gaps	Needs	Type of needs *(financial(F), technical(T), capacity building(CB))*	Status of the needs
Industry	The problem of selection and deployment of energy efficient technologies in industrial enterprises	Retrain the staff of the enterprises to select the best available technologies.	CB & T	Identified in the BUR2
Agriculture	Low awareness of farmers on nitrogen fertilizer norms and another better alternative. Excessive use of fertilizers is frequent in Georgia.	Preparation of relevant training and information materials for raising awareness of farmers on the nitrogen fertilizer norms and other ecologically pure alternatives in the soil, organize trainings and conferences.	CB & T	Identified in the BUR1 and still valid
Agriculture	Inadequate awareness of farmers on biogas production technologies from animal waste and their benefits	Improve awareness of farmers on biogas technology by implementing pilot projects and training programs	CB & T	Identified in the BUR2
Agriculture	Lack of financing and high preliminary expenditure of biogas technology installation prevents biogas generation from dung	In order to stimulate the development of the sector, preferential loans, government grants / subsidies and cost sharing programs, as well as the production of cheap biogas technologies are needed	F & T	Identified in the BUR2
LULUCF	There is no land use monitoring mechanism in the country to improve registering the absorption of greenhouse gases and emissions	Promoting land use research using remote sensing databases, capacity building and technical support of local experts and institutions.	CB & F	Identified in the BUR1 and still valid
LULUCF	Lack of information about land types and quality of land degradation in Georgia	Determine, update and specify data on land types and degradation quality.	F & T	Identified in the BUR1 and still valid
Waste	There are no reliable data on the number and composition of waste located on landfills in the country. Qualified staff is limited, low level of experience and awareness there is no enough financial resources and deficiencies in relevant legislation.	Technical assistance and strengthening capacity of the National Statistics Office through the sharing of international practice of collecting, processing and using the necessary data. Strengthening capacity of the relevant responsible body in terms of waste management	F, T & CB	Identified in the BUR1 and still valid
Waste	In all landfill operation projects, there is defined methane extraction and usage, but because of the lack of awareness there is still not selected the best technological solution	Technical assistance is needed to select the best relevant technological solution	T	Identified in the BUR2
Waste	Mismanagement wastewater discharge systems, insufficient quantity of treatment facilities and problems related to shale management raised in active treatment facilities - lack of stabilization practices	The need for attracting financial resources for building and rehabilitation of wastewater infrastructure	F	Identified in the BUR2

Sector	Barriers and Gaps	Needs	Type of needs *(financial(F), technical(T), capacity building(CB))*	Status of the needs
Waste	Lack of qualified staff and modern equipment in research laboratories for analysis.	Preparation and retraining of appropriate personnel, rehabilitation of existing laboratories	F & T	Identified in the BUR2

The needs identified during the Technical Analysis of the First Biennial Update Report of Georgia are provided below in the table.

Table 28 - The needs identified during the Technical Analysis of the First Biennial Update Report of Georgia by the TTE

Sector	Barriers and Gaps	Needs	Type of needs *(financial, technical, capacity building)*	Status of improvement
LULUCF	Enhancing the national capacity of experts to develop the GHG inventory for the LULUCF sector, including the development of a land-use matrix in accordance with the requirements set out in the 2006 IPCC GL	The capacity building trainings and workshops were conducted for the LULUCF experts aiming to improve the GHG inventory quality through the design of a land-use matrix corresponding with the 2006 IPCC GL requirements.	Capacity Building	Partly implemented
Energy	Enhancing the national capacity to process primary data on fuel use in the national economy and/or at the sectoral level, taking particular account of structural changes in energy use since 1990	Since 2013, the GEOSTAT has been publishing the annual National Energy Balances including sectoral use of fuel. With support of the IEA, the GEOSTAT improves the data quality year to year. The AD for the previous years is provided by the IEA. Further improvement is planned under the CBIT project.	Capacity Building	Partly Implemented
IPPU	Developing a data management system for the IP sector and enhancing the capacity of the relevant national institutions to collect and provide more reliable activity data needed for the development of the GHGI for this sector (specifically considering the following categories: lime production, limestone and dolomite use, lubricant and paraffin wax use and road paving with asphalt)	The data for the lime production and road paving with asphalt has been gathered from the national statistics office and a factory processing the lime. The data gathering system for the lubricant and paraffin wax use functions based on the national energy balance. Accordingly, the aggregated data has been provided since 2013. Further improvement is planned under the CBIT project.	Technical Support	Partly implemented
Agriculture	Developing a data management system for the agriculture sector and enhancing the capacity of the national institutions to conduct studies, research and assessments, focused on collecting and providing the enhanced activity data	The system was created, allowing automatically collect and archive the data for the inventory of greenhouse gases from relevant sources under the UNDP/GEF project - "Improvement of Global Environmental Monitoring and Improvement of Knowledge of Information Management in Georgia." Further improvement is planned under the CBIT project.	Technical Support	Partly implemented
Waste	Developing a data management system for the waste sector and enhancing the capacity of the national network of research institutions	The system was created, allowing automatically collect and archive the data for the inventory of greenhouse gases from relevant sources under the UNDP/GEF project - "Improvement of Global Environmental Monitoring and Improvement of Knowledge of Information Management in Georgia." Further improvement is planned under the CBIT project.	Technical Support	Partly implemented

Sector	Barriers and Gaps	Needs	Type of needs *(financial, technical, capacity building)*	Status of improvement
IPPU	Enhancing the national capacity to improve methodologies and procedures for gathering data on emissions of hydrofluorocarbons and perfluorocarbons	The actual emissions from the air conditioning and refrigerant source-category have been estimated first time by use of Tier 1 method of the IPCC 2006 GL. Further improvement is planned under the CBIT project.	Capacity Building	Partly implemented
Energy and IPPU	Enhancing the national capacity to adopt higher-tier methodologies for the most relevant source categories (e.g. 1.B.2 fugitive emissions from natural gas transmission and distribution, 1.A.3.b road transport, 2.B.1 ammonia production and 2.B.2 nitric acid production)	The tier 2 methods have been applied for 2.B.1 ammonia production and 2.B.2 nitric acid production with a combination of IPCC default values and factory specific data. National emission factors were used in calculation of fugitive emissions from natural gas transmission and distribution. Further improvement is planned under the CBIT project.	Capacity Building Technical Support	Partly implemented
LULUCF	Enhancing the national capacity to plan and implement sustainable forest management practices	With the support of ADA "Sustainable Forest Governance in Georgia Phase II" Georgia develops National Forest Policy implementation tools and modernizes Forest Management Practices, based on the best international experiences.	Capacity Building	Partly implemented

Chapter 5 Measurement, Reporting and Verification

5.1 Introduction

The Measurement, Reporting, Verification (MRV) chapter of Georgia's First Biennial Update Report on Climate Change (BUR1) submitted in 2016, covered the experience of Georgia with MRV and MRV arrangements in the period of 2010 to 2013. In BUR1, the plans to establish a domestic measurement, reporting and verification (MRV) system were described, targeting, at first, domestically supported Nationally Appropriate Mitigation Actions (NAMA), while taking into consideration the possibility to accommodate the requirements for MRV of internationally supported NAMAs, as well as of other mitigation activities in the future.

There have been significant developments related to the design of the domestic MRV system in Georgia since the release of BUR1. Further studies were conducted, and recommendations provided for a more detailed assessment of the MRV, specifically the institutional arrangements, legal setup, and overall design of the system. Most of the relevant work was conducted by GIZ under the project "Information Matters: Capacity Building for Ambitious Reporting and Facilitation of International Mutual Learning through Peer-to-Peer Exchange". The final publications related to the domestic MRV in Georgia under this project are listed below:

- Background paper on a legal setup for MRV in Georgia
- High Level Strategy (Roadmap) for Establishing the Necessary Institutional Framework and System for MRV
- Guidance Document: MRV of Support needs and support received
- Guidance Document: Methods to Improve the Inventory of Hydrofluorocarbon (HFC) Emissions in Georgia

Through these GIZ-supported activities, the necessary elements to develop the MRV system were further analyzed in detail and preparations of the necessary legal documents for institutionalizing the MRV system

were drafted. Additionally, it was proposed by various stakeholders to integrate a monitoring and evaluation system for adaptation activities in the national MRV system to allow more efficient tracking of the progress of Georgia towards achieving its goals under the Paris Agreement, providing a new and more comprehensive approach for an MRV system in Georgia that will allow the country to move smoothly towards the application of the Enhanced Transparency Framework under the Paris Agreement.

Georgia also joined during the reported period the Capacity Building Initiative for Transparency (CBIT) funded under the sixth period of the Global Environmental Facility (GEF-6) through the "Georgia's Integrated Transparency Framework for Implementation of the Paris Agreement"[43] project. The project includes the design and deployment of an integrated, bottom-up MRV system that accounts for action both at the municipal level and at the national level. CBIT support is expected to be used to create the necessary reporting structures to allow municipal level data to be incorporated directly into the country's national GHG inventory system, thereby feeding into Georgia's climate policies and targets.

This chapter provides a brief update of the experience of Georgia with MRV since the submission of BUR1, the proposed revised design of domestic MRV system in the country, respective institutional arrangements and the implementation plan. The chapter also provides an analysis of the identified existing gaps on the road towards the establishment of a sustainable MRV system and the required support for overcoming them.

5.2 Experience with MRV in Georgia

Georgia has experience with the different elements of MRV for greenhouse gas (GHG) emissions through project- and program-based activities, and preparation of the national GHG inventory.

The earliest experience that Georgia had with MRV on a project basis was through the implementation of Clean Development Mechanism (CDM) projects under the Kyoto Protocol. Out of seven registered CDM projects[44] in the country, only three issued CERs in the past; however, due to the carbon market conditions since the submission of the BUR1, no additional CERs issuance took place. It is important to integrate that experience in the design of the MRV in Georgia, especially in relation to data gathering and MRV execution in the energy sector, which is envisioned to be a major target for future mitigation actions.

Georgia also acquired experience in designing MRV for NAMAs. Although NAMAs were originally envisioned as an approach to support large scale mitigation activities in the period prior to the Paris Agreement, NAMAs are currently viewed by many practitioners as one of the ways to support the implementation of the NDCs. Table 29 is reproduced from BUR1 and provides the list of NAMAs from Georgia registered in the NAMA Registry of the UNFCCC. There have been no additional NAMA activities initiated since the BUR1 submission.

Table 29 - NAMAs from Georgia in the NAMA Registry as of November 2018[45]

NAMA Title	Developed by
Adaptive Sustainable Forest Management in Borjomi-Bakuriani Forest District	National Forest Agency
Efficient use of biomass for equitable, climate proof and sustainable rural development	Women in Europe for a Common Future

[43] https://www.thegef.org/project/integrated-transparency-framework-implementation-paris-agreement
[44] See http://cdm.unfccc.int for details.
[45] https://unfccc.int/topics/mitigation/workstreams/nationally-appropriate-mitigation-actions/nama-registry

Energy Efficient Refurbishment in the Georgian Public Building Sector	Ministry of Environmental Protection and Agriculture Ministry of Economy and Sustainable Development Ministry of Energy

Source: UNFCCC, Georgia's BUR1

The NAMAs are currently not implemented, but once in operation, they still have the potential to provide a good basis for the execution of the domestic MRV system. The only MRV system that is currently operational in Georgia is the one established under the Covenant of Mayors,[46] an EU initiative under which 23 municipalities in Georgia have committed to voluntary GHG reductions. Under this initiative, participating municipalities have estimated their GHG emissions baseline, developed sustainable energy action plans, as well as MRV methodologies to capture the effects of the proposed mitigation actions. The experience from the Covenant of Mayors is taken into consideration while updating the design of the MRV system of Georgia.

In addition to the project, program and regional (municipality) MRV systems, it is important to emphasize the experience of Georgia with MRV under its national GHG inventory system. Most of the data for the GHG inventory, prepared as part of the previous three NC and BUR1 was sourced from the National Statistics Office of Georgia (GEOSTAT).[47] With certain additional arrangements, the GEOSTAT is expected to become a key player in the process of operationalization of the MRV system in Georgia, both for adaptation and mitigation activities.

When discussing the MRV system in Georgia, it is important also to look at the experience with MRV for finance (or MRV for Support). Currently, Georgia does not formally have a system for tracking climate change mitigation and adaptation financial flows, neither domestic nor international. At the same time, the Ministry of Finance of Georgia and the Government of Georgia keeps track of all approved donor supported projects. Government agencies also keep track of the projects that they are implementing. These existing systems and databases can easily become the basis for the future MRV for finance, as explained later in this chapter.

Finally, the GIZ studies and consultations with stakeholders emphasized the need to incorporate a monitoring and evaluation system for adaptation in the overall MRV system in the country, with the establishment of a tracking system for adaptation activities as the first step. Georgia does not possess any system for tracking climate change adaptation activities at the moment. Thus, currently, it is impossible to get a clear picture of the resources invested domestically or internationally for climate change adaptation, except for donor-funded projects marked explicitly as climate change adaptation or cross-cutting area projects. At the same time, government entities, such as the Ministry of Regional Development and Infrastructure, implement a large number of adaptation activities often labeled as disaster risk management projects. Therefore, it is considered that with appropriate classification of adaptation activities and coordination among the relevant government entities, it will be possible to develop a system for tracking adaptation activities in Georgia, which is considered as the first step in establishing a monitoring and evaluation system for climate change adaptation.

[46] Covenant of Mayors for Climate & Energy. https://www.covenantofmayors.eu/en/
[47] National Statistics Office of Georgia. *GEOSTAT Official Website*. 2018. http://www.GEOSTAT.ge/index.php?action=0&lang=eng

5.3 Design of the Domestic MRV System in Georgia

The Georgian domestic MRV system is proposed to be designed in a holistic manner and in line with the existing UNFCCC Guidelines, covering not only GHG emissions, but also SDG co-benefits of the implemented mitigation activities, tracking of adaptation activities and MRV for financial flows for climate change mitigation and adaptation. The system not only reflects the current vision of the Georgian Government on MRV design and implementation but is also designed in a manner that allows Georgia to track its progress towards achieving its NDCs and implement the Enhanced Transparency Framework requirements.

The MRV system follows the principles of cost efficiency and utilization of existing infrastructure, as already described in BUR1, and utilizes as much as possible the existing systems and processes for data collection, reporting, and verification, including quality control and quality assurance procedures.

The mitigation MRV methodological approach follows the most recent developments related to national MRV systems and looks into a balance between conservativeness and ease of application. The methodological approach refers to the assumptions made in the national GHG inventory of Georgia, such as NCV for fuels, and others, allowing for the necessary information for emission reductions form individual activities to be collected from the already existing information in the GHG inventory and statistical data. The approach will be adjusted following further guidance on this by the UNFCCC.

The Government of Georgia is supportive of the idea of introducing an MRV for SDG co-benefits following appropriate guidance and decisions by the UNFCCC. The BUR1 refers to the UNDP SD Evaluation Tool which was developed to evaluate the sustainable development performance indicators and sustainable development results achieved over the lifetime of NAMAs. However, there is an updated, more recent tool, which is better suited for the domestic MRV purpose, the UNDP Climate Action Impact Tool.[48] These tools can serve as a basis for the MRV for SDG co-benefits.

The adaptation communication principles were taken into consideration while designing the monitoring and evaluation system for adaptation. The decisions[49] of COP24 in Katowice confirmed that the purpose of the adaptation communication is to:

"…
(a) Increase the visibility and profile of adaptation and its balance with mitigation;
(b) Strengthen adaptation action and support for developing countries;
(c) Provide input to the global stock take;
(d) Enhance learning and understanding of adaptation needs and actions."

It was further decided that the adaptation communication shall be "country-driven and flexible, including in the choice of communication or document, as provided in Article 7, paragraphs 10 and 11, of the Paris Agreement and shall not pose any additional burden on developing country Parties, is not a basis for comparisons between Parties and is not subject to a review."

Taking into consideration the current experience of Georgia in communicating adaptation activities and the available data, at this stage only, a tracking system for adaptation activities is proposed to be implemented and used as a basis for adaptation communication. As most agencies in Georgia involved in the implementation of adaptation activities are not confident which activities should be reported under adaptation, an online questionnaire and checklist is planned to be developed to allow tracking of adaptation related work. The concept of the questionnaire consists of the project name, project size (in GEL), project

[48] United Nations Development Programme. *Climate Action Impact Tool*. https://climateimpact.undp.org/#!/
[49] https://unfccc.int/sites/default/files/resource/l21_0.pdf

location, project period, investor and other elements. The type of relevant adaptation projects can be selected from a drop menu allowing for the ease of use of the tracking tool by all relevant agencies, without requiring extensive training.

In the future, the system is expected to evolve into an operational monitoring and evaluation system for adaptation, where set of indicators will be set up for different types of adaptation activities and their achievement will be monitored during and after individual project implementation. The GCF/UNDP project "Scaling-up Multi-Hazard Early Warning System and the Use of Climate Information in Georgia" can be used as a prototype how such a system can be developed in Georgia.

The MRV for Support is developed based on the guidance document on the MRV of support needs and support received, produced through the "Information Matters: Capacity Building for Ambitious Reporting and Facilitation of International Mutual Learning through Peer-to-Peer Exchange in Georgia". The document provides guidance to the Ministry of Environment and Natural Resources Protection of Georgia (MENRP)[50] on the reporting of needs and support received, taking into account the UNFCCC framework and existing experiences from developing countries. The key part of the MRV system for financial flows is that it utilizes the existing tracking system for donor-supported project implemented by the Government of Georgia.

5.3.1 Institutional Arrangements to Facilitate the MRV System

Current Institutional Framework

The existing institutional arrangements of Georgia's MRV system is shown in figure below.

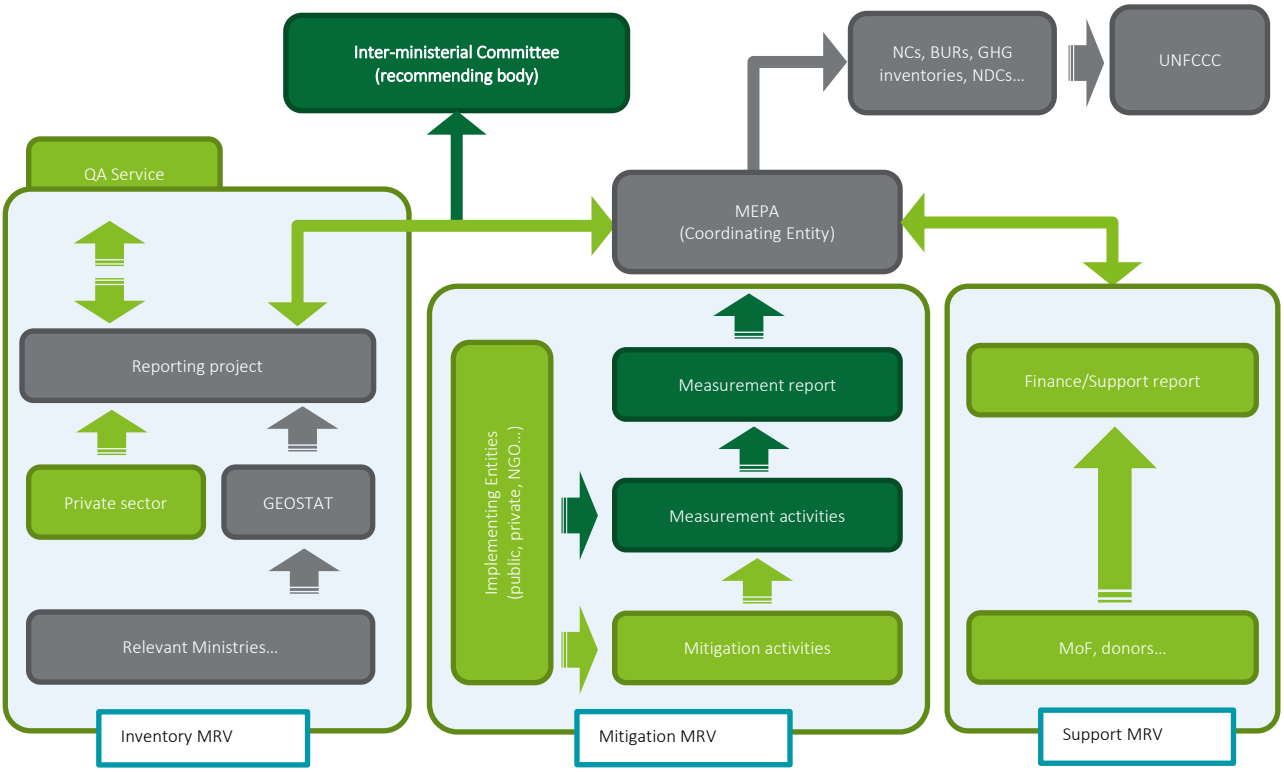

Figure 6 - Current MRV Implementation Framework in Georgia

[50] In December 2017, MENRP was merged with the Ministry of Agriculture to form what is now the Ministry of Environmental Protection and Agriculture of Georgia (MEPA).

In the figure, those in gray are elements of the MRV system that are currently in place. The current MRV system is mainly focused on data collection and reporting on GHG inventories. Elements necessary for a holistic MRV system are in place such as defined roles and responsibilities of key stakeholders as indicated by those in light green in the diagram. However, capacities of these key stakeholders need to be further developed in order for the MRV system to be sustainable. Moreover, this could be strengthened with the establishment of policies such as a law, decree or ordinance for the MRV system. To further enhance the MRV system, it is proposed to include additional elements in dark green in the diagram, and is discussed in further detail in the next section.

Proposed Institutional Framework

Following to extensive discussions with stakeholders and taking into consideration the mandates of the existing institutions, an updated MRV system is designed, based on the Draft Papers for Institutional Setup of Reporting Systems in Georgia, a High-Level Strategy (Roadmap) for Establishing the Necessary Institutional Framework and System for MRV.

In the period after the release of BUR1 and the Roadmap, the Ministry of Environmental Protection and Agriculture worked with GIZ experts and local stakeholders to identify the possible ways for improving the MRV system in Georgia from the viewpoint of its operationalization. The existing model of the Low Emission Development Strategy (LEDS) coordination committee established under the project EC-LEDS supported by USAID was presented and analyzed as a possible basis. The analysis concluded that maintaining the inter-ministerial format of the committee is the most appropriate option, while enhancing the mandate of the committee to take over a supervisory role and provide policy direction and guidance on all climate change activities, including MRV

Currently, MEPA considers the preferable option for establishing the committee (Council) – under the Office of the Prime Minister of Georgia. The latter option has been attracting more support from stakeholders. In that case, the Climate Change Council under supervision of Prime Minister would require the technical support from the MEPA through its Climate Change Division and possibly the logistical support from the government administration office.

The new organizational structure proposes MRV system covering of GHG inventory preparation and operation, mitigation and adaptation actions, and support. MEPA will be supported by the Environmental Information and Education Centre of Georgia, which will also serve as a technical advisory body and all the work will be supervised by a separate body (Climate Change Council). The proposed institutional framework for the MRV system is presented in the figure below. The description of the individual functions is based on the GIZ report on the draft institutional setup of the MRV system in Georgia.

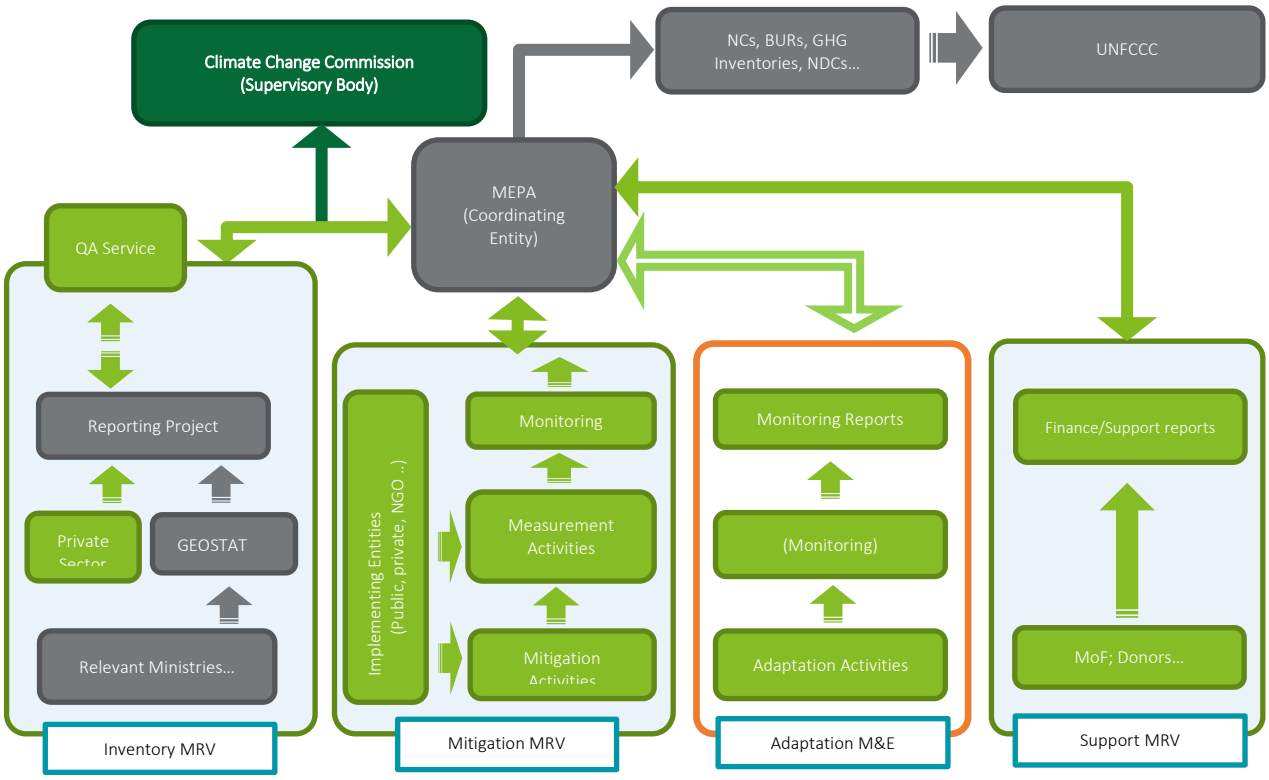

Figure 7 - Proposed Institutional Framework for the MRV System in Georgia

Climate Change Council (Supervisory Body)

A Climate Change Council (CCC) proposed to be established under the Office of the Prime Minister of Georgia will have a wider mandate to provide policy direction and guidance on all climate change activities, including MRV. The Council will include representatives from different line ministries such as the Ministry of Environmental Protection and Agriculture (MEPA), Ministry of Economy and Sustainable Development, Ministry of Finance and others. This will ensure streamlining of climate change issues into the policies and strategies of the different ministries. Moreover, having representatives from different ministries will ensure ownership of the processes and that any proposed action related to climate change, which is relevant to any of the ministries, is feasible and implementable. The main roles and responsibilities of the Council are proposed to be as follows:

- Overall guidance and supervision of climate action in Georgia
- Formulating strategies and actions which promote the implementation of mitigation and adaptation actions;
- Determining roles and responsibilities of the MRV system and future reporting requirements under the Paris Agreement;
- Approving national action plans for climate change to be developed by relevant ministries;
- Addressing obstacles facing national efforts in the field of studies and research related to climate change;
- Addressing any obstacles facing the collection and management of data related to climate change;
- Suggesting to the Ministry of Finance budget allocation for climate change adaptation and mitigation projects;
- Approving projects that are submitted for funding to the GCF;
- Approving any updates to the NDC of Georgia.

In relation to MRV system implementation, three additional units are proposed to be established within the CCC: GHG Inventory, Mitigation and Adaptation, and Support. Within each of the three units, a Quality Manager Officer should be appointed to be responsible for performing quality checks of the data and reports received from different entities.

The proposed role of the **GHG inventory unit** is to coordinate the preparation of the GHG inventory and be responsible for receiving collected data from GEOSTAT and other data providers to compile the inventory. Another responsibility of this unit is the development of the required inventory reports.

The proposed role of the **Mitigation and Adaptation Unit** is to compile information collected by different entities implementing mitigation actions on the progress of actions and on the estimated mitigation impacts as well as to prepare reports related to mitigation (mitigation section in the BUR and NC or new reporting requirements for NDC under Paris agreement). Additionally, the unit will track the adaptation activities in Georgia in order to lay the foundations of the Monitoring and Evaluation system for adaptation activities.

The proposed role of the **Support Unit** is to collect data related to climate finance or other support received e.g. technology or capacity building projects from the Ministry of Finance and other relevant stakeholders, such as international donors, and to compile such data and issue required reports (support section under the BUR or new reporting requirements under Paris Agreement).

It is also recommended to consider the creation of a separate unit for adaptation reporting in the long term, as this is likely to become a requirement under the Enhanced Transparency Framework under the Paris Agreement.

The proposed size (number of staff members) and responsibilities for the 3 units in the CCC are included in the table below.

Table 30: Responsibility and Sizes of the Proposed Units within the CCC

Unit	Size	Responsibilities
Inventory	4 to 5	• GHG inventory preparation activities including: - Data sets compilation from data providers; - Data quality checks; - Calculation of emissions from different sectors; - Development of an inventory database; - Updating of the inventory database; - Development of QC/QA plan. • Defining a timeline for the inventory cycle. • Setting up and maintaining cooperation agreements with relevant ministries, agencies and private sector organizations. • Coordinating the timely delivery of inputs and eventually compiling reports. • Making sure that resources are available to keep the system functioning. • Ensuring that improvements of the system are identified and regularly conducted. • Maintaining an archiving system for inventory data.
Mitigation and Adaptation	2 -3	• Mitigation actions MRV including: - Calculation of baseline emissions; - Estimation of aggregated emission reductions from different mitigation actions; - Review of calculations done by other entities, if any; - Review of data quality, assumptions, and methodologies (e.g., modelling outputs);

		- Identification of co-benefits in addition to GHG emission reductions; - Compilation of results and preparation of reports. • Setting up and maintaining cooperation agreements with relevant ministries, agencies and private sector organizations. • Communicating with engaged stakeholders. • Coordinating the timely delivery of inputs and eventually compiling reports. • Performing checks for continuous improvements. • Developing templates for reporting of mitigation actions and associated impacts. • Collecting data to track the implementation of Georgia's NDCs. • Development of a database and archiving system for mitigation actions. • Communication with proposed Climate Change Committee on implementation of NDCs. • Tracking of adaptation activities • Development of Monitoring and Evaluation indicators
Support	1 – 2	• Communicating with relevant ministries, agencies and private sector organizations to collect data on financial support for climate-related projects • Collection of data related to support received for adaptation projects. • Communicating with relevant ministries, agencies and private sector organizations to collect data on technology transfer and capacity building projects • In cooperation with relevant ministries, identify needed financial resources and capacity needs for the implementation of mitigation and adaptation projects. • Development of reporting templates for support needed and received

Ministry of Environmental Protection and Agriculture (Coordinating Entity)

The Ministry of Environmental Protection and Agriculture is proposed to be the coordinating entity of the MRV system. The coordinating entity is responsible for all coordination activities for the MRV system in addition to the compilation of all reports required under the UNFCCC e.g., BUR, NCs, or future reporting requirements under the Paris Agreement. The main roles envisaged for the coordinating entity include:

- Plan and conduct all coordination and consultation activities
- Identify all institutions and teams involved (stakeholder mapping)
- Allocate responsibilities for all components of the MRV system within MEPA and other stakeholders involved in the MRV process
- Develop and monitor a time frame and schedule for the preparation of the required deliverables
- Identify constraints and gaps, and related financial, technical and capacity needs
- Keep any committees/working groups informed of progress and emerging issues
- Develop and oversee the implementation of a QA/QC system
- Provide guidance on methodologies, templates and standards to be used for monitoring and reporting of relevant data
- Allocate staff members for the preparation of the required deliverables
- Develop and maintain an archiving system

The development of a fully functional coordinating entity is expected to require significant resources and time. Thus, it is proposed to take actions in the short term with the available resources. In the long term,

adding capacity and resources to MEPA by including more units will enable MEPA to gradually increase the required responsibilities.

The role of coordinating entity is crucial in the sustainable setup of the MRV system. The following paragraphs identify actions needed in the short and long term for further development of the MEPA into a fully functioning coordinating body.

In the short and medium term, funding for MRV activities is secured by the GEF. If the funding method under the UNFCCC changes in the future or if Georgia joins the EU, the proposed structure may need to look for additional/alternative funding sources. In this case, funding can be allocated from the Ministry of Finance to MEPA for carrying out MRV activities and establishment of the new proposed units under the MEPA.

The challenge in the short term will be the limited resources available at MEPA, which would mean additional workload and effort. For the purpose of Inventory MRV, in the short term, it is proposed to appoint a GHG inventory coordinator from existing inventory experts. The GHG inventory coordinator can be responsible for the following activities:

- Establishing roles and responsibilities for GHG inventory preparation;
- Defining a timeline for regular update of the inventory;
- Setting up and maintaining cooperation agreements (i.e., memorandums) with relevant ministries, agencies and private sector organizations;
- Coordinating the timely delivery of inputs and eventually compiling reports;
- Making sure that resources are available to keep the system working;
- Ensuring that improvements of the system are identified and regularly conducted.

It is also proposed to appoint another coordinator for mitigation actions in the short term. The responsibility of the mitigation coordinator is the overall coordination of MRV of mitigation actions, providing guidance on the information needed for UNFCCC from implementing institutions. It is suggested that a framework for mitigation action MRV is established in order to ensure a common approach to the development of MRV systems, based on the technical guidance of the WRI Policy and Action Standard [51] and the NAMA reporting template used by UNEP RISO.[52] The coordination of the NAMA/mitigation actions MRV system will lie with the CCC, in the form of validation of monitoring plans, review of annual NAMA reports, etc. Moreover, the mitigation coordinator can handle coordination activities with outsourced consultants involved in the development of mitigation chapters in either the BUR or NC.

In the long term, the role and responsibilities of MEPA need to be extended so that MEPA develops the capacity to deal with challenges and tasks related to the implementation of the Paris Agreement and its Enhanced Transparency Framework.

[51] https://www.wri.org/publication/policy-and-action-standard
[52] UNEP DTU NAMA Pipeline Analysis and Database. *NAMAs Information Note (NINO) template*. http://www.namapipeline.org/Publications/URC_NINOtemplate2012.docx

There exist international funding opportunities for securing the functioning of the coordinating entity by, e.g. making use of GEF-funds for BUR[53] and NC preparation and from the Capacity Building Initiative for Transparency (CBIT)[54].

Technical Working Group for MRV

The development of special templates, methodologies, and standards is essential for a functional MRV system and requires special technical expertise. Therefore, a Technical Working Group for MRV (TWG-MRV) is proposed to be established within the Environmental Information and Education Centre (EIEC). The role of the TWG-MRV is to design templates for collection data for GHG, mitigation actions, and support. Moreover, the role includes preparation of protocols and standards for estimation of mitigation actions impacts. It is also proposed that the TWG-MRV provides technical advice and capacity building to the proposed units to be established under the Climate Change Council and to GEOSTAT. Technical advice may include complex methodological issues which would require special expertise or advice on specific assumptions or surrogate methods which can be used to fill in gaps in data. Drawing upon external expertise, which might not be available within the proposed units under Climate Change Service and GEOSTAT, will serve this purpose. Available expertise from universities and different research institutes may be utilized for the technical working group. The use of this approach would allow for a wider range of expertise that can be available to the process of MRV in Georgia. However, relying too much on external support needs to be decreased by time to allow for a more sustainable MRV system.

Data Providers

Efficient and reliable data providers are key for a successful implementation of an MRV system. This section describes the proposed entities for providing the needed data for GHG inventory, mitigation and adaptation actions, and support.

GHG Inventory

the GEOSTAT is proposed to be the entity, which would provide most of the data needed for inventory purposes. If needed, other entities such as industry associations can be a good source of data that are not reported to the GEOSTAT. Currently, the GEOSTAT collects many of the data relevant for the preparation of GHG inventory. However, some data are not collected or are not in the proper format needed for inventory purposes. Therefore, modification of data collection templates will be needed and capacity building of the GEOSTAT personnel involved in data collection is important. Given the fact that data is already collected by the GEOSTAT from different ministries, building on the existing system would be more cost effective than establishment of a new data collection system. Data that is collected by the GEOSTAT should be subject to quality control procedures by all departments involved in data collection. A quality control plan should be developed and made mandatory for all departments to follow. All data used for inventory purposes should be validated and checked. Well-trained personnel on QA/QC at each of the existing departments in the GEOSTAT are essential.

Since the development of capacity of the GEOSTAT is expected to take some time, a short-term strategy can be relying on agreements/memoranda of understanding with relevant ministries to collect data needed for inventory preparation until the capacity of the GEOSTAT is developed. The drawback of relying on agreements or memoranda of understanding is the non-sustainability of such approach. In most developing

[53] Global Environment Facility. *GEF Policy Guidelines for the financing of biennial update reports for Parties not included in Annex I to the United Nations Framework Convention on Climate Change*. https://www.thegef.org/sites/default/files/documents/GEF_Policy_Guidelines__for_the_financing_of__Biennial_update_reports_for_Non-Annex_1_Parties.pdf

[54] Global Environment Facility. *Capacity Building Initiative for Transparency (CBIT)*. https://www.thegef.org/topics/capacity-building-initiative-transparency-cbit

countries, memoranda of understanding are not respected after changes in administration or governments. Having a system which is based on a strong legal instrument e.g. a law or a prime ministerial decree ensures the continuity and sustainability of the data collection process.

In order to address barriers to data collection such as confidentiality issues, a proposal for legal set-up is under preparation by Information Matters project.

Mitigation and Adaptation Activities

Different ministries/entities implementing mitigation and adaptation activities are proposed to be the providers for data required to monitor such actions. This is a dynamic process as new entities are always added whenever a mitigation or adaptation action on a national or sectoral level is implemented. Ongoing capacity building should be offered to such entities to be able to collect the required data and perform any required analysis before submitting the data to the coordinating entity. The templates and methodologies to be used by entities involved in mitigation actions are proposed to be prepared by TWG-MRV.

Support

The Ministry of Finance and donor and implementing agencies are proposed as sources of data for support. For all grant- based projects above GEL 100,000, the Ministry of Finance has to be informed. Moreover, any loan-based project has to be approved by the Ministry of Finance and the Executive Council of Government Ministers of Georgia (The Cabinet of Georgia). Although the Ministry of Finance has the information on all donor-funded projects and projects funded by the domestic budget, indicators to identify and classify climate-related projects are not in place yet. The Ministry of Finance follows the International Monetary Fund (IMF) classification of projects. It is therefore proposed to modify the classification of projects to be able to clearly identify support received, which is climate related. The main gaps with support data will be for projects financed by the private sector as such projects are not reported to the Ministry of Finance. Therefore, it is important to add any relevant climate funded project in the system by the concerned ministry, which may have the data related to such projects. A separate guidance document on the MRV of support is under preparation for Georgia, which will include specific recommendations on how to enhance this aspect.

Quality Assurance

Quality assurance of developed reports is an important step in any MRV system. It is essential to review the developed reports by external experts/entity, which were not involved in the preparation of such reports. It is proposed to have a QA/QC coordinator in the proposed coordinating entity. The QA/QC coordinator should be responsible for coordinating all QA/QC activities within the MRV system. The quality assurance of the reports may be done by third Party experts, who would be Council ed by MEPA, under coordination of the QA/QC coordinator.

5.3.2 Measurement and Monitoring

The measurement of the impact of mitigation activities implemented in Georgia is conducted by each implementing entity. The implementing entities can be government institutions, municipalities, NGOs, private entities or any other organizations and institutions that implement the mitigation activity.

The measurement is aimed to be executed in a simplified manner following approved templates, guidance and standards. In case specific standards do not exist, the implementing entity may request the TWG-MRV to provide guidance and/or develop the new templates and standards.

A set of default values will be developed for each of the sectors where mitigation activities are implemented in order to simplify the measurement on the side of the implementing entities, while still maintaining conservativeness, transparency and accountability. The default values will be determined based on data by GEOSTAT and other official sources. For example, for the energy sector, as long as grid emission factor values, default values for energy loss in the transmission and distribution system are established, measurement can be simplified for electricity generation (e.g. for renewable energy generation activities) or electricity consumption (e.g. for energy efficiency activities).

The tracking of adaptation activities will be conducted by the government agencies implementing those. They will use a predesign template provided in online format by the Environmental Information and Education Centre.

All mitigation and adaptation data will be eventually compiled within the EIEC.

5.3.3 Reporting

For the ease of implementation of the reporting process, sector-specific templates for reporting will be designed. The templates will allow standardization of reporting requirements and procedures and will allow to easily processing the data reported as a result of all mitigation activities.

It is noteworthy that the reporting templates will contain a section to describe the application of the QA/QC procedures in order to further improve the overall quality of reporting. The QA/QC approach and the uncertainty assessment of the inventory that is provided in the respective chapter of this BUR report will be also referred to during the operationalization of the MRV system. The QA/QC procedures should be designed and implemented by each implementing entity, while following guidance from the TWG-MRV and the existing Georgian national requirements.

Reporting will be conducted at predetermined intervals and will be streamlined with the already existing reporting processes, such as statistical reporting. However, the data collection system of GEOSTAT does not specifically operate for the purpose of execution of MRV. Similar issues were identified in the preparation of the national GHG Inventory.

In order to overcome this, at the stage of design of new mitigation activities, consultations will be conducted with GEOSTAT to confirm the availability of required data and the need for any changes in order to request different or more detailed data than the available ones. GEOSTAT possess a system to accommodate such requests and update its data collection system and statistical reporting forms at annual intervals. Training on MRV will be provided to GEOSTAT in the process of MRV operationalization to facilitate this process.

5.3.4 Verification

All measurement reports shall be subject to verification. For transparent operation of the MRV system, the verification process is designed as a third-party independent process under the verification guidelines to be approved by the Climate Change Services. The verification procedure also includes the circulation of the document to the key line ministries for their comments, which has already addressed to the BUR2 preparation cycle.

The verification guidelines will reflect the national circumstances in Georgia, including the specific conditions in the various sectors of the economy, as well as the existing national requirements and procedures. The domestic MRV system will prioritize national verifiers and will actively work towards building sufficient local capacity. The verifiers can be individuals and/or companies employing individuals that meet at least the following requirements:

- A minimum of three years of experience in energy audit, ISO audit or CDM validation and verification.
- Valid certification for ISO 14064-3.
- Proven knowledge of Georgian energy, forestry and other relevant sectors.

A list of national experts, who can support the MRV system, including the adaptation part, is provided in the table below.

Table 31 - Local Experts

Name	Institution	Certificate/Experience
Anna Sikharulidze	Remissia	Certified reviewer of greenhouse gas inventories of Parties included in Annex I to the UNFCCC Certified reviewer of NC, BR and BUR of Parties to the UNFCCC
Giorgi Machavariani	MEPA	Certified reviewer of NC, BR and BUR of Parties to the UNFCCC
Giorgi Mukhigulishvili	World Experience for Georgia	Certified reviewer of greenhouse gas inventories of Parties included in Annex I to the UNFCCC Certified reviewer of NC, BR and BUR of Parties to the UNFCCC
Kakhaber Mdivani	MEPA	Certified reviewer of greenhouse gas inventories of Parties included in Annex I to the UNFCCC Certified reviewer of NC, BR and BUR of Parties to the UNFCCC
Medea Inashvili		Certified reviewer of greenhouse gas inventories of Parties included in Annex I to the UNFCCC Certified reviewer of NC and BR of Parties to the UNFCCC
Marina Shvangiradze	Remissia	Certified reviewer of greenhouse gas inventories of Parties included in Annex I to the UNFCCC Certified reviewer of NC and BR of Parties to the UNFCCC

At the initial stage, the process for accreditation of verifiers will involve only a submission of a set of documents, confirming that the applicants fulfill the eligibility requirements listed above. Upon screening of the provided documents by the Environmental Information and Education Centre, accreditation will be granted by the CCS. With the operationalization of the MRV, and if deemed needed and practical, local accreditation standards may be further designed.

All measurement reports and their verification reports will be submitted to the MEPA. The MEPA will use the provided information to assess the impact of the ongoing mitigation activities and will report the results to the UNFCCC as part of the subsequent BURs, national communications and other reporting documents.

5.4 MRV Implementation Plan

The establishment of an MRV system is a complex process, consuming time and resources. In addition to the establishment of a working organizational structure, it is necessary that the MRV system is also legally supported through Government decrees on the work of the MRV. This will provide the legal basis for the relevant institutions to demand from the implementing entities to conduct measurement and reporting and subject the outcome of their work to verification. Furthermore, the legal basis of the MRV will allow the domestic MRV system to become permanent and independent of political changes. The process of and timelines for establishing the domestic MRV system in Georgia is presented in the figure below.

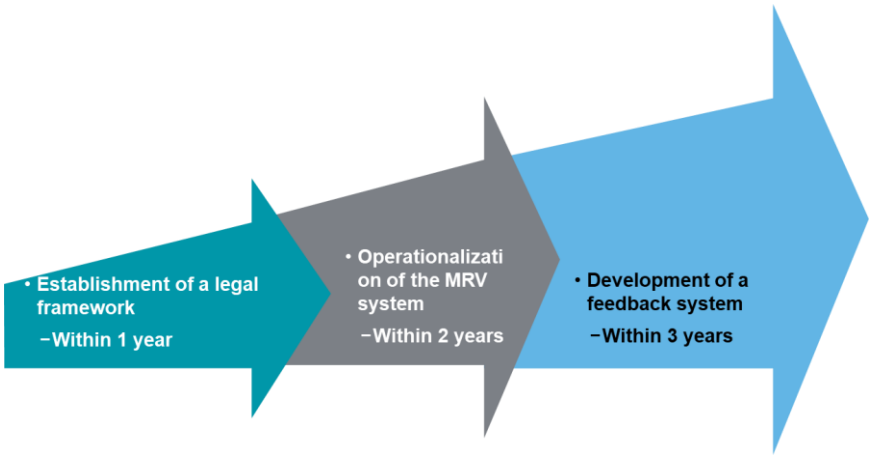

Figure 8 - Establishment of the MRV System

5.4.1 Establishment of the legal framework

The first and immediate step in the establishment of the MRV system involves finalization of the legal framework for the necessary institutional arrangements of the MRV system. The MEPA and the Office of the Prime Minister of Georgia shall initiate consultations with other relevant government entities and get their endorsement for the proposed system. A good basis for the institutionalization of the MRV system is the Background Paper on a Legal Setup for MRV in Georgia prepared by GIZ. It outlines recommendations for the development of an MRV legal framework document that allows Georgia meet current and future reporting obligations under the UNFCCC based on the existing framework of relevant institutions and legal instruments for climate change in the country and the challenges currently faced. It is important to

emphasize, however, that the Legal Setup paper does not reflect the recent institutional changes in Georgia and requires further updates.

To achieve the short-term goals, it is recommended to develop an ordinance of the Government of Georgia on a "Climate Change MRV System of Georgia". Many of the short-term goals outlined in the Report on Institutional Setup may be achieved and regulated within the ordinance, including the obligations of each line ministry (except regulated by law) and subordinated departments in data provision. As an example, in the case of the Ministry of Finance, the obligation will include provision of available data on international financial support for climate change activities within Georgia.

The ordinance should include a separate obligation for each ministry to appoint a focal point within its structure, which will be responsible for the collection of data relevant to the MRV System. Such an authority/obligation may be added to the already existing structural element within the ministries, which will require amendments to relevant charters of each ministry.

Assignment of new obligations to collect and provide information to GEOSTAT will require amendments to the law on official statistics. Relevant Changes must be made to the charter of the GEOSTAT as well.

5.4.2 Operationalization of the MRV System

The operationalization of the MRV system requires development of standards for conducting the MRV for mitigation activities and the operationalization of the tracking system for adaptation activities. This will be followed by the creation of a domestic registry of mitigation activities, covering the description of each activity and the parameters to be monitored. Furthermore, the measurement and data collection responsibilities, as well as reporting and verification processes will be established. The operationalization process will include also the application of the QA/QC procedures to ensure data quality.

5.4.3 Establishment of Feedback Mechanism

Once the MRV system is operational, sufficient data on the effect of the various mitigation actions will be collected, including data on GHG emission reductions, effect on sustainable development and financial flows. These data need to be analyzed in order to understand the impacts of the various mitigation activities and provide feedback to the national climate change and development policy of Georgia. Such a mechanism will also allow creating a more efficient model of policy making on the path to low carbon development.

5.5 Gap Analysis and Required Support

Analysis of the current situation in Georgia showed that there are certain gaps in several areas that might prevent the timely and successful implementation of the MRV system in the country.

5.5.1 Capacity

Despite the experience of Georgia with GHG MRV, there are a very small number of MRV experts on the ground. Therefore, it is reasonable to provide constant support for increasing the local capacity for MRV in different economic sectors through the training and education of the staff of the TWG-MRV and local verifiers. Furthermore, overall dissemination of information on the role of MRV and its importance in the combat against climate change and sustainable development should be conducted.

External support is required for overcoming this gap, including through training by international experts, development of training courses, and preparation of printed materials and publications targeted at experts and wider audience.

5.5.2 Legal Gap

There is currently no law or decree that defines MRV and its operation in Georgia. It is crucial that such a legal document is developed as soon as possible for the operationalization of the MRV. Although starting with a law may be difficult due to the time required for adopting such a document, the issuance of an Ordinance on MRV is expected to be the first step in defining the MRV legally.

The background paper on the legal setup for MRV in Georgia can be built upon for this purpose. Presenting a view on the legislative framework that is required to meet the country's reporting obligations under UNFCCC (i.e. Biennial Update Report and National Communication, as well as to meet future reporting requirements under the Paris Agreement), will allow the country to fulfill its international obligations stemming from international treaties and implement these obligations into national legislation.

5.5.3 Financial Gap

The current budget of the government has not allocated any funds for the establishment and operationalization of the MRV in Georgia. At the initial stages, existing structures, institutions and processes will be applied for the MRV. However, with the establishment of new institutions for designing MRV standards, additional financial support might be required until the full operationalization of the domestic MRV system.

Chapter 6 Annex

Table 32 - Uncertainty Analysis

	A	B	C	D	E	F	G	H	I	J	K	L	M
	2006 IPCC Categories	**Gas**	**Emissions of 1990**	**Emissions of 2015**	**Uncertainty of Activity Data**	**Emission factor / estimation parameter uncertainty**	**Combined uncertainty**	**Contribution to Variance by Category in Year 2015**	**A type sensitivity**	**B type sensitivity**	**Uncertainty in trend in national emissions introduced by emission factor /estimation parameter uncertainty**	**Uncertainty in trend in national emissions introduced by Activity Data uncertainty**	**Uncertainty introduced into the trend in total national emissions**
			Input data	**Input data**	**Input data (Note A)**	**Input data (Note A)**	$\sqrt{E^2 + F^2}$	$\frac{(G \bullet D)^2}{(\Sigma D)^2}$	**Note B**	$\left\|\frac{D}{\Sigma C}\right\|$	**I * F Note C**	**J * E * $\sqrt{2}$ Note D**	$K^2 + L^2$
			Gg CO_2-eq.	**Gg CO_2-eq.**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
1A1	Electricity and Heat Production - Liquid Fuels	**CO_2**	8172,17	0,00	1	5	5,10	0,00	-0,07	0,00	0,00	-0,07	0,00
1A1	Electricity and Heat Production - Gaseous fuels	**CO_2**	4604,23	1275,00	1	5	5,10	0,30	-0,01	0,03	0,24	-0,01	0,06
1A1	Heat Production and other Energy Industries - Solid Fuels	**CO_2**	955,46	344,51	1	5	5,10	0,02	0,00	0,01	0,07	0,00	0,00
1A2	Manufacturing Industries and Construction - solid fuels	**CO_2**	3519,07	801,60	5	5	7,07	0,23	-0,01	0,02	0,15	-0,04	0,02
1A2	Manufacturing Industries and Construction – biomass	**CO_2**	0,00	3,80	5	5	7,07	0,00	0,00	0,00	0,00	0,00	0,00
1A2	Manufacturing Industries and Construction - liquid fuels	**CO_2**	2008,10	31,90	5	5	7,07	0,00	-0,02	0,00	0,01	-0,08	0,01
1A2	Manufacturing Industries and Construction - Gaseous Fuels	**CO_2**	2007,79	224,60	5	5	7,07	0,02	-0,01	0,01	0,04	-0,06	0,00
1A3a	Civil aviation	**CO_2**	0,00	2,00	7	5	8,60	0,00	0,00	0,00	0,00	0,00	0,00
1A3b	Road Transportation - Liquid Fuels	**CO_2**	3603,22	3138,42	7	5	8,60	5,11	0,05	0,08	0,59	0,37	0,49
1A3b	Road transportation - Gaseous Fuels	**CO_2**	0,00	714,70	7	5	8,60	0,26	0,02	0,02	0,14	0,13	0,04
1A3c	Other transportation	**CO_2**	141,32	207,16	7	5	8,60	0,02	0,00	0,01	0,04	0,03	0,00

	A	B	C	D	E	F	G	H	I	J	K	L	M
	2006 IPCC Categories	Gas	Emissions of 1990	Emissions of 2015	Uncertainty of Activity Data	Emission factor / estimation parameter uncertainty	Combined uncertainty	Contribution to Variance by Category in Year 2015	A type sensitivity	B type sensitivity	Uncertainty in trend in national emissions introduced by emission factor /estimation parameter uncertainty	Uncertainty in trend in national emissions introduced by Activity Data uncertainty	Uncertainty introduced into the trend in total national emissions
			Input data	Input data	Input data (Note A)	Input data (Note A)	$\sqrt{E^2 + F^2}$	$\frac{(G \bullet D)^2}{(\Sigma D)^2}$	Note B	$\left\lvert\frac{D}{\Sigma C}\right\rvert$	I * F Note C	J * E * $\sqrt{2}$ Note D	$K^2 + L^2$
			Gg CO_2-eq.	Gg CO_2-eq.	%	%	%	%	%	%	%	%	%
1A4a	Commercial/Institutional - solid fuels	CO_2	85,85	3,08	5	5	7,07	0,00	0,00	0,00	0,00	0,00	0,00
1A4a	Commercial/Institutional - liquid fuels	CO_2	762,45	48,05	5	5	7,07	0,00	-0,01	0,00	0,01	-0,03	0,00
1A4a	Commercial/Institutional - Gaseous Fuels	CO_2	228,21	358,73	5	5	7,07	0,05	0,01	0,01	0,07	0,04	0,01
1A4b	Residential - solid fuels	CO_2	73,83	1,47	5	5	7,07	0,00	0,00	0,00	0,00	0,00	0,00
1A4b	Residential - liquid fuels	CO_2	986,76	50,79	5	5	7,07	0,00	-0,01	0,00	0,01	-0,04	0,00
1A4b	Residential - Gaseous Fuels	CO_2	2627,65	1362,67	5	5	7,07	0,65	0,01	0,04	0,26	0,07	0,07
1A4c	Agriculture, Fishing and Forestry - solid fuels	CO_2	56,76	0,99	7	5	8,60	0,00	0,00	0,00	0,00	0,00	0,00
1A4c	Agriculture, Fishing and Forestry - Liquid Fuels	CO_2	390,99	28,75	7	5	8,60	0,00	0,00	0,00	0,01	-0,02	0,00
1A4c	Agriculture, Fishing and Forestry - Gaseous Fuels	CO_2	70,48	8,33	7	5	8,60	0,00	0,00	0,00	0,00	0,00	0,00
1B1	Fugitive Emissions from Solid Fuel Mining and transformation	CO_2	62,20	11,48	5	300	300,04	0,08	0,00	0,00	0,13	0,00	0,02
1B2	Fugitive Emissions from Fuels - Oil and Natural Gas (Flaring, production, distribution)	CO_2	11,68	2,62	5	300	300,04	0,00	0,00	0,00	0,03	0,00	0,00
2A1	Cement Production	CO_2	C	C	5	5	7,07	0,17	0,01	0,02	0,13	0,07	0,02
2A2	Lime Production	CO_2	36,66	45,86	40	15	42,72	0,03	0,00	0,00	0,03	0,04	0,00
2B1	Ammonia Production	CO_2	C	C	5	7	8,60	0,11	0,01	0,01	0,12	0,04	0,02
2C1	Cast Iron and Steel Production	CO_2	C	C	10	25	14,14	0,00	-0,02	0,00	0,00	-0,17	0,03

	A	B	C	D	E	F	G	H	I	J	K	L	M
	2006 IPCC Categories	Gas	Emissions of 1990	Emissions of 2015	Uncertainty of Activity Data	Emission factor / estimation parameter uncertainty	Combined uncertainty	Contribution to Variance by Category in Year 2015	A type sensitivity	B type sensitivity	Uncertainty in trend in national emissions introduced by emission factor /estimation parameter uncertainty	Uncertainty in trend in national emissions introduced by Activity Data uncertainty	Uncertainty introduced into the trend in total national emissions
			Input data	Input data	Input data (Note A)	Input data (Note A)	$\sqrt{E^2 + F^2}$	$\frac{(G \bullet D)^2}{(\Sigma D)^2}$	Note B	$\left\|\frac{D}{\Sigma C}\right\|$	I * F Note C	J * E * $\sqrt{2}$ Note D	$K^2 + L^2$
			Gg CO_2-eq.	Gg CO_2-eq.	%	%	%	%	%	%	%	%	%
2C2	Ferroalloys Production	CO_2	C	C	5	25	25,50	0,75	0,01	0,01	0,38	0,05	0,15
5A	Forest land	CO_2	-6571,90	-5627,70	5	20	20,62	94,31	-0,09	0,15	4,26	-0,47	18,33
5B	Cropland	CO_2	-3265,40	-1942,90	15	75	76,49	154,73	-0,02	0,05	5,51	-0,36	30,48
5C	Grassland	CO_2	2800,50	2810,90	15	75	76,49	323,86	0,05	0,08	7,97	0,77	64,12
1A1	Stationary fuel combustion (except biomass)	CH_4	8,59	0,54	7	100	100,24	0,00	0,00	0,00	0,00	0,00	0,00
1A2	Fuel combustion (biomass)	CH_4	9,44	1,84	20	100	101,98	0,00	0,00	0,00	0,01	0,00	0,00
1A3a	Civil aviation	CH_4	0,09	0,03	7	50	50,49	0,00	0,00	0,00	0,00	0,00	0,00
1A3b	Road transportation	CH_4	20,60	39,60	7	40	40,61	0,02	0,00	0,00	0,06	0,01	0,00
1A3c	Other transportation	CH_4	0,07	0,12	7	100	100,24	0,00	0,00	0,00	0,00	0,00	0,00
1A4a	Commercial/Institutional	CH_4	9,50	2,60	5	100	100,12	0,00	0,00	0,00	0,01	0,00	0,00
1A4b	Residential	CH_4	126,30	105,80	5	100	100,12	0,79	0,00	0,00	0,40	0,01	0,16
1A4c	Agriculture, Fishing and Forestry	CH_4	5,03	0,16	7	100	100,24	0,00	0,00	0,00	0,00	0,00	0,00
1B1	Fugitive Emissions from Solid Fuel Mining and transformation	CH_4	676,51	124,82	5	300	300,04	9,83	0,00	0,00	1,42	-0,01	2,00
1B2	Fugitive Emissions from oil Extraction	CH_4	66,89	93,20	5	300	300,04	5,48	0,00	0,00	1,06	0,01	1,12
1B2	Fugitive Emissions from oil and natural gas production	CH_4	142,02	30,68	5	300	300,04	0,59	0,00	0,00	0,35	0,00	0,12
1B2	Fugitive Emissions from oil and natural gas Transmission and distribution	CH_4	5126,65	1768,22	50	100	111,80	273,84	0,00	0,05	6,69	0,17	44,73

	A	B	C	D	E	F	G	H	I	J	K	L	M
	2006 IPCC Categories	Gas	Emissions of 1990	Emissions of 2015	Uncertainty of Activity Data	Emission factor / estimation parameter uncertainty	Combined uncertainty	Contribution to Variance by Category in Year 2015	A type sensitivity	B type sensitivity	Uncertainty in trend in national emissions introduced by emission factor /estimation parameter uncertainty	Uncertainty in trend in national emissions introduced by Activity Data uncertainty	Uncertainty introduced into the trend in total national emissions
			Input data	Input data	Input data (Note A)	Input data (Note A)	$\sqrt{E^2 + F^2}$	$\frac{(G \bullet D)^2}{(\Sigma D)^2}$	Note B	$\left\lvert \frac{D}{\Sigma C} \right\rvert$	I * F Note C	J * E * $\sqrt{2}$ Note D	$K^2 + L^2$
			Gg CO_2-eq.	Gg CO_2-eq.	%	%	%	%	%	%	%	%	%
4A	Enteric fermentation	CH_4	57,0	1472,0	2150	40	44,72	30,36	0,03	0,04	2,23	0,52	5,23
4B	Manure management	CH_4	185,0	118,0	20	50	53,85	0,28	0,00	0,00	0,22	0,03	0,05
6A	Solid Waste Disposal Sides	CH_4	558,0	894,0	30	30	42,43	10,08	0,02	0,02	1,01	0,57	1,36
6B1	Industrial Waste Water handling	CH_4	124,0	47,0	30	50	58,31	0,05	0,00	0,00	0,09	0,01	0,01
6B2	Domestic Waste Water handling	CH_4	226,0	183,0	5	30	30,41	0,22	0,00	0,00	0,21	0,01	0,04
1A1	Stationary fuel combustion (except biomass)	N_2O	26,89	2,19	7	100	100,24	0,00	0,00	0,00	0,01	0,00	0,00
1A2	Fuel combustion (biomass)	N_2O	21,56	4,02	20	100	101,98	0,00	0,00	0,00	0,02	0,00	0,00
1A3a	Civil aviation	N_2O	0,00	0,00	7	100	100,24	0,00	0,00	0,00	0,00	0,00	0,00
1A3b	Road transportation	N_2O	54,90	60,50	7	50	50,49	0,07	0,00	0,00	0,11	0,01	0,01
1A3c	Other transportation	N_2O	2,55	0,22	7	100	100,24	0,00	0,00	0,00	0,00	0,00	0,00
1A4a	Commercial/Institutional	N_2O	3,70	0,70	5	150	150,08	0,00	0,00	0,00	0,00	0,00	0,00
1A4b	Residential	N_2O	26,50	21,10	5	150	150,08	0,07	0,00	0,00	0,12	0,00	0,01
1A4c	Agriculture, Fishing and Forestry	N_2O	1,33	0,08	7	150	150,16	0,00	0,00	0,00	0,00	0,00	0,00
2B2	Nitric Acid Production	N_2O	C	C	5	20	11,18	0,18	0,01	0,01	0,19	0,03	0,04
3	Solvents and other product use	N_2O	0,011	0,015	25	1	25,02	0,00	0,00	0,00	0,00	0,00	0,00
4B	Manure management	N_2O	286,0	253,0	50	100	111,80	5,61	0,00	0,01	0,96	0,22	0,96
4D1	Direct soil emissions	N_2O	1079,0	623,0	20	100	101,98	28,28	0,01	0,02	2,36	0,15	5,57

	A	B	C	D	E	F	G	H	I	J	K	L	M
	2006 IPCC Categories	**Gas**	**Emissions of 1990**	**Emissions of 2015**	**Uncertainty of Activity Data**	**Emission factor / estimation parameter uncertainty**	**Combined uncertainty**	**Contribution to Variance by Category in Year 2015**	**A type sensitivity**	**B type sensitivity**	**Uncertainty in trend in national emissions introduced by emission factor /estimation parameter uncertainty**	**Uncertainty in trend in national emissions introduced by Activity Data uncertainty**	**Uncertainty introduced into the trend in total national emissions**
			Input data	**Input data**	**Input data (Note A)**	**Input data (Note A)**	$\sqrt{E^2 + F^2}$	$\frac{(G \bullet D)^2}{(\Sigma D)^2}$	**Note B**	$\left\|\frac{D}{\Sigma C}\right\|$	**I * F Note C**	**J * E * $\sqrt{2}$ Note D**	$K^2 + L^2$
			Gg CO_2-eq.	**Gg CO_2-eq.**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**	**%**
4D3	Indirect soil emissions	**N_2O**	329,0	185,0	100	100	141,42	4,80	0,00	0,00	0,70	0,21	0,53
6B2	Domestic Waste Water handling	**N_2O**	57,0	58,0	5	70	70,18	0,12	0,00	0,00	0,15	0,01	0,02
2F	Consumption of halocarbons and sulfur hexafluoride (Refrigeration and Air Conditioning Equipment)	**HFC**	0,00	139,39	5	25	25,50	0,09	0,00	0,00	0,13	0,02	0,02
2F	Consumption of halocarbons and sulfur hexafluoride (Emissions from Appliances (electrical equipment)	**SF6**	0,00	0,32	5	100	100,12	0,00	0,00	0,00	0,00	0,00	0,00
	Total emissions:		**37404,44**	**11946,63**		**Percentage uncertainty in total inventory:**		**951,44**					**175,88**
								30,85				**Trend uncertainty:**	**13,26**

Table 33 - Uncertainty Values of Activity Data and Emission Factors

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
1A1	Electricity and Heat Production - Liquid Fuels	CO_2	According IPCC GHG uncertainty for main activity electricity and heat production, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is less than 1%. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (table 2.15). Therefore, the uncertainty was set at 1%.	According to the IPCC Guidelines, selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.
1A1	Electricity and Heat Production - Gaseous fuels	CO_2	According IPCC GHG uncertainty for main activity electricity and heat production, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is less than 1%. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (table 2.15). Therefore, the uncertainty was set at 1%.	According to the IPCC Guidelines, selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.
1A1	Heat Production and other Energy Industries - Solid Fuels	CO_2	According IPCC GHG uncertainty for main activity electricity and heat production, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is less than 1%. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (table 2.15). Therefore, the uncertainty was set at 1%.	According to the IPCC Guidelines, selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.
1A2	Manufacturing Industries and Construction - solid fuels	CO_2	According IPCC GHG uncertainty for Industrial combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 2-5%, but when data are based on extrapolation, uncertainty is about 3-10%. A complete official energy balance, according international standards and requirements was developed by the National Statistics Office of Georgia (GEOSTAT) in 2014 (for the 2013 reference period). The energy balance for 1990 was also developed by Official Statistics Office, however it was mostly based on soviet standards and methodologies, and was not fully in line with EU requirements. Therefore, the uncertainty was set at 5%.	According to the IPCC Guidelines, selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.
1A2	Manufacturing Industries and Construction - biomass	CO_2	According IPCC GHG uncertainty for Industrial combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 2-5%, but when data are based on extrapolation, uncertainty is about 3-10%. A complete official energy balance, according international standards and requirements was developed by the National Statistics Office of Georgia (GEOSTAT) in 2014 (for the 2013 reference period). The energy balance for 1990 was also developed by Official Statistics Office, however it was mostly based on soviet standards and	According to the IPCC Guidelines, selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
			methodologies and was not fully in line with EU requirements. Therefore, the uncertainty was set at 5%.	
1A2	Manufacturing Industries and Construction - liquid fuels	CO_2	According IPCC GHG uncertainty for Industrial combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 2-5%, but when data are based on extrapolation, uncertainty is about 3-10%. A complete official energy balance, according international standards and requirements was developed by the National Statistics Office of Georgia (GEOSTAT) in 2014 (for the 2013 reference period). The energy balance for 1990 was also developed by Official Statistics Office, however it was mostly based on soviet standards and methodologies and was not fully in line with EU requirements. Therefore, the uncertainty was set at 5%.	According to the IPCC Guidelines, selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.
1A2	Manufacturing Industries and Construction - Gaseous Fuels	CO_2	According IPCC GHG uncertainty for Industrial combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 2-5%, but when data are based on extrapolation, uncertainty is about 3-10%. A complete official energy balance, according international standards and requirements was developed by the National Statistics Office of Georgia (GEOSTAT) in 2014 (for the 2013 reference period). The energy balance for 1990 was also developed by Official Statistics Office, however it was mostly based on soviet standards and methodologies and was not fully in line with EU requirements. Therefore, the uncertainty was set at 5%.	According to the IPCC Guidelines, selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.
1A3a	Civil aviation	CO_2	Typical 7% https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf (pg. 3.69)	According to the IPCC Guidelines, with complete survey data, the uncertainty may be very low (less than 5 percent). Selecting a typical value for Emission Factors is within the 95% confidence interval and uncertainty is less than 5%. Therefore, a value of 5% was selected.
1A3b	Road Transportation - Liquid Fuels	CO_2	Typical 7%. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf (pg. 3.29)	Typical 5%.
1A3b	Road transportation - Gaseous Fuels	CO_2	Typical 7%.	Typical 5%.
1A3c	Other transportation	CO_2	Typical 7%.	Typical 5%.
1A4a	Commercial/Institutional - solid fuels	CO_2	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	According to the IPCC Guidelines, selection of typical value for Emission Factors is within 95% confidence interval and uncertainty has less than 5%.
1A4a	Commercial/Institutional - liquid fuels	CO_2	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case uncertainty of 5% was chosen, as	Typical 5%.

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
			comprehensive energy data collection system for official statistics exists since 2014.	
1A4a	Commercial/Institutional - Gaseous Fuels	**CO_2**	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case, uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	Typical 5%.
1A4b	Residential - solid fuels	**CO_2**	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case, uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	Typical 5%.
1A4b	Residential - liquid fuels	**CO_2**	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case, uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	Typical 5%.
1A4b	Residential - Gaseous Fuels	**CO_2**	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	Typical 5%.
1A4c	Agriculture, Fishing and Forestry - solid fuels	**CO_2**	The IPCC typical value of uncertainty for countries with less well-developed energy data systems, where no good practice of energy balances creation exists - is 10%; in case of countries with well-developed energy data systems the uncertainty is 5%. A complete official energy balance, according international standards and requirements was developed by the National Statistics Office of Georgia (GEOSTAT) in 2014 (for the 2013 reference period). The energy balance for 1990 was also developed by Official Statistics Office, however it was mostly based on soviet standards and methodologies and was not fully in line with EU requirements. Therefore, the uncertainty is 7%.	Typical 5%.
1A4c	Agriculture, Fishing and Forestry - Liquid Fuels	**CO_2**	Typical 7%.	Typical 5%.
1A4c	Agriculture, Fishing and Forestry - Gaseous Fuels	**CO_2**	Typical 7%.	Typical 5%.

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
1B1	Fugitive Emissions from Solid Fuel Mining and transformation	CO_2	Coal mining data provided by GEOSTAT is reliable and, therefore, the uncertainty value of 5% was chosen. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_4_Ch4_Fugitive_Emissions.pdf (pg. 4.15, 4.16)	According the IPPC methodology, using the typical emission factor for this category has a huge uncertainty value. Therefore, an uncertainty value of 300% was chosen. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_4_Ch4_Fugitive_Emissions.pdf (pg. 4.15, 4.16)
1B2	Fugitive Emissions from Fuels - Oil and Natural Gas (Flaring, production, distribution)	CO_2	Data on Oil and Natural Gas was provided by the Oil and Gas Corporation and is reliable. Therefore, an uncertainty value of 5% was chosen	According the IPPC methodology, using the typical emission factor for this category has huge uncertainty value. Due to the complexity of the oil and gas industry, it is difficult to quantify the net uncertainties in the overall inventories, Emission Factors and Activity Data. Therefore, an uncertainty value of 300% was chosen. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_4_Ch4_Fugitive_Emissions.pdf (table 4.2.4, table 4.2.5)
2A1	Cement Production	CO_2	Activity Data is quite accurate; therefore, its uncertainty value is within 5%.	Major source for emission factor uncertainty is associated with determining the CaO content of clinker. If clinker data are available, the uncertainty of the emission factor is equal to the uncertainty of the CaO fraction and the assumption that it was all derived from CaCO3 (Table 2.3)55. According methodology, it is assumed that the content of CaO is standard, associated with 4-8% of uncertainty. That's why, the uncertainty of Emission Factors is about 5%.
2A2	Lime Production	CO_2	The source of the data on lime production is National Statistics Office of Georgia (GEOSTAT), however, as far as lime production is scattered in many small enterprises, there are some risks for full coverage. According the IPCC methodology, this uncertainty could be quite big. In the case of Georgia, based on experts' assessment, the uncertainty of Activity Data from this source is estimated as 40%.	The stoichiometric ratio is an exact number and, therefore, the uncertainty of the emission factor is the uncertainty of lime composition, in particular of the share of hydraulic lime that has 15% uncertainty in the emission factor (2% uncertainty in the other types). Therefore, the total uncertainty is 15%
2B1	Ammonia Production	CO_2	Activity Data was collected from the National Statistics Office of Georgia (GEOSTAT), as well as from the enterprise Rustavi Chemical Fertilizers Plant, which is rather accurate data. Emissions are calculated from the used natural gas volume, as well as from the produced ammonia amount. Based on the expert judgment, their uncertainty is within 5%.	Based on the 2006 IPCC, the only required fuel uncertainty is estimated from determining the parameters of the CO_2 emissions coefficient for manufacturing the unit weight ammonia, which is about 6-7%, when using the Tier 1 approach. In Georgia's case, based on expert assessment, the overall uncertainty of the CO_2 emission coefficient is not less than 7%.
2C1	Cast Iron and Steel Production	CO_2	According guideline, the most important type of Activity Data is the amount of steel produced using each method and national statistics should be available and likely have an uncertainty of ± 10 percent. Therefore, uncertainty value of 10% was selected.	According 2006 IPCC methodology[56] the default Emission Factors for iron and steel production used in may have an uncertainty of ± 25 percent (see table 4.4).
2C2	Ferroalloys Production	CO_2	According IPCC methodology, the most important type of Activity Data is the amount of ferroalloy production by product type and national statistics should be available and likely have an uncertainty less than 5 percent. The Activity Data was collected from the National Statistics Office of Georgia (GEOSTAT), as well as from the Metallurgy	In case of using the Tier 1 method, the uncertainty of emission standard coefficients is estimated in a 25% range.

[55] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_2_Ch2_Mineral_Industry.pdf (pg. 2.17)
[56] https://www.ipcc-nggip.iges.or.jp/public/2006gl/pdf/3_Volume3/V3_4_Ch4_Metal_Industry.pdf (pg. 4.30)

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
			research Institute of Georgia. Therefore, the data is rather accurate. Based on expert assessment, their uncertainty value is 5%.	
5A	Forest land	CO_2	According to the IPCC methodology, uncertainties vary between 1-15% in 16 European countries (Laitat et al. 2000). Area data should be obtained using the guidance in Chapter 3 or from FAO (2000). Industrialized countries estimated an uncertainty in forest area estimates of approximately 3%. In Georgia's case 5% uncertainty was selected.	In Finland, the uncertainty of basic wood density of pine, spruce and birch trees is under 20% in studies of Hakkila (1968, 1979). The variability between forest stands of the same species should be lower or at most the same as for individual trees of the same species. In Finland, the uncertainty of biomass expansion factors for pine, spruce, and birch was approximately 10% (Lehtonsn et al., 2003). In eight Amazon tropical forest inventory plots, combined measurement errors led to errors of 10-30% in estimates of basal area change over periods of less than 10 years (Phillips et al., 2002). The overall uncertainty of country-specific basic wood density values should be about 20%
5B	Cropland	CO_2	Activity Data is quite accurate. Based on expert assessment, its uncertainty value is within 15%.	The sources of uncertainty when using the Tier 1 method include the degree of accuracy in land area estimates (see Chapter 3) and in the default biomass carbon increment and loss rates. Uncertainty is likely to be low (<10%) or estimates of area under different cropping systems since most countries annually estimate cropland area using reliable methods. A published compilation of research on carbon stocks in agroforestry systems was used to derive the default data provided in Table 5.1 (Schroeder, 1994). While defaults were derived from multiple studies, their associated uncertainty ranges were not included in the publication. Therefore, a de-fault uncertainty level of +75% of the parameter value has been assigned based on expert judgment.
5C	Grassland	CO_2	Activity Data is quite accurate. Based on expert assessment, its uncertainty value is within 15%.	According to the IPCC methodology and based on expert judgment, the default uncertainty value of 75% was selected.
1A1	Stationary fuel combustion (except biomass)	CH_4	Typical 7%.	According to the IPCC GPG document, Table 2.12 reads that the uncertainty boundary is in the 50%-150% interval. In Georgia's case the intermediate at 100% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf
1A2	Fuel combustion (biomass)	CH_4	In general, the data on consumption of firewood has high uncertainty. The data is based on survey results on consumption of energy forms, which was conducted by the National Statistics Office of Georgia (GEOSTAT), as well as data from Georgia's Energy Balance. Compared to the 2013 inventory report, more reliable data on consumption of fire wood is available, which has been collected by GEOSTAT since 2014 through household surveys and surveys in other sectors (industry, construction etc.). As mentioned above, the standard IPCC value of uncertainty for countries with less well-developed energy data systems, where energy balances creation are not well practiced, is 10%; in case of countries with a well-developed energy data systems, the uncertainty is 5%. Due to the fact that fire wood is mainly consumed by the household sector, survey respondents may asses and indicate inaccurate (approximately) volumes of consumed	According to the IPCC GPG document, Table 2.12 reads that the uncertainty boundary is in the 50%-150% interval. In Georgia's case the intermediate at 100% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
			firewood, especially when consumed firewood is not purchased. That's why the 20% uncertainty value was selected.	
1A3a	Civil aviation	CH_4	Typical 7% https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf (pg. 3.69)	According IPCC GHG methodology, the uncertainty of the CH4 emission factor may range between -57 and +100 percent. In Georgia's case, uncertainty value of 50% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf (pg. 3.69)
1A3b	Road transportation	CH_4	Typical 7%.	Methane usually contributes less than 1% of the CO_2-eq. emissions from the transportation sector. Experts believe that there is an uncertainty of ±40% in the CH4 estimate. That's why uncertainty value of 40% was selected https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_3_Ch3_Mobile_Combustion.pdf (pg. 3.29)
1A3c	Other transportation	CH_4	Typical 7%.	Typical 100%.
1A4a	Commercial/Institutional	CH_4	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	According to the IPCC GPG document, Table 2.12, the uncertainty boundary is in the 50%-150% interval. In Georgia's case the intermediate 100% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (pg.2.38)
1A4b	Residential	CH_4	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	According to the IPCC GPG document, Table 2.12, the uncertainty boundary is in the 50%-150% interval. In Georgia's case the intermediate 100% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (pg.2.38)
1A4c	Agriculture, Fishing and Forestry	CH_4	The IPCC GPG document does not provide uncertainty typical values for Agriculture, Fishing and Forestry sectors. That is why uncertainty typical value of 7% was used (The IPCC typical value of uncertainty for countries with less well-developed energy data systems, where no good practice of energy balances creation exists - is 10%; in case of countries with well-developed energy data systems the uncertainty is 5%. A complete official energy balance, according international standards and requirements was developed by the National Statistics Office of Georgia (GEOSTAT) in 2014 (for the 2013 reference period). The energy balance for 1990 was also developed by Official Statistics Office, however it was mostly based on soviet standards and methodologies, and was not fully in line with EU requirements. Therefore, the uncertainty was defined at 7%).	According to the IPCC GPG document, Table 2.12, the uncertainty boundary is in the 50%-150% interval. In Georgia's case the intermediate 100% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (pg.2.38)
1B1	Fugitive Emissions from Solid Fuel Mining and transformation	CH_4	Coal mining data provided by GEOSTAT is reliable and, therefore, the uncertainty value of 5% was chosen. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/	According the IPPC methodology, using the typical emission factor for this category has a huge uncertainty value. Therefore, an uncertainty value of 300% was chosen.

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
			V2_4_Ch4_Fugitive_Emissions.pdf (pg. 4.15, 4.16), (table 4.2.4, table 4.2.5)	https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_4_Ch4_Fugitive_Emissions.pdf (pg. 4.15, 4.16), (table 4.2.4, table 4.2.5)
1B2	Fugitive Emissions from oil Extraction	CH_4	Data on Oil extraction is provided by the Oil and Gas Corporation and is reliable. Therefore, the uncertainty value of 5% was chosen	According the IPPC methodology, using the typical emission factor for this category has huge uncertainty value. Due to the complexity of the oil and gas industry, it is difficult to quantify the net uncertainties in the overall inventories, Emission Factors and Activity Data. Therefore, an uncertainty value of 300% was chosen. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_4_Ch4_Fugitive_Emissions.pdf (table 4.2.4, table 4.2.5)
1B2	Fugitive Emissions from oil and natural gas production	CH_4	Data on gas production was provided by the Oil and Gas Corporation and is reliable. Therefore, an uncertainty value of 5% was chosen	According the IPPC methodology, using the typical emission factor for this category has huge uncertainty value. Due to the complexity of the oil and gas industry, it is difficult to quantify the net uncertainties in the overall inventories, Emission Factors and Activity Data. Therefore, an uncertainty value of 300% was chosen. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_4_Ch4_Fugitive_Emissions.pdf (table 4.2.4, table 4.2.5)
1B2	Fugitive Emissions from oil and natural gas Transmission and distribution	CH_4	The data was calculated using the analytical method, it is not based on real measurements and, therefore, an uncertainty value of 50% was chosen.	According the IPPC methodology, 100% value of uncertainty was chosen for Emission Factors. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_4_Ch4_Fugitive_Emissions.pdf (pg. 4.49, 4.50)
4A	Enteric fermentation	CH_4	The Activity Data was taken from the official statistical publication and is reliable. However, classification and distribution of cattle is not entirely consistent with the IPCC standard on dairy and non-dairy cattle, however, it could be assumed, that the data provided by GEOSTAT about “cows” and “other cattle” are in conformity with the classification of "dairy" and “non-dairy cattle”, as cows were intended for exactly dairy purpose in the case of Georgia, and the rest for its meat. Therefore, the uncertainty of Activity Data is moderate and does not exceed of 20%.	According good practice, In general, uncertainty of Emission Factors is at least 30%, since they were taken from the standard form, without taking into account the specific nature of the country. This uncertainty reaches to 40% in case of Georgia. As for Activity Data (heads of cattle by species), they should be considered as reliable, since they are based on Official Statistical Data from GEOSTAT.
4B	Manure management	CH_4	The uncertainty of Activity Data related to animal number is estimated at 20%, as it is based on official statistical data.	According to the IPCC GPG, 50% is taken for methane emissions-related uncertainty.
6A	Solid Waste Disposal Sides	CH_4	Estimations were calculated based on the IPCC 2006 methodology, Table 3.5; The final uncertainty of the Activity Data was estimated at 30%. https://www.ipccnGgip.iges.or.jp/public/ 2006gl/pdf/5_Volume5/V5_3_Ch3_SWDS.pdf (pg. 3.27)	Estimations were calculated based on the IPCC 2006 methodology, Table 3.5; and similar calculations performed in the SNC. The value of uncertainty for emission factor 30% was chosen.
6B1	Industrial Waste Water handling	CH_4	Estimations were calculated based on the IPCC 2006 methodology, Table 6.10 and similar calculations performed in the SNC. The final uncertainty of the Activity Data was set at 50%. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/5_Volume5/ V5_6_Ch6_Wastewater.pdf (pg. 6.23)	Estimations were calculated based on the IPCC 2006 methodology, Table 6.10 and similar calculations performed in the SNC. The final uncertainty in Emission Factors was set at 30%.
6B2	Domestic Waste Water handling	CH_4	Estimations were calculated based on 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Table 6.7; The final uncertainty	Estimations were calculated based on the 2006 IPCC Guidelines (Table 6.7) and similar calculations performed in the SNC. The final uncertainty in Emission Factors was set at 30%.

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
			of the Activity Data was set at 5%. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/5_Volume5/ V5_6_Ch6_Wastewater.pdf (pg. 6.17)	
1A1	Stationary fuel combustion (except biomass)	**N_2O**	Typical 7%.	According to the IPCC GPG document, Table 2.12 reads that the uncertainty boundary is in the 50%-150% interval. In Georgia's case the intermediate at 100% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_2_Ch2_Stationary_Combustion.pdf
1A2	Fuel combustion (biomass)	**N_2O**	Data source is survey results on consumption of energy forms, which was conducted by the National Statistics Office of Georgia (GEOSTAT), as well as data from Georgia's Energy Balance. Compared to the 2013 inventory report, more reliable data on consumption of fire wood is available, which has been collected by GEOSTAT since 2014 through household surveys and surveys in other sectors (industry, construction etc.). As mentioned above, the standard IPCC value of uncertainty for countries with less well-developed energy data systems, where energy balances creation are not well practiced, is 10%; in case of countries with a well-developed energy data systems, the uncertainty is 5%. Due to the fact that fire wood is mainly consumed by the household sector, survey respondents may asses and indicate inaccurate (approximately) volumes of consumed firewood, especially when consumed firewood is not purchased. That's why the 20% uncertainty value was selected.	According to the IPCC GPG document, Table 2.12 reads that the uncertainty boundary is in the 50%-150% interval. In Georgia's case the intermediate at 100% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_2_Ch2_Stationary_Combustion.pdf
1A3a	Civil aviation	**N_2O**	Typical 7% (http://www.ipcc-nGgip.iges.or.jp/public/gp/english/2_Energy.pdf pg. 2.63)	According IPCC GHG methodology, the uncertainty of the N_2O emission factor may range between -70 and +150 percent. Based on expert assessment, uncertainty value of 150% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_3_Ch3_Mobile_Combustion.pdf (pg. 3.69)
1A3b	Road transportation	**N_2O**	Typical 7%.	Typical 50% https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_3_Ch3_Mobile_Combustion.pdf (pg. 3.29). Nitrous oxide usually contributes approximately 3% to the CO_2-eq. emissions from the transportation sector. Expert judgment suggests that the uncertainty of the N2O estimate may be more than ±50%. The major source of uncertainty is related to the Emission Factors.
1A3c	Other transportation	**N_2O**	Typical 7%	Typical 100%
1A4a	Commercial/Institutional	**N_2O**	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	According to the IPCC GPG document, Table 2.12, uncertainty ranges from one-tenth of the mean value, to ten times the mean value should be applied. In this case, an uncertainty value of 150% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/ V2_2_Ch2_Stationary_Combustion.pdf (pg.2.38)
1A4b	Residential	**N_2O**	According IPCC GHG uncertainty for commercial, institutional, residential combustion, for countries with well-developed statistical	According to the IPCC GPG document, Table 2.12, uncertainty ranges from one-tenth of the mean value, to ten times the mean value should

	IPCC source-category	Gas	Uncertainty values in Activity Data and its selection reasons	Uncertainty in Emission Factors and its selection reasons
			systems, when data are based on surveys (or administrative sources), is about 3-5%, but when data are based on extrapolation, uncertainty is about 5-10%. In Georgia's case uncertainty of 5% was chosen, as comprehensive energy data collection system for official statistics exists since 2014.	be applied. In this case, an uncertainty value of 150% was selected. https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (pg.2.38)
1A4c	Agriculture, Fishing and Forestry	**N_2O**	The IPCC GPG document does not provide uncertainty typical values for Agriculture, Fishing and Forestry sectors. That is why uncertainty typical value of 7% was used	The IPCC GPG document does not provide uncertainty typical values for Agriculture, Fishing and Forestry sectors (see. Table 2.12 https://www.ipcc-nGgip.iges.or.jp/public/2006gl/pdf/2_Volume2/V2_2_Ch2_Stationary_Combustion.pdf (pg.2.38), therefore, an uncertainty typical value of 150% for other sectors (Commercial and Public Services, Residential) was used.
2B2	Nitric Acid Production	**N_2O**	The Activity Data is rather accurate. Based on the expert judgment its uncertainty value does not exceed 5%.	A new IPCC manual allows standard boundaries of 20% uncertainty assessment for medium-pressure technology plants
3	Solvents and other product use	**N_2O**	Activity Data was collected from the National Statistics Office of Georgia (GEOSTAT) and, therefore, 25% of uncertainty was chosen.	IPCC GPG methodology doesn't provide exact data on Emission Factors uncertainty. Consequently, based on expert's assessment and taking into account of Activity Data, 1% of uncertainty value was selected.
4B	Manure management	**N_2O**	The uncertainty of Activity Data for nitrous oxide emissions calculation in the manure management sector was estimated at 50%, as there is no exact information about the management systems.	According to IPCC GPG, the uncertainty for Emission Factors was estimated at 100%
4D1	Direct soil emissions	**N_2O**	The Activity Data was collected from National Statistics Office of Georgia (GEOSTAT), which is a competent source and quite accurate. Therefore, 20% was selected as the indicator of uncertainty.	The uncertainty for Emission Factors were taken from the standard range of the IPCC GPG and are equal to 100%.
4D3	Indirect soil emissions	**N_2O**	According IPCC GPG, the uncertainty of Activity Data is quite high and related to the assumption of the percentage leached. In addition, nitrogen content in fertilizers has also certain level of uncertainty. Therefore, the uncertainty of Activity Data was set at 100%.	According to the IPCC GPG, the uncertainty of Emission Factors is in the same range. A value of 100% was selected due to the absence of better information.
6B2	Domestic Waste Water handling	**N_2O**	The only national value in the formula to calculate emissions is number of populations, of which the uncertainty is estimated within 5%. Consequently, 5% of uncertainty was chosen.	The assessment for this source is based on estimations of standard coefficient (2006 IPCC) and is about 70%.
2F	Consumption of halocarbons and sulfur hexafluoride (Refrigeration and Air Conditioning Equipment)	**HFC**	Activity Data is relatively accurate. Based on the expert judgment, its uncertainty value is 5%	According to the IPCC GPG, the uncertainty level for standard coefficients of emission is estimated at 25%.
2F	Consumption of halocarbons and sulfur hexafluoride (Emissions from Appliances (electrical equipment)	**SF6**	Activity Data is relatively accurate. Based on the expert judgment, its uncertainty value is 5%	According to the IPCC GPG, tier 1 estimates are set at an uncertainty of 100% or more, representing an estimate of actual emissions. Therefore, the value of 100% was selected.