National Report on the State of the Environment of Georgia

2014-2017

Ministry of Environmental Protection and Agriculture of Georgia expresses its deep respect and gratitude towards the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and United States Agency for International Development (USAID) for supporting the preparation of the National Report on the State of the Environment of Georgia 2014-2017. The Ministry expresses appreciation to invited experts involved in the development of the Report: Davit Darsavelidze, Ana Rukhadze and Nino Malashkhia. The Ministry also expresses its gratitude to everyone who participated in the elaboration of the document.

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Ministry of Foreign Affairs of Georgia
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LEPL Revenue Service
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MINISTER OF ENVIRONMENTAL PROTECTION AND AGRICULTURE OF GEORGIA

ORDER N 2-1294

30/12/2019 **TBILISI**

On the Approval of the National Report on the State of the Environment of Georgia 2014-2017

In pursuance to the Law of Georgia on "Environmental Protection", article 14,

ORDER:

1. the enclosed "the National Report on the State of the Environment of Georgia 2014-2017" shall be approved.

2. This order may be appealed to a higher authority - the Government of Georgia (Tbilisi, 7 Ingorokva Street) within one month after the order was made officially available for the interested party.

Levan Davitashvili

Minister

PREFACE

Proper assessment of the state of the environment is essential for the development of result-oriented environmental policy. For this purpose, in accordance with Article 14 of the Law of Georgia "on Environmental Protection" and the Decree of the Government of Georgia "on Approval of the Rule on Preparation of the National Report on the State of the Environment" (N337, 06/05/2014), the National Report on the State of Environment 2014-2017 was elaborated.

The National Report is a summary of the information available on the state of Georgia's environment, which is produced every 4 years in accordance with the legislation, with the aim of providing detailed information to decision makers and the general public.

This document provides a comprehensive assessment of the state of the elements of the environment in 2014-2017, the challenges and response mechanisms, the impact of economic sectors on the ecosystem and environmental governance in the country. Due to topicality of certain environmental issues the report also includes data and information on environmental governance for 2018-2019.

Document covers the following areas:

- State of the environment (ambient air, water resources, land resources and soils, mineral resources and biodiversity);
- Other important environmental issues and risks (climate change, natural disasters, waste, chemicals and ionizing radiation);
- Impact of the economic sectors on the environment (hunting and fishing, agriculture and forest use, transport, industry and energy);
- Environmental governance (environmental policy and planning, environmental regulation and control, environmental research, education and awareness raising).

The Ministry of Environment and Agriculture of Georgia was assisted in the preparation of the National Environmental Report 2014-2017 by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) (the so-called Green and Economic Sector Impact chapters) and the US Agency for International Development (USAID) (Water Resources chapter). The document was worked out by both, specialists of the Ministry and invited independent experts. The relevant governmental agencies and representatives of local authorities were involved in the development of specific chapters of the national report, in provision of the necessary information and in discussion of the draft report. The public hearing of the report was also organised with the participation of NGOs and all stakeholders, whose comments and remarks were reflected in this document.

It should be noted that the document does not reflect information on the environmental situation in the occupied territories of Georgia, as at this stage the Georgian government is unable to obtain information directly from these territories.

ACRONYMS AND ABREVIATIONS

A / R	Autonomous Republic
AA	EU-Georgia Association Agreement
ADA	Austrian Development Agency
AFA	LEPL Adjara Forestry Agency
AF	Adaptation Fund
ANRS	LEPL Agency of Nuclear and Radiation Safety
APA	LEPL Agency of Protected Areas
BAT	Best Available Technique
BACA	Batumi Actions for Clean Air
BDD	Basic Data and Directions document
BEAST	Black Sea Eutrophication Assessment Tool
BIG-E	Batumi Initiative on Green Economy
bln	Billion
BMZ	German Ministry of Cooperation and Economic Development
BOD	Biochemical Oxygen Demand
CBD	Convention on Biological Diversity
CBRN	Chemical, Biological, Radiological and Nuclear
CENN	Caucasus Environmental NGOs Network
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CNF	Caucasus Nature Fund
CzDA	Czech Development Agency
DCFTA	Deep and Comprehensive Free Trade Area Agreement, which is a part of AA
DES	State Sub-Agency Department of Environmental Supervision
DPSIR	Conceptual analytical model "Drivers-Pressures-State-Impacts-Responses"
EIA	Environmental Impact Assessment
EIEC	Environmental Education and Information Centre
ELVs	Emission Limit Values
EMBLAS	EU project "Environmental Monitoring of the Black Sea"
ENVSEC	Environment and Security Initiative of OSCE
EPR	Environmental Performance Review (Chapter 16)
EPR	Extended Producer's Responsibility (Chapter 9)
EQS	Environmental Quality Standards
E-TRIX	Trophic Index
EU	European Union
FAO	United Nations Food and Agriculture Organization
GCF	Green Climate Fund
GDP	Gross Domestic Product
GEF	Global Environment Facility
GEL	Georgian Lari
GEO	Georgia's Environmental Outlook
GEOSTAT	National Statistics Office of Georgia
GFCM	General Fisheries Commission for the Mediterranean
GHG	Greenhouse Gas
GIPA	Georgian Institute of Public Affairs
GIZ	Deutsche Gesellschaft für Internationale Zusammenarbeit
GMOs	Genetically Modified Organisms
GWP	LLC Georgian Water and Power
IAEA	International Atomic Energy Agency
IBiS	GIZ programme "Integrated Biodiversity Management, South Caucasus"
INDC	Intended Nationally Determined Contribution
IUCN	International Union for Conservation of Nature

KfW	German Development Bank
LDN	Land Degradation Neutrality
LEPL	Legal Entity of Public Law
LLC	Limited Liability Company
LMO	Living Modified Organizm
MAC	Maximum Allowable Concentration
MEPA	Ministry of Environmental Protection and Agriculture of Georgia
mln	Million
MTEF	Medium Term Expenditure Framework
NACRES	Centre for Biodiversity Conservation & Research
NAP	National Adaptation Plan
NCR	National Communication to the UNFCCC
NDC	Nationally Detemined Contribution
NEA	LEPL National Environmental Agency
NEAP	National Environmental Action Program of Georgia
NFA	LEPL National Food Agency (Chapter 3)
NFA	LEPL National Forestry Agency (other chapters)
NIP	National Implementation Plan
NNLE	Non-entrepreneurial Non-commercial Legal Entity
NVE	Norwegian Water Resources and Energy Directorate
ODSs	Ozone Depleting Substances
ODP	Ozone Depletion Potential
OECD	Organization for Economic Cooperation and Development
OSCE	Organization for Security and Co-operation in Europe
PCBs	Polychlorinated Biphenyls
PM_{10}, $PM_{2,5}$	Particulate Matter
POPs	Persistent Organic Pollutants
RBM	River Basin Management
SAICM	Strategic Approach to International Chemicals Management
SDGs	Sustainable Development Goals
SEA	Strategic Environmental Assessment
SOER	National Report on the State of the Environment
TJS	Transboundary Joint Secretariat in South Caucasus
UN	United Nations
UNCCD	United Nations Convention to Combat Desertification
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNECE	United Nations Economic Commission for Europe
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
UWSC	LLC United Water Supply Company of Georgia
VOC	Volatile Organic Compound
WURS	Water Use Reporting System
WHO	World Health Organization
WRI	World Resources Institute
WWF	World Wildlife Fund
WWTP	Wastewater Treatment Plant
WFD	EU Water Framework Directive
WURS	Water Use Reporting System

TABLE OF CONTENT

CHAPTER I. SOCIAL-ECONOMIC FACTORS AFFECTING THE ENVIRONMENT

I/1. SOCIAL-ECONOMIC FACTORS AFFECTING THE ENVIRONMENT

The increase in the number of households and the high concentration of urban population, as well as the unsustainable use of natural resources and production, are major challenges for most countries in terms of adverse environmental impacts. Significant impacts are also being made by intensive infrastructure construction, both in terms of living environment and ecosystems change. Georgia is not an exception in this case.

1.1 MAIN QUESTIONS AND MESSAGES

1. What are the dynamics and migration flows of Georgia's population and households?

- As of 2017, Georgia's population is 3.7 million. Although there is a slight increase in this indicator over the reporting period, it is noteworthy that 2017 data is significantly lower than in 2002, mainly due to both external negative migration balance and the aging trend;
- The depopulation of the villages at the expense of migration to other countries and to the inner cities is also noteworthy. This, on the one hand, is hampering the development of rural-type settlements, on the other hand, increases traffic flows in urban-type settlements and overburdens urban infrastructure;
- The number of relatively small households, in particular two-member households, has increased, consistently leading to a rise in demand for various utilities and an increase in the magnitude of environmental impacts due to waste generation, energy consumption or other factors.

2. Which are the main tendancies in the State economy?

- In 2014-2017 gross domestic product had a positive growth trend, and was rated 4.8% in 2017. The largest share of GDP was in the service sector. First place in GDP with 17.1% share, as in previous years, again is trade, followed by industry with 16.7%, followed by transport and communication with 10.1%, followed by construction (9.8%) and other types of economic activity. In addition, there was a significant increase in trade, processing, construction, real estate, transport and tourism.

3. How is the country's infrastructure developing and what is its impact on the environment?

- During the reporting period, road, rail, marine and air infrastructure rehabilitation or construction activities were actively carried out to develop the country's international transport corridor and improve domestic infrastructure. In addition, the extent of coverage of agricultural land by irrigation systems has increased significantly. In the field of energy, power transmission systems have been improved and new power generation facilities (first wind power plants, several hydropower plants) built. Consequently, large-scale construction processes have notably increased environmental pressure during the development of infrastructure, in terms of intensive use of natural resources and waste generation. Water abstraction for agriculture and the volume of artificial ecosystems created by new linear infrastructure have also increased. At the same time, the positive impact achieved by the construction of wastewater treatment plants (WWTPs) and the improvement of road or other transport infrastructure is noteworthy.

1.2 POPULATION AND ITS DYNAMIC

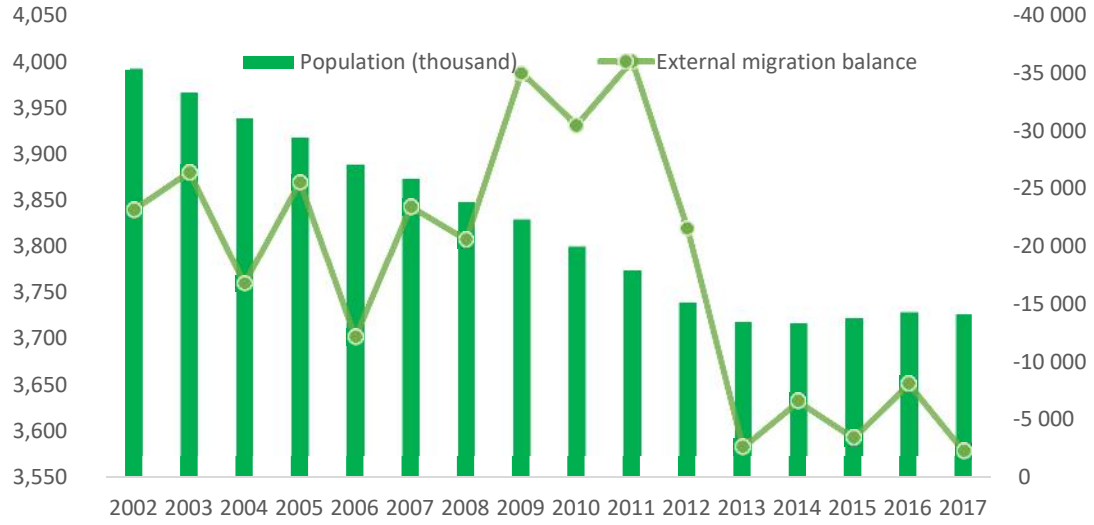
In 2017 the number of the population of Georgia was 3 726.4 thousand. This figure is significantly lower than in 2002, the main reason being the negative external migration balance.[1] Negative natural growth also played an important role in reducing the number of population until 2007[2]. Since 2013, as a result of the decline in the negative external migration balance and the increase in the rate of natural growth, at least a 20-year population decline has been stopped and a slight increase in population has been observed. However, as of 2017, the gender and age structure of the population and the trend of

[1] The difference between the number of immigrats during the year.

[2] The Difference Between Birth and Mortality

aging do not indicate the potential for population growth: The overall, as well as the median age of women (37 and 40 years, respectively) is gradually increasing, with the increase in the non-fertile population of 60 years and older.

Figure 1.2.1: Population number[3] and external migration (2002-2017 ff)



Source: Geostat

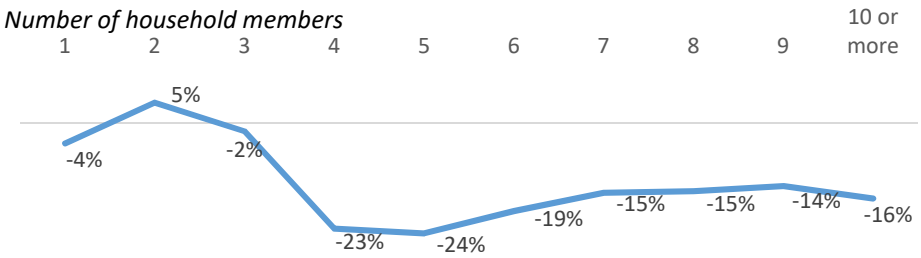
There is a tendency of population decline by regions, except for the capital, Adjara A / R and Kvemo Kartli. In 2017, compared to 2016, population increased by 1.2% in the capital, 0.9% in Adjara Autonomous Republic and 0.4% in Kvemo Kartli. The country's internal migration processes continue from village to town. In 2017, 58% of the population lived in urban-type settlements. As for population density, it is about 65 people per km^2 nationwide after 2013. The most densely populated territorial units continue to be the capital (2 272 persons) and Adjara A / R (118 persons), with the lowest densities in Racha-Lechkhumi and Kvemo Svaneti (7 persons), Mtskheta-Mtianeti (17 persons) and Samtskhe-Javakheti (24 people).

1.3 HOUSEHOLDS

According to the 2014 Census, the number of households in Georgia was 1 109 130, with an average of 3.3 members per household. Comparing this figure with the 2002 Census, the number of households decreased by 11% and the average household size decreased by 5%. The number of multi-member households has also declined significantly. This trend was less reflected on households with 1, 2 and 3 members. Moreover, the number of 2-member households has increased (see Figure 1.3.1).

[3] Estimated data for 2002-2013; Since 2014 relies on registered data.

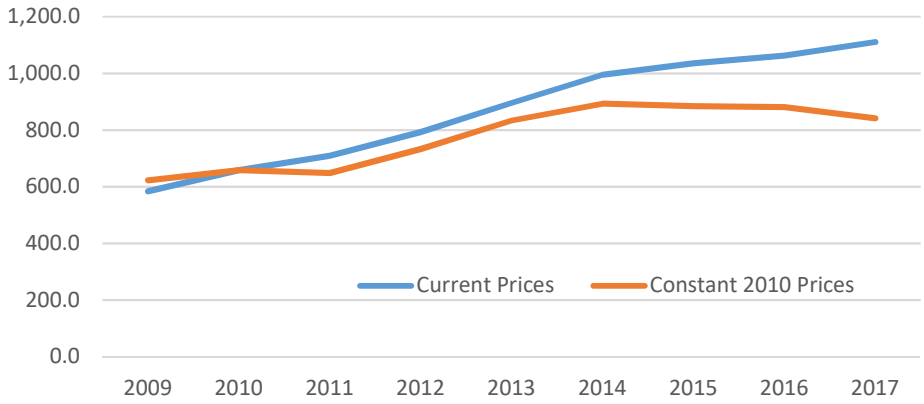
Figure 1.3.1: Change in the number of households (%) by number of members according to the 2002 and 2014 census



Source: Geostat

In 2014-2017, household incomes increased at current prices by 1 111 GEL. However, if we look at the Consumer Price Index, taking into account the average prices of 2010, households' real incomes tend to decrease in purchasing power, as in 2015-2017 only 3-5% annual growth of this indicator was observed in current prices, which was not enough to compensate inflation (see Figure 1.3.2).

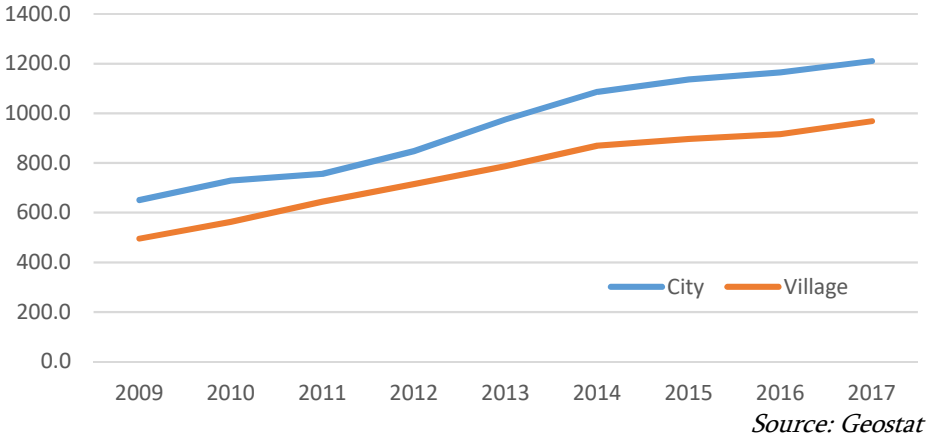
*Figure 1.3.2: Average monthly income distribution per household (*GEL*, 2009-2017)*



Source: Geostat

In the current prices of households, there has been an increase in income by urban and rural type. It is noteworthy that the average monthly income per household in urban households was about a quarter more than in rural areas and varied between 25-27% in 2014-2017 (see Figure1.3.3).

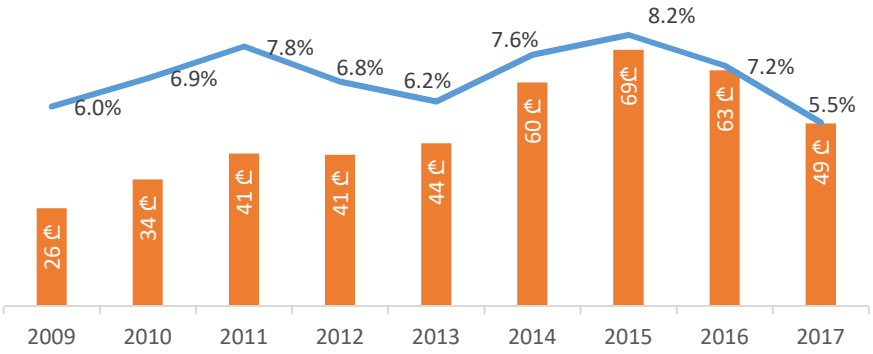
*Figure1.3.3: Average monthly income distribution per household in urban and rural areas at current prices (*GEL*, 2009-2017)*



Source: Geostat

The volume of income from the sale of agricultural products, as well as its share in households' revenue structure, increased in 2014-2015, and decreased in 2016-2017 (see Figure 1.3.4).

Figure 1.3.4: Volume (GEL) of income from sale of agricultural products in household income and its share (%) in monetary income and transfers (2009-2017)



Source: Geostat

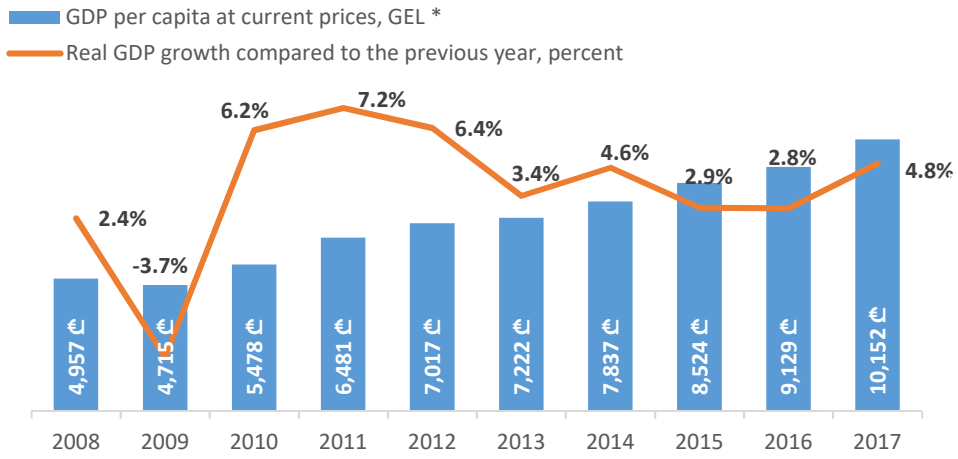
The decline in household size and the rise in current income prices stimulate additional demand from households for various goods and services. This has led to an increased demand for household appliances, water and energy resources, waste management and other household infrastructure and services. Along with the development of society, this is compounded by increased consumer demand for modern social-economic needs to improve living conditions, health care or others. This circumstance automatically increases the impact on environmental conditions.

1.4 ECONOMY

In 2009, following the Russian military aggression in 2008 and the global financial crisis, the country's economic growth slowed. Specifically, GDP growth was -3.7%. With support from the US, Europe and other partner countries and the intensification of local economic activity, the country's economy has continued to grow since 2010. In 2015-2016, real GDP growth declined relatively (to 2.8%), although in 2017 it also increased (4.8%). According to forecasts, this positive trend will continue to be maintained for years to come[4].

[4] According to IMF preliminary long-term forecasts, real GDP growth in 2018-2024 is expected to remain within the range of 4.6-5.2%.
Source:https://www.imf.org/external/datamapper/NGDP_RPCH@WEO/OEMDC/ADVEC/WEOWORLD/GEO

Figure1.4.1: GDP and real growth rate per capita (GEL,%, 2008-2017)

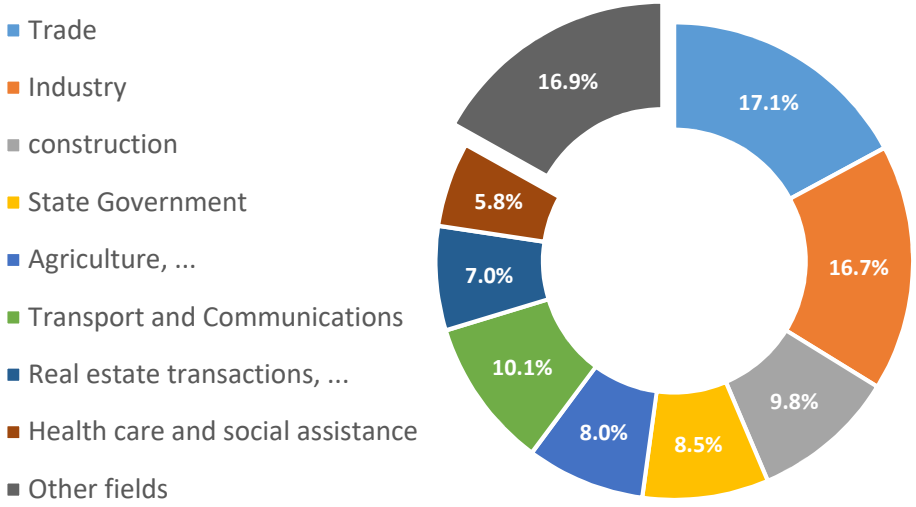


** Per capita estimates were adjusted based on updated census data for 2014.*

Source: Geostat

It is important to note that we still see the highest economic activity in the service sector. The largest share of GDP comes on trade with 17.1%, followed by industry with 16.7%, followed by transport and communications with 10.1%, followed by construction (9.8%), state government (8.5%), agriculture (8%), real estate, leasing & consumer operations serving (7%), health and social services (5.8%) and other fields (16.9%) (see Figure 1.4.2).

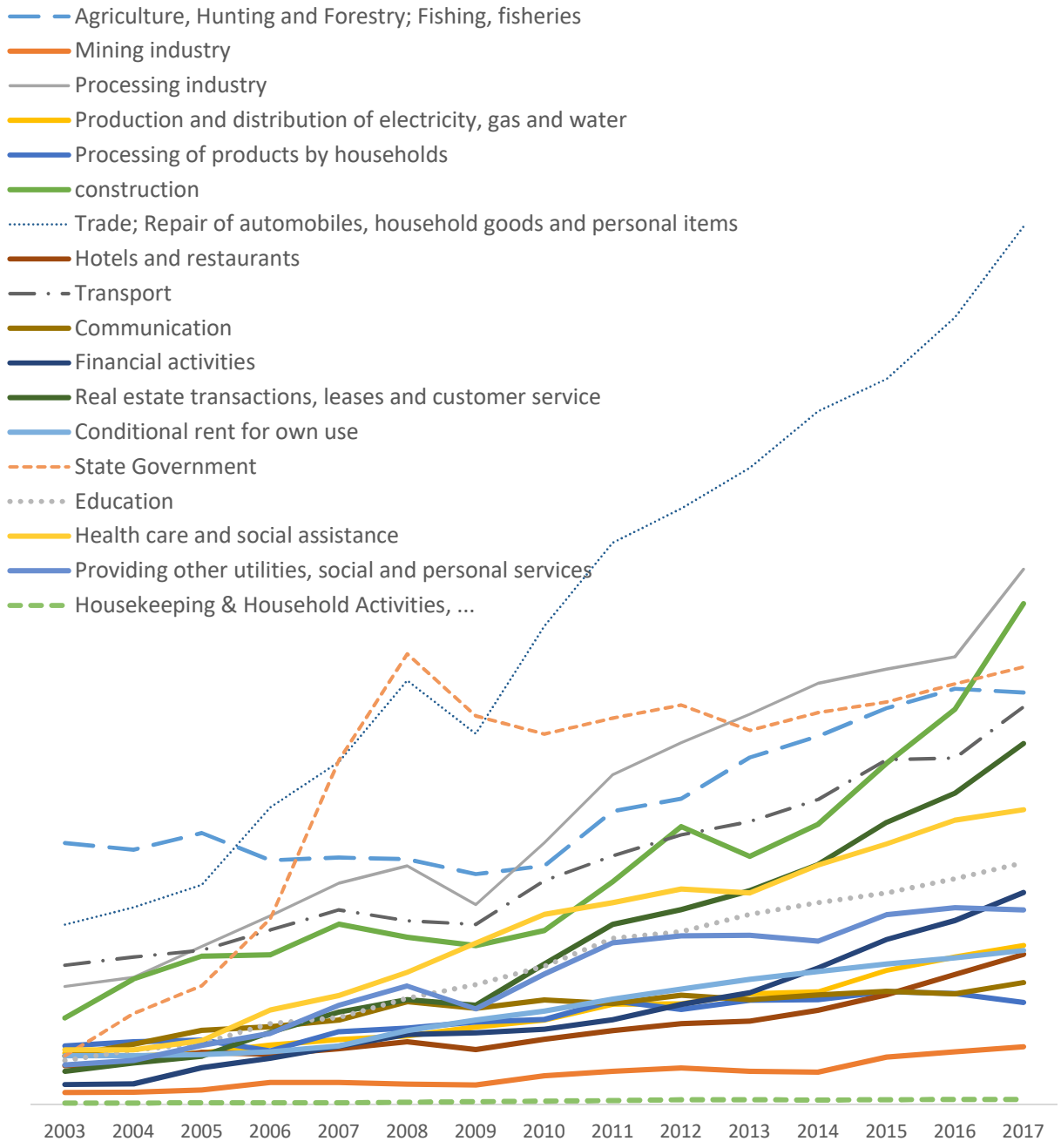
Figure 1.4.2: Sectoral Distribution of GDP (at current prices, mln GEL)



Source: Geostat

If you look at the GDP growth dynamics, the most growing area is still trade, which has increased by about 52% compared to 2009. After 2013, the construction sector is also growing significantly. Significant GDP growth is seen in the processing industry, real estate and transport operations. For the most part, the average upward trend is maintained in the areas of agriculture, education, healthcare, finance and energy-water supply. (See Figure 1.4.3).

Figure 1.4.3: GDP Distribution Dynamics per sector (Mln, 2003-2017 at constant 2010 prices)



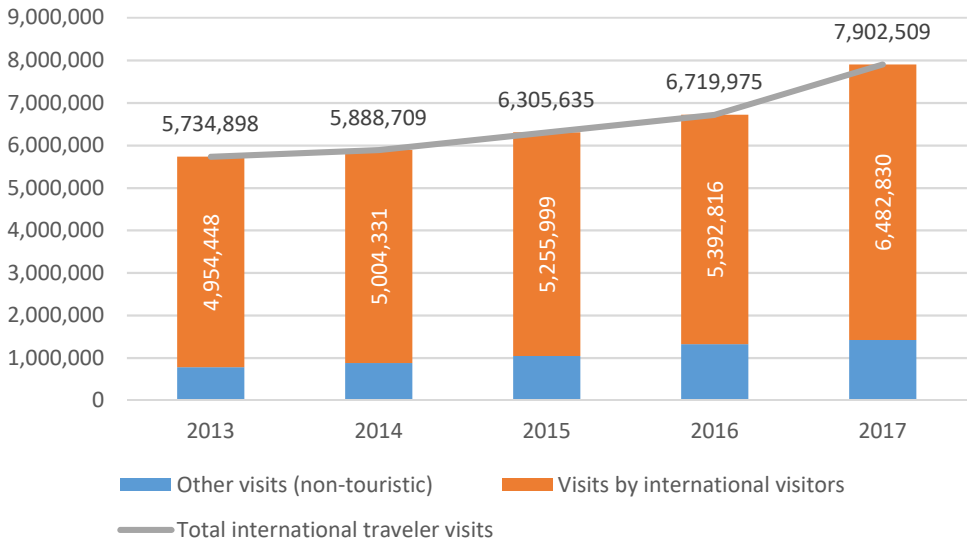
Source: Geostat

In 2013-2017, there was a clear upward trend in tourism. In 2017, the number of visitors increased by 38% compared to 2013 and it reached 7.9, 82% of which included international visits (see Figure 1.4.4).

The growth of the tourism sector is an opportunity for the country to present its unique environment by developing appropriate infrastructure and receiving visitors at protected areas. It is important to develop tourism infrastructure with the least impact on the environment and following the principles of sustainable development. The creation of new protected areas and the provision of appropriate

services to visitors create new foundations for local employment and additional economic activity to achieve sustainable development.

Figure 1.4.4: International Traveler Visits to Georgia (2013-2017)

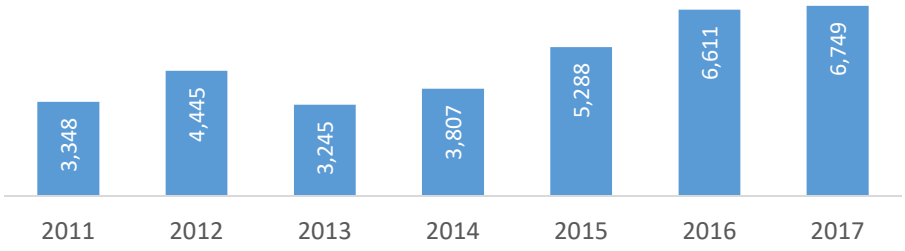


Source: National Tourism Administration of Georgia, Ministry of Internal Affairs of Georgia, Information-Analytical Department

1.5 INFRASTRUCTURE

Building and rehabilitating infrastructure is one of the country's top priorities for sustainable development and improvement of living standards. Consequently, large-scale activities were carried out in this area during the reporting period. The process of developing transport, energy, utilities or other public infrastructure is still ongoing, which is funded by the State or other international partners. General construction rates are significantly increasing. Turnover in construction increased twice (by 208%) compared to 2013 (see Figure 1.5.1).

Figure 1.5.1: Turnover volume in construction (mln GEL, *2011-2017)*

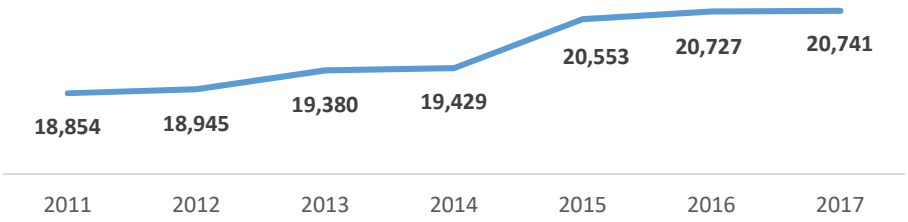


Source: Geostat

During the reporting period, significant infrastructure works were carried out to develop the country's international transport corridor. The construction of the Baku-Tbilisi-Kars railway is actively underway, which will connect Asia and Europe and significantly reduce the time of delivery of goods compared to sea shipping. In addition, significant work was done to increase transit cargo traffic and

accelerate passenger mobility. At the same time, in order to increase shipping, Anaklia deep-sea port is under construction, which will further increase the freight turnover capacity. In 2013-2017 total length of motorways increased by 7% and in 2017 it was 20 741 km (see Figure 1.5.2).

Figure 1.5.2: Length of common use roads (km, 2011-2017)

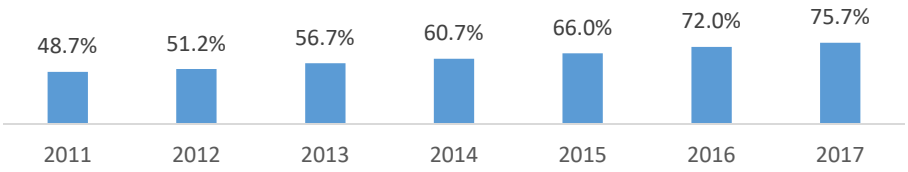


Source: Geostat

For the purpose of energy security, both central and internal distribution networks are increasingly developing, which is vital for the continuous supply of electricity, gas and other energy resources. In order to diversify energy and reduce energy dependency, new energy generation and gas storage facilities are being built. For this purpose, Gori Wind Power Plants, hydro power plants of various capacities have been constructed and the gas pipeline construction process is underway.

New water treatment plants and waste disposal polygons were built, which significantly reduced the rate of environmental contamination by household waste both in terms of water pollution and solid waste. It is important to note also the ongoing large-scale processes of construction and rehabilitation of water supply, sewage and irrigation management systems, which are important infrastructural works in terms of development and improvement of living standards of the country. As of 2017, according to official statistics, 100% of the population is supplied with electricity. The rate of natural gas supply also increased, if 56.7% of households were supplied with natural gas in 2013, the same value was up to 75.7% in 2017. The percentage of water supply systems in households has also improved, increasing from 57.8% to 63.4% in 2013-2017.

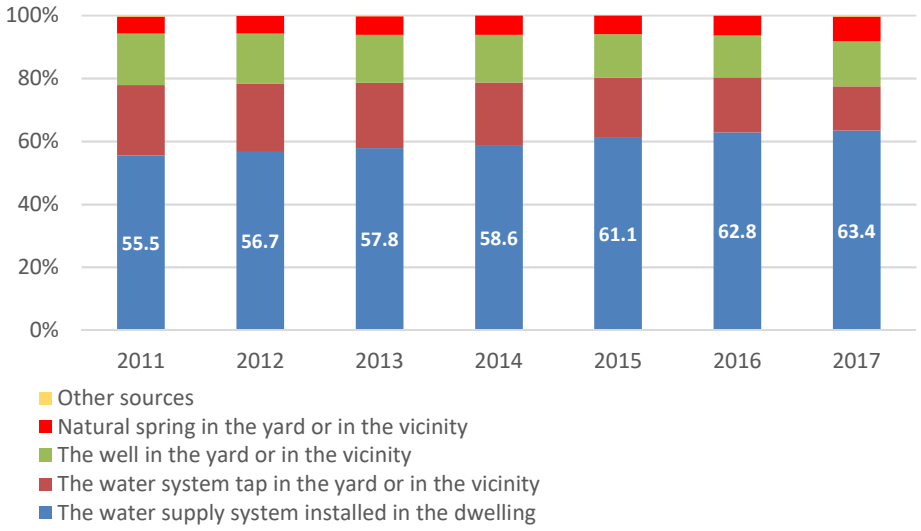
Figure 1.5.3: Number of households provided with natural gas (%)



* 2011-2016 is recalculated according to the 2014 Population Census; The 2017 sampling frame is the 2014 Census Database.

Source: Geostat

Figure 1.5.4: Distribution of households by main sources of drinking water (%)



Source: Geostat

The development of rail, road or marine infrastructure has a significant impact on the environment during construction, alters the local ecosystem, and necessarily requires a careful approach for preserving local biodiversity or habitat. It should also be noted that, with reasonable regard for the environment and environmental principles, the above actions can have a positive impact on the environment, resulting in a reduction in mobility and turnover times and in the consumption of relatively less energy per unit (eg less fuel consumption per transport). The construction of a number of infrastructure facilities, however, directly contributes to the recovery of the environment and minimizes anthropogenic impacts and enables the management of natural resources smartly. One example of this is the proper development of waste management infrastructure.

1.6 MAIN CHALLENGES

There was no sharp migration or natural increase in population throughout the reporting period, although a slight increase in population was observed. Given the demographic aging of the population, a sharp increase in population is not expected. The challenge of uneven economic development is the migration from rural to urban areas, which on the one hand increases the pressure on urban ecosystems for intensive anthropogenic impacts and on the other hand often impedes the sustainable development of deserted rural settlements and ecosystems and suppliance of local services necessary for health. Increasing population density in large urban-type and tourist-friendly urban areas, reduced household size, and improved access to mortgages have increased demand for new housing, repairs or other construction products. Consequently, the pressure on utilities and environmental pressure has increased. Active construction resulting in adverse impacts on the environment, in particular: air pollution with particulate matter, noise, construction equipment and even then, the residents of the new means of transportation, road infrastructure, excessive workload, which leads to the need for more rehabilitation and the traffic inconveniences, especially in the districts, where the cross is already limited. This is also accompanied by overloading of on-site utilities and in many cases additional construction work to increase capacity. The challenge today is that despite the city's capacity for

construction, there is no extensive but intensive development of cities, which further increases the population density in cities. Therefore, reducing the negative impacts on the environment and overcoming relevant challenges requires significant efforts.

It is also noteworthy that improved access to finance for the purchase of technique through consumer loans and installments during the reporting period, has led to increased purchasing power of the population. This has in turn accelerated the demand for small appliances, central heating or air conditioning, and therefore increased demand for energy resources not only in winter but also in summer. It is also important to note the development of a number of energy-efficient industrial sectors, which has increased the demand for energy consumption and consequently the improvement of its generation and transmission systems. This relates to the process of building and using an additional part of the ecosystem for deploying energy infrastructure.

In order to raise the standard of living of the population, equal consideration of intensification of economic activities (extraction of natural resources, growth of the processing industry, development of tourism, other services or transit hubs) and balancing of interests is essential for sustainable development. Significant steps were taken during the reporting period to improve the legislative environment (waste management, environmental impact assessment legislation, etc.), the consistent implementation of which will significantly contribute to the country's sustainable development.

Chapter II. KEY ELEMENTS OF THE ENVIRONMENT AND THEIR STATE

II/2 AMBIENT AIR

Ambient air pollution is one of the major environmental challenges of humankind today. Ambient air is polluted by harmful substances emitted from anthropogenic and natural sources. The main anthropogenic sources of ambient air pollution are the transport, energy, industry and agricultural sectors. According to the World Health Organization (WHO), 91% of the world's population lives in the environment where air quality does not meet WHO standards.

The problem of ambient air pollution in Georgia is found in the largest cities of the country, as well as in large industrial sites or industrial zones. Almost everywhere except Zestaponi municipality, the problematic pollutants are fine particulate matter (PM_{10}) and nitrogen dioxide.

2.1 MAIN QUESTIONS AND MESSAGES

1. Are the concentrations of major harmful substances in ambient air exceeding the limits set for the protection of human health?

- In Georgia's largest cities, the concentration of particulate matter (PM_{10}) and nitrogen dioxide (NO_2) concentrations are exceeded. Problematic pollutant in Zestaponi is manganese dioxide;
- Concentrations of ground-level ozone (O_3), sulphur dioxide (SO_2), lead (Pb), benzene (C_6H_6) and carbon monoxide (CO) are within the limit values and in most cases (SO_2, Pb, CO) are significantly below these thresholds.

2. Have the emissions of major harmful substances in the air been reduced?

- Since 2014, emissions of solid particles (PM_{10} and $PM_{2.5}$), volatile organic compounds (VOC), carbon monoxide (CO) and ammonia (NH_3) have been reduced;
- Emissions of nitrogen dioxide (NO_2) are increasing, mainly due to the emission of the pollutant from the motor transport sector. In recent years, along with the increase in the consumption of coal in the industrial sector, emissions of sulphur dioxide (SO_2) have increased significantly.

2.2 STATE REGULATION

Ambient air pollution occurs in many sectors of human activity. Accordingly, improving ambient air quality requires complex actions that need the joint efforts of various government agencies and the involvement of the population.

Ambient air protection issues are regulated by the Law of Georgia on Ambient Air Protection (1999) and its bylaws. Under the said legislation, considering the threshold values of ambient air quality, emission limit values - the emission limits for each harmful substance are set individually for industrial objects, which are large and harmful to humans and the environment. The regulation of emissions in ambient air from other stationary facilities is governed by the relevant technical regulations. Currently, the process of implementing European principles of emission regulation from the industrial sector is underway, which implies the introduction of the best available technique (BAT) in each industry and the determination of respective emission limit values (ELVs).

Emissions from motor vehicles are regulated by technical regulations[5] governing vehicle emissions and by resolutions determining the standard of gasoline and diesel fuel quality.[6]

[5] Decree No. 510 of the Government of Georgia of December 1, 2017 on the Approval of "Technical Regulation on the Periodic Technical Inspection of Motor Vehicles and their Trailers".

[6] Resolution No. 124 of December 31, 2004 of the Government of Georgia „on the Quality Standards of Motor Gasoline" and Resolution No. 238 of December 28, 2005 of the Government of Georgia „on Norms, Methods of Analysis of Diesel Fuels and Measures for Their Implementation".

The Ministry of Environment Protection and Agriculture of Georgia carries out registration of emissions from the main sectors of ambient air pollution (transport, energy, households, industry, agriculture, waste, etc.) and monitoring of ambient air quality. The results of air quality monitoring are evaluated by comparison with quality standards.

Since August 1, 2018, ambient air quality in Georgia has been assessed by modern European standards. In particular, Resolution No. 383 of the Government of Georgia of 27 July 2018 on the approval of the "Technical Regulation on the Ambient Air Quality Standards" sets threshold values for 13 key pollutants based on European standards for the protection of human health and ecosystems. Technical Regulation also specifies target values, margins of tolerance, upper and lower assessment thresholds, alert and information thresholds, critical levels and long-term objectives.

Table 2.1 presents the limit values for the concentrations of the major harmful pollutants established for the protection of human health, indicating the relevant avaraging period and number of allowable exceedance per year

Table 2.1: Limit values for the concentration of harmful substances in ambient air

Harmful substance	Limit value	Avaraging Period	Number of allowable exceedance per year
Sulphur dioxide (SO_2)	350 μg / m^3	1 hr	24
	125 μg / m^3	24h	3
Nitrogen dioxide (NO_2)	200 μg / m^3	1 hr	18
	40 μg / m^3	1 year	0
Solid particles (PM_{10})	50 μg / m^3	24h	35
	40 μg / m^3	1 year	0
Solid particles ($PM_{2.5}$)	25 μg / m^3	1 year	0
Carbon monoxide (CO)	10 mg / m^3	Maximum daily 8-hour mean	0
Benzene (C_6H_6)	5 μg / m^3	1 year	0
Ozone (O_3)	120 μg / m^3	Maximum daily 8-hour mean	25 (for 3 years averaging period)
Lead (Pb)	0.5 μg / m^3	1 year	0
Arsenic (As)	6 ng / m^3	1 year	0
Cadmium (Cd)	5 ng / m^3	1 year	0
Nickel (Ni)	20 ng / m^3	1 year	0
Benzo(a)pyrene ($C_{20}H_{12}$)	1 ng / m^3	1 year	0
Manganese dioxide (MnO_2)	1 μg / m^3	24h	0

Source: „Technical Regulation - On the Ambient Air Quality Standards"

2.3 AMBIENT AIR QUALITY IN GEORGIA

An essential prerequisite for developing an efficient and timely policy on ambient air quality is the assessment of ambient air quality. A sound assessment system allows identifying the problematic pollutant, the magnitude of the problem, and its causes, enabling appropriate response measures to be planned.

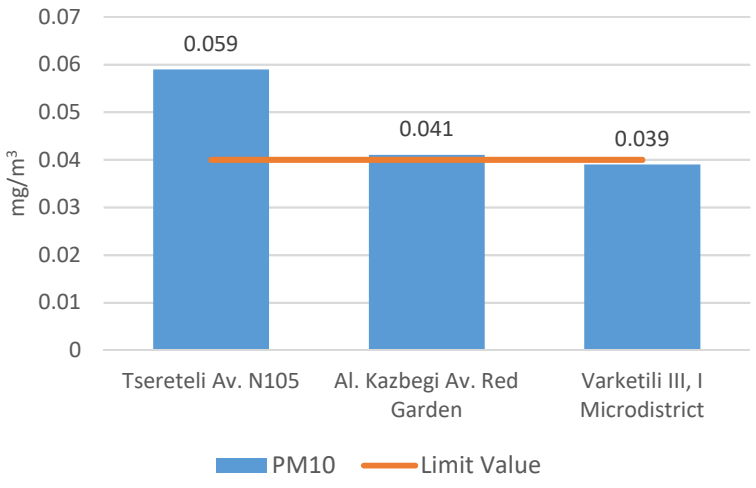
One of the key components of an ambient air quality assessment system is a quality monitoring system. Ambient air quality monitoring in Georgia is carried out by the LEPL National Environmental Agency (NEA) of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA). 2014-2017 is the period when the country gradually replaced the outdated air quality assessment system with the modern European system. In particular, the old methodology and standards have been changed along with the replacement of old non-automatic stations with modern automatic stations.

In 2014, the only modern automated ambient air quality monitoring station operated in the country (at Vashlijvari Meteorological Station in Tbilisi). At the same time, ambient air quality tests were carried out at 3 outdated non-automatic stations in Tbilisi. The similar stations were located in the following 4 cities: Batumi, Kutaisi, Rustavi and Zestaponi.

Since 2014, the ambient air quality assessment system has improved significantly. In particular, in line with modern European practice, in 2015 the country started quarterly indicative measurements (the so-called passive sampling method). In 2017, passive samplings were carried out in 20 municipalities across the country. In 2016, one automatic station was launched in Chiatura and Batumi, and three automatic stations were added to the Tbilisi monitoring network. As a result, Tbilisi has a fully automated monitoring network with 4 automatic stations that meets European standards in terms of technical parameters and number of stations. In 2017, two more modern automatic stations (in Kutaisi and Batumi) were added to the country monitoring network. At the end of 2017, 8 automatic stations operated in the country.

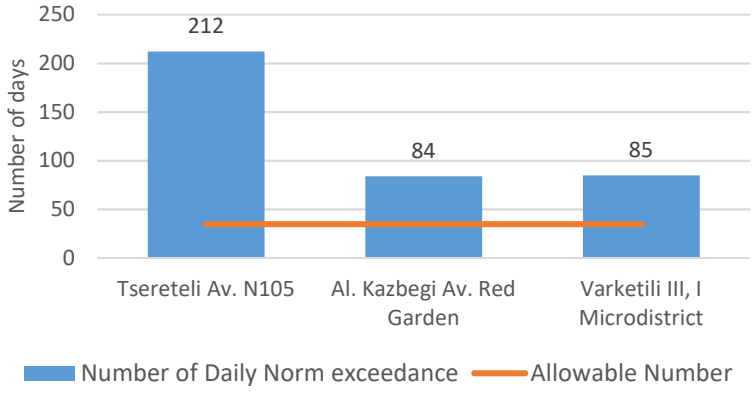
In 2017, ambient air quality monitoring through modern automatic stations was continuously carried out in Tbilisi at three points. Accordingly, the data of these stations can be compared with the modern limit values of the pollutants. Figures 2.3.1-2.3.7 show exactly the data of the above three automatic stations of Tbilisi.

Figure 2.3.1: Avarage annual concentration of particulate matter PM_{10} in 2017



Source: NEA, air.gov.ge

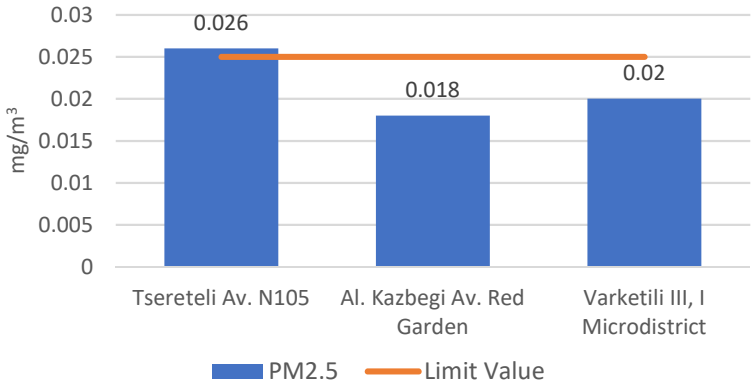
Figure 2.3.2: Number of exceedance of daily limit values of PM_{10} in 2017



Source: NEA, air.gov.ge

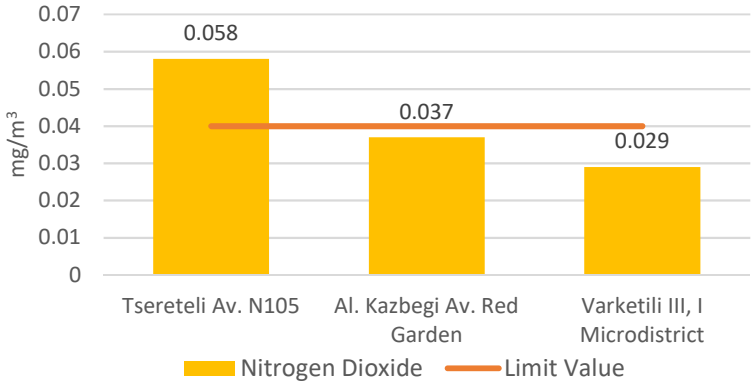
It is noteworthy that in Georgia in general, a significant portion of the daily limit value of PM_{10} is caused by transboundary air pollution. In particular, as a result of spreading desert dust across the African continent and the Arabian Peninsula into Georgia.

Figure 2.3.3: Average annual concentration of particulate matter $PM_{2.5}$ in 2017



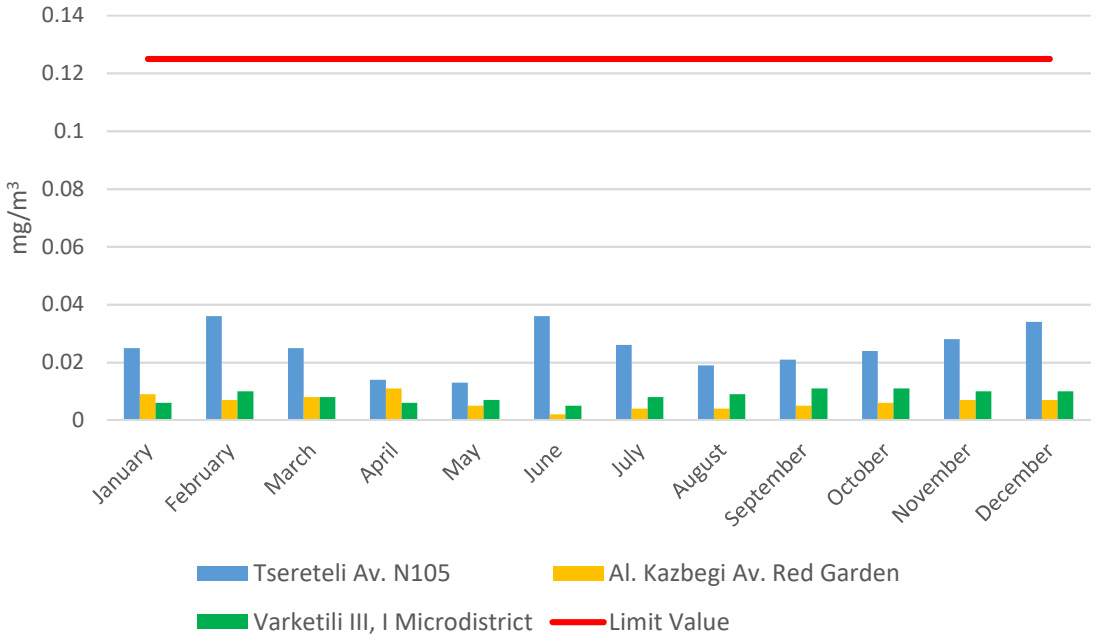
Source: NEA, air.gov.ge

Figure 2.3.4: Average annual concentration of nitrogen dioxide in 2017



Source: NEA, air.gov.ge

Figure 2.3.5: Average monthly concentration of sulphur dioxide in 2017

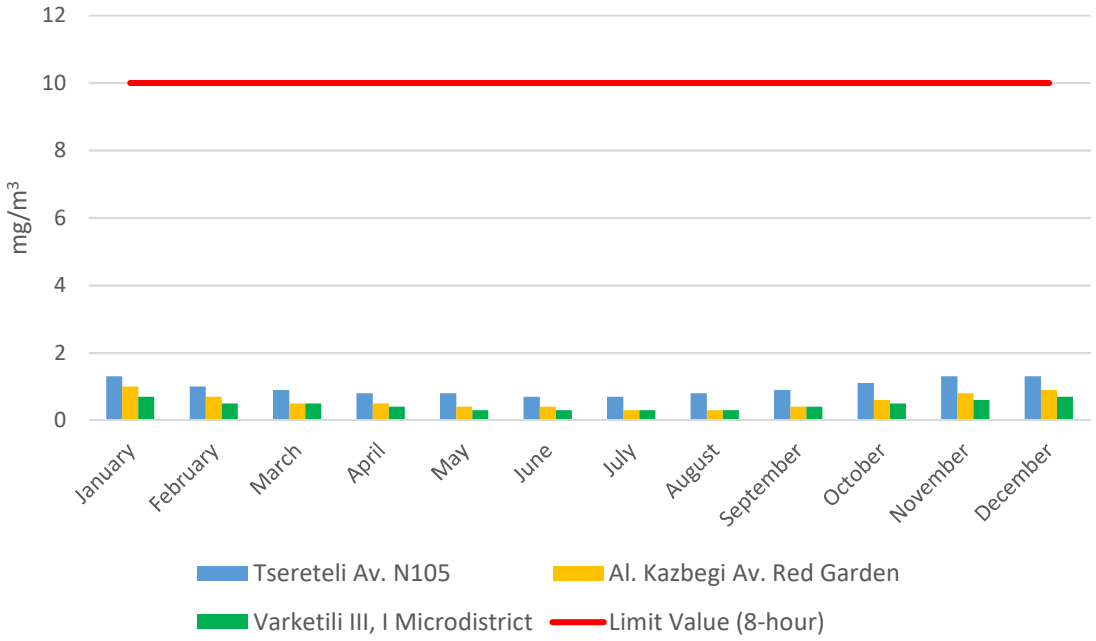


Source: NEA, air.gov.ge

Figure 2.3.6: Average monthly concentration of ground-level ozone in 2017

Source: NEA, air.gov.ge

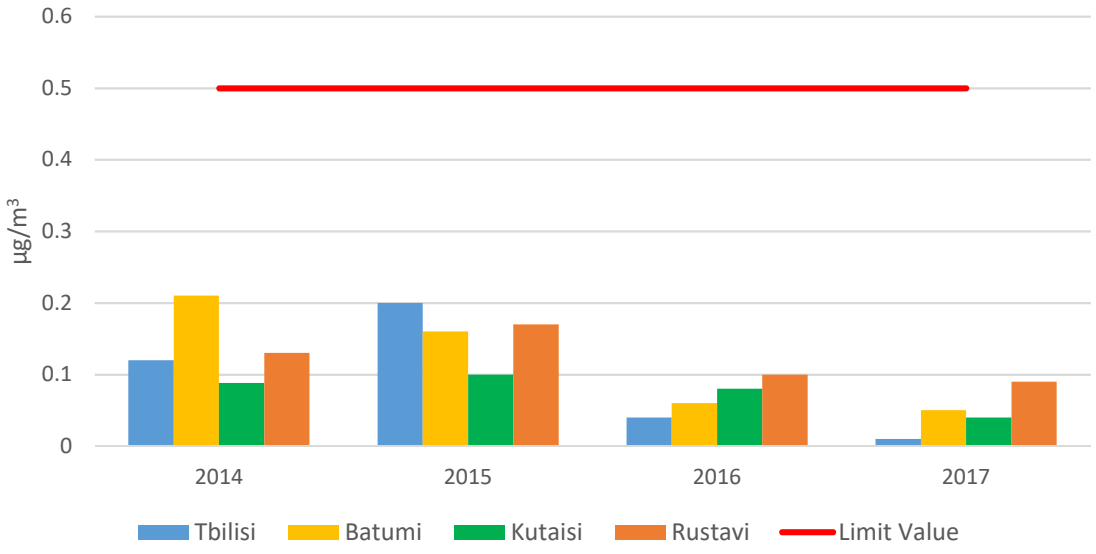
Figure 2.3.7: Average monthly concentration of carbon monoxide in 2017



Source: NEA, air.gov.ge

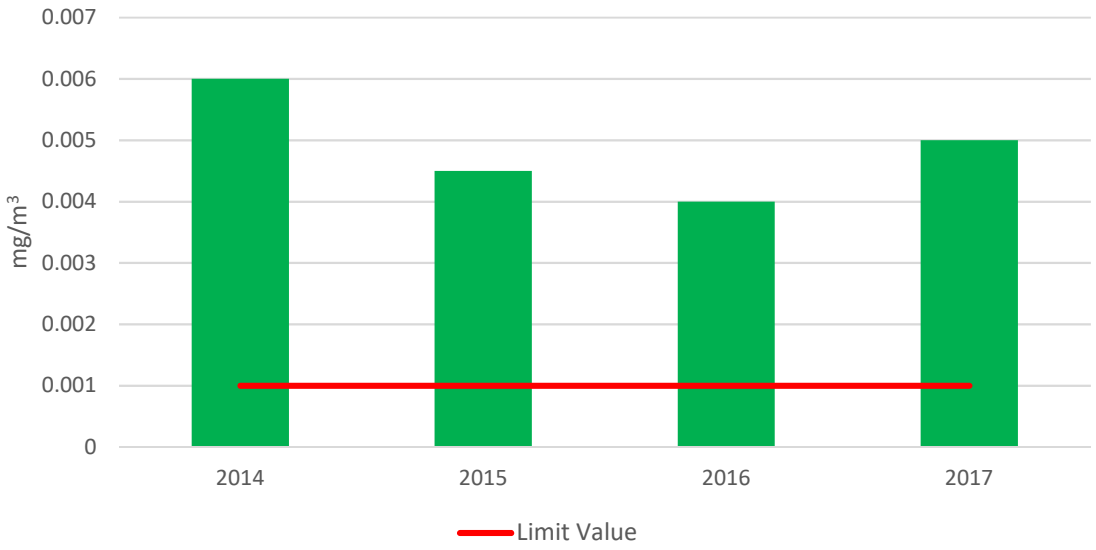
Monitoring of concentrations of lead and manganese dioxide in ambient air is carried out based on the passive sampling method in the country. The results of monitoring of these pollutants are presented in Figures 2.3.8 and 2.3.9.

Figure 2.3.8: Average annual concentration of lead



Source: NEA, air.gov.ge

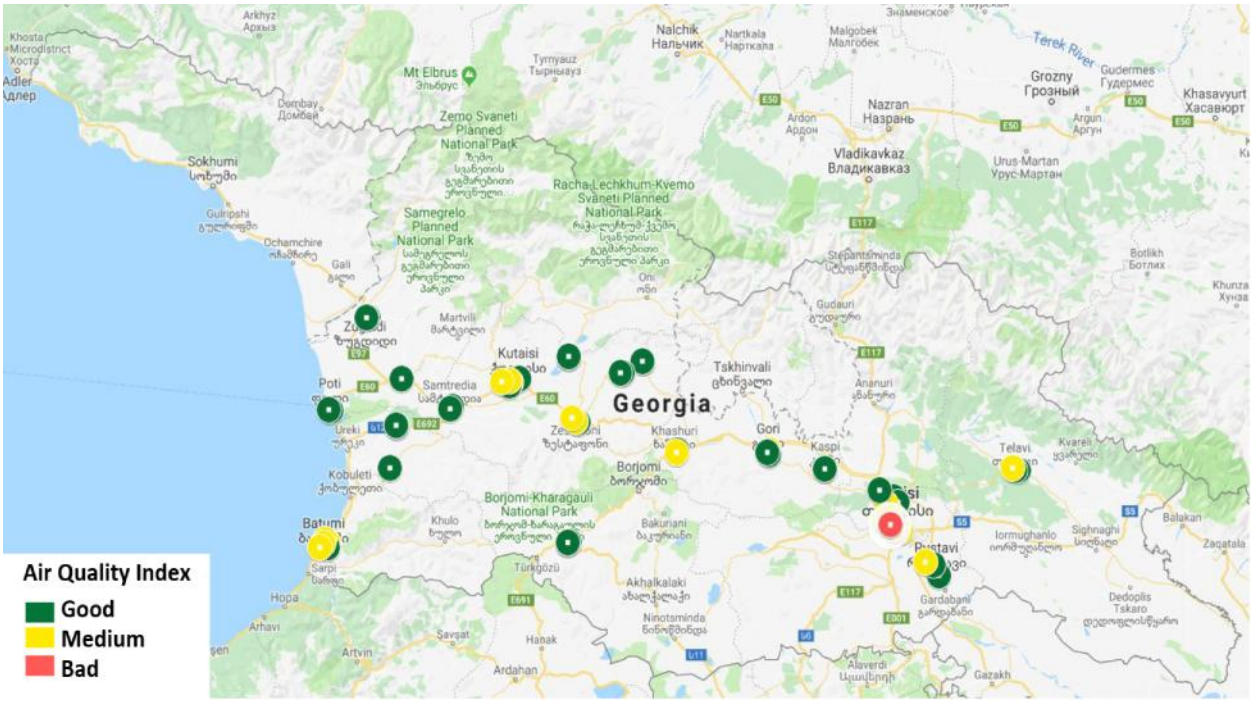
Figure 2.3.9: Average annual concentration of manganese dioxide in Zestaponi



Source: NEA, air.gov.ge

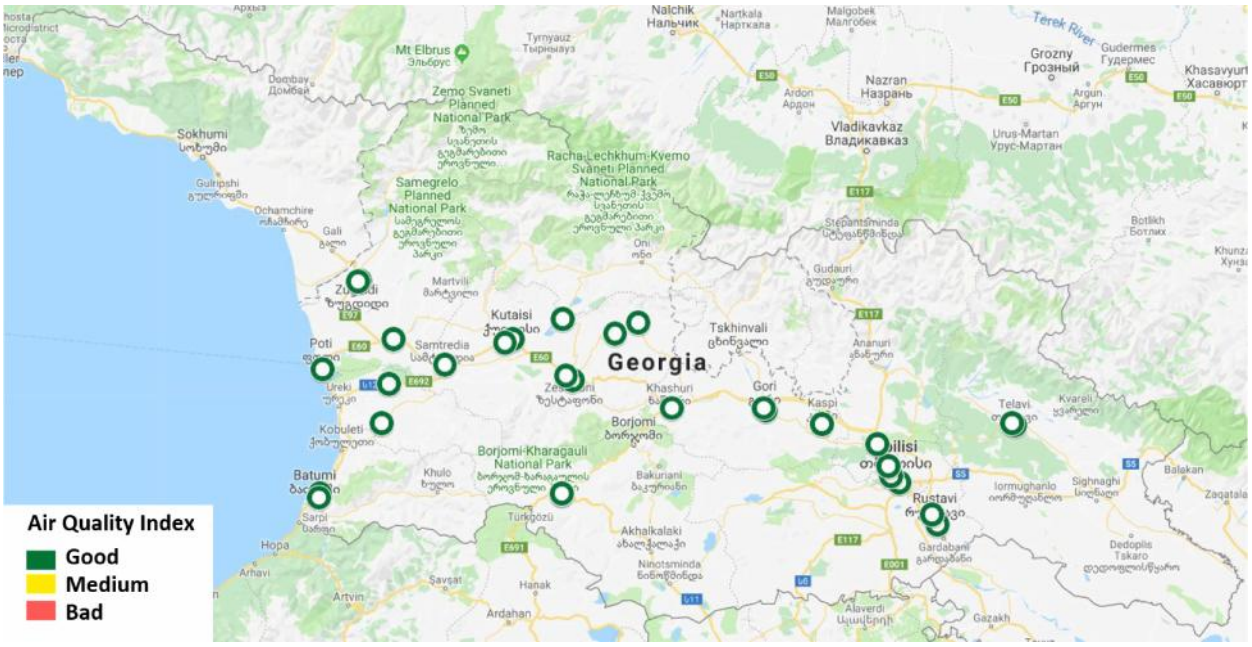
The results of passive samplings of nitrogen and sulphur dioxide, ground ozone and benzene concentrations in ambient air in the 20 municipalities of the country are shown on the maps 2.1-2.4 with the air quality index.

Map 2.1: Annual average values of nitrogen dioxide



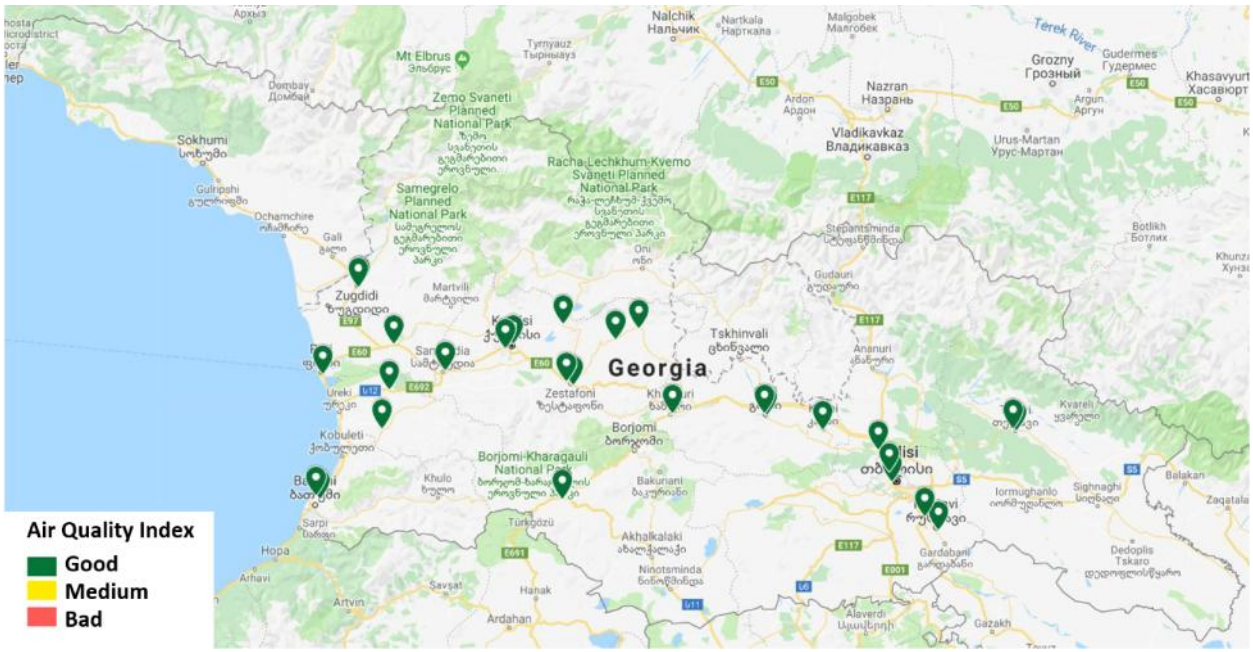
Source: NEA, air.gov.ge

Map 2.2: Annual average values of sulphur dioxide in 2017



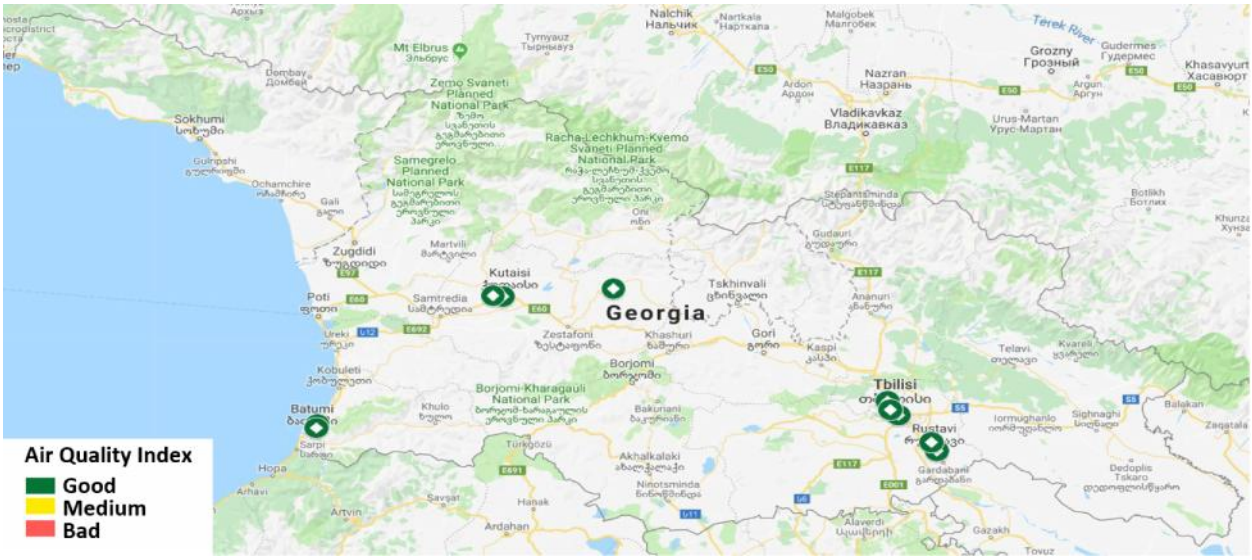
Source: NEA, air.gov.ge

Map 2.3: Annual average values of ground-level ozone in 2017



Source: NEA, air.gov.ge

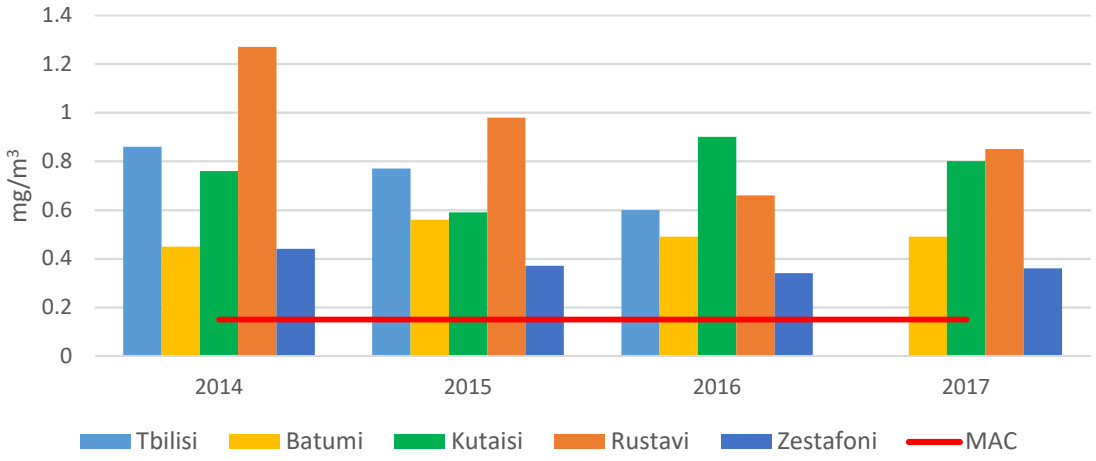
Map 2.4: Annual average values of benzene in 2017



Source: NEA, air.gov.ge

As for the monitoring results of non-automatic stations, since the sampling methodology for non-automatic stations does not comply with modern European air quality criterias, it is not possible to compare the data obtained from such stations with modern national and European standards of ambient air quality. Consequently, in the diagrams below, the data obtained from these stations are compared with the old norms – Maximum Allowable Concentrations (MACs). Diagrams 2.3.10-2.3.13 show the average annual concentrations of non-automatic measurements carried out at Tbilisi, Batumi, Kutaisi, Rustavi and Zestaponi stations in 2014-2017[7], which cannot be compared with the data of modern atmospheric air quality stations due to the above methodological inconsistencies.

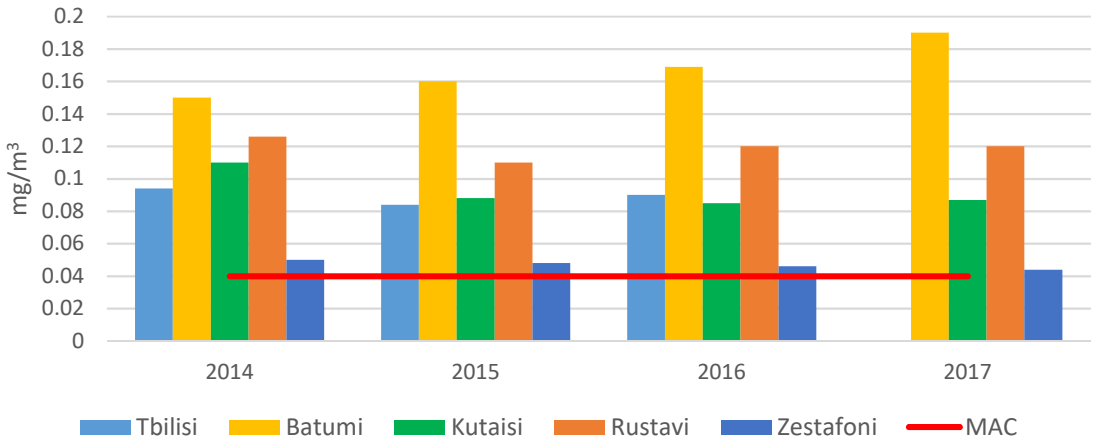
Figure 2.3.10: Average annual concentration of particulate matters



Source: NEA, air.gov.ge

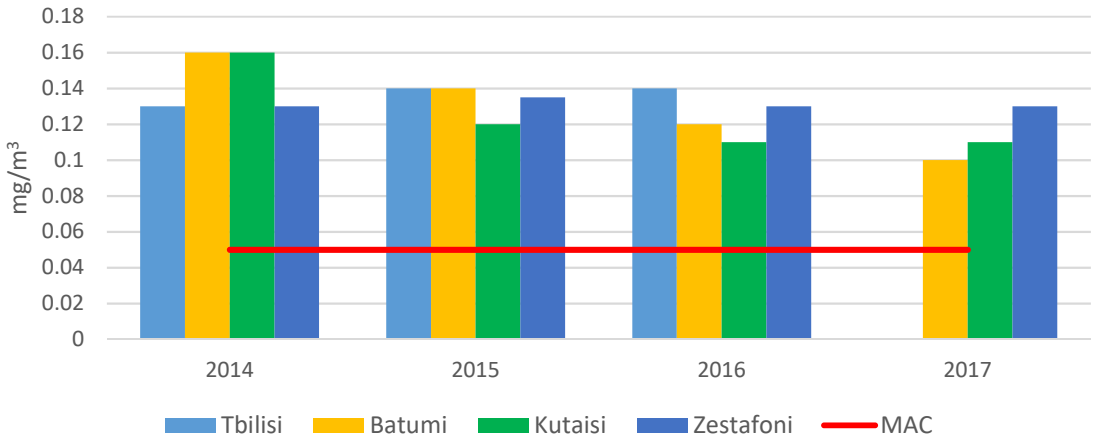
[7] As a result of the replacement of non-automatic stations with automatic stations in Tbilisi in September 2016, the data for 2017 is not presented on the charts, while the figure for 2016 covers the period from January 1, 2016 to September 1, 2016.

Figure 2.3.11. Average annual concentration of nitrogen dioxide



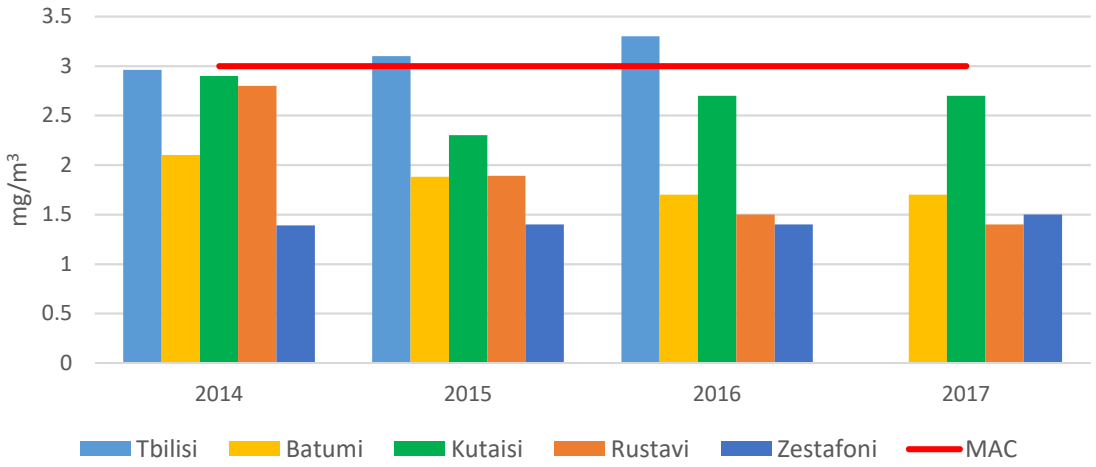
Source: NEA, air.gov.ge

Figure 2.3.12. Average annual concentration of sulphur dioxide



Source: NEA, air.gov.ge

Figure 2.3.13. Average annual concentration of carbon monoxide



Source: NEA, air.gov.ge

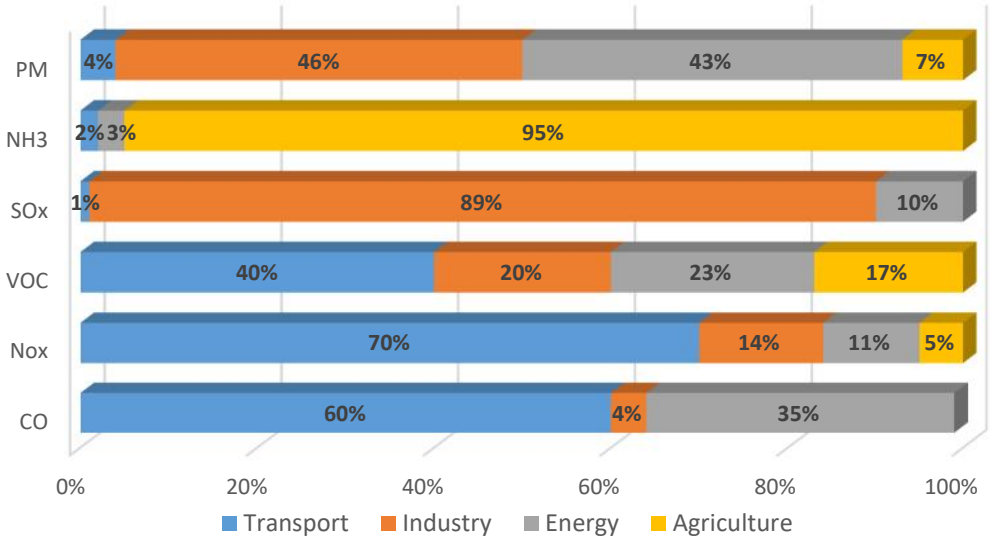
Atmospheric air quality monitoring results show that the major polluters in the country's largest cities are particulate matter (PM) and nitrogen dioxide, and the main challenge in Zestaponi is manganese dioxide pollution.

2.4 CAUSES OF AMBIENT AIR POLLUTION

Ambient air pollution generally comes from both natural and anthropogenic sources. In Georgia, natural sources play a very important role in polluting ambient air with particulate matters. Particularly important in this regard are the masses of desert dust from the Sahara and Arabian Peninsula that periodically enter in the territory of Georgia and often spread throughout the country. From the natural sources, there is also an open ground (i.e. a land surface covered with lawn or other means), which is a significant source of pollutants.

Anthropogenic sources of pollutants from major air pollutants can be divided into the following major sectors: auto transport, energy, industry and agriculture. However, it is noteworthy that in large cities, where the city is actively developing, the construction sector is an important source of particulate matters emissions.

Figure 2.4.1. Share of economy sectors in total emissions of harmful substances,%



Source: MEPA

Almost 90% of the country's total particulate matter (PM) emissions come from industry and energy (mainly firewood).

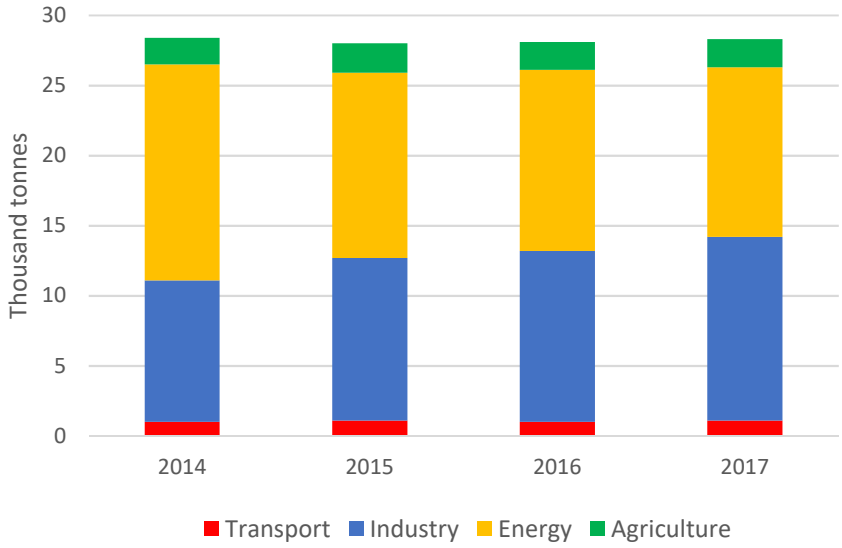
70% of nitrogen oxides (NOx) and almost 40% of volatile organic compounds (VOCs) emit from vehicles.

Ammonia (NH_3) emissions from agriculture account for 95% of the country's total emissions.

Almost 90% of sulphur oxides (SOx) emissions are emitted from industry.

About 95% of carbon monoxide (CO) emissions come from transport and energy.

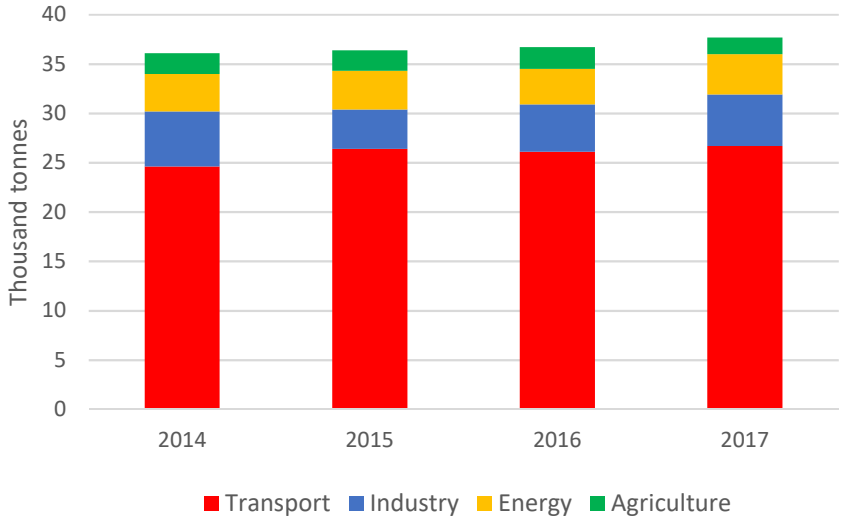
Figure 2.4.2. Dynamics of particulate matter (PM) emissions from economy sectors



Source: MEPA

During the reporting period, particulate matters emissions in the country did not increase and remained steadily at an average of 28 000 tonnes. However, emissions of this pollutant from the energy sector are reduced by about 20%, along with the reduction in firewood consumption. PM emissions were increased by almost 30% from industry, mainly as a result of increased production of construction materials, asphalt and metals.

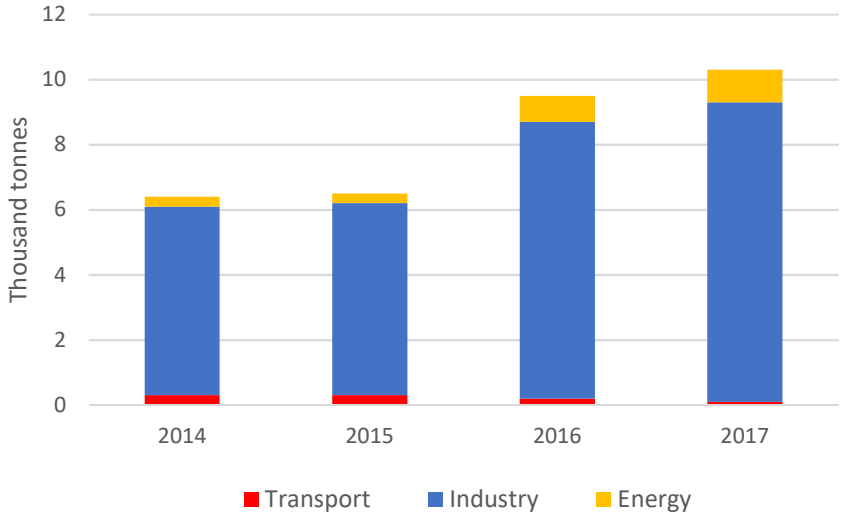
Figure 2.4.3. Dynamics of nitrogen dioxide (NO_2) emissions from economy sectors



Source: MEPA

Nitrogen dioxide emission dynamics are slightly increasing (4%). About 70% of the total emissions of this pollutant are emitted from motored vehicles. Despite the growth of the fleet, nitrogen dioxide emissions have stabilized in 2015-2017, reflecting the growth of the fleet rejuvenation and cleaner cars (hybrids and electromobiles). However, it is noteworthy that the emissions from the agricultural sector decreased by 21% in 2017 compared to 2014.

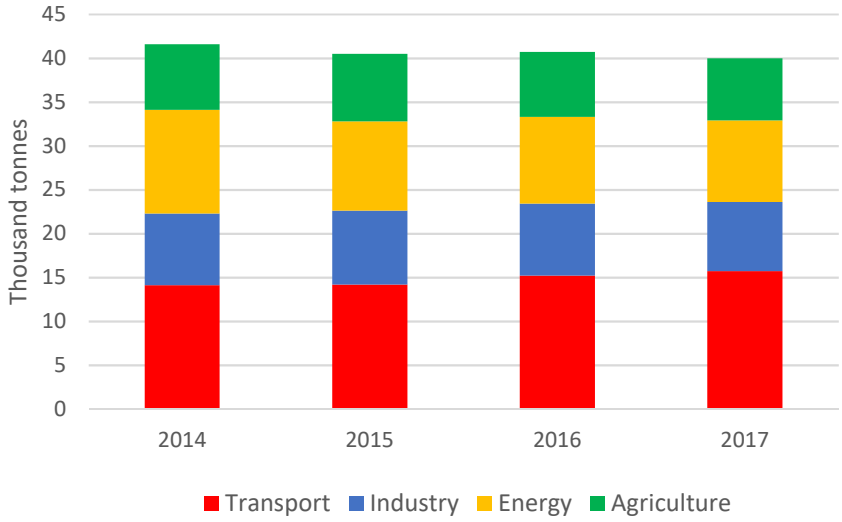
Figure 2.4.4. Dynamics of sulphur dioxide (SO_2) emissions from the economy sectors



Source: MEPA

However, in the reporting period, as a result of improved fuel quality, emissions of sulphur dioxide from the transport sector decreased by almost 55%, total emissions in the country increased by 62% due to increases in emissions from industry and energy sectors. 2016-2017 high levels of emissions from the industry sector are mainly attributable to the consumption of coal with high sulphur content in the cement production process. During the same period, increased emissions from the energy sector are driven by the launch of the Tkibuli coal-fired thermal power plant. Despite the increasing trend of emissions, air quality monitoring results show that sulphur dioxide concentration in ambient air is lower than the limit value across the country, including Tkibuli, Kaspi and Rustavi (where the largest cement plants are located).

Figure 2.4.5. Dynamics of volatile organic compounds (VOCs) emissions from economy sector

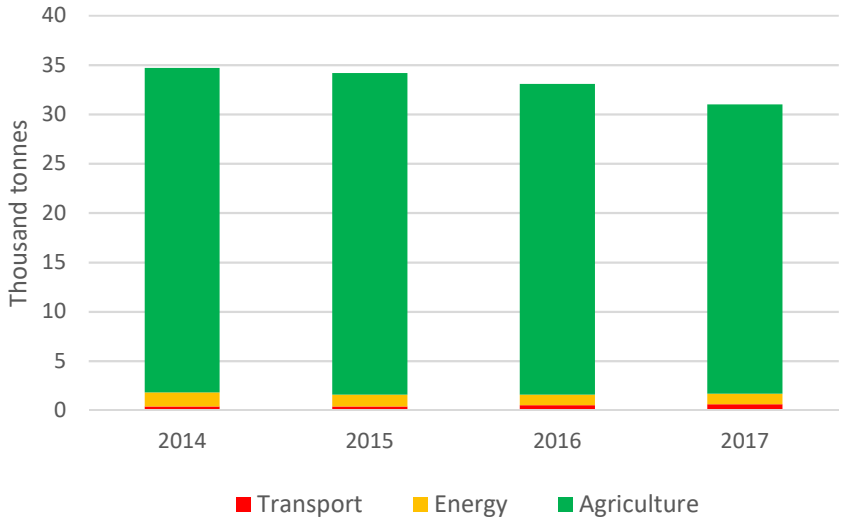


Source: MEPA

Volatile organic compound emissions are reduced. In 2017, emissions fell by 4% compared to 2014. Although emissions from the transport sector increased by 12% as a result of the increase in gasoline

consumption, emissions of these pollutants from all other sectors decreased. The largest decline (about 20%) is in the energy sector, driven by a decline in firewood consumption.

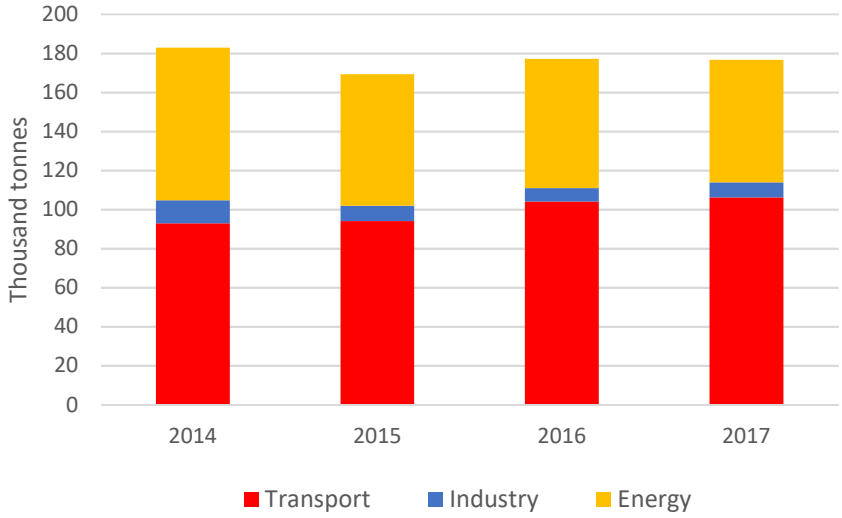
Figure 2.4.6. The dynamics of ammonia (NH_3) emissions from the economy sector



Source: MEPA

Ammonia emissions from the agricultural sector decreased in parallel with the decrease of cattle and inorganic nitrogen fertilizer consumption.

Figure 2.4.7. Dynamics of carbon monoxide (CO) emissions from the economy sector



Source: MEPA

Despite a 14% increase in carbon monoxide emissions from the transport sector, overall emissions fell 3.4% in the reporting period as a result of the reduction in emissions from industry and energy sectors. The 34% reduction in emissions from the industry sector is mainly due to the improvement of combustion quality in the cement production process, while the 20% decrease in emissions from the energy sector is mainly due to the reduction of firewood consumption.

2.5 MAIN CHALLENGES

Today, the major challenge for Georgia's largest cities in terms of ambient air quality is nitrogen dioxide and particulate matter pollution (mainly PM_{10}). In the case of Zestaponi, the problematic pollutant manganese dioxide caused by ferroalloy production in Zestaponi municipality.

Nitrogen oxides are released into the atmosphere by fuel combustion, and the amount of their emission depends largely on the quality of the combustion and not on the quality of the fuel itself. 70% of the total emissions of these pollutants come from motor transport. Although, due to the improvement in fuel quality the problem of ambient air pollution from vehicles with some of the most important harmful substances (lead, sulphur dioxide, benzene) have been solved, the combustion process in the cars is not carried out to an appropriate quality due to the size, age and technical malfunction of the car fleet. This results in increased emission of nitrogen oxides. In this respect, there is a promising growing trend of demand for younger and cleaner cars (hybrids and electric cars). This was stimulated, on the one hand, by raising the excise tax on old cars and fuel, and on the other hand, the tax policy of encouraging the import of hybrids and the creation of an electric vehicle charger infrastructure. However, in the absence of vehicle emission standards and based on this, prohibition of import of low standard cars, the issue of rejuvenation / refurbishing of the fleet remains a major challenge, especially given that almost all neighboring countries have similar restrictions.

During the reporting period, periodic technical inspections of motor vehicles were not mandatory. However, since then, a virtually new system of periodic technical inspections has been introduced in the country to ensure that significant progress can be made in terms of ambient air pollution from the transport sector to ensure effective enforcement.

The underdeveloped pedestrian and bicycle transport infrastructure and public transport remain a challenge in the transport sector. In recent years, positive changes have been observed in the two largest cities of the country - Tbilisi and Batumi.

In the country's largest cities, and especially in central areas, inadequate greenery is another problem. The issue of covering the ground with lawn or other type of cover is also important in this respect, since open ground is one of the important sources of particulate matters (dust) in ambient air. Construction processes are another major source of ambient air pollution by PM. On the one hand, building standards in the country do not meet today's challenges, and on the other, ensuring compliance with existing minimum requirements is problematic.

Ambient air pollution from the industrial sector, although in most cases local, is still a major problem. In this regard, disproportionately small and consequently ineffective sanctions for ambient air pollution are noteworthy. However, the legislation does not require the introduction of the best available technique that would minimize the negative impact on the environment from this sector.

Significant share of fine particulate matters ($PM_{2.5}$) emitted in the country comes from consumed firewood in the household sector. Although firewood consumption and related emissions tend to decline over the reporting period, overall firewood consumption rates (mainly in rural areas) remain high. In response to this challenge, it is necessary to raise public awareness of the harmful effects and proper use of firewood, as well as to promote the energy efficiency of wood stoves and buildings. Offering alternative sources of energy is also very important.

In terms of ambient air quality assessment, it is important to further expand the monitoring network with modern monitoring stations. In this respect, the reporting period can be said to have been a turning point, since it was at this time that the outdated stations and consequently the methodology shifted to modern automatic stations and the European methodology for air quality assessment. This has dramatically improved the amount and reliability of ambient air quality information. In order to improve the ambient air quality assessment system, it is also necessary to introduce air quality modeling and monitoring of the major pollutants not currently being evaluated, in particular: benz(a)pyrene, arsenic, cadmium and nickel.

In order to reduce ambient air pollution in the capital, the Interagency Commission on Ambient Air Pollution Reduction developed and the Government of Georgia approved (N1457; 12/07/2017) a 40-point "State Program on Enabling Activities to Abate Ambient Air Pollution in Tbilisi". The program covers the following main areas:

- Introduction of modern effective system of mandatory periodic inspection of motor vehicles of all categories;
- Promoting the rejuvenation of the car fleet and environmentally friendly cars;
- Improvement of motor fuel quality;
- Development of public transport;
- Improvement of road infrastructure and traffic flow management;
- Regulation of the construction sector;
- Growth and maintenance of the green cover area;
- Monitoring of air quality and health of population;
- Assessment of the impact of polluted air on health of population;
- Informing and awareness raising of the public.

While much of the program focuses on improving air quality in Tbilisi, a number of measures go beyond the capital and cover the whole of Georgia. For example: restoration of periodic inspection, improvement of fuel quality, rejuvenation of the fleet and encouraging cleaner transport.

II/3 WATER RESOURCES

Water is one of the most common substances found on earth in natural conditions, existing in solid, liquid and gaseous forms.

Ensuring good quantitative and qualitative status of surface and groundwater bodies, as well as coastal waters, is an important prerequisite for protection of human health and maintenance of aquatic ecosystems. To this end, it is necessary to reduce water pollution from point and diffuse sources and to introduce sustainable water use practices.

3.1 MAIN QUESTIONS AND MESSAGES

1. *What is the quality of water in Georgia?*

- Majority of rivers meet the water quality standards. There are however, several rivers, where the water pollution problems persist regularly or periodically;
- Contamination of water bodies with ammonia nitrogen is the most widely spread water quality issue in Georgia. Based on the monitoring results, the concentration of ammonia nitrogen consistently exceeds the Maximum Allowable Concentration (MAC) in 11 rivers and 4 lakes;
- High pollution level with heavy metals is a problem in the Kazretula and Mashavera rivers of the Caspian Sea basin. Concentrations of heavy metals here exceed the MAC values. In the Black Sea basin, in the river Kvirila, water contamination with manganese is present;
- Chemical and microbiologic parameters of monitored groundwater are within the norm;
- Quality of the Black Sea water can be assessed as mostly good in respect to the eutrophication status. Nevertheless, there are two areas – Anaklia and Poti Port surroundings, where the moderately high level of chlorophyll-a was observed. In terms of chemical pollution, most of parameters are within the limits of the Environmental Quality Standards (EQS) of the EU.

2. *What is the trend of water use in Georgia?*

- Total volume of water abstracted from water bodies has slightly (by 3.7%) declined in 2017 as compared to 2013. Withdrawal of water from groundwater sources on the other hand, in the same period has increased by 21.3%;
- The largest share of water abstracted from surface water bodies is used for hydropower generation. In 2017 the sector used 11% more water than in 2013;
- Water consumption for irrigation grew from 156 mln m^3 in 2013 to 488 mln m^3 in 2017. The growth is driven by the expansion of irrigated land area, however water consumption for irrigation is still considerably less than in late 1980s. Total volume of water use for domestic purposes has reduced by 30.5% between 2013-2017;
- In 2017 the share of population with the access to improved drinking water supply reached 65.5% (2.44 mln persons); 47.9% (1.78 mln persons) had the access to sanitation services. Wastewater treatment facilities provided service to 1.33 mln persons.

3. *What are the main challenges of water resources management in Georgia?*

- Low water-use efficiency and high-water losses, particularly, in the household sector;
- Discharge of untreated urban wastewater into water bodies;
- Discharge of untreated or insufficiently treated wastewater from mining industry that leads to contamination of water bodies with heavy metals and other pollutants;

- Hydro-morphological changes in water bodies;
- Deteriorated state of the water infrastructure – drinking water supply and sanitation network;
- The need to develop and approve sanitary protection zone projects for the sources of water supply;
- Shortcomings of the national legislation:
    - the 1997 Water Law that does not meet the requirements of present time and development trends;
    - Deficiencies in current legislation that does not set the Environmental Flow requirement and its calculation method to prevent over-abstraction of water.
    - Absence of effective economic instruments that leads to an over-abstraction and ineffective use of water resources.
- Shortcomings of the law enforcement that are mainly associated with the lack of adequate human and financial resources;
- Reliability and availability of data on water abstraction and uses.

3.2 WATER RESOURCES OF GEORGIA

Georgia has abundant water resources. Annually generated renewable surface water is estimated at around 66 bln m^3. The Total Actual Renewable Water Resources per capita in Georgia is one of the highest in Europe. It accounts for 15 832 m^3 per inhabitant per year[8].

There are over 26 000 rivers in the country, 99% of which are rivers with less than 25 km length. Although the number of medium and large size rivers is relatively small, their contribution to generation of renewable water resources is considerable. Rivers in Georgia are distributed unevenly. The annual discharge of rivers in west Georgia makes up to 75% of the total annual discharge. Total annual water discharge of all rivers in Georgia is estimated at 61.45 bln m^3, out of which around 86% (52.77 bln m^3) is generated within the territory of the country, the rest flows into Georgia from the neighboring countries[9]. Detailed information about transboundary rivers is provided in the box 3.1.

Map 3.1: Six river basin districts of Georgia

Source: MEPA

The richest by water discharge is the river Rioni with 419 mln m^3 annual water discharge followed by Kura with 206 mln m^3. Rivers with the annual discharge higher than 100 mln m^3 are Kodori (117 mln m^3), Enguri (110 mln m^3) and Alazani (107 mln m^3) rivers followed by other rivers with high, moderate and relatively small water discharges. The hydrological flow of rivers in Georgia is generated by precipitation (snow, rainfall), glacier melting and groundwater. Importance of each of these sources in generation of water runoff varies depending on the time of year, geological characterization of landscape and altitude. Usually, in spring precipitation and snow melting have a leading role in generation of flow, while in winter groundwater plays the considerable role in formation of water discharge. Georgia's rivers are divided into the Black Sea and the Caspian Sea basins. River basin districts that belong to the Black Sea basin are: Enguri-Rioni, Chorokhi-Ajaristskali and Kodori-Bzifi.

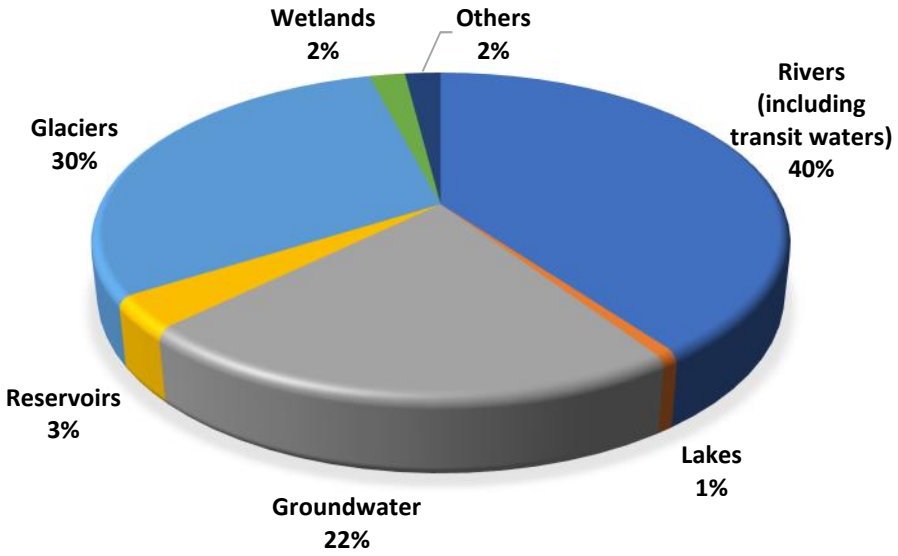
[8] Source: United Nations Food and Agriculture Organization (FAO)

[9] Source: Ministry of Environmental Protection and Agriculture of Georgia (MEPA)

The Kura, Alazani-Iori, and Khrami-Debeda river basins are part of the Caspian Sea basin[10] (see figure 3.2.1). At present the Kura river basin is the most populated river basin of the country. Around 64% of population of Georgia resides in this basin.

Groundwater in Georgia plays substantial role in meeting water demand, both in west and east Georgia. Groundwater reserves include waters with low, medium and high mineralization level.

Figure 3.2.1: Water resources of Georgia



Source: V. Trapaidze, Water Resources, 2012, Technical University of Georgia

Annual total groundwater debit is estimated at 21.7 bln m^3. Groundwaters, similarly to surface waters, are distributed unevenly. Around 63% of groundwater reserves are located in west Georgia, 24% in east and 13% in south (the Samtskhe-Javakheti and Kvemo Kartli regions). Groundwaters in Georgia play an important role in feeding rivers. Their contribution to the annual water discharge varies from region to region but particularly high is it in the southern part of the country, where groundwater generates over 40% of the annual river runoff. Groundwater plays considerable role in generation of the river runoff in east Georgia as well, for such rivers as Liakhvi, Aragvi, Tergi and Alazani.

Georgia's groundwater resources also include thermal waters, temperature of which varies between 40C° and 108 C°. Total estimated reserves of thermal waters are around 160,000 m^3 daily.

Other sources of fresh water include lakes and wetlands. There are around 860 lakes in Georgia absolute majority of which are small in size. In terms of volume, the largest lake is the Tabatskuri lake containing around 221 mln m^3 of water, followed by the Didi Ritsa lake with 94 mln m^3 water reserves. It is also the deepest lake in the South Caucasus (with maximum depth of 101 m). Other large lakes by size and volume are: Paliastomi, Pharavani, Kartsakhi and Jandari lakes. Wetlands in Georgia currently cover

[10] Allocation of river basins by districts is in the process of discussion and can be subjected to changes.

around 627 km² ([11]) and are manly presented in the Kolkheti lowland in the western part of the country. The Kolkheti wetlands play important role in the formation of coastal area and protection of coastal lands from the saltwater intrusion.

BOX 3.1: Transboundary water resources

Several rivers in Georgia are of transboundary nature. Annually around 8.7 bln m³ of water flows into the country from neighboring Turkey and Armenia. Around 13.45 bln m³ water flows out from Georgia to Azerbaijan. There are eleven transboundary rivers in total, out of which four originate beyond the boundaries of the country:

- the Chorokhi, Kura and Photskhovistskali rivers flowing from Turkey
- the Debeda river – flowing from Armenia

The Psou river, originating in Georgia, forms the border between Georgia and Russia. The Alazani and Iori rivers originate in Georgia and flow farther downstream to Azerbaijan. Kura river, also, flows downstream to Azerbaijan. The rivers of Pirikita Khevsureti, such as Asa and Arghuni, flow from Georgia to Russia. The rivers Tushetis Alazani and Tergi also flow to Russia.

Besides transboundary rivers, Georgia also has two large transboundary lakes - the Kartsakhi lake at the border with Turkey (53% located in Georgia; 47% - in Turkey) and the Jandari lake at the border with Azerbaijan (67% located in Georgia, 33% - in Azerbaijan).

Georgia also shares its groundwater resources with the neighboring countries. There are several large aquifers that are of transboundary nature. The Alazani artesian aquifer, that is located in Azerbaijan and Georgia, is one of the important transboundary aquifers in terms of water reserves. Due to its natural characteristics, groundwater in this aquifer flow from Georgia to Azerbaijan. This transboundary aquifer is an important groundwater source in the Alazani valley.

Source: MEPA, NEA

Significant amount of fresh water is stored in glaciers but it is mostly inaccessible for use. Glacial melting contributes around 1.4% of the total water discharge annually. The number may seem insignificant but it plays considerable role in generation of river runoff of the largest rivers in July-August. For example, in case of the Enguri river, around 30% of water discharge in July-august is generated from glacier melting.

Besides natural water bodies Georgia also relies on artificial water reservoirs for its water needs**.** There are 44 artificial reservoirs throughout the country with 3.3 blm m³ total storage capacity. Reservoirs are mainly used for irrigation, electricity production and water supply. Most of them are also used for the seasonal regulation of flow and flood control.

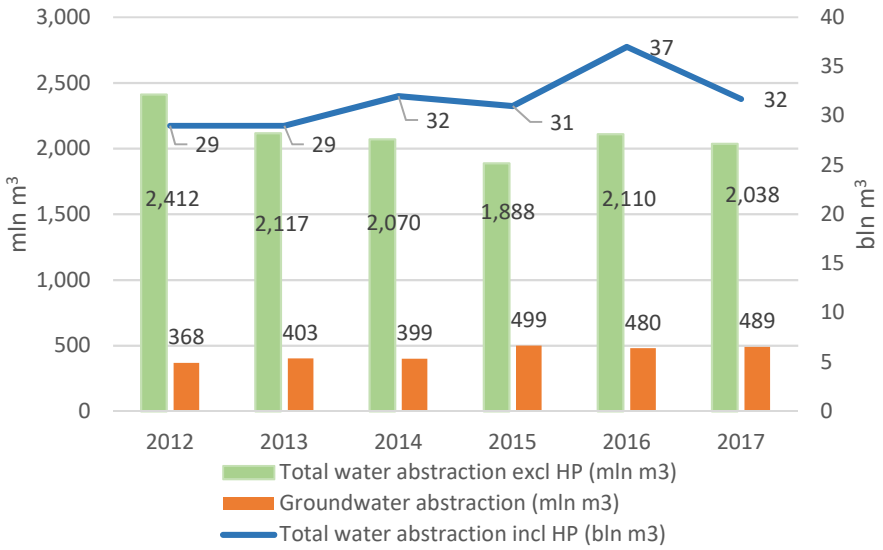
The Black Sea is an important part of Georgia's ecosystem. It also plays a significant role in the economy of the country. Over three quarters of rivers belong to the Black Sea basin and discharge in the sea. The coastal line of the Georgia's Black Sea makes up 320 km.

[11] Wetlands and swamps in past occupied 2 560 km², of which 88% was situated in the western Georgia. Most of wetlands have been drained and currently are dry.

3.3 WATER USE

The main water users in Georgia are: agriculture, industry, energy and household sectors. Water resources are also used for recreational purposes. In 2017 the total water abstraction, excluding the water withdrawn for hydropower generation, amounted to 2.04 bln m^3. The share of groundwater in abstracted water was 489.2 mln m^3 that makes up to 24% of the total withdrawn water. In recent years the abstraction of groundwater has been increasing gradually. 1.3 times more groundwater was abstracted in 2017 than in 2012. The total water abstraction, excluding water used for hydropower generation, on the other hand has declined by 15.5% in the same period. Water abstraction for hydropower generation has been steadily growing from year to year. In 2017 it reached 29.7 bln m^3. The water abstraction trends during 2012-2017 is presented in figure 3.3.1.

Figure 3.3.1: Water abstraction trend in 2012-2017



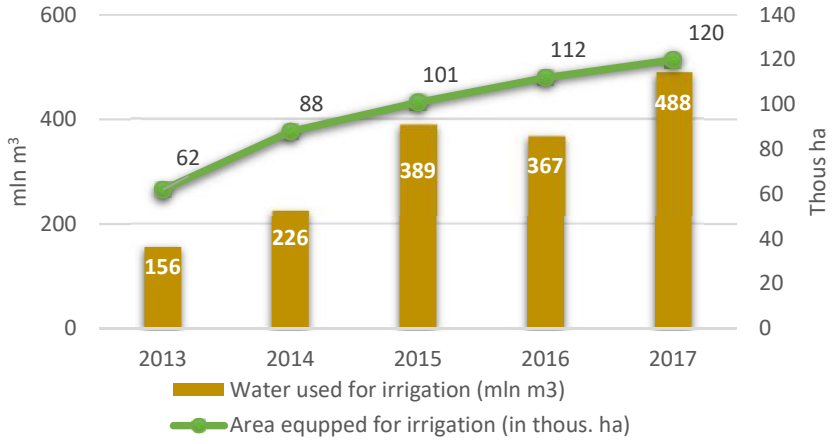
Source: MEPA

Chapters bellow provide a brief overview of the water uses by sectors and highlight the key development programmes and strategies of Georgia that define the water use trends for coming years.

3.3.1 WATER USE FOR IRRIGATION

In terms of the water use, agriculture remains the largest consumptive water user in Georgia. In this sector largest portion of the water is used for irrigation purposes. Water use for irrigation rose from 156 mln m³ in 2013 to 488 mln m³ in 2017 (see figure 3.3.2), that equals to 3-fold increase. This process was driven by the expansion of irrigated land. In 2017 the land area equipped for irrigation reached 120 thousand ha, out of which around 52,5 thousand ha (44%) were actually irrigated. [12]

Figure 3.3.2: Water use in agriculture in 2012-2017

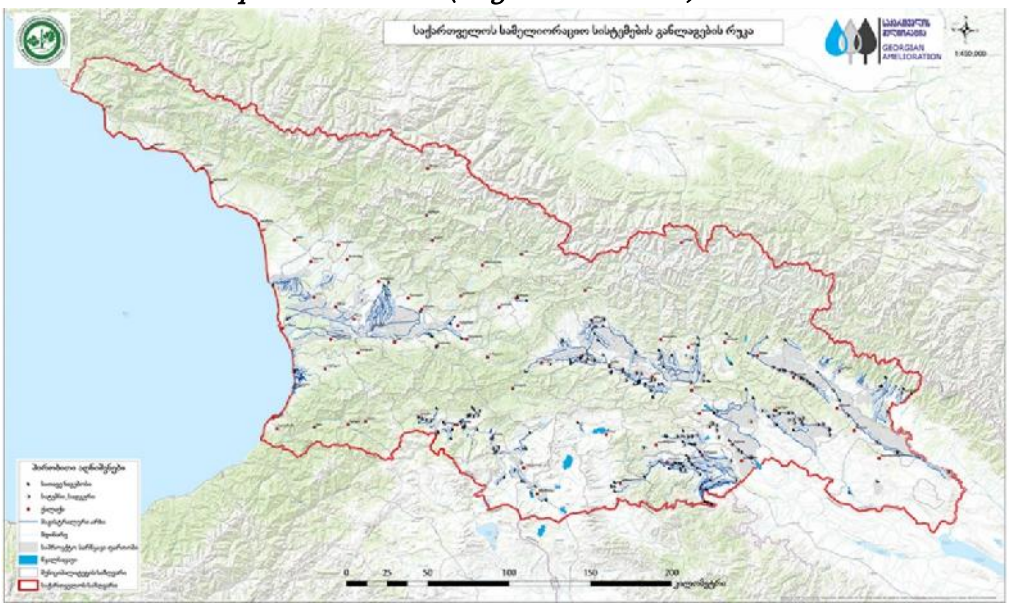


Source: LTD Georgian Amelioration

The rehabilitation of irrigation infrastructure, that has been among top infrastructure priorities of the government of Georgia in recent years, will continue in future as well. The State Strategy for Agriculture Development for 2015-2020 sets the objective to increase the irrigated farmland area to 150,000 ha by 2020 and to 200,000 ha by 2025. This process will have positive impact on the productivity increase and revenue generation in agriculture sector. It will also contribute to an improved food security of the country. In a view of these plans it is likely that the water consumption for irrigation will continue to grow. Prognosis suggest that it will reach up to 912.2 mln m³ by 2025.[13] Increased demand on water can partially be offset by the reduction of losses in irrigation systems (as a result of rehabilitation works) and application of modern irrigation methods, which will increase the water use efficiency. Water losses are considerable in the main, secondary and tertiary irrigation canals. According to estimations, the water loss in canals reaches up to 50%.[14] Currently flood irrigation is the most widely applied irrigation method in Georgia. It has considerably less water productivity rate than its modern alternatives, such as for example, sprinkler and drip irrigation. The Irrigation Strategy of Georgia for 2017-2025, underlines the intention of the government of Georgia to facilitate the wide application of the sprinkler and drip irrigation that can considerably reduce the water consumption in agriculture if applied widely.

[12] Source: LTD Georgian Amelioration.
[13] Source: Irrigation Strategy of Georgia for 2017-2025.
[14] Source: Irrigation Strategy of Georgia for 2017-2025.

Map 3.2: Ameliorated (irrigated and drained) land areas

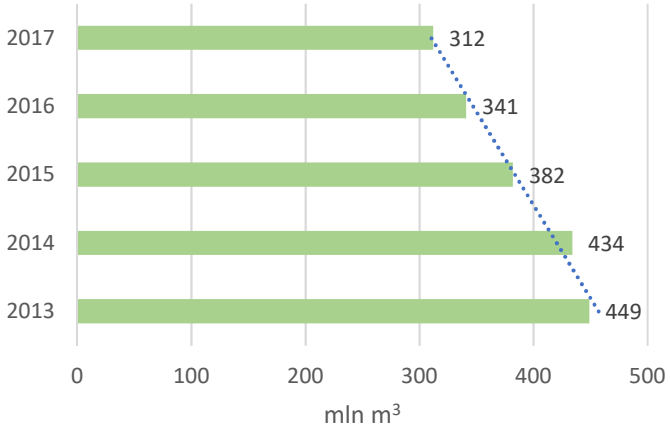


Source: Georgian Amelioration

3.3.2 DOMESTIC WATER USE

Water use for domestic purposes comes as a second in terms of consumed water. This sector uses water mainly for households, public services, municipal buildings. In 2017 this sector consumed 312 mln m^3 of water. Figure 3.3.3 demonstrates the water use trends for domestic purposes in 2013-2017 that indicates, the water use has declined in the recent years.

Figure 3.3.3: Water uses in the household sector in 2013-2017



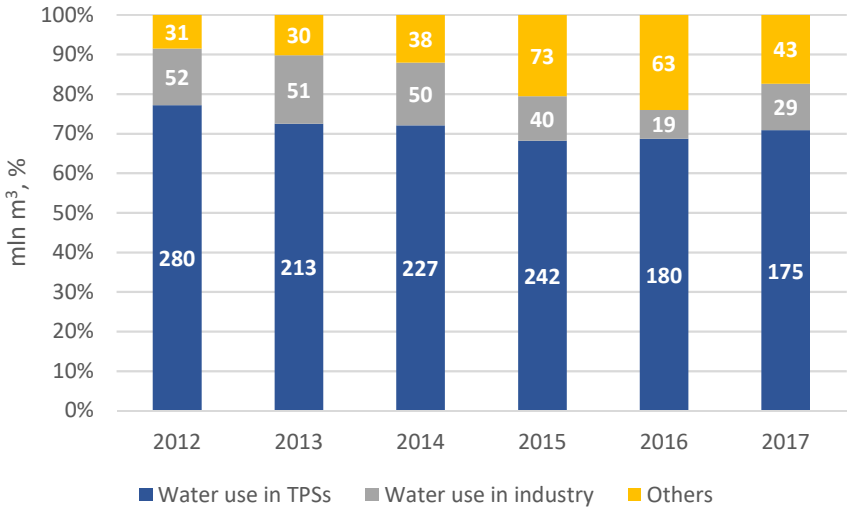
Source: MEPA

The water loss still remains to be one of the biggest challenges of Georgia's household sector. As estimated by the GeoStat, in 2017 water service providers released in the water supply network around 882.2 mln m^3 of water, while water supplied to households was 262.7 mln m^3. Water loss consequently

amounted to around 70% that corresponds to 625.5 mln m³. To put it into perspective, in 2017 water loss in domestic sector was slightly less than what Georgia consumed for irrigation in the same year. In Georgia water is lost to leakages in water supply network, evaporation, breakdown or errors of the water meter, etc. Significant efforts have to be made at all levels to reduce the water loss in the household sector.

Considerable number of households in Georgia still lack the access to drinking water supply and sanitation services through water supply and sanitation network. The National Statistics Office (GeoStat) reports that in 2017 the share of population with the access to improved drinking water supply (through water supply network) was 65.5%. Water demand in household sector is expected to grow in coming years in a view of the government's plan to extend and improve drinking water supply and sanitation services throughout whole Georgia. The water demand in household sector will be influenced by the growing number of tourists as well. In 2012-2017, the number of tourists[15] grew from 2.5 mln to 4.1 mln[16] and this trend is expected to continue in coming years as well, which means that more water will be used in the tourism sector (restaurants, hotels, etc.).

Figure 3.3.4: Water use for manufacturing in 2012-2017



Source: MEPA

3.3.3 WATER USE FOR MANUFACTURING

Manufacturing sector has undergone considerable transformation in the last three decades, both in terms of its structure and production output. The 1990s deep economic recession resulted in more than 90% decrease in water use for manufacturing purposes. Since 2000 water use in this sector started to increase gradually but in the recent years water use has been exhibiting a declining trend. 247 mln m³ water was used in 2017 for manufacturing purposes, out of which 28.8 mln m³ was used by industry

[15] Tourists - visitors staying in the country longer than 24 hours.
[16] Source: Georgian National Tourism Administration.

and 175 mln m^3 by thermoelectric power. These figures are considerably less than in 2012-2015 (see figure 3.3.4). Water use for thermoelectric power has also declined as a result of increased share of the hydropower in energy generation. Within the industry sector metallurgy, manufacturing of building materials, food and chemical industry accounted for the largest water consumption in 2017. Chemical industry and thermal power sector have relatively higher levels of water use efficiency as the water in these sectors is used in recycling systems.

3.3.4 WATER USE FOR HYDROPOWER

Energy sector in Georgia is the largest non-consumptive water user. 79.9% of electricity produced in the country comes from hydropower, 19.4% from thermoelectric power and 0.8% comes from wind power.[17] The use of water for hydropower increased considerably in the last years. If in 2011 water use in this sector was around 21 bln m^3, in 2017 it reached 29.7 bln m^3 that corresponds to 11% increase. With economic development demand on energy is expected to grow. The prognosis of the electricity demand suggests that demand may grow by 51 - 158% between 2019-2032 as compared to 2018, depending on the development scenarios[18]. Ensuring stable and accessible energy supply for population of Georgia and economic sectors, as well as reducing dependence of Georgia on external energy sources is among top priorities of the government. Development of the renewable energy potential of the country, in which hydro-resources play a key role, is the main strategy for achieving these goals. An increased demand is intended to be met mostly by the installation of new hydropower plants.

Table 3.1: Total water abstraction and some of the main water uses in Georgia during 2013-2017

Water abstraction and uses	2013	2014	2015	2016	2017
Water abstraction mln m^3					
Water abstraction excl. water used for hydropower generation	2,117	2,070	1,888	2,110	2 038
Groundwater abstraction	403	399	499	480	489
Water uses excl. hydropower mln m^3					
Water use for irrigation purposes	156	226	389	367	488
Domestic water use	448	434	382	341	312
Water use for manufacturing purposes *of which*	294	315	355	262	247
Thermal power	213	227	242	180	175
Water use in hydropower mln m^3	26,728	27,823	28,436	34,673	29,680

Source: MEPA, Georgian Amelioration

3.3.5 REGULATORY FRAMEWORK FOR WATER ABSTRACTION

The key legislation that sets the framework for the protection and management of surface water resources is the 1997 Water Law. The management of groundwater is regulated by the 1996 Law on

[17] Source: JSC "Commercial Operator of Electricity System".

[18] With the pessimistic growth scenario (consumption growth of 3% annually) an increase with 51% is expected, with the moderate growth scenario (5% growth annually) - 98%, and with the "optimistic growth" scenario (7% growth annually) - 158% (Ten Year Network Development Plan of Georgia, 2019).

Mineral Resources. Until July 2017 water abstraction for activities[19] subject to the State Ecological Expertise was regulated by the Law on Environmental Impact Assessment. From July 2017 when the law on Environmental Impact Assessment was replaced by the Environmental Assessment Code, the scope of activities subject to the Environmental Impact Assessment (EIA) and screening procedures has expanded[20]. Activities, which are not subject to the environmental decision, are regulated by the 2014 Technical Regulation for the Abstraction of Water from Surface Bodies that requires from the water user to seek an approval of the MEPA on the plan for the abstraction of surface water.

Currently the water abstraction fees for the surface water are not applied. The abstraction and use of groundwater require obtaining of a license that can be issued for maximum 25 years. Charges for groundwater abstraction are set by the Law on Fees for Use of Natural Resources (2004). Charges vary according to the groundwater source and the type of the use (commercial/industrial or municipal use for drinking water supply).

The 1997 Water Law also requires from the water user submission of records on the water abstraction and uses once a year for statistical accounting. Water users eligible for the state accounting of water uses are defined by the MEPA. Current practice of water accounting is insufficient. Reliability of data on water abstraction and uses was identified as one of the shortcomings by the Third Environmental Performance Review of Georgia prepared by the UNECE.[21] As highlighted by the EPR-3, data submitted by water users has a reliability issue, since majority of enterprises do not have measuring devices and water uses are mainly based on estimates. Data at hand often is inaccurate, contradictory or incomplete that does not allow to carry out comprehensive analysis of water uses and water demand. It also makes it difficult to calculate water balance by river basins that is an important tool for assessing the water availability and water use trends by river basins. Building a reliable and modern system of water accounting would be an important step forward for improved decision making in the field of water management. This issue becomes particularly important in the context of Georgia's plans to introduce the river basin management (RBM) principles and implement the permit system for water abstraction and discharge that is reflected in the new draft Law on Water Resources Management the MEPA is currently working on. Further information on this subject is provided in subchapter 3.6.1.

[19] Activities related to abstraction/storing of water that are subject to the EIA are included abstraction/storing of 10,000 m^3 water and above.

[20] Activities related to abstraction/storing of water that are subject to the EIA are: Carrying out of works related to groundwater abstraction or artificial groundwater recharge where the annual volume of water to be abstracted or recharged is 10 mln m^3 or more; transfer of water resources between river basins; where the amount of water transferred exceeds 20 mln m^3 per year; where the multi-annual average flow from the basin of abstraction exceeds 2 000 mln m^3 per year and where the amount of water transferred exceeds 5% of that flow; Construction and operation of dams and/or other structures designed for the holding back or permanent storage of water and where the amount of water held back or stored exceeds 50 000 m^3. Water abstraction/storing related activities, subject to the scoping procedure include: extraction of underground fresh water for entrepreneurial purposes, where the amount of resources extracted exceeds 100 000 m^3 per year; drilling for the extraction of thermal waters; construction of dams and/or other structures/installations designed to hold water or store it on a long-term basis where the amount of water held or stored is more than 10 000 m3.

[21] Source: Third Environmental Performance Review of Georgia, 2015. UNECE

3.4 WATER QUALITY

Water quality refers to physicochemical, microbiological, radiological and biological characteristics of water. Regular assessment of water quality parameters is necessary to determine the suitability of water resources for different uses, as well as ecosystem functioning. Regular monitoring of water quality is also needed to identify pollution issues, to analyze the main drivers of water quality degradation and pressures on water bodies and to plan appropriate response measures.

To assess the quality of water resources, LEPL National Environmental Agency (NEA) carries out regular monitoring of water bodies throughout Georgia[22]. The monitoring covers surface waters (rivers and lakes), groundwater and coastal waters. Information on monitoring system and activities carried out by the NEA is presented in sub-chapter 3.6.4. Chapters below discuss the main findings of the water quality observations by the type of the water body.

3.4.1 SURFACE WATER QUALITY

Findings of the surface water monitoring in 2014-2017 show that the quality of water in Georgia's surface water bodies in overall was satisfactory. Contamination by ammonia nitrogen, that is associated with the discharge of untreated wastewater from urban agglomerations and agricultural facilities into water bodies, is the most widespread pollution surface waters suffer from. Contamination with heavy metals is an acute problem only in few rivers and is mainly associated with the operation of mines.

Concentration of ammonia-nitrogen in majority of rivers is within permissible limits. Single elevated concentrations spotted through regular monitoring is usually observed during low-water season when dilution rate is low. The situation however, is different for rivers, where ammonia-nitrogen concentrations are high throughout the year and frequently exceed the Maximum Allowable Concentration (MAC). In 2014-2017 rivers that consistently have been suffering from the elevated concentration of ammonia-nitrogen are: Kubastskali (Batumi), Bartskhana (Batumi), Choloki, Menijistskali (Batumi), Kvirila (Chiatura, Zestafoni), Rioni, Suramula, Kura (Khashuri, Kareli, Zahesi, Tbilisi, Rustavi, Gachiani), Vere (Tbilisi), Gldaniskhevi (Tbilisi), Dighmula (Tbilisi) and Kazrethula rivers. Lakes that are affected by pollution from ammonia-nitrogen are: Pharavani, Khanchali, Saghamo, Lisi.

In the Caspian Sea basin pollution with heavy metals is most pronounced in the Kazretula and Mashavera rivers. Concentrations of heavy metals in these two rivers exceed MAC consistently. Concentration of iron, manganese, cadmium, copper, lead, zinc is mostly beyond the norm in Kazretula. In the Mashavera river iron and manganese are being found above the MAC every once in a while. In the Black Sea basin, the Kvirila river is affected by pollution with manganese.

More detailed information on water quality parameters observed in 2014-2017 is presented below by chemicals. Driving forces of pollution and pressures are discussed in chapter 3.5.

[22] Currently monitoring of water bodies in the occupied territories of Georgia is not performed.

Box 3.2: Ammonia-nitrogen

Ammonia-nitrogen is present in water in two forms - NH_3 and NH_4^+. Although nitrogen is a nutrient required by all living organisms, its high concentrations are harmful. Nitrogen causes alternation of metabolism in aquatic species as it accumulates in the body. It also affects hatching and growth of fish. Plants show more tolerance to ammonia than animals. Toxic concentrations of ammonia in humans may cause serious health conditions that can lead to coma and death.

The sources of ammonia ions in water bodies are: biochemical degradation of proteins, deamination of amino-acids, degradation of uric acid and salami effect of kreazin, therefore, high concentration of ammonia is related to decomposition of dead bodies of organisms. Pollution with ammonia is also caused by the discharge of untreated urban and industrial wastewaters. The MAC for the ammonia-nitrogen according to the national legislation is 0.39 mg/l.

Ammonia nitrogen: in 2014-2017 concentrations of ammonia nitrogen has consistently exceeded the MAC values in several rivers (see the figure 7). In 2017 rivers, where the annual average concentrations of ammonia nitrogen exceeded the MAC value twice or even more are: Vere (4.7 times), Kazretula (3.1 times), Kubastskali (3.1 times), Gldaniskhevi (2.6 times), Dighmula (2.4 times) Kura at the Vakhushti bridge (2 times).

Other rivers, where the annual average concentration in 2017 was above the MAC are: Ksani (1.9 times) Kura at Gachiani (1.7 times), Kvirila at Chiatura (1.5 times), Kura at the Metekhi bridge (1.5 times), Kvirila at Zestaphoni (1.4 times), Suramula (1.4 times), Rioni at Photi (1.4 times – southern branch), Bartskhana (1.3 times), Rioni at Kutaisi (1.3 times - lower Kutaisi), Kura at the Vakhushti bridge (1.3 times), Oghaskura (1.1 times), Rioni overall (1.1 times), Kura at Khashuri, Kareli, Rustavi (1.1 times). In 2016 the annual average concentration of ammonia nitrogen for the Kura river in overall exceeded MAC 2.1 times, but it was less in 2017 (1.1. times). For further details see figure 3.4.1-3.4.4.

In other rivers that are being monitored regularly, concentrations of ammonia nitrogen were observed at levels below the MAC or exceeded it insignificantly once or twice a year.

In 2017 the annual average concentration of ammonia nitrogen exceeded the MAC in following lakes: Pharavani, Khanchali, Saghamo and Lisi. In other lakes ammonia nitrogen concentrations were mostly within the permissible limits with few exceptions when concentration exceeded the MAC slightly.

Figure 3.4.1: Annual Average Concentrations of ammonia-nitrogen in the Kura river in 2014-2017

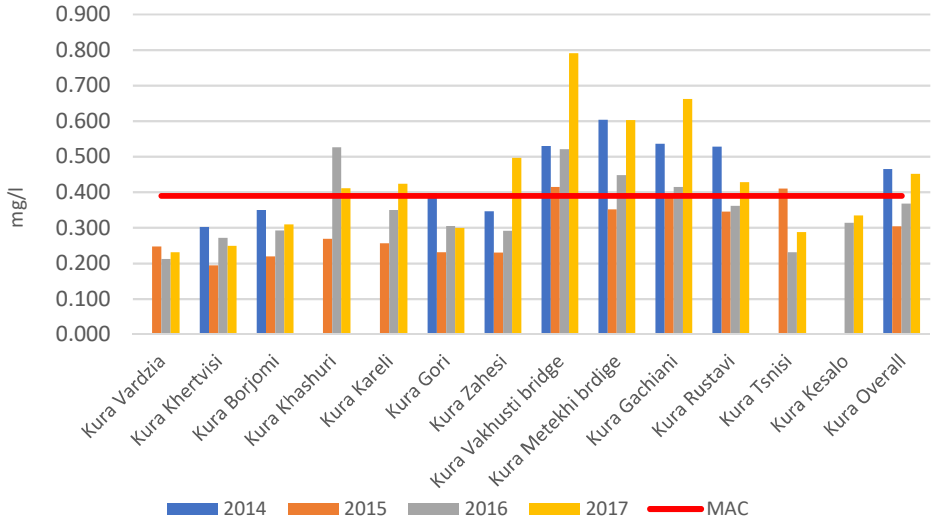
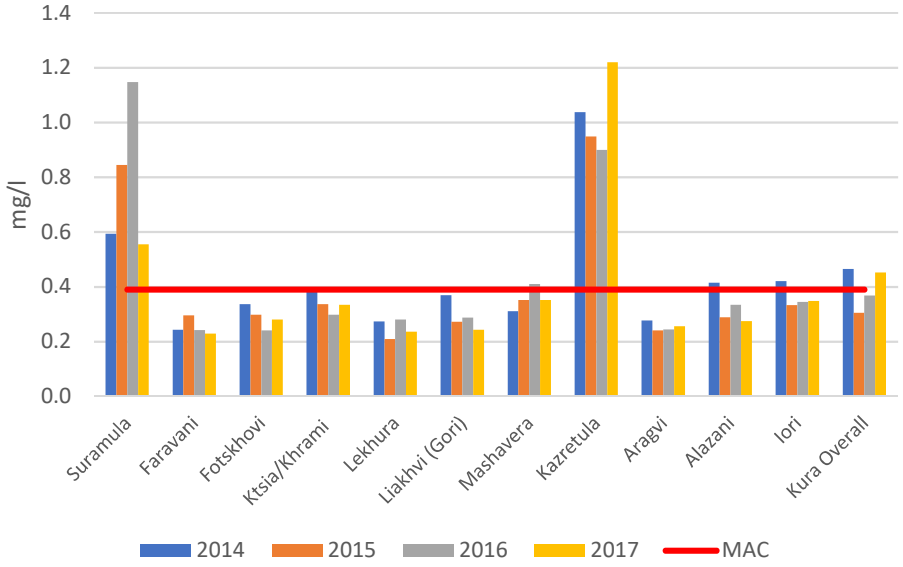


Figure 3.4.2: Annual Average Concentrations of ammonia-nitrogen in rivers of the Caspian Sea basin in 2014-2017



Source: NEA

Figure 3.4.3: Annual average concentrations of ammonia-nitrogen in rivers of the Black Sea basin in 2014-2017

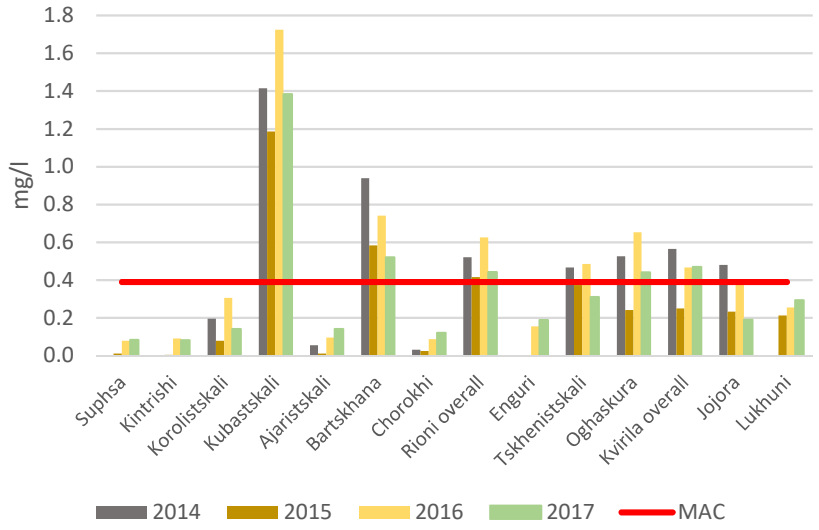
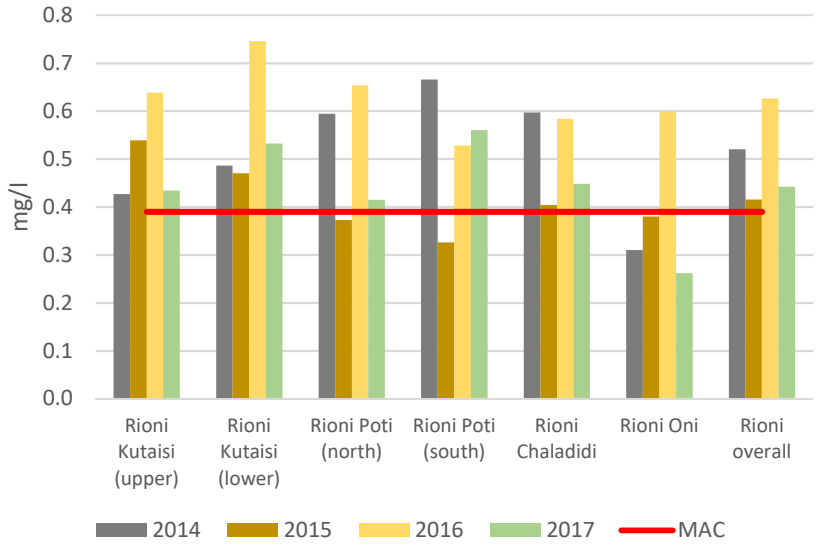


Figure 3.4.4: Annual average concentrations of ammonia-nitrogen the Rioni river in 2014-2017



Source: NEA

Nitrogen of Nitrate and Nitrite, Sulphate, Phosphate and Chloride: as monitoring results show in 2014-2017 concentrations of these compounds in all monitored rivers and lakes were below the MAC with an exception of the Kazretula river, where the concentration of sulphates exceeded MAC several times throughout these years.

Box 3.3: Nitrate, Nitrite, Sulphate, Phosphate and Chloride

High concentrations of nitrate, nitrite and phosphate in water bodies are considered to be the main cause of the excessive plant growth that lead to eutrophication of water bodies. Sulfates are considered less toxic. Problems with high concentration of sulphates are mainly associated with the ability to form acids that affects the pH level of water. Aquatic organisms are particularly sensitive to high levels of chlorides.

Nitrogen of Nitrate and Nitrite, Sulphate, Phosphate and Chloride occur is water mainly as a result of leaching of nutrients from farms, where fertilizers are applied for crop production and garden care, as well as from municipal and industrial wastewater discharges. The MAC levels of these pollutants are presented in table 3.2.

Biochemical Oxygen Demand (BOD): Biochemical Oxygen Demand is an important water quality parameter. Analysis of water samples taken both in rivers of the Black Sea and Caspian Sea basins, as well as lakes, show that in 2014-2017 the BOD was within the norm.

Box 3.4: Biochemical Oxygen Demand

Biochemical Oxygen Demand (BOD) is the amount of dissolved oxygen needed for decomposing organic matter (such as dead plants, leaves, manure, sewage, food waste) by aerobic bacteria at certain temperature over a specific time period. The BOD helps to assess whether there is sufficient oxygen in water body after decomposing organic matter. Unpolluted rivers typically have the BOD below 1 mg/l. According to the national legislation the MAC for BOD is 3 or 6 mg/l depending on the category of a water body.

Metals: heavy metals that are being monitored regularly in water bodies of Georgia include: arsenic, barium, copper, cadmium, iron, lead, manganese, nickel, molybdenum, silver and zinc.

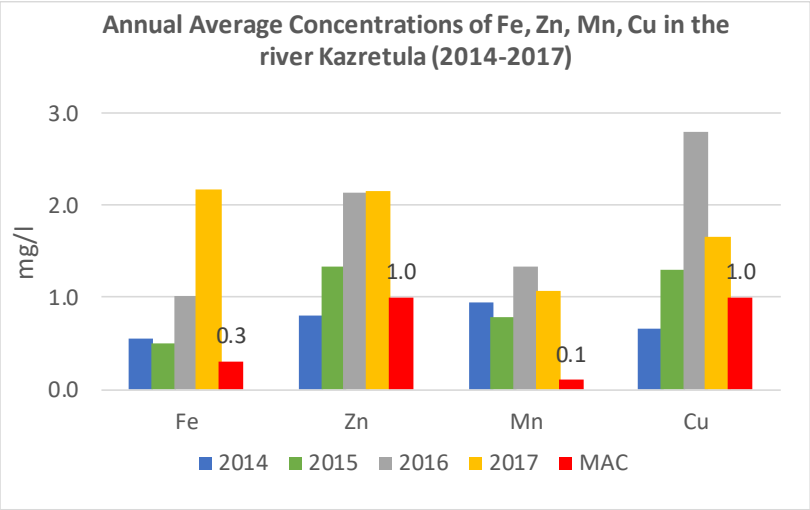
Box 3.5: Heavy Metals

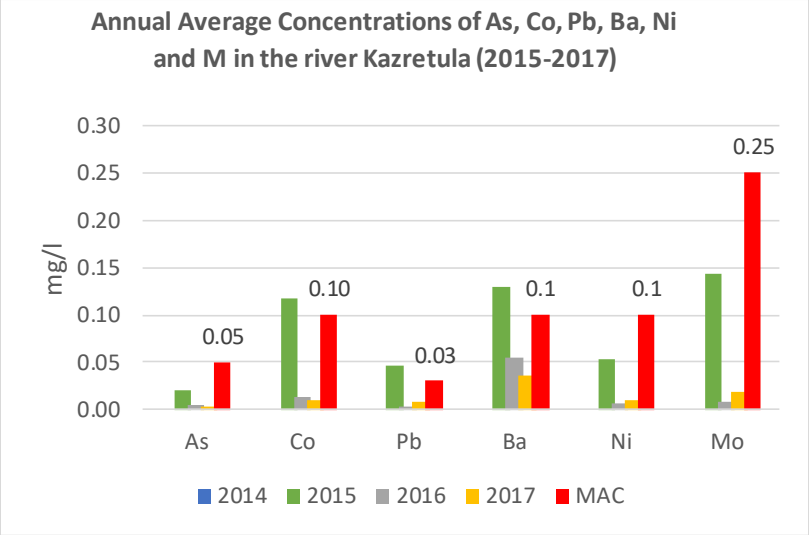
Heavy metals can cause serious damage to human health, plants and animals if concentrations exceed permissible levels and exposure to pollution continues over long time period allowing pollutants to accumulate in the body. Used in industrial processes, heavy metals are being released by factories in air and discharged into water bodies with wastewaters. Landfills are considered to be another source of pollution with metals. For example, zinc carbon and alkaline batteries that end up on landfill sites may enter water bodies through leaching into soil. Information on the Maximum Allowable Concentrations by metals is provided in the table 3.2.

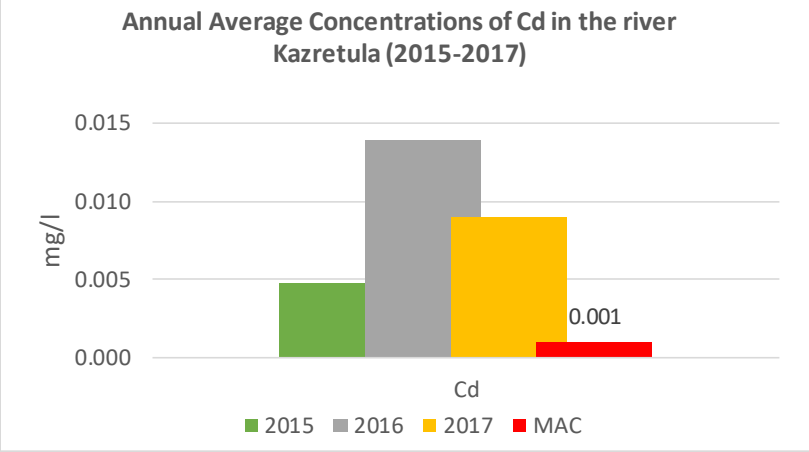
Iron (Fe): in majority of monitored rivers and all monitored lakes the concentration of iron was within permissible limits. High concentrations of iron were detected in Alazani, KazreTula, Mashavera, Oghaskura and Poladauri rivers. Single spikes of iron concentrations observed in the Alazani river is attributed to the naturally high background concentration of iron, while in the Kazretula and Mashavera rivers it is related to anthropogenic activities. The annual average concentration of iron in 2017 in Kazretula exceeded MAC value 7.2 times. In the Mashavera river a year earlier, in 2016 the annual average concentration of iron was 1.5 times MAC value but in 2017 annual average concentration was already within the norm. Single spikes of iron concentration observed in the Pholadauri and Oghaskura rivers also have anthropogenic origin.

Manganese (Mn): in 2014-2017 high concentration of manganese was observed only in the Kazretula. In 2017 in Kazretula the annual average concertation was 10.7 times higher than MAC, in 2016 – 13 times higher; annual average concertation of manganese has been high in the Kvirila river as well. In 2017 it exceeded MAC value 1.6 times, in 2016 – 2.2 times. In 2014-2017 single spikes of elevated concentrations were also observed in Oghaskura, Mashavera, Kura and Ksani rivers.

Figure 3.4.5: Annual average concentration of metals in relation to the MAC in the Kazretula river in 2014-2017

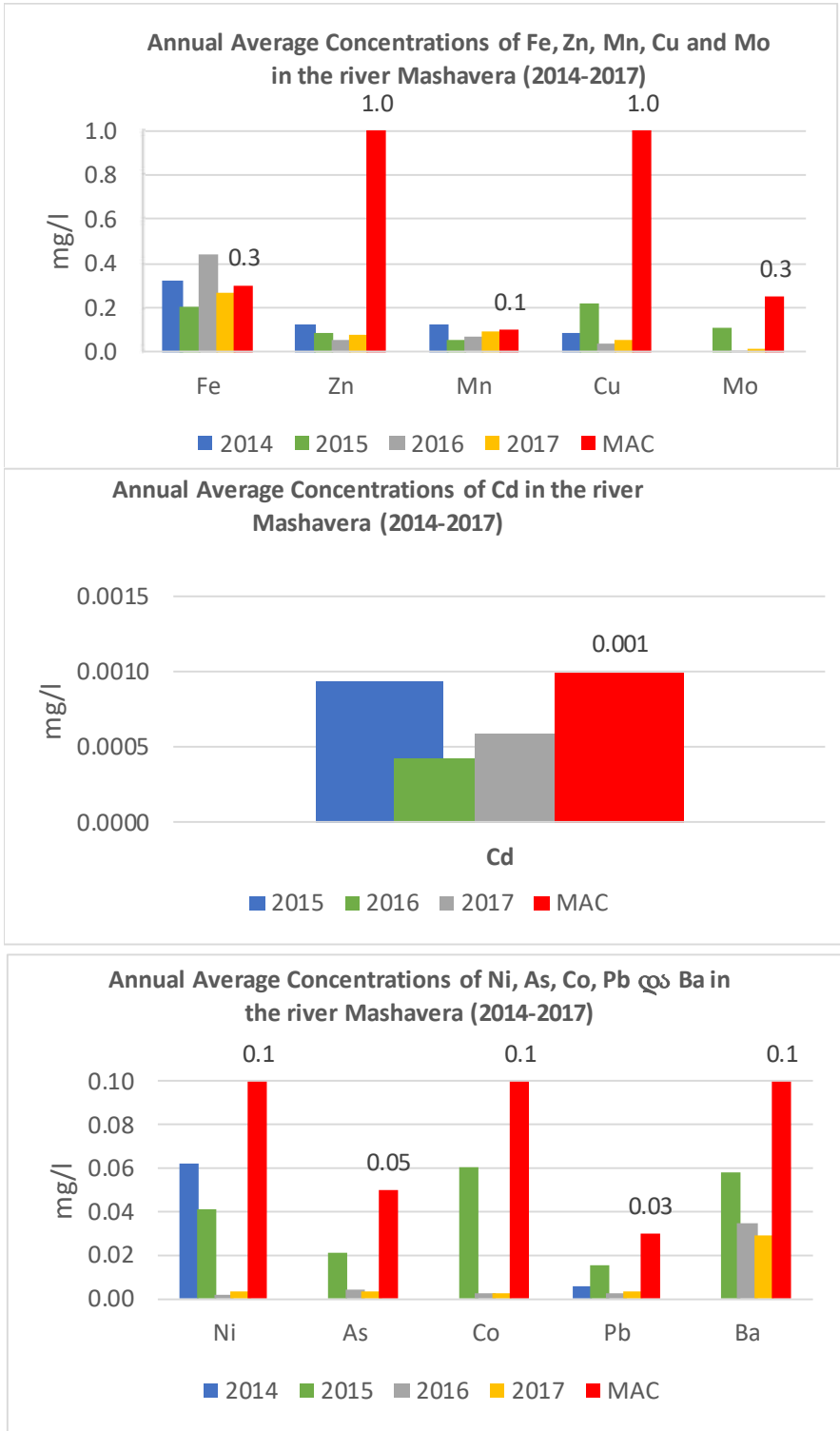






Source: NEA

Figure 3.4.6: Annual average concentration of metals in relation to the MAC in the Mashavera river in 2014-2017



Source: NEA

Cadmium: high level of cadmium was detected only in the Kazretula river. The annual average concentration in 2017 was 9 times higher than MAC value. Concentration of cadmium was high in the previous years as well (see figure 3.4.5). After Kazretula discharges into Mashavera the concentration of cadmium drops down considerably as a result of dilution. Monitoring results show that the annual average concentration of cadmium in Mashavera was within the MAC values (see figure 3.4.6).

Copper: high concentrations of copper were observed only in the Kazretula river, exceeding MAC consistently from year to year.

Zinc: high concentrations of zinc were observed only in the Kazretula river, where the annual average concentration in 2017 exceeded permissible limits 2.1 times. The concentration of zinc is high in the river consistently from year to year.

Lead: the annual average concentration of lead was within the norm in all rivers.

Water quality parameters, such as temperature, Dissolved Oxygen (DO) and mineralization was within the norm in all monitored surface water bodies.

Table 3.2: Maximum Allowable Concentrations by main pollutants

Pollutants	Concentrations (mg/l)
Ammonia-nitrogen	0.390
Arsenic	0.05
Cadmium	0.001
Chloride	350
Copper	1.0
Cobalt	0.1
Iron	0.3
Lead	0.03
Manganese	0.1
Molybdenum	0.25
Nickel	0.1
Nitrate	45
Nitrite	3.3
Poli-phosphate	3.5
Sulphate	500
Zinc	1.0

Source: Technical Regulation on Protection of Surface Water from Pollution[23]; the Order # 297 of the Minister of Labor, Health and Social Protection of Georgia

3.4.2 GROUNDWATER QUALITY

Monitoring of groundwater quality is carried out at 55 points. Installed hydrogeological equipment allows to carry out automated monitoring of water debit, temperature, mineralization, pH, conductivity. Twice a year the Geology Department together with the Department of Environmental Pollution Monitoring takes water samples that are analyzed in the laboratory of the NEA for several

[23] Approved by decree N425 of the Government of Georgia, December 31, 2013.

chemical and biological pollutants, including nitrites, phosphates, fluorine, silicon acid, coliforms, faecalis streptococcus, e-coli, mesophilic microbes, etc. As the results of monitoring indicate, in 2014-2017 chemical and microbiologic parameters of monitored groundwater were within the norm. Chemical and microbiologic parameters varied to a small extent within the MAC values. Concentrations of heavy metals also remained below the MAC values set by the Technical Regulation for Drinking Water (enacted from January 2014).

3.4.3 DRINKING WATER QUALITY

In accordance with the Technical Regulation for Drinking Water approved by the decree N58 of the Government of Georgia, January 15, 2014, 2 levels of drinking water quality control are defined: internal control and monitoring, and state control. Internal control and monitoring of drinking water is conducted by the water supplier while the state control of drinking water is carried out by LEPL National Food Agency (NFA) of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA).

State Control

State control over drinking water safety by the LEPL National Food Agency is carried out in accordance with the relevant schedule-plan of the State Food Safety Control Programme approved by the order of the Minister of Environmental Protection and Agriculture of Georgia. The number of samples to be taken and analyzed annually is determined based on certain criteria (probability of water related diseases - depending on its severity; assessment of laboratory studies from previous years; Intestinal infections, sporadic cases/epidemics caused by drinking water). In addition, sampling points for drinking water are determined and by considering the risk, specific indicators are selected for each point. With this in mind, the focus is only made on the parameters, which pose threats to the health of the local population in a particular region/district. Development of the plan is based on the following factors: water-related epidemiological statistics from previous years, capacity of the water supply system, population size, technical condition of water supply system, touristic potential of the area, etc.

In the case of a water distribution network, authorized personnel of the LEPL National Food Agency collect the drinking water samples inside the building, directly from the tap, from which the water is normally consumed. As for bottled water - at the retail outlet, in the case of food enterprises - samples are taken at the water consumption points. Water quality is also controlled in the water pipelines from which the population is supplied with drinking water. According to the above criteria, 2 507 drinking water samples were collected by the authorized personnel of LEPL National Food Agency between 2014-2017.

Findings of the drinking water quality monitoring show that in 2014-2017 over 45-47 % of drinking water samples were incompliant with the requirements of the Technical Regulation for Drinking Water.[24] Particularly high was incompliance in Guria and Racha-Lechkhumi region and the Adjara A/R, where over 60% of samples were incompliant with the requirements for drinking water. Water

[24] In 2018 and during the first six months of 2019, 731 drinking water samples were collected, out of which 276 samples, representing 37% of the total, showed incompliance.

quality parameters in Tbilisi were within the norm except 4.5% of samples in 2017 (for further details see table 3.3).[25]

Around 97% of incompliances with the drinking water quality requirements are attributed to the microbiological parameters. In particular, elevated concentrations were observed for the mesophilic aerobic bacteria, facultative anaerobic bacteria, total coliform, E-coli and St. faecalis. Contamination by parasites is very low (0.18% of incompliant samples) and was caused by the lamblia cysts. In rural areas contamination is taking place mainly in the drinking water distribution network In addition, due to the lack of approval procedures for the sanitary protection zone projects for drinking water supply sources, sanitary protection zones are often not determined, which is an additional risk for contamination of drinking water sources.

Table 3.3: Percentage of incompliant drinking water samples by regions analyzed by the NFA

Regions	2014		2015		2016		2017	
	Total Samples	Incompliant samples in %	Total Samples	Incompliant samples in %	Total Samples	Incompliant samples in %	Total Samples	Incompliant samples in %
Mtskheta-Mtianeti	67	56.7	32	56.3	40	40.0	44	54.5
Kakheti	85	58.8	51	58.8	58	63.8	51	49
Shida Kartli	77	45.5	31	58.1	45	57.8	42	42.9
Kvemo-Kartli	64	31.3	39	41.0	60	28.3	54	24.1
Samtskhe-Javakheti	59	40.7	36	58.3	44	52.3	46	15.2
Tbilisi*	59	3.4	56	1.8	22	4.5	22	4.5
Guria	28	57.1	26	61.5	13	53.8	23	78.3
Racha-Lechkhimi, Kvemo Svaneti	29	65.5	42	59.5	13	76.9	24	79.2
Imereti	126	32.5	158	39.2	63	52.4	97	57.7
Ajara AR	91	60.4	114	56.1	40	50.0	59	39
Samegrelo-Zemo Svaneti	82	40.2	100	16.0	41	26.8	58	20.7
Total	787	44.9	695	42.7	454	47.4	530	42.6

**Note: Incompliance was caused by insufficient disinfection and cleaning of the water tank*;

Source: the NFA

Based on the above mentioned epidemiological outbreak of the *gastro-intestinal infectious diarrhea* remains as a challenge for Georgia and is being observed every year. For example, in 2013 were registered 25,235 cases of the infectious diarrhea, in 2014 – 25,480, in 2015 – 30,501.[26] However, exact causes of the infectious diarrhea registered by the epidemiological observation system is determined rarely.

[25] In 2018 and during the first six months of 2019, there was no incompliance present in any of the drinking water samples collected in Tbilisi (57 in total).

[26] Source: Lashkhauri, M., Rdzelishvili, M., 2017. Drinking Water-related Risks. Scientific Report, Risk Assessment Scientific Board of the LEPL Scientific-Research Center of Agriculture.

Incompliance of drinking water quality with the physicochemical parameters are relatively low - around 6.5% of incompliant samples don't meet the requirements of Technical Regulation for Drinking Water. Incompliances were mainly observed in relation to the standards for oxidation (that is a sign of contamination by organic matter). In 2014 elevated concentrations of pesticides was detected in drinking water samples taken in Telavi, Akhmeta and the Kazreti settlement of the Bolnisi municipality. In the subsequent monitoring (following days and years) of drinking water from these locations concentrations of pesticides were within the limits.

In all cases of incompliance, the NFA provides information and recommendations to the respective service provider and agencies (including local municipalities). It also requests to carry out immediate measures to improve drinking water quality.

Internal Control and Monitoring

In accordance with the technical regulation of drinking water, internal water quality control and monitoring is conducted by the water supplier. Accordingly, the water supplier companies carry out laboratory studies of the drinking water samples in accordance with requirements determined by the technical regulation (drinking water determining indicators and the number of samples). For example, the state-owned LLC United Water Supply Company of Georgia (UWSC), which currently operates in 57 cities and 315 villages (excluding Tbilisi, Mtskheta, Rustavi, Gardabani Municipality and A/R Adjara), ensures the compliance of water quality with the requirements of the national regulations. In addition, the company ensures epidemic safety of drinking water, performs appropriate purification and disinfection procedures and gradually improves the technological processes. The company has developed annual plans and a monitoring programme for laboratory studies, ensuring the consistent internal monitoring and control of drinking water quality and safety. More than 150,000 water samples were collected in 2014-2017, the results of which are presented in Table 3.4.

Table 3.4: Statistics of incompliant drinking water samples, collected between 2014-2017 by the UWSC

Year	Total samples	Incompliant samples in %
2014	43089	1,99
2015	46812	1,56
2016	44554	1,55
2017	47351	0,73

Source: UWSC

LLC Georgian Water and Power (GWP) serves 507 432 customers throughout Tbilisi, including 477 762 household and 29 670 non-residential customers. The chemical and microbiological laboratories of GWP are accredited according to the SST ISO/IEC 17025:2018 standard. The quality of drinking water is tested permanently in automatic mode and is monitored by specialists in the chemical and microbiological laboratory once per hour. Quality control is carried out both at headworks (Samgori, Grmaghele, Aragvi Gorge) as well as in the city's water supply network. The monitoring results of drinking water quality are presented in Table 3.5.

Table 3.5: Statistics of incompliant drinking water samples, collected between 2014-2017 by the GWP

Year	Total samples	Incompliant samples in %
2014	12035	0.5
2015	12278	0.2
2016	12295	0.2
2017	11646	0,1

Source: GWP

3.4.4 THE BLACK SEA WATERS

The Black Sea pollution and ecosystem degradation problems are of transboundary nature. In Georgian part of the Black Sea, challenges are mainly associated with the eutrophication. Chemical pollution is less, as compared to other Black Sea countries, nevertheless several pollutants have been detected at relatively high concentrations at few monitoring points.

The focus of the regular monitoring are physicochemical parameters (transparency, salinity, temperature, conductivity, pH, dissolved oxygen, phosphates, nitrites, nitrates, ammonia nitrogen, organic matter, chlorophyll) and hydrobiology of the coastal water.

In 2016, with the support of the project Environmental Monitoring of the Black Sea (EMBLAS) funded by the European Union, Georgia obtained substantial water quality information through an expedition and scientific research carried out in the Black Sea. The study was conducted at 15 points along the Georgian shore, that included points where the monitoring has not been performed since the last 25 years. The study focused on macrobenthos, meiobenthic, microplankton, ichthyoplankton, solid waste, noise and chemical pollution. This information significantly enhanced the understanding of the state of the coastal waters of Georgia. Bellow presented information includes both findings of the regular monitoring and results of the EMBLAS project.

As monitoring results show, the water quality status of the Georgian shelf can be assessed as mostly good in respect to eutrophication status. There are however two areas – Anaklia and surroundings of the Poti port, where the moderately high level of chlorophyll was observed. These findings are further supported with the results of the hydrobiological monitoring, that shows excessive growth of diatoms particularly in the Supsa-Poti coastal waters. The study findings also point to presence of polychlorinated biphenyls (PCBs) and pesticides. If PCBs were within the Environmental Quality Standards (EQS) of the EU, concentrations of hexachlorocyclohexane, heptachlor epoxide and cypermethrin exceeded the EQS values at several points of the coastal area. Experts recommend to pay attention to these observations and take necessary measures if the problem persists. Diversity of zooplankton species have been growing in the last years, that is an indication of improving quality of coastal waters. Results of monitoring of microphytes and macrozoobenthic species indicate bad to moderate status of the coastal waters only in the Batumi Port area.

Box 3.6: Eutrophication

Eutrophication is a result of increasing concentration of nutrients (nitrates and phosphates) in water body that leads to excessive growth/bloom of microalgae (phytoplankton). The algal bloom creates hypoxic or anoxic conditions, as more oxygen is consumed for the bacterial degradation of the biomass after phytoplankton dies. The sources of pollution by nutrients are sewage and industrial waste, as well as fertilizers that come from diffuse sources (agriculture activities), etc.

Below is presented more detailed information on the findings of the regular monitoring performed by the NEA and results of the EMBLAS project expedition.

Eutrophication: measurements carried out in May 2016 at the Black Sea shelf showed relatively low concentrations of inorganic nitrogen both in the surface and bottom layers of the Sea. The values of total Dissolved Inorganic Nitrogen (DIN) and Total Nitrogen[27] (TN) were low. The maximum value of the TN was observed in the surface waters near the Enguri river discharge and in the Kobuleti area. Average silicate concentration in the Georgian shelf (above 116 m) was higher than the mean value for the north-west shelf of the Black Sea. The elevated silicate concentrations in spatial distribution in surface layers were observed in the coastal area. The silicate concentrations increased with the depth of the shelf in the bottom layer.

The EMBLAS study concluded that the lowest concentrations of chlorophyll were observed in the open waters of Georgia, as compare to coastal waters of Ukraine and Russia. This is likely to be due to low concentration of nutrients in this area, as compare to other countries. Nevertheless, it is important to note that the highest concentration of chlorophyll-a within the coastal water of Georgia was registered in Anaklia in the upper mixed waters, which is likely to be attributed to the discharge of ammonia nitrogen from the Enguri river. The only region where the values at the distant station are higher than at coastal sites was the Poti transect, which might be due to high anthropogenic load in the port of Poti.

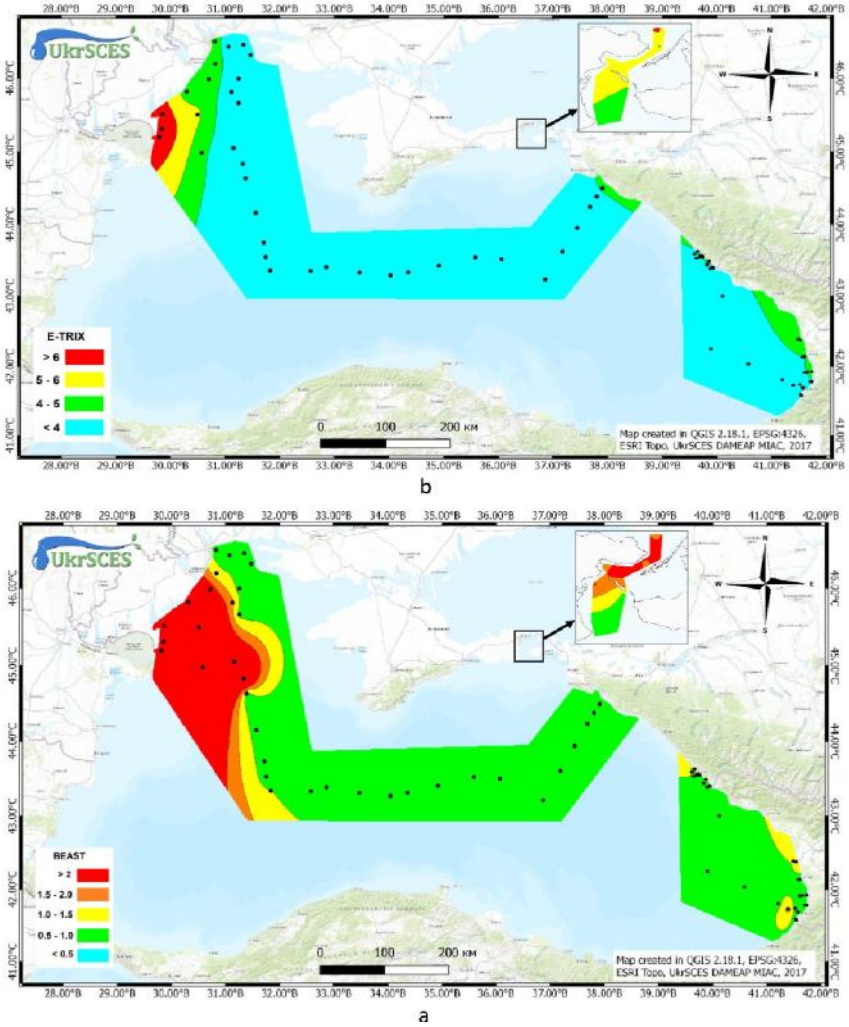
Suspended solids, presence of which in higher concentrations is also an indication of eutrophication, were observed in slightly higher concentrations. The maximum concentrations of suspended substance were found in the Batumi area in the zone of influence of the Chorokhi river.[28]

Results of analyses carried out by the EMBLAS project were further used for the assessment of the state of the coastal waters of Georgia. In particular the Black Sea Eutrophication Assessment Tool (BEAST) and Trophic Index (E-TRIX) have been applied to determine the eutrophication status. According to the BEAST assessment, water quality status of the Georgian shelf can be assessed as mostly good. It is moderate in the part of the shelf that is likely to be affected by the port of Poti. The assessment showed similar results by applying the E-TRIX method. The status of waters by the E-TRIX is mostly good and some areas are rated as waters with high status (see map 3.3).

[27] Total Nitrogen - ammonia nitrogen, nitrite nitrogen, nitrate nitrogen.

[28] Source: National Pilot Monitoring Studies and Joint Open Sea Surveys in Georgia, Russian Federation and Ukraine, Final Scientific Report, 2016. EU EMBLAS Project.

Map 3.3: Assessment of the environmental status of the studied Black Sea areas in 2016 by BEAST (a) and E-TRIX (b) methods (2016)



Source: EMBLAS, 2016

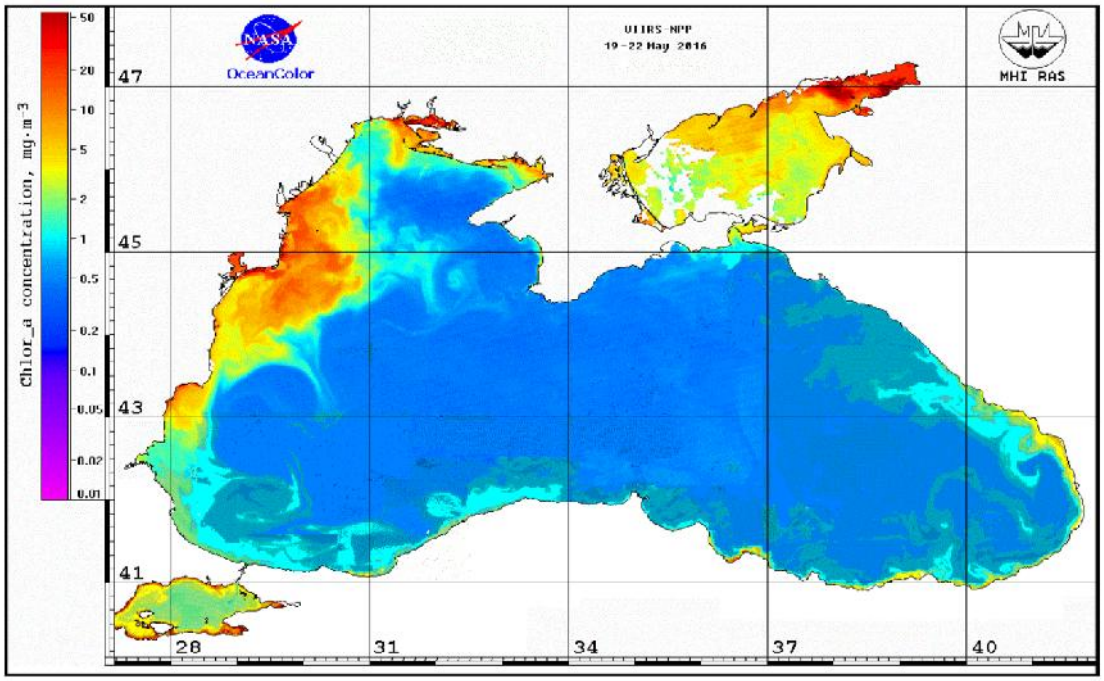
Chemical Pollution: monitoring results indicate that concentrations of heavy metals in the surface sea water are within the norm. The studies within the EMBLAS project, that looked at As, Cd, Cu, Fe, Ni, Mn, Pb, Zn also confirmed that concentrations of cadmium, lead and nickel were far below recommended EQS. Incompliance was observed only in relation to nickel (Ni). Concentrations exceeded the recommended EQS of the European Legislation around 3 times only at two monitoring sites - near Tsikhisdziri and Kobuleti.

The analysis of water samples of the EU Water Framework Directive (WFD) Priority Substances revealed the presence of several pollutants however, concentrations were well below the EQS values. In particular, polyaromatic hydrocarbons with increased concentrations were registered at several Georgian sampling sites (mostly in the central part, near Anaklia, as well as near Batumi and Gonio).

Polychlorinated biphenyls (PCB) were detected at most of assessed sites but concentrations were within permissible values.

Concentrations of pesticides analyzed by the EMBLAS project in May 2016 were far below their EQS values. However, the study observed specific distribution of few pesticides - hexachlorbutadiene (HCBD) was detected near Gonio and Batumi. Dichlorodiphenyltrichloroethane (DDT) was present alongside the entire coast. Concentrations of both pollutants were below the EQS values.

Map 3.4: Composite satellite image of the chlorophyll-a concentration (2016)

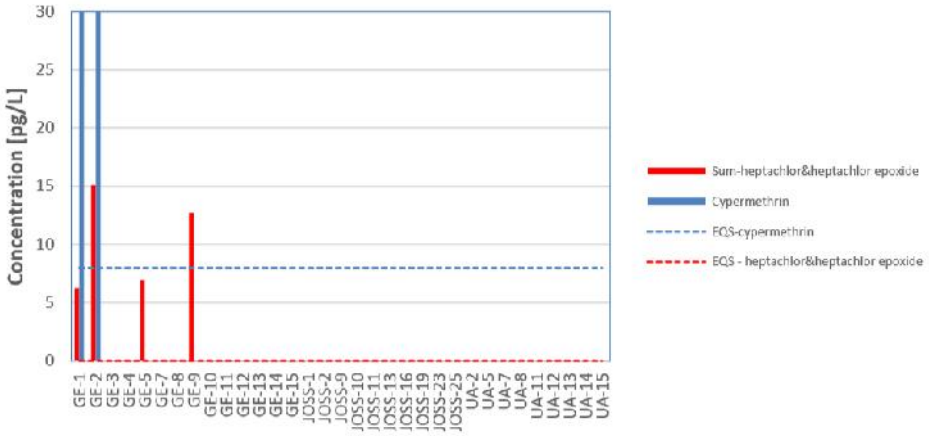


Red color represents the highest value of chlorophyll-a; yellow, green and blue show – point to gradual reduction

Source: JRC, http://marine.jrc.ec.europa.eu/

Elevated concentrations of hexachlorocyclohexane (HCH) were detected at the Gonio site, where it exceeded the permissible limit. Heptachlor and heptachlor epoxide were found at four sampling sites. At two sites it exceeded the EQS values. Cypermethrin was found at two sampling sites near Gonio, exceeding its EQS values significantly (see figure 3.4.7). As recommended by the EMBLAS project, further monitoring of these substances is needed and if problem persists respective follow up measures have to follow to address the issue.

Figure 3.4.7: Summary overview of concentrations of the sum of heptachlor and heptachlor epoxide and cypermethrin



Source: EMBLAS 2016

Petroleum hydrocarbons were observed in the open sea surface waters. Concentrations exceeded MAC (MAC=50 µg/l) values by up to five times in 83% of water samples.

Marine litter: pollution of the Black Sea with municipal waste is widespread in Georgia. The study that was carried out within the EMBLAS project found that at average 322 litter items are to be found per km² in the coastal waters of the Black Sea. Packaging, plastic bags and bottles dominate in the litter. The study concluded that rivers contribute significantly to macro and micro litter that is present in the Sea.

Microbiology: monitoring of microbiology looks at coliform bacteria and streptococcus faecalis. If in 2014 all parameters were within the norm, in summer of 2015 high concentrations of these groups of bacteria have been detected in Poti (particularly coliforms), Supsa and Batumi monitoring sites. According to the data of 2016, general microbiological as well as fecal contamination parameters at Sarpi and Batumi were within the norms, higher concentrations were only observed in few cases. In 2017 all above mentioned parameters at the Green Cape, Batumi and Sarpi stations were mostly within the MAC values. Slightly high concentration of coliforms was detected in summer at the Batumi monitoring station. In summer and autumn samples taken at the port of Batumi concentrations of these bacteria exceeded the norm considerably.[29]

3.4.5 REGULATORY FRAMEWORK FOR PROTECTION FROM WATER POLLUTION

Protection of water resources from pollution is carried out by setting the water quality standards for surface and groundwater and overseeing their implementation. Legal framework for the protection of water bodies from pollution is provided in the 1997 Water Law. Specific regulations, that spell out the requirements in regards to water pollution, are provided in the technical environmental regulations. In particular:

[29] Source: NEA

- the Technical Regulation on Protection of Surface Water from Pollution regulates activities that have negative impact on the state of surface water; the regulation defines the categories of the water uses and norms for the surface water, as well as its characteristics by categories. It also sets the MAC values for polluting substances in surface water bodies by categories of water uses.
- The Technical Regulation on Discharge of Wastewaters by Economic and Non-economic Objects sets the MAC values in wastewaters for polluting substances.
- The Technical Regulation on Calculation of Maximum Permissible Discharge of Pollutants in Wastewater to be Discharged in the Surface Water Bodies sets the rules for calculation of permissible discharge of pollutants. It requires submission of a draft project on permissible discharge to the relevant state authorities for the approval.

Ballast water discharge by ships is governed by the Technical Regulation on Management of Ballast Waters. It sets the rules for discharge of ballast water. The regulation requires to have ballast water management plan for each ship to reduce to minimum the possibility of transfer of pathogenic organisms and pollution of coastal waters. Such plans are also necessary to ensure secure and efficient implementation of the procedures of discharge and uptake of ballast waters.

Although incompliance with the norms and standards are penalized, low fines and shortcomings of the law enforcement (e.g. low probability to detect offences) make control of water pollution less effective.[30] More stringent enforcement of the law and revision of fines might be necessary to prevent repeated offences.

3.5 DRIVERS, PRESSURES AND IMPACTS

Overall quality of surface and groundwater resources in Georgia can be assessed as satisfactory. Nevertheless, regular monitoring of the surface water indicates that several water bodies consistently suffer from the pollution by ammonia nitrogen. The pollution with heavy metals remains an acute problem for few rivers. In regards to hydro-morphology of surface waters, changes of conditions are being observed in several river basins. Experts suggest that such situations arise as a result of reduced flow in rivers caused by anthropogenic pressure (e.g. damming of or diverting water).

Box 3.7: Drivers-Pressures-State-Impacts-Responses

Drivers-Pressures-State-Impacts-Responses (DPSIR) is an analytical framework that is widely applied for analyzing interlinkages and feedbacks between sectoral, environmental, demographic, social and developmental parameters.

Driver refers to social, demographic and economic development, activities in societies that provoke changes in the overall levels of production and consumption (e.g. urbanization, sectoral development).

Pressure refers to developments in release of substances, physical and biological agents, the use of resources and land (e.g. pollution of water body).

[30] Source: Facilitating the Reform of Economic Instruments for Water Management in Georgia, 2017, OECD.

State describes observable changes in environment (e.g. physical, chemical and biological status of the water body).

Impact explores changes in the state of environment (e.g. loss of aquatic biodiversity) that affects the social and economic functions on the environment.

Response refers to actions directed to prevention, remediation or adapting to changes in the state of the environment (e.g. measures taken to improve the state of the water body).

Sources: Smeets E., et al. 1999; Guidance Document, 2002

This chapter focuses on human driven changes in water bodies. It particularly explores the main driving forces of degradation of water bodies attributed to socio-economic activities and it looks at pressures and impacts that human activities place on water bodies and water related ecosystems. Analysis is guided by the DPSIR analytical framework.

3.5.1 SURFACE WATERS

Pollution with ammonia nitrogen

Drivers: the primary source of pollution of water bodies by ammonia nitrogen in Georgia are households. Ammonia derives from the wastewater generated in households – it is present in sewerage and graywater[31] as the remnants of cleaning products used in households and decaying excreta of humans.

The agriculture sector is another source of ammonia-nitrogen. Within this sector there are several activities that contribute to increased loads of ammonia nitrogen in surface waters. Wastewater generated at livestock farms are often discharged into water bodies without any treatment creating additional loads of ammonia nitrogen. Animal grazing at the margins of lakes also contributes to contamination through deposition of nutrients from urine and feces in close vicinity from the water body. Overfertilization at farms can result in leaching of ammonia-nitrogen to water bodies.

Pressure: significant share of ammonia-nitrogen loads in water bodies in Georgia come from poorly treated or untreated wastewater. According to 2017 GeoStat data, only 0.2% of the urban household wastewater discharged into surface water bodies was subjected to a full cycle treatment[32]; 5.5% of discharged wastewater underwent biological treatment and 31.1% was subjected to the primary (mechanical) treatment only[33]. Furthermore, 23.8 % of population connected to sanitation does not have the access to WWTPs, which means that the wastewater from these households is discharged into water bodies without any treatment. As of 2017, large portion of population – around 51.4%, still did not have the access to sanitation. Greywater generated in these households therefore, is discharged into water bodies without any treatment.

[31] Greywater or sludge is wastewater generated in households or office buildings that does not contain human excreta.

[32] Full cycle treatment includes mechanical, biological and chemical treatments.

[33] The primary treatment refers to treatment of wastewater in clarifiers, where organic matter settles out from wastewater and top layer water becomes partially treated.

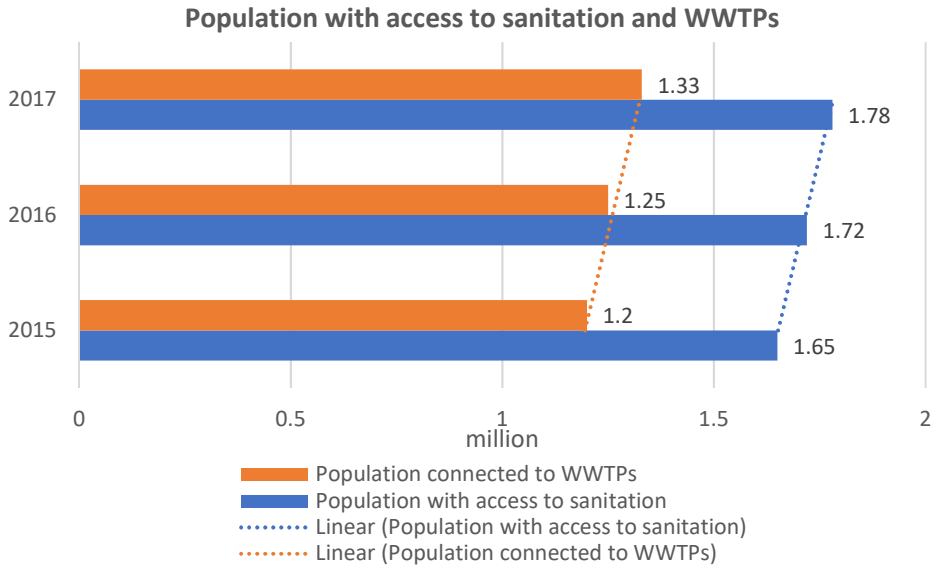
As compare to 1980s, when over 30 WWTPs operated throughout the country in 2017 only three WWTPs functioned in Gardabini, Adlia and Sachkhere. These WWTPs treat municipal effluents generated in Tbilisi, Rustavi, Gardabani, Batumi, Akhalsofeli, Kvariati, Gonio and Sachkhere. As of 2017 full cycle of treatment was performed only at the WWTPs in Adlia and Sachkhere.

Photo 3.1: Adlia WWTP

Source: Website of the Batumi Water

It must be also highlighted that in recent years the number of households connected to wastewater treatment facilities has increased (see figure 3.5.1) and plans have been made to put into operation additional WWTPs that should decrease the pressure of water bodies. Further information on this subject is provided in chapter 3.6.6.

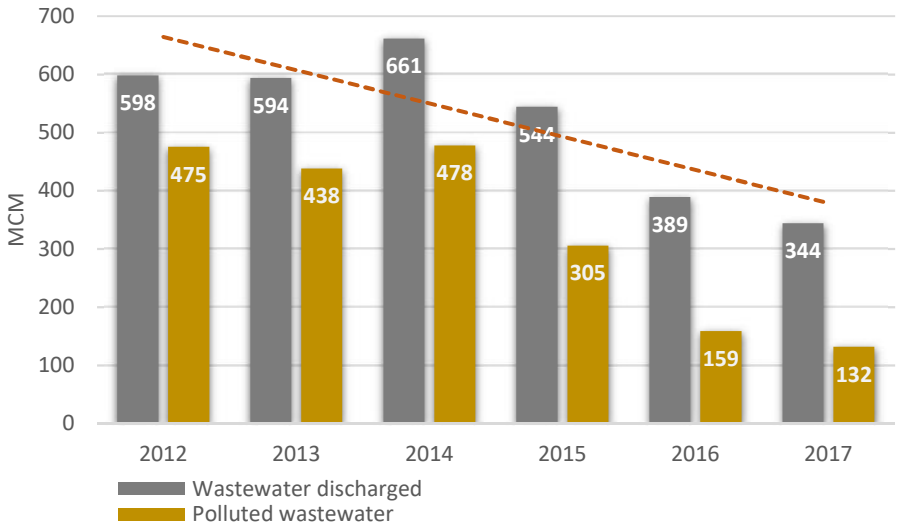
Figure 3.5.1: Population with access to sanitation and WWT services in 2015-2017



Source: GeoStat

Total volume of wastewater discharged into surface water bodies in 2017 amounted to 344 mln m^3. As presented in figure 3.5.2, the volume of discharged wastewater has declined in the recent years. The volume of polluted wastewater has also decreased from 438.2 mln m^3 in 2013 to 131.7 mln m^3 in 2017. Around 38.3 % of wastewater discharged in 2017 was polluted.

Figure 3.5.2: Wastewater discharged into water bodies in 2012-2017



Source: MEPA

Impacts: harm caused by ammonia-nitrogen in water bodies might be considerable, given its high toxicity for aquatic organisms. Increased loads of this pollutant in water lead to toxic buildup in tissues of aquatic organisms and to their potential death. Nevertheless, further studies are necessary to assess the change of affected water bodies and impacts on living organisms there.

Pollution with heavy metals

Drivers: high concentrations of heavy metals in several rivers that are being observed from year to year are mainly attributed to mining activities. Particularly acute is the situation in the Kazretula, Mashavera and Kvirila rivers. In case of the Kazretula and Mashavera rivers pollution is associated with the operation of the gold, copper and zinc mines and ore processing plants. In case of the Kvirila river these are manganese mines and ore processing plants.

High concentrations of iron occur in the Alazani, Pholadauri and Oghaskura rivers as well. In Alazani river it is likely to be conditioned by the geology of the river bed and variation of flow, since there are no apparent anthropogenic sources of pollution. Single spikes of iron concentrations observed in Pholadauri is likely to be attributed to mining activities in the area. Single spikes of iron observed in the Oghaskura in the lower and upper sections of Kutaisi is likely to be related to the historic pollution (Soviet legacy) in the city. Further studies are necessary to determine the causes of single spikes of iron in some rivers.

Pressure: industrial wastewaters generated at large and small mine processing plants are not sufficiently treated or not treated at all, that results in acute pollution of rivers. Attention has to be paid not only to large operators of mines but small operators as well, as wastewaters generated by them is not treated (e.g. in Chiatura). Even if large operators resolve the wastewater treatment issue, the pressure on water bodies may remain if small mines continue to operate under same conditions.

Surveys of atmospheric deposition of heavy metals (directly or via rainfall and runoff) as a result of the mining process and emissions at the ferroalloy plant in Zestaphoni are necessary to determine its potential contribution to elevated concentrations of heavy metals in the river Kvirila.

Impacts: high concentration of heavy metals in Kazretula, Mashavera and Kvirila rivers are unsafe not only for aquatic organisms but human health as well. Particularly far reaching might be the consequences in the Kazretula and Mashavera river basins, since water from the Mashavera river (where the river Kazretula discharges) is used for irrigation. Irrigating agriculture lands with polluted water facilitates spread and accumulation of contaminants in soil, groundwater and agricultural produce that can trigger negative impact on human health. Studies on pollution of land and agriculture products in the Mashavera river basin have not been conducted for a long time. New data is necessary to assess the situation and identify areas of high impact for evidence-based response.

Pollution with mineral fertilizers

Primary driving force of pollution of water bodies with fertilizers is the agriculture sector. Scientific evidence suggests that unregulated and excessive use of fertilizers on farms leads to increased leaching of these substances into groundwater or are directly washed from land by rainfall or irrigation water into surface waterbodies. Results of the surface water monitoring however show, that in Georgia contamination of surface water bodies with fertilizers is not widespread. Further studies are necessary to determine the impact on groundwater. Extension of the groundwater monitoring network should allow to obtain a better understanding of possible contamination of groundwater with fertilizers.

Hydro-morphological Changes

Drivers: intensive use of water resources by agriculture (irrigation, fish farming), energy, industry and households, results in increased withdrawal of water from water bodies that leads to reduced hydrological flow in rivers and triggers hydro-morphological changes in the river basins. In Georgia in this respect is the impact of the energy sector, that is responsible for the use of 87.5% of all withdrawn water (according to the 2017 data), and the impact is the highest. Although energy sector is a non-consumptive water user and does not affect the annual water availability in the river basins, it however has an impact on seasonal availability of water for ecosystems[34].

Pressure: large dams, derivation pipes, channels and tunnels for run-of-river type hydropower plants used for energy generation and irrigation are particularly impactful in terms of disturbances brought upon aquatic ecosystems, as the segments downstream from reservoirs and derivation structures run-out dry. This is particularly visible in low water seasons. More stringent supervision might be necessary

[34] In General, hydropower sector has an impact on seasonal availability of water for other sectors as well, e.g. agriculture.

to prevent incompliance of the Hydro Power Plant operators with the conditions of the Environmental Impact Permits. Deficiencies in the current legislation that does not set the Ecological Flow [35] requirements and its calculation methods is a part of the problem that needs to be addressed.

Impacts: water flow below the limit of the Ecological Flow alters the hydro-morphological conditions of rivers and streams and leads to irreversible impact on the ecological status of water bodies. Furthermore, some biological quality elements of the water (such as dissolved oxygen and temperature) also deteriorate in reservoirs that affect negatively the aquatic species after such water is released back to rivers. A detailed study is necessary to assess the impact of large dams and derivation structures on the hydro-morphology of rivers to identify the most affected river basins. The hydro-morphological monitoring of water bodies that started in Georgia in 2014 is particularly important in this regard. Expansion and further strengthening of the hydro-morphological monitoring and in-depth analysis of the DPSIR is necessary for drawing more accurate picture of the situation (further information on monitoring is provided in subchapter 3.6.4).

3.5.2 BLACK SEA

Drivers: the EMBLAS project study concluded that the water quality status of the Georgian shelf was mostly good in respect of the eutrophication status. Relatively high concentration of chlorophyll-a that detected in the area of Anaklia and Poti is the outcome of nutrient input from urban agglomerations along the coast. Contamination of the coastal waters with hydrocarbons is also related to human activities – mainly with their transportation and storage.

Pressures: as findings of the EMBLAS project assessment indicate, the pressure exerted on the coastal waters of the Black Sea originates from land-based sources and is mainly related to the issue of urban wastewater treatment.

Pollution of coastal waters with petroleum hydrocarbons are likely to be attributed to the operation of the Batumi Oil Terminal and Poti port.

Sources of elevated concentrations of pesticides – hexachlorocyclohexane (CHC), heptachlor & heptachlor epoxide and cypermethrin detected at few monitoring points along the coast - are not known. The use of CHC has been banned under the Stockholm Convention on Persistent Organic Pollutants and is neither imported nor produced in Georgia. Heptachlor was used for killing insects in buildings and food crops. Its use currently is limited to fire control in power transformers. Its presence in the coastal waters of Georgia in unknown and requires further investigation. Cypermethrin is highly toxic for aquatic species and insects. This insecticide is present in many products used in households for insect (ant, cockroach, mosquito) killing. Further studies are necessary to determine the exact sources of these pesticides to prevent pollution of coastal waters.

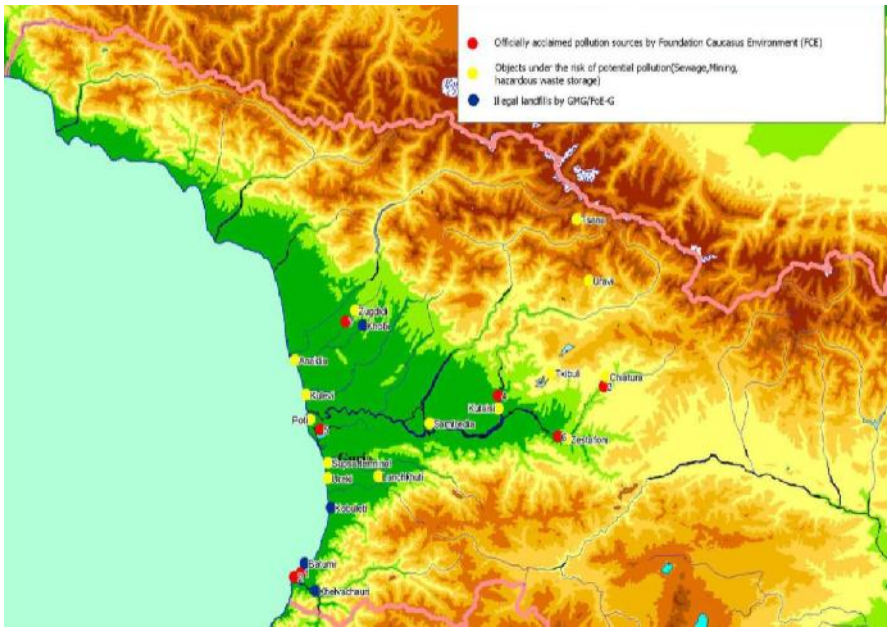
[35] "Ecological Flow is amount of water required for the aquatic ecosystem to continue to thrive and provide the services humans rely upon" (Ecological Flows in the Implementation of the WFD, 2015).

Another pollution problem that persist in the coastal waters of the Black Sea is the marine litter. The main causes of this problem are illegal landfills located along the rivers and litter brought to the Georgian shores by the Sea from neighboring regions and cargo ships.

Impacts: pollution of coastal waters of the Black Sea poses serious threat to the marine environment. Eutrophication that is one of the biggest concerns in entire Black Sea region, is triggered by increased load of nutrients discharged into the Sea together with untreated wastewater. While eutrophication problem is far from acute in the Georgia's coastal waters, some of the areas near Poti and Anaklia still exhibit signs of the high trophic level (with hypoxia of bottom water and occasional cases of anoxia). Pollution by pesticides and petroleum hydrocarbons further contribute to reduced quality of the marine environment. Marine litter that is often found in the coastal waters of the Black Sea disturbs not only an aesthetic quality of marine environment, but also has an impact on marine life. Scientific evidence suggests that microplastic and microplastic debris in particular, is very harmful for the marine mammals.

The coastal area of the Black Sea plays significant role in the economy of Georgia, as it provides important source of income through tourism. Deterioration of the marine environment and loss of biodiversity will have negative impact on the Black Sea ecosystems and the economy of the Black Sea regions as well.

Map 3.5: Land based pollution sources, located in the Black Sea catchment basin



Hot-spots are marked in red. Possible candidate Hot-sports are marked by yellow and blue

Source: EMBLAS, 2016

3.5.3 CLIMATE CHANGE AS A PRESSURE FACTOR

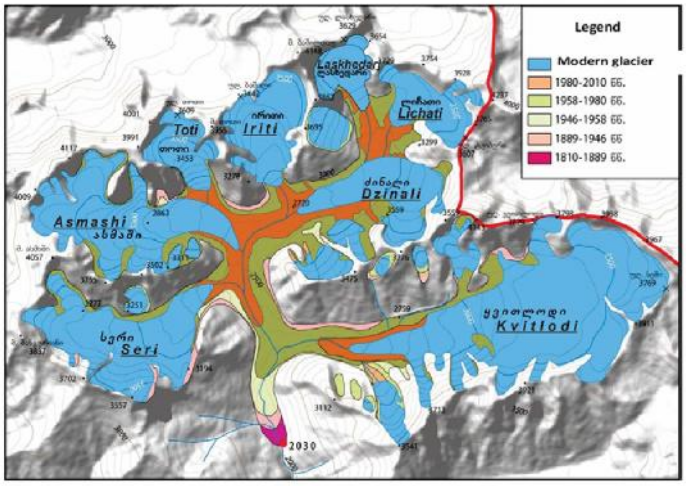
Climate change issue is discussed in depth in chapter 7 of the report, however, given its potential implications on water resources of Georgia, it is important to discuss it in this chapter as well. In

coming years climate change is likely to become an additional pressure factor for the water resources of Georgia.

The Third National Communication to the UNFCCC (NCR) submitted by Georgia in 2015 revealed important findings that are of high relevance for water resources management. One of the visible consequences of climate change impacts in Georgia are glacier retreat, which in long run is likely to affect the water flow in rivers and lakes. As observations show, during last 50 years the total area of glaciers in Georgia shrank by 30% (NCR, 2015). Although the share of water generated from glacier melting is relatively low (around 1.4%) in the annual discharge of rivers, it generates considerable runoff in July-August and plays an important role in the annual distribution of water discharge. For example, glacier generated water runoff in the Enguri river accounts for more than 30% in July-August (NEA). First impact of glacial recession is the formation of glacier lakes that can become a cause of natural disasters during heavy rains. In 2014 break of the Devdoraki glacier accompanied by mudflow and rockslides is an example of climate change induced disaster that resulted in casualties and damage of infrastructure.[36] Climate change projections suggest that the glacier retreat will continue further that may lead to a complete disappearance of glaciers by 2160.[37]

The Third NCR also draws attention of decision-makers to the increasing vulnerability of agriculture sector. For example, climate change models for the Dedoplistskaro municipality indicate that irrigation requirements for crops is expected to rise. Experts suggest that substantially more water will be required in future in critical agricultural areas of Georgia to maintain the current cropping patterns and irrigation water shortages are predicted to become an issue of concern.[38] Negative impacts will be felt in the hydro power sector as well.

Map 6: The retreat of the glacier Tviberi in 1810-2010



Source: NCR, 2015

Findings of the NCR and other recent studies highlight the need to mainstream climate change adaptation in sectoral policies and implement climate change adaptation measures in highly vulnerable geographical areas and sectors.

[36] Source: Climate Change and Security in the South Caucasus, 2017. ENVSEC/OSCE.

[37] Source: The Third National Communication of Georgia to the UNFCCC (NCR), 2015.

[38] Source: Ahouissoussi, N., J.E. Neumann, and J.P. Srivastava, 2014. Building Resilience to Climate Change in South Caucasus Agriculture. Directions in Development. Washington, D.C.: World Bank. doi:10.1596/978-1-4648-0214-0.

3.6 RESPONSES

Previous, the 2007-2009 and 2010-2013 Reports on the State of Environment (SOER) of Georgia among other issues discussed water resources degradation problems and emphasized the need to have in place more effective polices and management approaches to address the challenges. In particular, reports stressed that: policy and legislative framework has to provide clear directions for actions to protect water resources; protection of water resources has to be streamlined in other sectoral polices and national strategies and made more cohesive; monitoring of water resources has to be strengthened; concrete measures have to be taken to reduce pollution of water bodies; water related information has to be made more reliable and accessible to the public. Responses of the government of Georgia implemented in 2014-2017 was guided by these needs. Table 3.6 gives a quick overview of key measures implemented by the government in 2014-2017 in response to water resources degradation. Responses are discussed in depth in the following sub-chapters.

Table 3.6: Responses of the State on Degradation and Unsustainable Use of Water Resources – 2014-2017

Response Measures on Degradation and Unsustainable Use of Water Resources			
Legislation	**Sectoral Policies/strategies**	**Monitoring of Water Resources**	**Infrastructure Projects**
- EU Association Agreement - New/updated technical regulations on water quality and water abstraction - New draft Law on Water Resources Management - Environmental Assessment Code - Waste Management Code	- Socio-Economic Development Strategy – Georgia 2020 - National Environmental Action Plan 2012-2016 - Draft National Environmental Action Plan 2017-2021 - National Waste Management Strategy (2016-2030) and Action Plan (2016-2020) - National Irrigation Strategy for 2017-2025 - National Strategy of Agriculture 2015-2020 - Strategy of Rural Development 2017-2020	- extension of the surface water quality monitoring - expansion of the groundwater monitoring network - started hydro-morphological and hydrobiological monitoring - biological monitoring of coastal waters - digitalization of hydrological data - comprehensive assessment of the quality of coastal waters - hydrological modeling - installation of early warning systems	- rehabilitation of old and construction of new WWTPs - closure of illegal landfills started - designing of plans for new landfills and their construction

**table includes a list of measures that to a certain extent will affect the state of the water resources.*

3.6.1 POLICY AND LEGAL FRAMEWORK

Within the EU-Georgia Association Agreement (AA) among other commitments, Georgia took a responsibility to preserve, protect and improve the quality of water resources and marine environment, ensure sustainable utilization of water resources, reduce flood risks and droughts. For this purpose, the government developed and approved a detailed road map that outlines the list of measures and suggests the timescale for their implementation. The key obligations of Georgia in regards to the water resources management include approximation of its legislation to the following EU legislation and international instruments:[39]

- Directive 2004/35/EC on environmental liability of the AA with regard to the prevention and remedying of environmental damage;
- Directive 2000/60/EC on establishing a framework for Community action in the field of water policy (known as the EU Water Framework Directive);
- the Directive 2007/60/EC on the assessment and management of flood risks;
- the Directive 91/271/EEC concerning urban waste water treatment as amended by Directive 98/15/EC and Regulation (EC) No 1882/2003;
- the Directive 98/83/EC on quality of water intended for human consumption as amended by Regulation (EC) No 1882/2003
- the Directive 91/676/EC concerning the protection of waters against pollution caused by nitrates from agricultural sources.
- Directive 2008/56/EC establishing a framework for Community action in the field of marine environmental policy (known as the Marine Strategy Framework Directive)

In addition to the AA, Georgia's state policy is guided by other international commitments such as Sustainable Development Goals. Among 17 SDGs the Goal 6 is addressing the availability and sustainable management of water and sanitation for all. Targets under the SDG 6 aim at improved access to water and sanitation, reducing water pollution, and improving water use efficiency across all sectors to address water scarcity. Targets also call for improved transboundary cooperation, capacity development, protection and restoration of water related ecosystems. The SDG 6 also aims at strengthened participation of local communities in the water and sanitation management processes. Georgia carried out extensive interagency consultations to identify the SDGs and targets that are of high relevance for the country. Under the SDG 6 were nationalized two targets that reflect the priorities and context of the country – 6.1: achieve universal and equitable access to safe and affordable drinking water for all; 6.2: by 2030, achieve access to adequate and equitable sanitation and hygiene for all.

Georgia, as a responsible member of international community, makes every effort to comply and implement international environmental conventions the country is party to. In the area of water resources these are:

1. The Convention on Protection of the Black Sea against Pollution (acceded in 1992). Georgia also is party to the four protocols of the Convention that focus on various aspects of the

[39] The List of relevant documents is indicated in the Annex XXVI of the AA on environmental protection.

pollution reduction (the control of land-based sources of pollution; dumping of waste and joint action in the case of accidents) and protection of biodiversity.

2. Environmental conventions signed within the framework of the International Maritime Organization, including the International Convention on Civil Liability for Oil Pollution Damage, 1969 (15.11.1993) [40], International Convention on Oil Pollution Preparedness, Response and Co-operation, 1990 (09.09.1995), International Convention for the Prevention of Pollution from Ships, 1973, and its Protocol of 1978 (15.11.1993); London Protocol of 1996 of the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter, 1972 (24.03.2006), Protocol of 1992 to the International Convention of 1971 on the Establishment of an International Fund for Compensation for Oil Pollution Damage (18.04.2001), International Convention Relating to Intervention on the High Seas in Cases of Oil Pollution Casualties, 1969 and its Protocol of 1973 Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances other than Oil (25.08.1995)[41]. Georgia acceded to the International Convention for the Control and Management of Ships' Ballast Water and Sediments in 2014. The convention created the legal framework for the management of the ballast waters in Georgia. The implementation of the Convention was supported further through the adoption of the Technical Regulation for the Management Procedures for Ballast Waters in 2015.

2014-2017 has been an important year for strengthening the protection of water resources through development of environmental legislation that has an impact on the state of water resources, as well as for advancing the drafting of laws and regulations on water use and protection from pollution.

In 2012 the Ministry of Environment and Nature Resources Protection of Georgia with the support of the UNECE started working on a new draft Law on Water Resources Management that is aligned with the EU Water Framework Directive (WFD) and is built around the Integrated Water Resources and River Basin Management (RBM) principles. The first draft of the Law was presented for discussions to stakeholders in 2014. The draft Law on Water Resources Management is currently at an advanced stage of development and is being discussed among relevant state agencies before submission to the Parliament of Georgia. Development and adoption of the new Water Law is one of the milestones of the AA implementation.

The new framework legislation on water resources will introduce the RBM; set a legislative framework for the development of RBM plans and their implementation; re-define principles of water resources protection and use; introduce the permit system for the water abstraction and wastewater discharge; introduce the volumetric charges/fees on the water abstraction.

The Parliament of Georgia adopted amendment to the law on the Marine Space (1999) to align national legislation with the EU Marine Strategy Framework Directive. In 2015 was adopted a new Technical Regulation for the Management Procedures for Ballast Waters.

Although RBM approach has not been adopted yet, with the support of donors Georgia has already embarked on the development of the RBM plan for the Chorokhi-Ajaristskali river basin. Support of

[40] The date of ratification/accession to the Convention/Protocol by Georgia.

[41] LEPL Maritime Transport Agency of Georgia website (mta.gov.ge).

donors will also be sought to develop the RBM plans for the Alazni/Iori and Khrami/Debeda river basins.

In the framework of the USAID programme on Governing for Growth (G4G) in Georgia was developed a Guidance Document on Delineation of Surface Water Bodies, Reference Conditions and Classification System in Georgia that provides the synthesis of guidance documents of the EU for different aspects of the implementation of the WFD. This customized document is tailored to the existing conditions in Georgia and is designed as a guidance document for the transition to the RBM. The Environmental Flow Methodology was elaborated in 2017.

Other new environmental legislation adopted in 2014-2017 that is of high relevance for the management of water resources is the Environmental Assessment Code (2016) and the Waste Management Code (2014). The Environmental Assessment Code replaced the law on Environmental Impact Permits. As compared to the old law, the new Code provides an improved framework for achieving balance between social, economic and environmental benefits of planned economic activities and strengthens public participation in decision making at all key stages of decision-making process, including decisions on the use of water resources. Implementation of the new Waste Code is an important prerequisite for the reduction of pollution of coastal, ground and surface waters with waste.

3.6.2 LAW ENFORCEMENT

The national legislation provides mechanisms for the protection of water resources, including through the means of economic regulation. It encompasses the system of penalties for the violation of national legislation. The MEPA, namely its sub-agency Department of Environmental Supervision (DES), that was re-established in May 2013, is the main institution responsible for the enforcement of environmental legislation in Georgia. In respect to water resources, the Department is responsible to identify and prevent illegal use and pollution of surface water resources and to control the compliance with the conditions of the issued permits, environmental decisions and decisions on extension of current activities. The Department is also responsible for identifying and preventing the Black Sea pollution and for controlling the use of Black Sea resources through its Convention Service located in Batumi. Since the establishment of the Agency of Mines in December 2017 its Department of Compliance of License Conditions carries out the control over the compliance with the license conditions for groundwater use. Until January 2018 this function rested with DES.

233 offences of the Water Law have been identified and registered in 2017. The number of these offences is considerably less compared to other environmental violations and accounts for around 2% of 11 796 environmental offences registered by DES in 2017.

Unfortunately, violations detection does not always yield desirable results (e.g. complete elimination of pollution). One of the reasons according to the 2017 OECD study on the water resources management in Georgia is low fines that do not provide sufficient incentive for the protection and sustainable use of water resources. In order to prevent environmental offences, the capacity of DES has to be further strengthened, including through elaboration of the methodology for compliance monitoring (inspection) planning and provision of adequate human and financial resources.

3.6.3 STRATEGIES

The state priorities in the area of water resources management for the period of 2012-2016 are outlined in the National Environmental Action Program (NEAP) of Georgia 2012-2016. Considerable progress has been achieved in implementation of all 21 measures planned in the NEAP in the area of water management. Majority of measures have been implemented fully. Implementation of others however faces some delay due to lack of funding (e.g. rehabilitation and construction of some planned WWTPs, pilot project on preservation of marine biodiversity, study on the feasibility of building material extraction from river beds in the Black Sea basin, trainings on utilization of groundwater, development of the electronic data-base for hydro-geological reports).

The 2017-2021 National Environmental Action Plan that was adopted in 2018 outlines the state priorities in the area of water resources management. These are:

- the establishment of efficient system of water resources management
- the reduction of water resources pollution from point and diffuse sources of pollution and ensuring sustainable use of water resources
- strengthening the monitoring of water quality and quantity and assessment systems.

During 2014-2017 Government of Georgia adopted several key policy documents that will affect water resources. In this respect particularly important was the adoption of the National Waste Management Strategy (2016-2030) and Action Plan for 2016-2020. In line with the requirements of the Waste Code and the Action Plan municipalities and companies operating in Georgia developed the waste management plans. Improved waste management at all levels will have a positive impact on rivers in terms of reduced and eliminated pollution by municipal waste.

Another important policy document is the Socio-Economic Development Strategy – Georgia 2020 adopted by the Government of Georgia in 2014. Commitments outlined in the strategy include provision of improved (24 hours a day) drinking water and sanitation services and streamlining water supply and drainage systems in all urban centers and towns. Increased number of citizens of Georgia will have access to basic services that will improve life quality considerably. Developing water supply and sanitation is also among top priories outlined in the Regional Development Programme of Georgia 2015-2017. Implementation of the strategy facilitates the reduction of pollution of water bodies by urban wastewater.

The Strategy for Agriculture Development of Georgia for 2015-2020 identifies environmental protection and the sustainable management of natural resources as one of the priority areas and in relation to water resources sets the objective to facilitate the application of modern irrigation methods. Particular attention is paid to introduction of the drip and sprinkle irrigation. The National Irrigation Strategy of Georgia for 2017-2025 pays attention to improving efficiency of irrigation systems and on-land application of water that is an important prerequisite for sustainable use of water resources in agriculture.

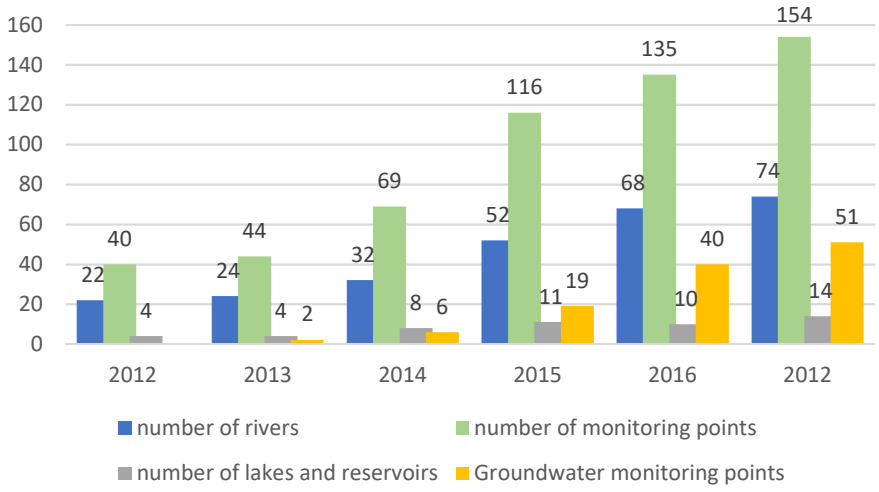
In 2019 the government of Georgia also adopted the National Energy Strategy for 2020-2030. To meet growing demand on electricity in transport, industry and household sectors, the strategy document sets the objective to increase electricity generation capacity through installation of new hydropower plants and improving energy efficiency. Construction of new hydropower stations will increase the pressure

on water bodies and aquatic and other ecosystems unless in the planning phase due consideration is given to environmental and social issues and adequate mitigation measures are put in place.

3.6.4 MONITORING SYSTEM

Regular monitoring of water quality and quantity is important source of information for decision making. Water monitoring data is needed for evidence based decision-making and proper planning. Monitoring of water resources is particularly important in a view of Georgia's plans to introduce the River Basin Management (RBM) system.

Figure 3.6.1: Water quality monitoring network expansion in 2012-2017



Source: NEA annual report, 2017

Map 3.7: Groundwater monitoring points

Source: NEA

The main institution that is in charge of the monitoring of qualitative and quantitative status of water resources in Georgia (including surface, groundwater and coastal waters) is the National Environmental Agency (NEA). This function is carried out by its three departments - the Environmental Pollution and Monitoring Department, Hydro-metrological Department and Geology Department.

As of December 2017, the water quality was regularly monitored once a month at 154 points of 74 rivers and at 14 lakes and reservoirs throughout whole Georgia. Hydrogeological monitoring of groundwater, that was re-established in 2013 after a long disruption, was performed at 51 points in 2017 that included 45 wells and 6 springs. Due to existing political and security situation, currently the monitoring of water bodies is not performed in the occupied territories of Georgia (the Abkhazia A/R and the Tskhinvali region). The part of the coastal area along the shore of the AR Abkhazia is not monitored either and data on the status of coastal waters along the Abkhazia A/R is therefore not available.

In the past few years the water quality monitoring network in Georgia has expanded considerably, that is indeed a positive development (see the figure 3.6.1). The government plans to further extend the monitoring network throughout whole Georgia. This applies both to surface and groundwater monitoring. In 2017 a new facility was built in Tbilisi for environmental monitoring (air, water, soil) that meets international standards and is equipped with the state-of-art equipment.

Given the acute character of water pollution problem in the Mashavera and Kzaretula rivers, in 2015 the NEA installed an automated system for taking water samples from these rivers. Another automated system was installed in the Kvirila river in 2017. The system allows the Agency to continuously measure the pH level of water. When it exceeds permissible level, water samples are taken automatically and information is transmitted to the NEA. The staff of the Agency then collects the water samples for further analysis in the laboratory. This advanced technology allows the Agency to closely monitor water quality parameters in these rivers. In addition to automated system for taking water samples, the NEA carries regular monitoring at the Mashavera, Kazretula and Pholadauri rivers twice a month.

2014 was an important year in Georgia in the field of water monitoring. The NEA embarked on the hydrobiological (bio-monitoring) and hydro-morphological monitoring of water bodies (see Box 3.8). Information about hydrobiology and morphology is key for determining the ecological status of water bodies. Hydro-biological monitoring in Georgia focuses on invertebrates, algae, macrophytes (aquatic plants), fish and amphibia. As of 2017, Georgia carried out hydrobiological and ichthyological observations at 20 lakes and reservoirs once a year.

The number of **hydrological monitoring** points has also increased during 2014-2017. In 2017 hydrometeorological observation was carried out at 56 stations[42]. New automated hydrological stations have been added to the network. The NEA intends to further expand the hydrological monitoring network to enable improved hydrological forecasting and enhanced disaster risk reduction.

Photo 3.2: Typical groundwater monitoring points (natural spring and well)

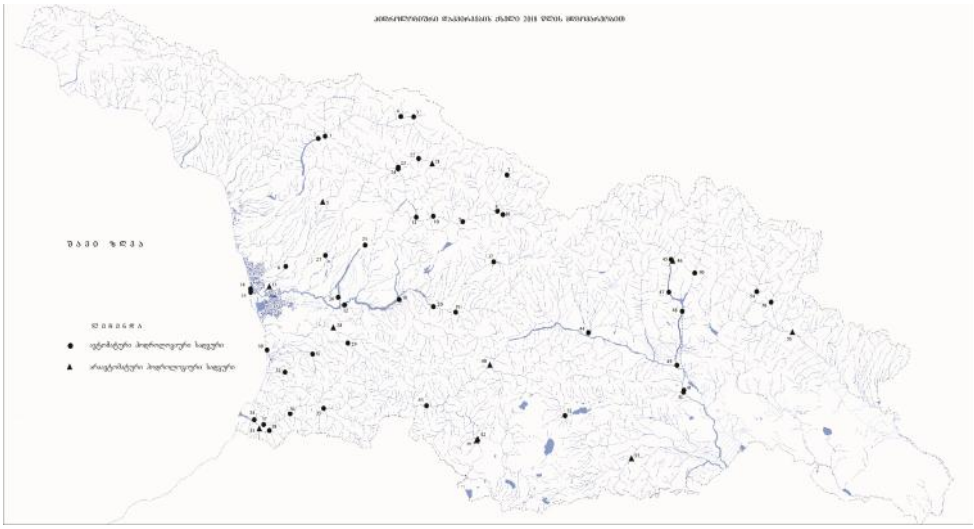
Source: NEA, Geology Department

In the framework of the project Institutional Cooperation between the Ministry of Energy (MoE), the National Environmental Agency (NEA) of Georgia and the Norwegian Water Resources and Energy Directorate (NVE) the NEA developed a runoff map for the entire Georgia and nationwide hydrological model was set up and operationalized. The hydrological model results for the runoff was used for the evaluation of the hydropower potential. Several other technical assistance projects carried out during 2013-2016 supported the capacity development for hydrological modeling. It nevertheless, requires further strengthening.

With the support of NVE, NEA also digitalized entire historical hydrological data (water level, discharge) that is now available for water managers to easily derive necessary data. The Geology Department started digitalization of the geological data and reports in 2015 and completed in 2018.

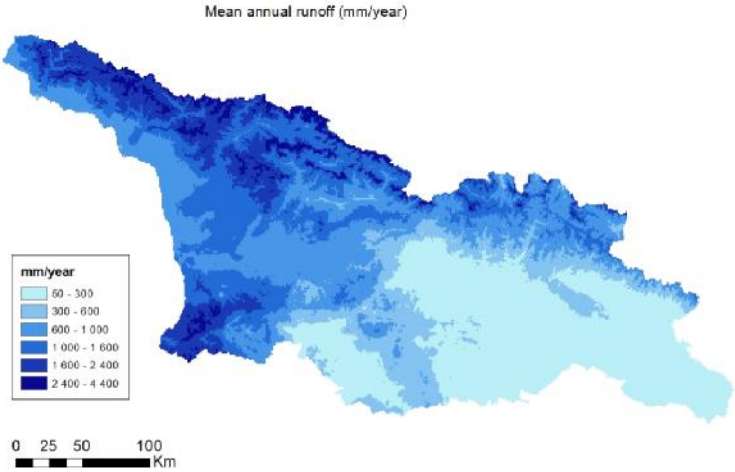
[42] For comparison in 1990 the number of operational hydrological stations was 149. (*source: Beldring at al. 2017).*

Map 3.8: Hydrological Observation Network 2017



Source: NEA

Map 3.9: Mean annual runoff (mm/year) for the period 1961-1990



Source: Runoff Map of Georgia, 2017

Hydrobiological and ichthyological monitoring of the marine environment is carried out by the Fisheries and Black Sea Monitoring Department of NEA. The monitoring is carried out on the continental shelf, coastal and transitional waters; special monitoring is also carried out. Hydrobiological monitoring of continental shelf is conducted twice a year at 6 observation points (Gonio, Batumi, Chakvi, Kobuleti, Poti and Anaklia), at 4 levels of depth - 10, 20, 40 and 50m. In the coastal waters, hydrobiological monitoring is carried out on a monthly basis at 4 stations (Sarpi, Batumi, Batumi Port and Mtsvane Kontskhi), where microbiological and physicochemical characteristics are also studied. Special monitoring is conducted three times a year at 5 stations: Sarpi, Batumi Port, Mtsvane Kontskhi

and Tsikhisdziri. Hydrobiological monitoring of Black Sea transitional waters is carried out twice a year – at the river mouth of 7 rivers (Chorokhi, Natanebi, Supsa, Maltakva, Rioni, Khobi, Enguri) and lake (lagoon) Paliastomi. Ichthyological monitoring is carried out 3 times a year at different depths, using bento-pelagic trawl in all zones designated as the bottom-trawl areas by the Georgian legislation. In 2017, NEA purchased an underwater robot for underwater observations.

Despite substantial progress in water monitoring, some challenges still remain. Although water monitoring network has expanded considerably, monitoring points are still not fully sufficient for a comprehensive assessment of the status of water bodies and would benefit from further extension. This particularly applies to the groundwater monitoring and water quality monitoring. Technical expertise in biomonitoring, disaster early warning, hydrological modeling, etc. also needs further strengthening, that is also needed for the implementation of the RBM approaches. Insufficient number of the field offices of the NEA, as well as its number of staff remain as challenges for full-fledged water monitoring.

BOX 3.8: Bio-monitoring

Traditional methods of water resources monitoring that include physical and chemical measures of water quality helps to assess the extent to which water bodies are polluted. It however, tells us little about the health of aquatic ecosystems. Bio-monitoring on the other hand helps to see how degradation of water quality affected ecosystems, biodiversity and their habitat by looking at the number and types of organisms present in the water body and what are the conditions they live in. This method is widely applied in the EU, USA, etc.

3.6.5 PUBLIC PARTICIPATION IN IMPROVING WATER MANAGEMENT

Georgia is relatively new to the public participation in water resources management and lacks experience in this area. At the same time, a certain part of the population does not have an information on their rights on access to water.

The important steps towards public engagement were taken in the process of development of the new draft law on Water Resources Management. In discussions of the draft law have been engaged wide spectrum of society, including general public. The process was supported by the Environmental Education and Information Centre (EIEC) to facilitate participation of all interested stakeholders. Transition to the RBM will also create an enabling environment for participation of local communities in management of water resources. To create a mechanism for public participation in decision making processes a separate provision was included in the new draft law on the public engagement in decision-making.

An important aspect of public participation in water management is the access to information. Uploading monthly and annual reports on results of the regular water quality monitoring on the web-site of the NEA ensures the accessibility of information for public. In order to further facilitate improved access to information on the state of water resources the Ministry intends to develop an information system for water resources that will enable the public to have improved access to the information about the state of water resources.

As it has been highlighted in subchapter 3.3.5, the reliability of data on water abstraction and uses is one of the challenges for proper water resources management in Georgia. In this regard, the MEPA has already made efforts to address the issue. In particular, the ministry with the support of the Financial

Analytical Service of the Ministry of Finance developed a beta version of the electronic Water Use Reporting System (WURS) that allows water users to submit annual data on water abstraction/use online. The system features enable the MEPA to generate data on water abstraction and use by river basins and at national level. To ensure public access to the information it is planned to disseminate received data through interactive web-map. The MEPA plans to finalize the WURS system and launch it in coming years that is one of the preconditions for evidence-based policy development, improved decision making on water resources management and wider public interest in water related issues.

3.6.6 INFRASTRUCTURE PROJECTS

In coming years pollution of water bodies with ammonia-nitrogen is expected to decline gradually with the rehabilitation of old and construction of new wastewater treatment plants (WWTPs). This will also have a positive impact on the quality of coastal waters. As of 2018 the rehabilitation/construction of WWTPs was underway in towns of Anaklia, Ureki, Zugdidi, Tskaltubo, Telavi and Poti. In coming years sewage systems and WWTPs will be built/rehabilitated in Abastumani, Ambrolauri, Bakuriani, Baghdati, Bakhmaro, Bolnisi (to be connected to the Marneuli WWTP), Chiatura, Gudauri, Khashuri, Kvareli, Marneuli, Martvili, Mestia, Samtredia, Stephantsminda, Tkibuli, Vani. By 2022 Kutaisi, the second largest city of Georgia, will have a new WWTP.[43] The Gardabani WWTP that treats wastewaters from Tbilisi, Rustavi and Gardabani was rehabilitated fully by the end of 2018 and currently performs the whole cycle of treatment.[44]

The Waste Management Plans for 2017-2022 adopted by municipalities of Georgia envision the closure and clean up on such uncontrolled waste dumping sites by 2022. This will gradually eliminate pollution of surface and coastal waters with municipal waste. The regional landfills[45] that will be built and put into operation in coming years and will meet the stringent design and operation requirements, will facilitate the minimization of the contamination of groundwaters and surface water bodies with dangerous effluents stemming from landfills.

Special attention needs to be paid to the situation in Georgia's educational and nursing, as well as medical institutions. One of the strategic objectives of the National Environment and Health Action Plan of Georgia is to improve access to safe water and sanitation, including for each child. The Action Plan provides for the planning and implementation of the priority measures to improve the sanitation and hygiene of drinking water supply in educational and nursing institutions, medical institutions, and in Internally Displaced Persons (IDP) settlements. According to the Action Plan, 100% of the schools, medical institutions and IDP settlements will use improved water supply sources by 2022.

[43] Source: Web-page of the UWSC; Parliament Meeting Notes 57, 2018

[44] Source: Ministry of Regional Development and Agriculture.

[45] New landfills have been built in Tbilisi, Rustavi and Borjomi. Construction of three regional landfills are planned in coming years in the Ajara, Imereti and Kvemo Kartli regions.

II/4 LAND RESOURCES AND SOILS

Sustainable land management is the basis for the long-term social and economic development of the community. The most important task for the country is to protect land and soil from degradation. In Georgia, degradation is caused by both natural and anthropogenic factors. Recently there has been a change in climate and a decrease in precipitation, especially in eastern Georgia. The use of man-made unsustainable agricultural practices, deforestation, forest fires, disruption of irrigation systems, and uncontrolled use of fertilizers and chemicals have further enhanced soil degradation and reduced soil fertility. It is necessary to develop a sustainable land management policy and legislative framework that will ensure the implementation of the principles of sustainable land use in the country.

4.1 MAIN QUESTIONS AND MESSAGES

1. ***What is the situation in Georgia regarding land degradation?***
   - Due to Georgia's climate-relief features and geodynamic processes, erosion of soils and soils in Georgia is quite extensive. 35% of agricultural land is degraded. The most common form of land degradation in Georgia is soil erosion. Soil erosion is a natural occurrence in some cases, although the severity of the degradation process is compounded by the unsustainable use of soil by humans. Water and wind erosion, as well as salinization and swamp processes are common in Georgia.
2. ***What is the quality of soil in Georgia?***
   - According to the heavy metal content, the soil quality in Georgia is satisfactory. Nonetheless, heavy metal contamination is found near industrial cities and mining sites;
   - According to the results of the 2017 monitoring, the highest lead content was recorded in Tkibuli;
   - High copper content was observed in the small town of Kazreti near the river Kazretula. The highest zinc content was observed in the study areas at one of the gas stations in Martvili;
   - The maximum value of iron was observed in several parts of the country in the cities of Akhalkalaki, Zugdidi, Gori and Samtredia;
   - High levels of manganese concentration were observed in Chiatura and Zestaponi.

4.2 STATE REGULATION

According to the national legislation, issues of land degradation and soil protection are the direct competence of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA). The Ministry coordinates the planning and implementation of measures against land degradation and desertification. In addition, MEPA participates in soil conservation and sustainable land management processes, in particular in policy development and implementation.

MEPA also has overall responsibility for agricultural production, soil fertility, plant protection, livestock and agricultural engineering, and also oversees state control of irrigation systems. Irrigation systems are state-owned and managed by the Ministry through its reclamation LLC Georgia amelioration. Soil degradation is monitored by the Scientific Research Laboratory, which is part of the LEPL Agricultural Research Center at the Ministry. The laboratory also conducts baseline soil analysis for farms and supports the so-called "Expansion Centers" established in the regions of Georgia.

Soil pollution monitoring is carried out by the LEPL National Environmental Agency (NEA) under the Ministry. The work of the state soil monitoring system was discontinued in 1991 and resumed in 2013, though only for the measurement of heavy metal contamination within large industrial cities. Currently, samples of about 30 settlements are analyzed for heavy metals content. Soil quality monitoring network is being developed and monitoring capacity is being improved. As for the

scientific institutes, the Institute of Soil Science, Agrochemistry and Reclamation is the only research organization operating in Georgia. However, its potential is very limited, hence its contribution to evidence-based decision-making on soil issues.

The main legislative framework in Georgia for soil protection is the Law of Georgia on Soil Protection (1994). The law aims to maintain the integrity of the soil cover, its conservation and to ensure the growth of soil fertility.

Other important legislative acts on soil protection are the Law of Georgia on Soil Conservation and Fertility Improvement (2003). The criteria for land use are also set out in the following legal acts on agricultural land use and food safety:

- Law of Georgia on Pesticides and Agrochemicals (1998)
- Law of Georgia on Vine and Wine (1999)
- Law of Georgia on New Varieties of Animals and Plants (2010)
- Georgian Law "Code of Food / Animal Feed Safety, Veterinary and Plant Protection" (2012)

International treaties and agreements have a significant impact on the national legal and policy framework. In this respect, the main multilateral environmental agreement is the United Nations Convention for Combat Against Desertification (UNCCD). A key initiative in support of member states on the Land Degradation Neutrality (LDN) was endorsed and adapted at the 2015 UNCCD Conference in Ankara. The above convention set out the target Sustainable Development Goals (SDGs) of 15.3: combating desertification, degraded land (including land affected by desertification, droughts and floods) and restoring soil and achieving LDN. The UNCCD and the Global Mechanism have set up a Global Support Program (GSP) to help countries set national goals for achieving LDN. Georgia, along with other countries, has also joined the global program. Within the framework of the program, a national working group was set up in 2016 to assess the state of the land in relation to land resources and to develop national goals for achieving LDN.

Tab 4.1: Land Degradation Neutrality

The Land Degradation Neutrality is a new approach developed by the UNCCD Secretariat and represents a situation in which the areas of healthy and productive land resources needed to support ecosystem services are stable or growing within a specified time and space. Accordingly, LDN means maintaining a balance between ongoing soil degradation (loss) and degraded soil recovery (yield). The approach implies that the area of restored land in the country should equal or exceed the total area of degraded land.

Georgia's Second National Action Plan to Combat Desertification 2014-2022 is the main national strategic document to combat desertification / land degradation. This Action Plan sets out national goals and outlines an action plan that Georgia will need to implement by 2022. The program addresses international priorities set by the 10-year strategy of UNCCD.

Another important national policy document is the Rural Development Strategy (2015-2020), which identifies aspects of land degradation as one of the most pressing problems in the agricultural sector. The main causes of the decline in soil fertility are: inadequate use of pesticides and fertilizers, malfunction of drainage systems, uncontrolled waste management and natural disasters exacerbated by climate change. The document outlines measures needed to address the situation, including proper fertilizer and pesticide management, waste monitoring, amelioration infrastructure, and the introduction of an early warning system for natural disasters.

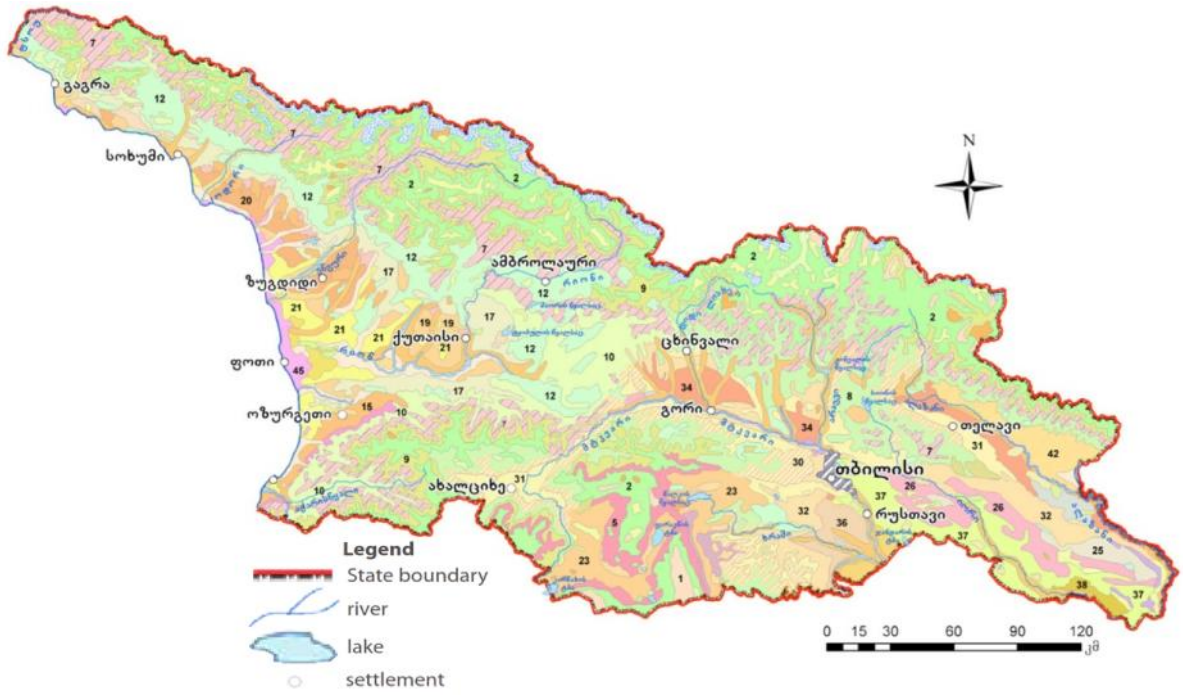
Environmental protection and sustainable management of natural resources is one of the priorities of the 2017-2020 Rural Development Strategy. Although no specific purpose or measure to protect the soil has been identified, its protection will indirectly have a positive impact on improving water,

forest and other resource management, as well as promoting the introduction of sustainable waste management systems.

4.3 LAND RESOURCES OF GEORGIA

Georgia is a small land country located in the South Caucasus region, which is distinguished by a variety of topography, a system of mountains of different height in the Caucasus that cross the country's territory. The territory of Georgia (without territorial waters) is 69.7 thousand km2. Semi-humid, semi-arid and arid landscapes cover 19.5 thousand km², mainly in the eastern part of the country. In winter the aridity index doubles on average.

Map 4.1: Map of Georgian soils

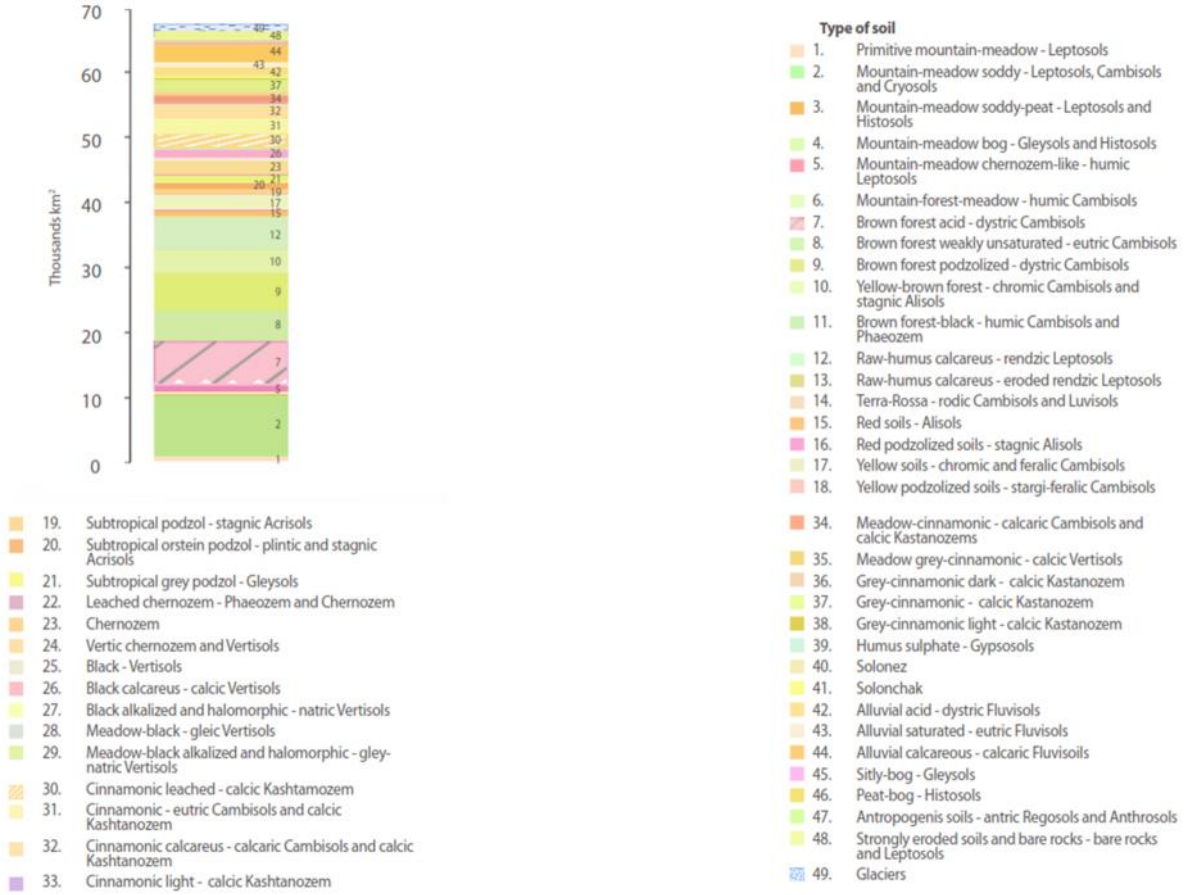


Source: MEPA

Georgia is a small land country characterized by soil diversity. Soils with different properties and fertility are found in different natural and climatic conditions on the territory of the country.

Georgia's agricultural sector plays a key role in the country's economy. 43% of the country's employed population is employed in the agricultural sector. Compared to 1990, the share of agriculture in Georgia's GDP is reduced. Along with economic reasons, the decline in agriculture is also a result of deteriorating soil quality and fertility, making most of the agricultural land unfit for economically sustainable production. Less fertile soils are most commonly found in eastern Georgia, where excessive grazing, low rainfall and frequent winds have caused wind erosion. According to the country's erosion index, erosion in eastern Georgia is stronger and more widespread than in western Georgia.

Figure 4.3.1 Total area of different types of soils

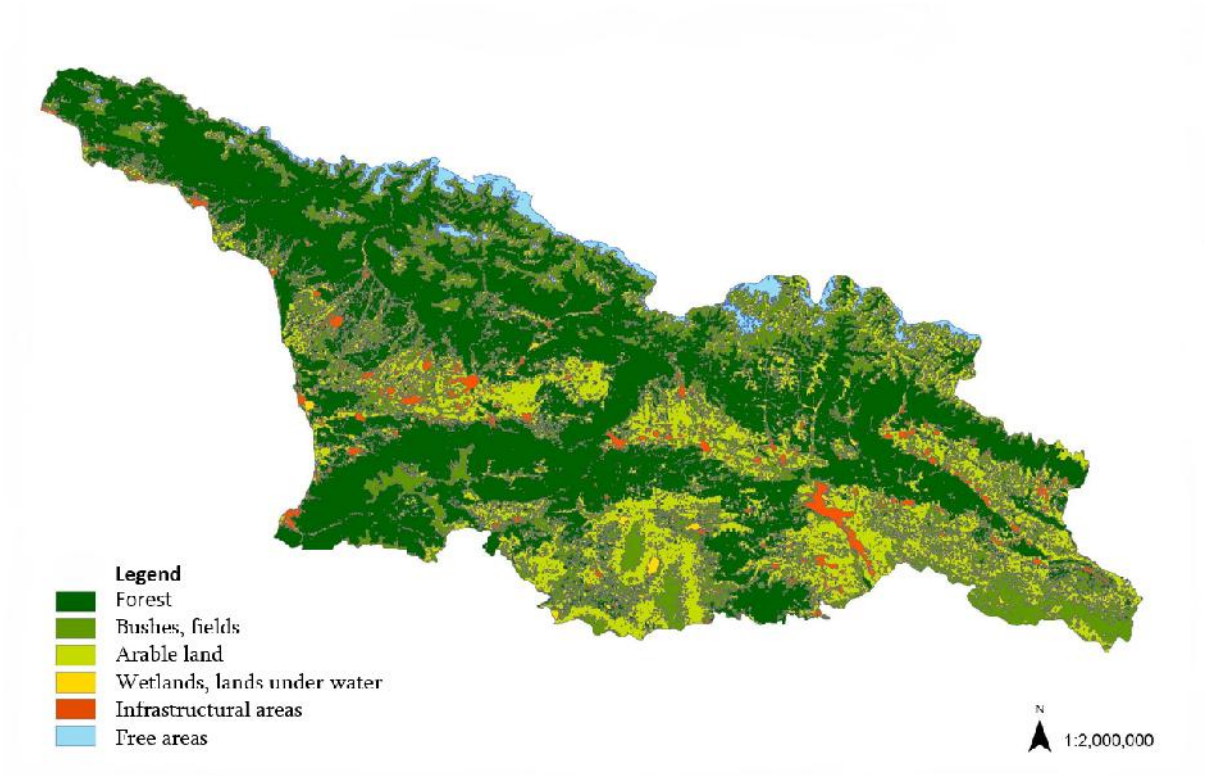


Source: MEPA

Georgia's agricultural land, including pastures, covers 3 025 800 ha (43.4% of the area), while 56.6% of the remaining land is covered by forest and other non-agricultural areas (inland waters, populated areas, etc.). Because of the mountainous terrain, much of the agricultural land is pastureland and pasture. Arable land - which is fertile - accounts for about one-quarter of all agricultural land.

According to the 2014 Agricultural Census, as of October 1, 2014, 787.7 thousand ha of agricultural land is held by farms, of which 86.5% (681.1 thousand ha) is held by households and 13.5% (106.6 thousand ha) by legal entities. 377.4 thousand ha of arable land is used, including 85.5% of households and 14.5% of legal entities. The average area of arable land is 0.7 ha. 70.3% (265.4 thousand ha) of arable land is occupied by crops.

Map 4.2: Map of Georgia land cover



Source: UNCCD, 2010

4.4 STATE OF LAND RESOURCES AND SOIL

For Georgia, as an agrarian country, land degradation is a major problem. Land degradation in Georgia is mainly caused by climatic conditions, topographic features and anthropogenic factors. The geodynamic process makes land more vulnerable to land degradation. Anthropogenic factors include unsustainable agricultural practices, in particular, excess livestock (leading to excessive grazing); lack of sustainable soil fertility management practices; lack of contouring plowing.

Reduced forest cover, wind and water erosion, landslides, excessive grazing, soil depletion and soil contamination are common throughout the country and are accompanied by socio-economic problems. Reductions in forest cover in eastern Georgia are contributing to human activity, causing widespread erosion. Due to reduced forest cover and erosion, 300,000 ha of arable land and 700,000 ha of pasture have been damaged due to excessive grazing on the slopes of the Kakheti Range. Due to climatic conditions and topography, there is also natural erosion in Georgia.

According to recent estimates, 35% of agricultural land is degraded. The most common form of land degradation in Georgia is soil erosion. Soil erosion has increased dramatically, with more than 1 mln ha damaged in recent years. 380 thousand ha of arable land is arable land, while pastures and lawns are 570 thousand ha. Wind erosion occurs in eastern Georgia and is caused by the destruction of windshields and excessive grazing. Arid and semi-arid zones of eastern Georgia have about 105,000 ha of degraded arable land and 59,220 ha of arable land have been degraded due to salinization and salts. Water erosion mainly occurs in western Georgia and is exacerbated by excessive grazing and steep slopes plowing.

In addition to the positive changes in the country's agricultural sector in recent years, many painful problems have emerged. There is a tendency for our country's most important national wealth - unsustainable soil exploitation and consumer dependency. All of this jeopardized the biological existence of the soil itself, as an integral part of the terrestrial bio-productive system, and the preservation of its fertility.

The processes of soil degradation and desertification of the lands of Eastern Georgia have begun and are being intensified.

There are 205,000 ha of saline and dry land in Georgia, 330,000 ha of acidic and 220,000 ha of swampy soils. Soils up to one mln ha are affected by erosive processes to varying degrees, which destroys fields, disrupts the natural-ecological equilibrium formed over thousands of years, resulting in a range of adverse socio-economic and environmental consequences.

The content of nutrients necessary for the plant in the soil is reduced. Up to 80% of the country's entire agricultural land is poor in nutrients, leading to low crop yields. In the eastern part of the country, the most important indicator of soil fertility - humus, is particularly noticeable.

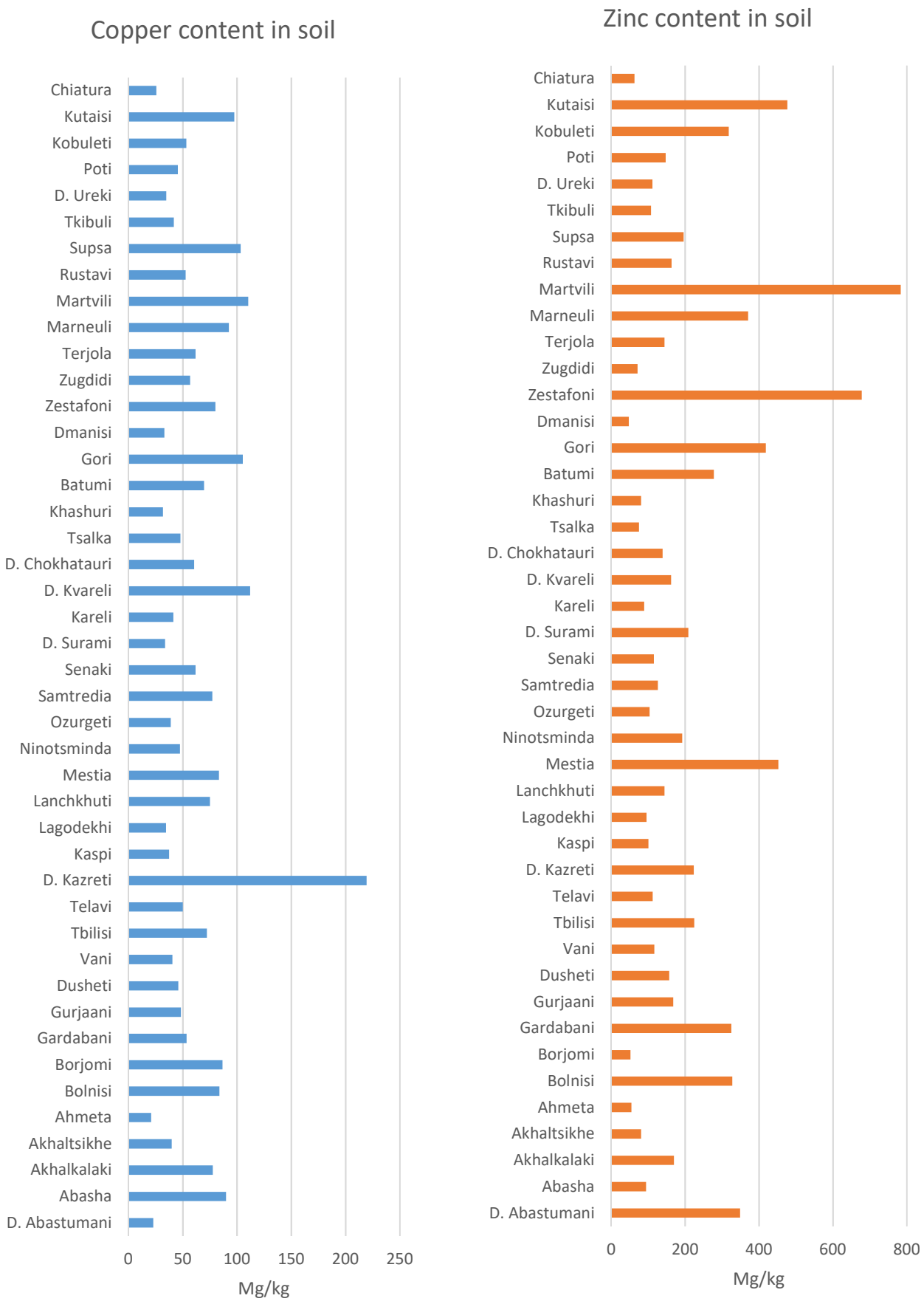
Soil monitoring and qualitative condition

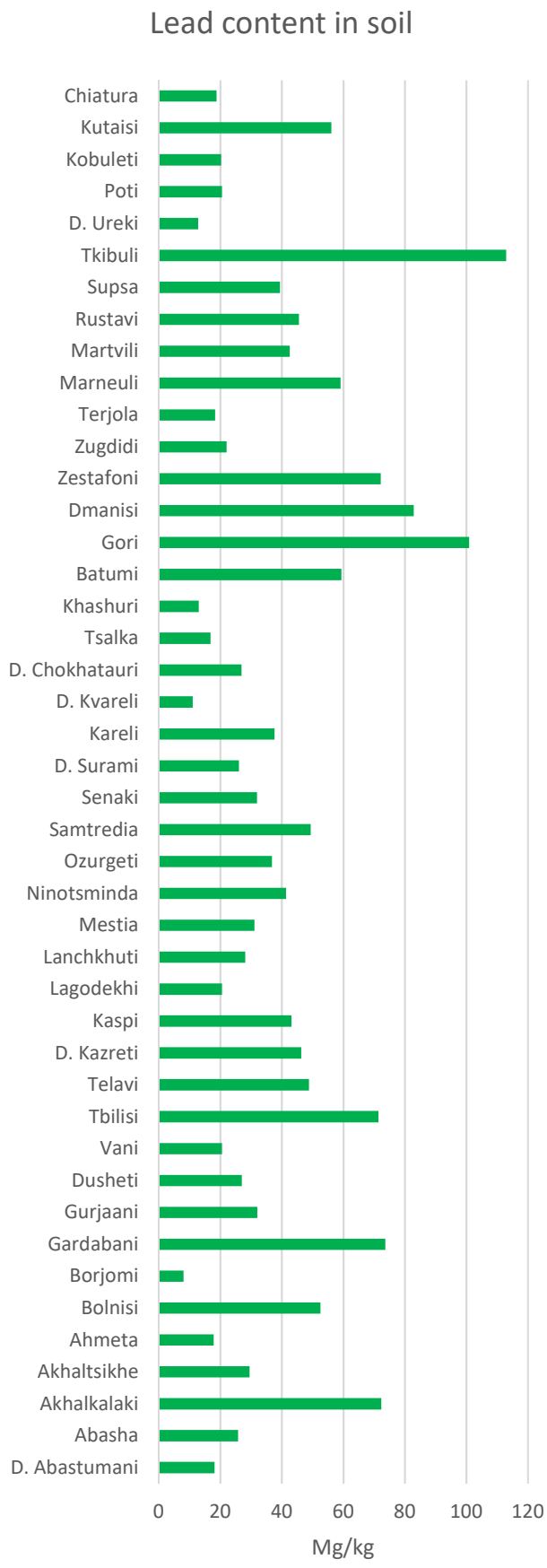
In 2017, specialists from the Department of Environmental Pollution Monitoring of the LEPL National Environmental Agency (NEA) carried out 240 soil samples to determine the heavy metal content in the territory of Georgia. Soil samples were taken from the following settlements: Abastumani, Abasha, Akhalkalaki, Akhaltsikhe, Akhmeta, Batumi, Bolnisi, Borjomi, Gardabani, Gori, Gurjaani, Dmanisi, Dusheti, Vani, Zestaponi, Zugdidi, Tbilisi, Telavi, Terjola, Kazreti, Kaspi, Lagodekhi, Lanchkhuti, Marenuli, Martvili, Mestia, Ninotsminda, Ozurgeti, Rustavi, Samtredia, Senaki, Surami, Supsa, Tkibuli, Ureki, Poti, Kareli, Kobuleti, Kutaisi, Kvareli, Chokhatauri, Tsalka, Chiatura and Khashuri. Soil contamination monitoring is carried out in the settlements in the upper layers of soil (0-10 cm) on the territory of Georgia. The concentrations of copper, zinc, lead, manganese and iron were mainly determined in soil samples, concentrations of cobalt, cadmium and nickel in arsenic samples from Dmanisi, Bolnisi and Borough Kazreti and arsenic from Mestia.

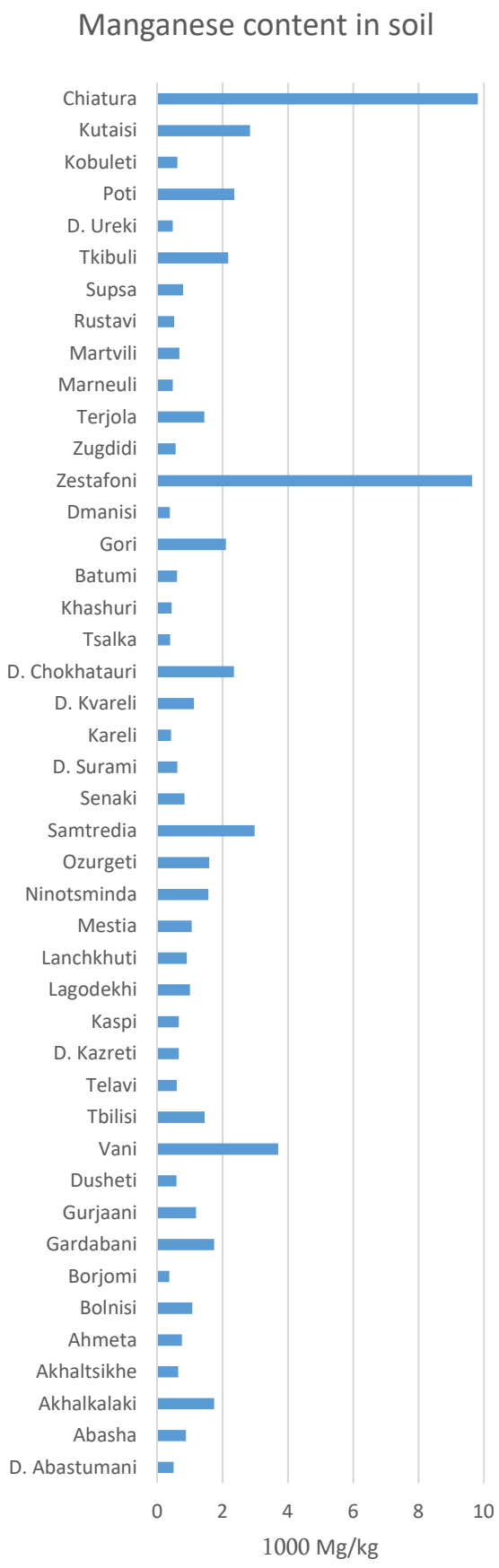
The Maximum Allowable Concentrations (MAC) for soil pollution[46] in the country are outdated and do not comply with modern European criteria. Based on the estimates and diagrams below, the monitoring data is not comparable to the old SDCs, as the comparison does not reflect the real situation. However, it is noteworthy that an update of the Soil Quality Assessment Standard is planned in the light of European experience, with more details in the main challenges section (4.5).

[46] The maximum permissible and benchmark concentrations of heavy metals in soils with different physico-chemical properties are set out in Order N297 / N of the Minister of Labor, Health and Social Affairs of Georgia of 16 August 2001 (Annex 9).

Figure 4.4.1: Soil content of heavy metals in Georgian cities (2017 year)




Lead content in soil
Chiatura
Kutaisi
Kobuleti
Poti
D. Ureki
Tkibuli
Supsa
Rustavi
Martvili
Marneuli
Terjola
Zugdidi
Zestafoni
Dmanisi
Gori
Batumi
Khashuri
Tsalka
D. Chokhatauri
D. Kvareli
Kareli
D. Surami
Senaki
Samtredia
Ozurgeti
Ninotsminda
Mestia
Lanchkhuti
Lagodekhi
Kaspi
D. Kazreti
Telavi
Tbilisi
Vani
Dusheti
Gurjaani
Gardabani
Borjomi
Bolnisi
Ahmeta
Akhaltsikhe
Akhalkalaki
Abasha
D. Abastumani
0
20
40
60
80
100
120
Mg/kg


Manganese content in soil
Chiatura
Kutaisi
Kobuleti
Poti
D. Ureki
Tkibuli
Supsa
Rustavi
Martvili
Marneuli
Terjola
Zugdidi
Zestafoni
Dmanisi
Gori
Batumi
Khashuri
Tsalka
D. Chokhatauri
D. Kvareli
Kareli
D. Surami
Senaki
Samtredia
Ozurgeti
Ninotsminda
Mestia
Lanchkhuti
Lagodekhi
Kaspi
D. Kazreti
Telavi
Tbilisi
Vani
Dusheti
Gurjaani
Gardabani
Borjomi
Bolnisi
Ahmeta
Akhaltsikhe
Akhalkalaki
Abasha
D. Abastumani
0
2
4
6
8
10
1000 Mg/kg

Source: NEA

The results of soil quality monitoring show that heavy metal contamination mainly occurs near industrial towns and near mining sites.

The highest lead content was observed in the settlements listed above. In Tkibuli, specifically at the Tkibula River Bridge, the maximum lead value was 112.98 mg / kg. The high lead content was also observed in Gori, in particular, d. Guramishvili str. With # 4, where it reaches 100.95 mg / kg. Lead content is high. Dmanisi, Vardisubani - 82.92 mg / kg; Gardabani - 73.65 mg / kg; In Akhalkalaki, at Peace Street # 77 - 72.39 mg / kg; Zestaponi, with crossover - 72.18 mg / kg; Varketili Third Micro-District in Tbilisi - 71.39 mg / kg.

High copper content was observed in the small town of Kazreti. Its value is 219.47 mg / kg near the river Kazretula, near police - 154.10 mg / kg, high copper content was reported in Kvareli, 112.11 mg / kg, in Aghmashenebeli Street, as well as in Kavtaruli. At Martvili Gas Station - 110.47 mg / kg.

The zinc samples showed the highest zinc content from the studied areas. In Martvili, near gas station - 783.82 mg / kg; Zestaponi, Uznadze Street # 142 - 678.21 mg / kg and swirling - 467.56 mg / kg; Kutaisi, I. Abashidze Street # 15 - 476.95 mg / kg; In the town of Mestia, King Tamar st. # 34 - 452.55 mg / kg.

The maximum value of iron was recorded in Akhalkalaki, in front of Golden Fish Hotel - 2.85% and Peace Street. # 77 - 2.82%; Zugdidi, square - 2.85%; Gori, Guramishvili str. # 4 - 2.78%; At the exit of Samtredia - 2.78%.

High concentrations of manganese were observed in Chiatura, ranging from 6149.05 mg / kg to 9824.22 mg / kg; In Zestaponi - from 807.87 mg / kg to 9646.94 mg / kg. Also high manganese content was observed in Vani - 3704.86 mg / kg.

The concentrations of cobalt, cadmium and nickel taken in the borough Kazreti were as follows: The concentration of cobalt varied from 3.00 mg / kg to 11.02 mg / kg. Its maximum value was 11.02 mg / kg in the village of Balichi. While the nickel concentration ranged from 5.76 mg / kg to 22.04 mg / kg, its maximum value of 22.04 mg / kg was reported in N 103/106. While the cadmium content ranged from 2.75 mg / kg to 7.51 mg / kg.

In Dmanisi, cobalt content ranged from 2.01 mg / kg to 4.76 mg / kg and its maximum value - 4.76 mg / kg was reported at SOCAR gas station, nickel content ranged from 3.76 mg / kg to 11.03 mg / kg. The highest concentration of 11.03 mg / kg was observed in Kostava st. With # 9. Cadmium concentrations ranged from 0.25 mg / kg. - within the range of 1.00 mg / kg.

Concentrations of cobalt in Bolnisi ranged from 0.75 mg / kg to 8.02 mg / kg, with a maximum value of 8.02 mg / kg in the yard of the meteorological station. Nickel concentrations ranged from 6.26 mg / kg to 18.07 mg / kg, and cadmium to 0.25 mg / kg to 1.25 mg / kg, nickel maximum value 18.07 mg / kg, and maximum cadmium value 1.25 mg / kg respectively. It was reported in Ratevani, behind the court and near the market.

As for the concentration of arsenic, according to the samples taken in the borough Mestia, its content varied from 1.76 mg / kg to 22.52 mg / kg, with a maximum value of 22.52 mg / kg in Hatsvali turn.

4.5 MAIN CHALLENGES

Lack of unified land management policy, land balance and accounting system, constant monitoring of soil degradation and pollution quality, soil degradation, lack of effective resource management practices, limited access to relevant information and technologies, weak institutional linkage among

various stakeholders Those are the main problems we have in this area. A number of measures are important to address these problems and to develop the country, including the study of the overall state of land resources, the development and implementation of measures to combat degradation, the implementation of measures and programs for improving soil fertility, and refining the legislative framework.

With the support of the Ministry of Environmental Protection and Agriculture of Georgia[47] a number of activities have been implemented in 2014-2017:

- The Draft Law of Georgia on Soil Protection has been prepared. The Draft Law combines the Laws of Georgia on Soil Protection and Soil Conservation and Fertility Improvement. Terms in the laws have been amended. M apiod separated soil protection of the rights and obligations. soil protection, the draft law provides for the creation of monitoring system, as soil quality indicators, as well as soil contamination. business and / or other activities will be restricted to the fertile soil layers of management mechanisms and regulated soil export related issues;
- A draft resolution of the Government of Georgia "On Approval of the Technical Regulation on Soil Pollution Quality" was prepared. The draft Resolution will update the maximum permissible concentrations of soil heavy metal contamination and determine the hygienic requirements of soil protection against adverse impacts of various activities that may limit their use for agricultural and / or domestic purposes and / or adversely affect On the health of the present. The technical regulations also set out the rules for soil quality control;
- In order to improve monitoring of land degradation, a draft of the Georgian Government Resolution "National Indicators of Land Degradation and Their Methodology" has been developed;
- A national concept for windshields was developed, which was the basis of the draft Law of Georgia on Windshields. the Agricultural Committee, together with the draft law "Wind (mindordatsviti) lines," which will regulate the territory of agricultural land windshields lanes inventory, status, registration, restoration and planting, management and use as well as the legal aspects, regardless of their form of ownership. On the basis of LEPL Agricultural Research Center, professor Ivane Sarishvili Soil Research Laboratory (Tsilkani Village, Mtskheta Municipality), which conducts research on soil and their fertility throughout the country with the help of modern techniques and equipment. Based on the results of the study, the soil is evaluated and its fertility levels determined for agricultural activities.

[47] Here: This includes both the Ministry of Environment and Natural Resources Protection of Georgia and the Ministry of Agriculture of Georgia, as well as the united Ministry.

II/5 MINERAL RESOURCES

Mineral resources are one of the main wealth of Georgia and an important economic asset for the development of the country. However, the depletable nature of most of it and the environmental impact of extraction of these resource is a major challenge. Quarrying of the minerals should be rational, planned and sustainable using appropriate regulation and control mechanisms, to avoiding the simultaneous depletion of natural resources, pollution of the environment and consequently irreparable harm to the environment and to humans. It must be considered that the extraction of mineral resources, especially heavy metals, can cause pollution of water, land and air, which can have an impact on both local and adjacent ecosystems, and may even have transboundary effects.

5.1 MAIN QUESTIONS AND MESSAGES

1. What is the role of mineral resources in the development of the country?

- Mineral resources presents a key wealth of Georgia and an important economic asset in the development of the country. Georgia has both metallic and non-metallic minerals, as well as fuel and hydromineral minerals. Mining-processing economic activity in Georgia is quite large, accordingly, it plays an important role in the development of the country's economy. Georgia's leading commodity export groups are the mineral resources, accounting for at least 32.7% of total exports. The economic activity of mineral extraction plays an important role not only in the formation of the country's balance of payments, but also in providing the income and employment needed for the local economic development of self-governance.

2. What are the key environmental challenges of mineral resource extraction?

The main challenge in the extraction of mineral resources is not only socio-economic, but also considerations environmental aspects, so-called use of sustainable practices. Depletable mineral resources should be extracted in a well-planned and efficient manner. Therefore, the environmental impacts of its extraction should be taken into account. In this regard, main challenges are:

- Elaboration of the national policies, strategies and updated legislation in accordance with current international standards;
- Reduction of environmental pollution hotspots and remediation of damaged areas to reduce negative environmental impact;
- Introduction of modern resource effiecient and clean technologies and enforcement of special environmental measures;
- Development of raw materials database;
- Enhancement of the supervisory function of license enforcement;
- Development of human resources

5.2 STATE REGULATION

Effective management of mineral resources is one of the directions for sustainable development of the country, which should lead to a significant recovery of the country's economy and economic growth. Therefore, the proper management of the mineral resources is of a great importance, regulated by the Constitution of Georgia and the relevant legislative acts.

The Constitution of Georgia in relation to minerals lays down the principle of special sovereignty of the highest public authorities (Article 7, paragraph 1, subparagraph (b)) and the right of the present and future generations to consider environmental protection and rational use of natural resources (Article 29, paragraph 2). According to the Law of Georgia on Minerals (1996), mines are the property of the state and any acts that directly or covertly infringe on state property rights are prohibited. Ownership of land does not mean and does not imply ownership of land.

According to the Law of Georgia on Licenses and Permits (2005), the extraction of minerals is subject to licensing. However, with the exception of the decision of the Government of Georgia, a person may be exempted from the license to extract minerals. Resolution N136 of the Government

of Georgia of August 11, 2005 "On Approval of the Regulation on the Rules and Conditions of Issuance of License for Extraction of Minerals" regulates the procedure for issuance of licenses and procedures for license exemption.

Mining licenses are issued for different terms, depending on the type and amount of the resource. The license grants the user of the minerals the right to carry out the activities of the use of minerals within the framework of mining, land or geological ownership, after which the user is obliged to carry out recultivation activities. The Law of Georgia on Regulatory Fees (2005) and the Law of Georgia on Fees for Natural Resources (2004) set the fees for the use and regulation of minerals.

In December 2017, as a result of the restructuring-optimization of government structures, a component of the management of the beneficial minerals and control of the licensing conditions was transferred to the newly established LEPL National Agency of Mines under the Ministry of Economy and Sustainable Development. Accordingly, the investment / economic policy-making, as well as the management and inspection functions of the fossil fuels have been merged under one authority.

National Agency of Mines provides access to geological information, prepares for licensing geological information, holds the balance of minerals, carries out monitoring on licensing process and license conditions executions, as well as contributes to the effective implementation of international obligations, most international studies and experience and prepares appropriate legislative proposals.

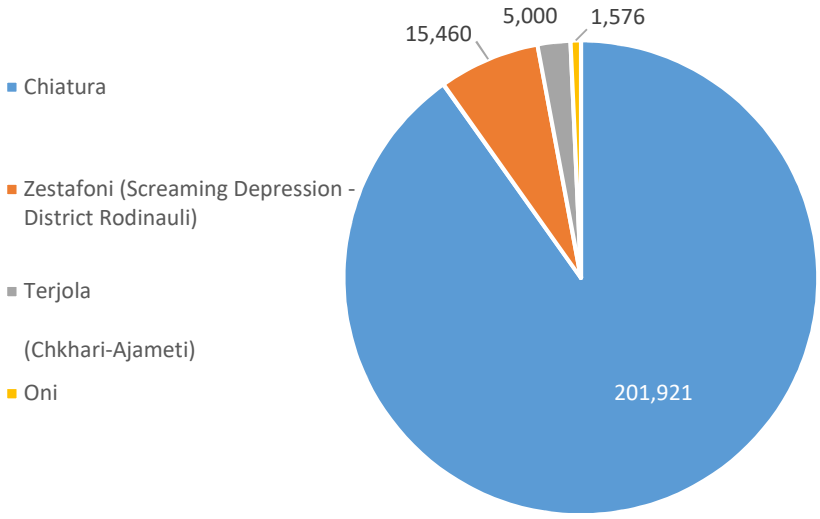
The Agency carries out state control of license conditions for licensing of minerals according to the Government Decree No. 84 of February 16, 2018 on "Approval of the Procedure for Exercising State Control while Examining Compliance with the Mining License or Mining License Conditions." The aforementioned resolution stipulates the following criteria for exercising state control: expiration of the license; License area and amount of resource to be extracted /extracted; Proximity of the facility to settlements, protected areas, forest fund; Existence of geo-ecological risks and threats. According to this rule, the state control is carried out by inspection of the subject of regulation by the License Conditions Control Service established by the Agency. The Service shall be authorized to draw up a record of administrative offenses in accordance with the procedure established by law and to file a lawsuit.

5.3 MINERAL RESURCES RESERVES OF GEORGIA

Georgia's geological peculiarity and location are due to the diversity of fossil deposits at the junction of the Eurasian and Afro-Arabian plates. Georgia has both metallic (ore: ferrous, non-ferrous, radioactive and rare ores) and non-metallic (non-ore: gypsum, barite, phosphorus, sulphur, salts, building materials, precious stones, etc.) as well as fuel (oil, natural gas, coal, peat, shale fuel) and hydromineral resources (mineral, thermal and drinking waters).

There are several large deposits of mineral resources in Georgia. Most of the mineral resources are in the form of medium and small-scale deposits and exposures. The oldest and largest mining activity is related to Chiatura manganese, which continues to this day. By the end of the 19th century, about 50% of the world's demand for manganese was provided by Georgia itself, due to finding mineral in other countries (Brazil, South Africa and India) competition increased and the share declined. Despite the increased competition, demand for manganese is still high in Georgia, significant export volumes is distributed on ferroalloys as well as the main source of employment and income for the Chiatura municipality is related to these activities. The majority of manganese supplies continue to come from the Chiatura municipality (90%), followed by the Zestaponi municipality (7%), and a small number to the Terjola (2%) and Oni (1%) municipalities.

Figure 5.3.1: Manganese ores and their supplies (thousand tonnes)



The Mineral Resources Fund combines state accounted supplies. The use of these supplies creates the base of the mining industry in the country. According to available information, the Georgian Solid Mineral Resources Fund comprises 960 deposits, the distribution of which is presented in table 5.1.

Table 5.1: Mines in the Mineral Resources Fund

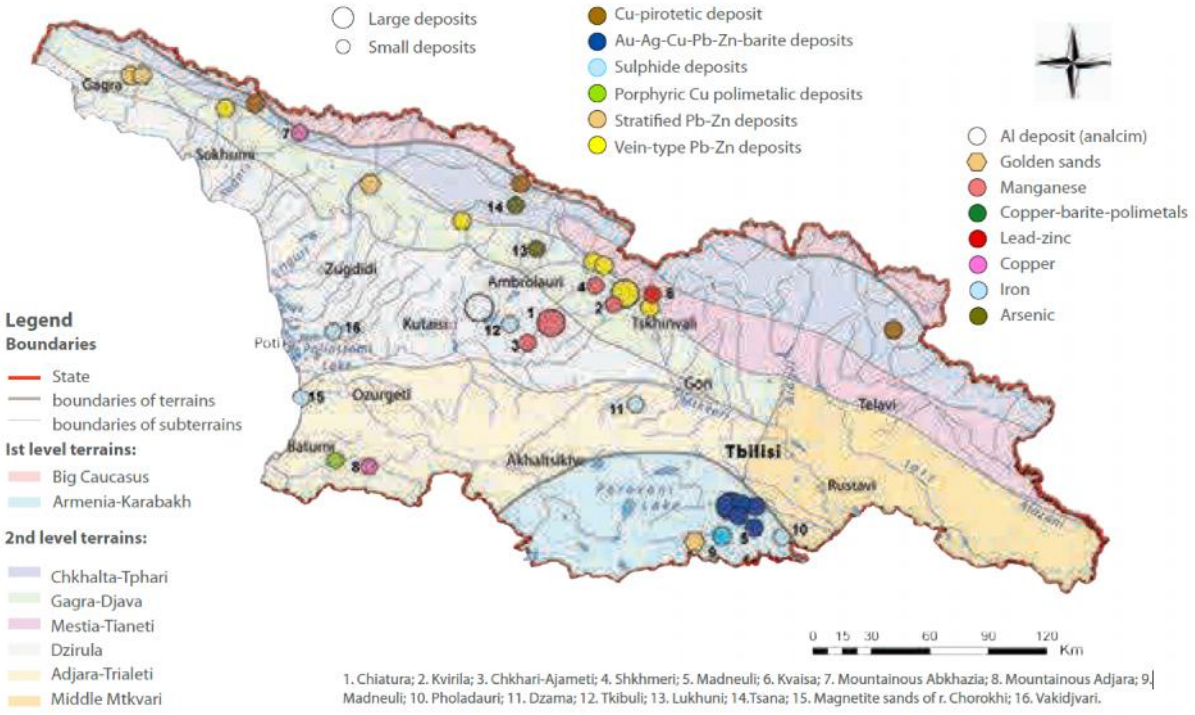
Type of mineral resource	Approved supply
Metals *(thousand t)*	
ferrous, non-ferrous metals, precious, rare	419 965
Solid fuel resources *(thousand t)*	
Coal	373 934
Peat	47 644
Facing stones *(thousand m³)*	
Gabbros	7 224
Gabbros-diorites	5 952
Syenite	660
Granite	5 400
Tuff-breccias	14 938
Dacite	2 289
Teschenite	6 165
Diabase	10 741
Basalt	45 052
Dolerite	19 579
Marble	4 259
Marble-like limestones	78 026
Chemical industry raw materials *(Thousand t)*	
Barytes	4 731
Acid-resistant andesite	12 717
Bentonite	6 418

Type of mineral resource	Approved supply
Building materials *(thousand m³)*	
Detritus	459 221
Sand gravel	658 487
Brick Clay	135 207
Chalk	3 962
Cement Clay	64 070
Sheetrock	14 917
Slate tiles	11 796
Light stuffs	220 323
Wall rocks	4 898
Silica sand	168 804
Brick clays	13 500
(Thousand t)	
Limestone for lime	292 173
Gypsum	20 342
Cement limestones	392 014
Subsidiary raw materials for metallurgy *(Thousand t)*	
Dolomite	44 904
Fluxing Limestone	1 700
(Thousand m³)	
Fire-clay	91 636

Mineral pigment	437		Molding (forming) sand	2 300
Talc	2 774		Spongolite	1 957
Calcite	27 211		**Supplies of industrial materials** *(Thousand m³)*	
	(Thousand m³)			
Mirabilite	1 493		Teeming basalt	9 892
Diatomite	7 995		Lithographic stones	120
Raw materials for ceramic industry *(Thousand t)*				(t)
			Semi-precious stones	920
Loamy gypsum	2 232		**Raw materials for agriculture** *(Thousand t)*	
	(Thousand m³)		Peat	41 880
Trachyte	945		Zeolite	30 381
Ceramic clay	2 504		Clay gypsum	3 460

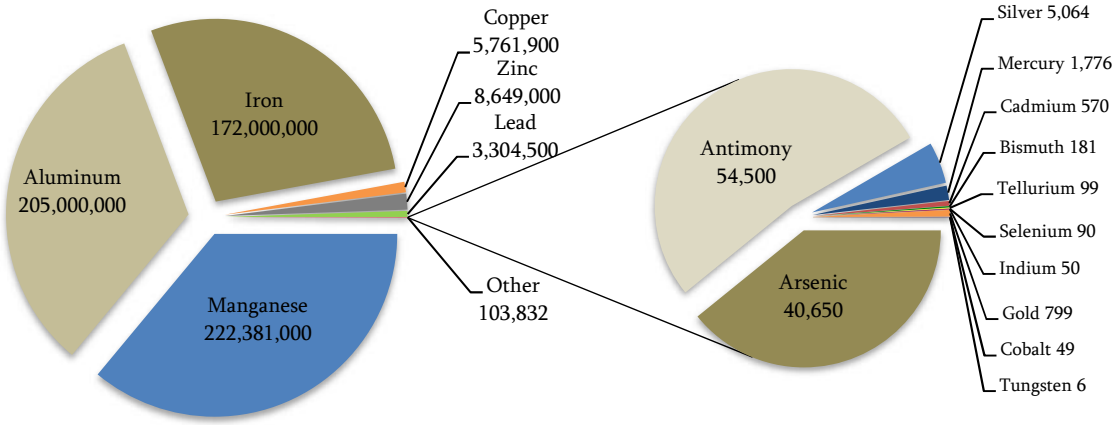
Among metal deposits of Georgia the most significant are Chiatura manganese and polymetallic deposits of Madneuli (Bolnisi ore district). The latter forms the two main export commodity groups.

Map 5.1: Distribution of metals in Georgia



There are 4 major iron ore deposits in Georgia - Poladauri, Dzama, Tkibuli-Shaori, and Supsa-Natanebi, where the predicted resources of iron are quite large (see map 5.1).

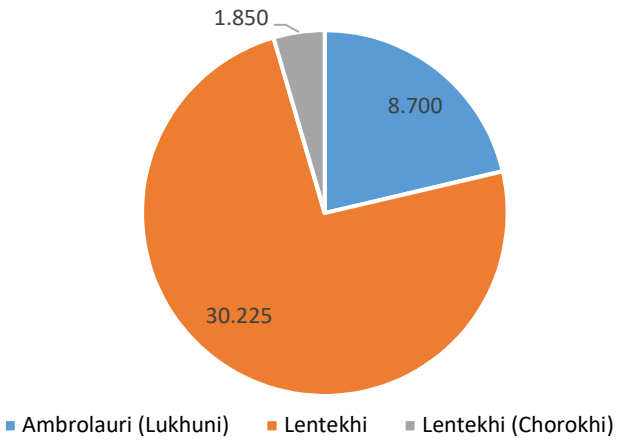
Figure 5.3.2: Supplies of Metals and Rare Elements in Georgia (tonnes)



Georgia is, also, rich with sediments of marine magnetite-titanomagnetic sandstones accumulated in the rivers Supsa and Natanebi. There are no iron ore mines operating in Georgia at present, but their study is continuing and processing may begin in the future.

On the main ridge of the Caucasus mountain range small deposits of arsenic, mercury, tungsten and molybdenum are located. Of which, Gold-arsenic, arsenic and gold-antimony deposits are of international importance. Arsenic extraction is not currently underway. Due to industrial waste of arsenic, former Industrial sites of Ambrolauri Municipality, vil. Uravi and Lentekhi Municipality, vil. Tsana are hotspots of significant pollution.

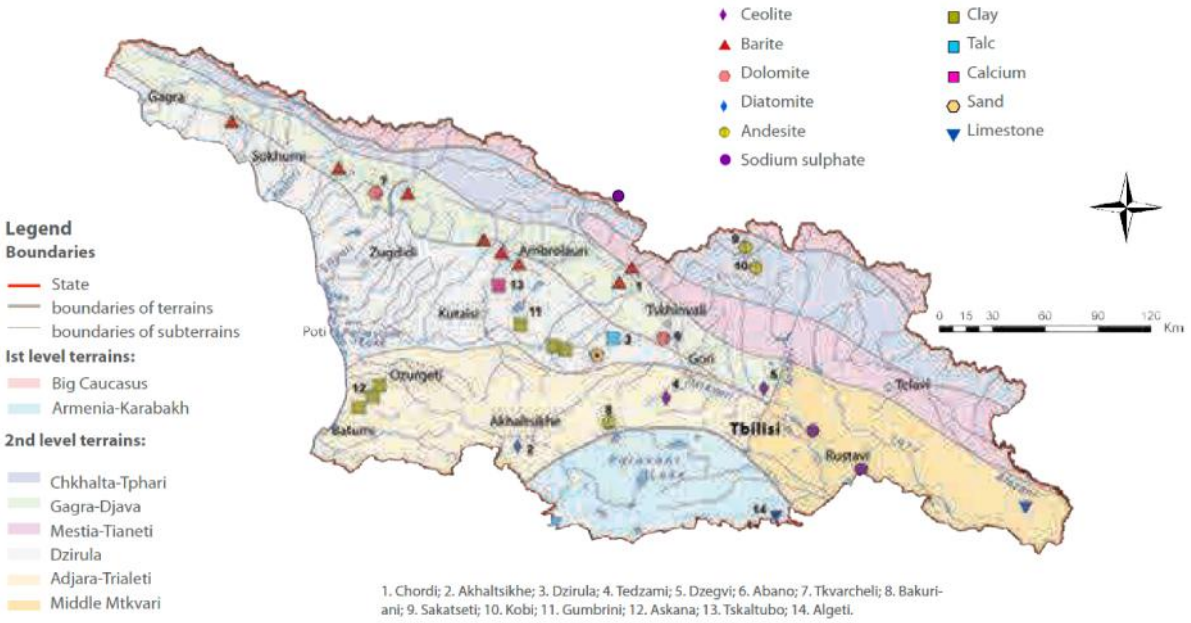
Figure 5.3.3: Arsenic Deposits and Supplies (Thousand T)



The extraction of metals, including gold and silver, is intensive at the gold-copper-barite-polymetallic deposits of Bolnisi Municipality.

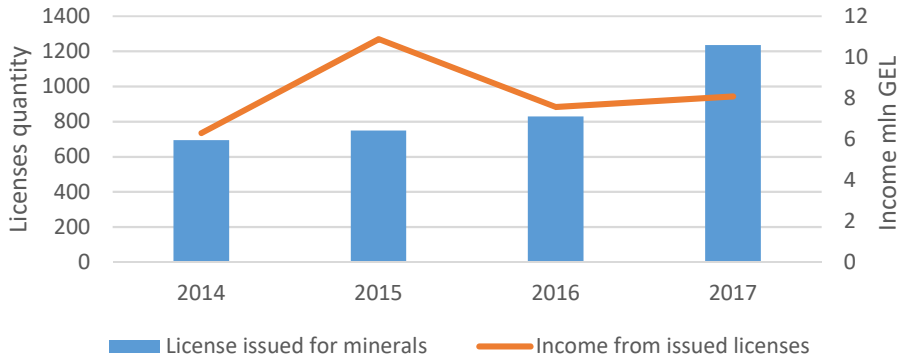
It is important to note separately the non-metal deposits, in particular zeolite-containing (Dzegvi, Tedzami, Akhaltsikhe, etc.) and construction-decorating deposits (see map 5.2).

Map 5.2: Distribution of non-metallic mineral resources in Georgia



In 2014-2017, 3 506 licenses for extraction of minerals were issued. About half of these licenses were issued for the extraction of solid mineral resources. It is noteworthy that there has been an increasing dynamics in the issuance of licenses, but the amount of revenue received in 2016-2017 has decreased compared to 2015.

Figure 5.3.4 Information on licenses for minerals issued in 2014-2017

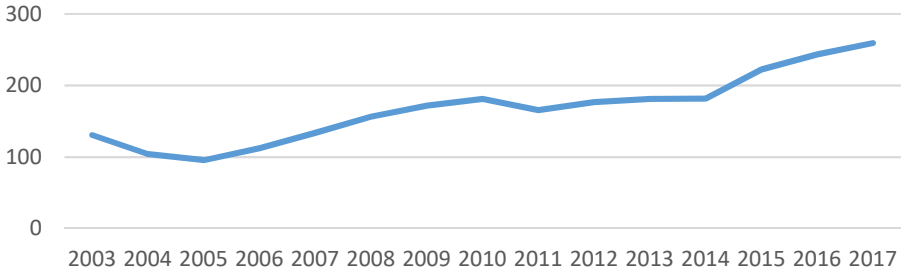


Source: LEPL National Agency of Mines

5.4 IMPACT OF EXTRACTION OF MINERAL RESOURCES ON THE ENVIRONMENT

Mining is one of the important drivers of the Georgian economy. It plays a vital role not only in the form of the country's balance of payments, but also in the development of the local economies of the regions or self-governments (infrastructure development, income and employment). If observing the dynamics, the mining industry sector (at constant 2010 prices) increased by 43% in 2013-2017 (see Figure 5.4.1).

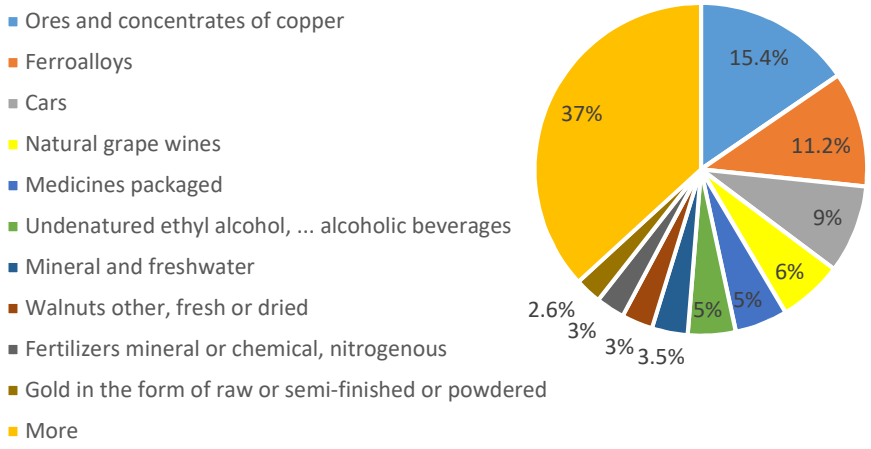
Figure 5.4.1 Total value added of the mining industry (at constant 2010 prices, GEL mln)



Source: Geostat

It is also worth noting the large volume of export of mineral resources. In 2017, the total share of the top ten mineral resources in total exports was 32.7% (USD 895 mln) (see Figure 6.4.2). Among the leading export commodity groups of Georgia, copper ores and concentrates (USD 422.5 mln; 15.4%) holds the first place in exports and ferroalloys (USD 306.4 mln; 11.2%) the second. "Mineral and Freshwater" (USD 95.8 mln; 3.5%) and "Gold Unprocessed or Semi-processed" (US $ 70.8 mln; 2.6%) product in the top ten heading export groups.

Figure 5.4.2 Composition of total export of Georgia by product (2017)



Source: Geostat

The extraction and recycling of fossil or mineral resources must be rational and maximally sustainable, since the extraction of exhaustive mineral resources will inevitably have a negative impact on the environment. However, the constitutional right to equal use of natural resources of the next generation must be taken into account, and the only way to ensure this is through intergenerational distribution of the benefits derived from these economic activities. Consequently, the benefits of fossil resources must be directed towards the diversification and sustainable development of the local economy. The budgetary revenue accumulated through the use of minerals should encourage economic activity in other areas and ensure the proper living conditions of the local community until the mineral resources are exhausted. In the event of a resource shortage in the local economy after the resource has run out, there may be unfavorable results.

In some cases, even with the stock of mineral resources, even with the suspension of unsustainable manufacturing activities, the dangers of water, air or land contamination associated with abandoned fossil sites are increasing. There are many clear examples of this in Georgia.

> *Ambrolauri Municipality, vil. Uravi and Lentekhi Municipality vil. Tsana, after discontinuation of arsenic extraction, arsenic-related waste management has become a major challenge. Arsenic-based waste burial sitess as well as abandoned industrial sites (factory or*

extraction sites) have become an essential source of pollution. Measures to mitigate the negative impacts of such pollution will require significant financial resources. Investors, even if they wish to engage in such activities, usually refrain from undertaking the obligation to prevent pollution. As for the local governments, they are not able to take the necessary measures due to insufficient budgetary resources. The only possible resource for the conservation / neutralization of these pollutants remains the efforts of the central government and the international community, which in many cases fail to do so quickly. Consequently, similar activities should be properly regulated and appropriate preventive measures taken during the production process.

The process of extraction of minerals is usually accompanied by environmental pollution. Extraction of mineral resources requires necessary environmental measures to ensure a safe working or living environment. It is essential to maximize environmental oversight functions and ensure full compliance with the requirements of the relevant regulatory framework. Particularly important is the control of the extraction of minerals, which can allow a wide spread of pollution by air, water, food products or other means. A number of methods for the extraction / treatment of ferrous, rare, heavy metals and coal are associated with the use of explosives or highly toxic substances, and the management of generated waste requires complex environmental measures. Accumulation of large quantities of hazardous waste and toxic substances in the tails should be avoided. They should be eliminated and controlled in a timely manner, thereby minimizing the potential for new sources of pollution.

Implementation of resource-efficient and clean technologies as well as enforecement of special environmental measures are also important, enabling the localization and remediation of contaminated areas as much as possible.

The new manganese processing plant in Chiatura has the ability to filter water multiple times and return to the production cycle instead of discharging it into the river, which partially reduces the pollution of the river. During extraction and processing of manganese, the introduction of water sprinkling or dust filtration systems significantly reduces air pollution. The recultivation of open-field manganese product areas, covering of various types of waste dumps with the geotextile, and the construction of toxic leachate blockade structures also significantly reduce the negative impacts on the environment. To prevent contamination from such large-scale activities, it is necessary to take all possible action.

Pollution of surface and ground water by heavy metals and toxic substances (iron, copper, arsenic, cyanide, etc.), increase in tailings, air pollution by dust from extraction and recycling of minerals are still major national security challenges. In this regard, in recent years, some environmental measures have been implemented:

In order to prevent the pollution of river Kazretula from diffusive discharges and runoff from slopes into the river, contaminated and clean water was separated. The ponds were arranged near the riverbed where water should be neutralized by chemicals during rain. Pumping stations were arranged to collect contaminated drained water from the tailings dump of Madneuli mining plant and return it back to the surface of the tailings dump. Biological purification mechanisms have also been set up in some areas. The installation of new purification and pumping systems is also planned. Modern airdustcapturing equipment-filters were installed in the lime-white workshop building of the "Madneuli" Mining Enrichment Factory to reduce the volume of dust there. Installation of similar systems is also considered for other workshops. With this mechanism, 95% of the dust from the plant is caught. In addition, a dustfiltering mechanism is installed on the "Sakdrisi" grinding plant, the licensee

holder also possesses road irrigation equipment, which enables further reduction of air pollution by dust.

The measures highlighted to reduce environmental damage are not enough. It is important that more efforts needs to be made to reduce the likelihood of such contamination and remediate the affected areas. In other cases, after the depletion of natural resources or the discontinuation of business activities, the risks of the large-scale pollution, similar to the arsenic industrial areas, of Bolnisi or Chiatura and their surroundings, including river Kazretula and Kvirila will increase, and the local self-government will not be able to carry out effective response actions on the negative results independently.

5.5 MAIN CHALLENGES

In order to systematically improve the management of use of minerals, fundamental reforms are required related to elaboration of policies and strategies, mainstreaming a legal framework, improvement of regulatory modeling and development of human capacity in line with international standards.

In order to improve the management of the mining sector, it is also important to develop the mining in accordance with international standards, taking into account all the modern methods and approaches available in developed countries. It is imperative that the country has a transparent and commercially attractive mineral resource management system in the minerals sector.

Significant challenges in the field of mineral resource management are: development of raw materials database, increase of investment attractiveness, and enhanced licensing oversight functions.

With the active support of partner organizations significant steps were relized in the sector of mineral resources management and several major reforms are underway. In the framework of the large-scale reform supported by the European Bank for Reconstruction and Development (EBRD), in line with international standards, policy and strategy documents have been developed, based which a relevant legal framework will be elaborated in the second phase of the reform, and in the final phase, recommendations of enhancement of the capacity of human resources in the sector for 2020-2021 will be provided.

In order to dispose state-owned resources and rationally use the minerals, access to information on minerals was increased and digitized accounts were opened. In particular, an electronic catalog was created, integrating the accounts of the State Geological funds and removing the service charge for obtaining geological information. Accordingly, information available in the State Geological fund indicating the type and location of the resource is accessible on the web-site: https://nam-geofund.archival-services.gov.ge/

Introduction of automated monitoring systems is very important in order to control compliance of maximum permissible concentrations of water, air and other polutions. Environmental obligations undertaken by companies licensed for the processing and extraction of heavy metals should become increasingly evident through the introduction of clean production methods. In this regard, effective steps were carried out by private operators (airpurification technology installation, heavy metals and toxic-contaminated water collection, launching operations of new processing plant, implementation of new cleaner technologies, etc.), though the effort is not sufficient. Implementation of cleaner technologies are required on each stage of extraction as well as refining/ processing. Therefore, the full oversight over the production cycle should be under the

environmental supervision and an action plan to prevent possible contamination, should be prepared in advance.

II/6. BIODIVERSITY

Over the last 50 years, nature has changed unprecedentedly around the world, due to the acquisition of natural areas, the extraction of living organisms, climate change, pollution and invasive alien species. The increase in the consumption of biological resources is accompanied by a decrease in the sustainability of natural environmental regulation. The number of endangered species of plants and animals is rapidly increasing. According to the latest estimates[48], the tendency to lose biodiversity and ecosystem services will continue to deteriorate even if current practices in energy, food, water supply and resource use are not changed. Nature can be preserved and preserved while achieving social goals and improving the quality of life, but this requires immediate and effective efforts at local, national and global levels.

6.1 MAIN QUESTIONS AND MESSAGES

1. Why is Georgia's Biodiversity Conservation Important?

- Due to the diversity of species and habitats, the high level of endemism and the spread of ecosystems of global importance, Georgia is on the priority list of nature conservation[49]. However, due to the significant threats to biodiversity, our country is also part of the world's biodiversity hotspots[50];
- Georgia's biodiversity is at significant risk of degradation and degradation of natural habitats, excessive use of natural resources, environmental pollution, invasive alien species and climate change;
- Our existence and well-being are highly dependent on nature-based products and services such as timber resources, food, medicinal and honey plants, fish resources, clean water, pollinating insects, livestock food, genetic resources, soil erosion and climate change, climate change and climate protection. Natural disaster Mitigate the impacts of tourism, create a conducive environment for recreation and tourism development. Biodiversity is our natural capital, which is an integral part of the country's sustainable development process for future generations.

2. What is the general trend towards the development of the system of protected areas?

- Development of a network of protected areas is of particular importance for the conservation of Georgia's unique biodiversity, the conservation of endangered species of flora and fauna. A modern network of protected areas has been established in Georgia since the 90s of the last century, which today comprises 14 nature reserves, 12 national parks, 20 nature reserves, 40 nature monuments and 1 protected landscapes. In 2014-2019, compared to 2013, the area of protected areas increased by about 27.9% to 666 107 ha, which is 9.56% of the total area of the country. In order to ensure effective management of protected areas, a Management Plan for 9 Protected Areas was approved in 2014-2017.

3. What is the state of conservation of endangered flora and fauna in the country?

- The status of the majority of the populations of species distributed throughout Georgia has not been assessed or updated for many years. In 2006, based on reliable data available at that time, 56 species of plants and 43 species of animals were identified that are at risk of extinction. These species have been included in the Georgian Red List. Studies in subsequent years have revealed that 117 species of Georgia's flora are in danger of extinction. Georgia's Red List, however, has not been updated since its approval, and therefore does not include part of the endangered species;

[48] Global Assessment report on Biodiversity and Ecosystem Services of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services, 2019, https://www.ipbes.net

[49] The World Wildlife Fund (WWF) globally identifies 35 priority areas for nature conservation, including the "Great Black Sea Basin", which is part of the Georgian territory.http://wwf.panda.org

[50] Conservation International has identified 36 hotspots globally - the most important nature conservation sites, including the Caucasus and Iran-Anatolia, part of which is Georgia https://www.conservation.org/

- Georgia has been in the process of establishing an emerald network since 2009, with the aim of protecting the species by preserving their habitats. In 2017-2019, 46 territories with a total area of 1 030 491.5 ha were designated as the Emerald Network sites. Along with the proposed areas, the total area of the emerald network is 1 285 974.74 ha, which is 18.45% of the total territory of Georgia.

6.2 STATE REGULATION

On May 8, 2014, the Government of Georgia adopted the Biodiversity Strategy and Action Plan of Georgia (2014-2020), which sets out consistent policies and national priorities to achieve the national vision set out in the document by 2030 - *„Georgia will be a country where citizens live in harmony with nature, biodiversity values are universally recognized; Conservation and prudent use of biological resources ensure the continuity of ecosystem processes, a healthy environment and vital benefits for the whole community. "*

Georgia's Biodiversity Strategy and Action Plan emphasizes the need for biodiversity conservation to ensure the country's economic development and welfare of the population, taking into account current threats, measures for the conservation and improvement of rare species, native species and endemic species. To preserve the genetic diversity of species, to further develop a network of protected areas and to introduce sustainable use of natural resources.

The development and implementation of a biodiversity strategy and action plan by the country is a commitment under the Convention on Biodiversity, to which Georgia has been a party since 1994. The document sets 21 national goals for preserving the country's biodiversity, improving its status and reducing existing threats.[51].

The Biodiversity Strategy and Action Plan for 2014-2020 forms the basis for the fulfillment of the obligations under the Association Agreement between Georgia and the European Union and promotes harmonization of the country's policy with the European nature protection strategies.

The Association Agreement signed in June 2014 includes significant commitments for the conservation of species and habitats and the sustainable use of biological resources. In particular, Georgia should ensure:

- Harmonization of legislation with EU Directives in the field of nature protection (EU Directive 92/43 / EEC on the Conservation of Natural Habitats and Wild Flora and Fauna, EU Directive 2009/147 / EC on the Conservation of Birds);
- Complete the identification, evaluation, and inclusion of relevant areas in the Emerald Network;
- Define species and habitat conservation objectives in the Emerald sites and take appropriate action;
- Assess the species of birds that need special protection measures, including migratory birds; Identify and protect areas important to birds; Establish a system for the protection of birds and prohibit certain means and methods of hunting;
- Establish a conservation status monitoring system for species and habitats;
- Ensure strict protection of certain species;
- Develop a mechanism for public education and information.

[51] The full version of the document is available at: http://mepa.gov.ge/Ge/PublicInformation/24

The conservation of critically endangered ecosystems and endangered species, as well as genetic resources, requires the adoption and enforcement of appropriate legal requirements. Accordingly, two important legislative documents have been prepared:

- Draft Law of Georgia on Biodiversity and
- Draft Law of Georgia "Forest Code of Georgia".

The draft Law on Biodiversity is currently being revised according to the comments received from stakeholders, and the Georgian Forest Code has been submitted to the Parliament for approval.

"Law on Biodiversity" specific aims are to provide:

- Protection for the wild plant and animal species and long-term conservation;
- Habitat conservation and preservation through the development of an emerald network and the creation of protected areas included in international networks;
- Regulation of international trade in wild flora and fauna species so that the trade is not detrimental to the survival of these species;
- Access to genetic resources and associated traditional knowledge and equitable distribution of benefits.

According to EU directives, the draft law sets out the legal requirements for the protection and preservation of plant and animal species, the rule for compiling a list of protected species and habitats, and prohibitions on protected species. The draft law establishes a legal basis for the establishment, management and monitoring of Emerald sites in Georgia, defines Emerald territory ownership forms, as well as establishes decision-making procedures for activities that may affect Emerald sites. The bill also sets out the conditions and procedures for the use of genetic resources on the territory of Georgia to ensure a fair and equitable distribution of the benefits received[52].

In order to improve national regulation and control of harvest, captive breeding/artificial propagation, export, import and re-export of species included in the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) [53], the Law of Georgia on "Red List" and "Red Book" (2003) was amended[54]. CITES is a legally binding, but not self-executing, multilateral agreement. Accordingly, Parties to the Convention, are obliged to adopt the national legislation necessary for the effective implementation of the Convention. Adoption of legislation relevant to the requirements of CITES is also a requirement of the Deep and Comprehensive Free Trade Area Agreement (DCFTA) between the EU and Georgia.

[52] Genetic resources are any material of plant, animal, microbial or other origin that contains functional units of inheritance and which have actual or potential value. For example, on the basis of which it is possible to create pharmaceuticals, cosmetics or to breed new varieties.

[53] Georgia has been a party to this convention since 1996.

[54] Before the amendment the permitting procedure was defined by the Resolution of the Government of Georgia N18 (06/02/2007) on the approval of "Provision on Export, Import, Re-export and Introduction from the Sea of species, their Parts and Derivates listed in the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). Also, the extraction of wild-growing green snowdrop (galanthus woronowii) bulbs and/or eastern sowbread (cyclamen coum) tubers listed in the CITES Appendices are governed by the the Resolution of the Government of Georgia N21 (06/02/2007) on the approval of "Provision on rules and terms for issuing use licenses of green snowdrop (galanthus woronowii) bulbs and/or eastern sowbread (cyclamen coum) tubers listed in the Appendices to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES).

Tab 6.1: Endangered species of wild fauna and flora trade in Georgia

One of the reasons for the decline of biodiversity is the illegal and uncontrolled international trade in wild flora and fauna species, which has endangered many species of plants and animals.

„In accordance with the requirements of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the National Legislation, the Ministry of Environment and Agriculture of Georgia issues relevant permits for the export, import and re-export of plant and animal species included in the Appendices to the Convention.

15 million green snowdrop bulbs (*Galanthus woronowii*) are exported from Georgia annually for commercial purposes, obtained under a special license. For the purpose of determining the quota for the commercial export of green snowdrop bulbs, surveys of wild populations are conducted with the involvement of international experts, as well as resources available on cultivation plots.

In addition to the green snowdrop bulbs, eastern sowbread (*cyclamen coum*) tubers, eastern sowbread extract (1 635 liters of eastern sowbread extract and 4,000 tubers were exported from 2015-2017), aloe (not naturally occurring in Georgia, 22-39 tonnes annually) and Caviar (*Acipenser baerii*, 3-7 kg) are exported from Georgia for commercial purposes. Permits are issued to re-export specimens of several species for commercial purposes (alligator and crocodile leather watchstraps, sturgeon).

Specimens of species included in CITES Appendices exported, imported or re-exported without relevant permits are subject to confiscation. In 2017, for example, 6 live gyrfalcons (*Falco rusticolus*) and one live saker falcon (*Falco cherrug*), sturgeon meat (49.10kg), tur horns, crocodile and wolf stuffs, live python and other specimens were confiscated.

Picture 8.1: Stand for confiscated specimens of species included in CITES Annexes at Tbilisi Airport

Source: Teona Karchava's photo

The Law of Georgia "on Living Genetically Modified Organisms", adopted in 2014, banned the introduction of living GMOs into Georgia, and in 2016 also prohibited the placement, import and re-export of live GMOs into the market. Accordingly, Georgia was declared a free zone of living genetically modified organisms. In Georgia, only the use of a closed system of genetically modified organisms (for example, scientific research) is permitted under the relevant license issued by the Ministry of Environmental Protection and Agriculture of Georgia (MEPA).[55]

[55] Georgia does not have any licenses for use in the locked system of Genetically Modified Organisms (GMOs).

Tab 6.2: Regulation and control of living GMOs in Georgia

Risk management for living GMOs is of particular importance to Georgia, where local varieties / landraces of agricultural crops and domestic animals and their wildlife species, including endemic species, are distributed. Establishing an effective biosecurity system is important for preserving Georgia's rich genetic resources and protecting its biodiversity.

Under the Deep and Comprehensive Free Trade Area Agreement (DCFTA) with the European Union, which is part of the Association Agreement, Georgia should bring its legislation on GMOs into line with EU legislation (DCFTA, Chapter IV, Sanitary and Phytosanitary Measures, Annex IV c).

The relevant national legislation was adopted in 2014-2018 and the responsibilities of state agencies in the field of biosafety were defined. During the same period, 5 cases of illegal import of living GMOs were identified. Consignments containing GMOs were destroyed or subjected to back-loading. The Department of Environmental Supervision annually controls agricultural plots to detect illegal introduction of GMOs in all regions of Georgia. As a result of the control, no cases of sowing / planting of living GMOs were identified. The market placement of genetically modified organisms for food / feed and the genetically modified product produced therefrom is monitored in accordance with the Food Safety, Veterinary and Phytosanitary State Control Program. The controls revealed no cases of live GMOs being marketed, but five cases of breach of the GMO (derived from GMO processing) labeling were identified.

In the field of biodiversity, Georgia is actively cooperating with the countries of the Caucasus Ecoregion. In 2018, the Caucasus Ecoregion Conservation Plan has been updated to reflect national biodiversity strategies. The plan promotes coordination of actions in the field of nature conservation in the ecoregion and assists governments in mobilizing financial resources to meet obligations under multilateral environmental agreements.

6.3 CURRENT STATE

6.3.1 SPECIES AND HABITATS

The nature of Georgia is extremely diverse. It features a variety of habitats and landscapes - forests, peat bogs, semicircles, steppes, high mountains, freshwater and marine ecosystems characterized by rich flora and peculiar fauna. There are thousands of species of plants and animals in Georgia, some of which are endemic to the Caucasus and Georgia. Georgia is one of the centers of cultural plant origin. Wild species of agricultural plants are common here, cultivating many local varieties of vines, wheat, fruits and nuts in ancient times.

Due to the diversity of species and habitats, the high level of endemism and the spread of ecosystems of global importance, Georgia is on the priority list of nature conservation. However, because of the significant threats to biodiversity, our country is also part of the world's biodiversity hotspots.

The status of most populations of flora and fauna species in Georgia has not been assessed or updated to date for many years. In 2006, based on reliable data available at that time, 56 species of plants and 43 species of animals were identified that are edangered.[56] These species have been included in the Red List of Georgia and are therefore prohibited from obtaining (removal from the environment) their individual individuals except as provided for by law, as well as any actions that may result in the destruction of endangered species and disturbance of the habitat. Studies carried

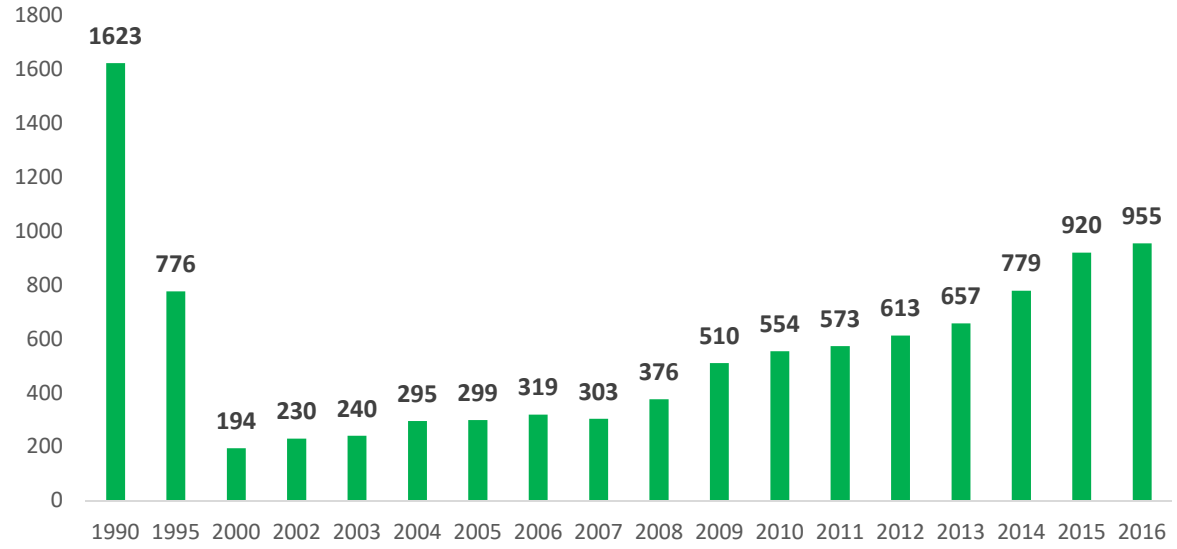
[56] Georgia Red List Approved by Georgian Government Decree # 190, 20 February 2014, Red List Species Protection Requirements, Exceptions to Obtaining Species, are defined by the Georgian Law on Georgian Red List and Red Book (2003).

out in later years revealed that 117 species[57] of Georgian flora are endangered. As Georgia's Red List has not been updated since its approval, it does not include part of the endangered species.

In Georgia, endangered species are mainly monitored within protected areas.

There is a tendency for deer populations to grow at Borjomi-Kharagauli National Park and Lagodekhi Nature Reserve. In 2016, the number of deer in Borjomi-Kharagauli, Lagodekhi and Gardabani Protected Areas was 955[58].

Figure 6.3.1: Deer quantity, populations of Borjomi-Kharagauli, Lagodekhi and Gardabani Protected Areas



Source: APA, Annual Report, 2017

[57] The study was carried out in 2014 with the support of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) programme "Integrated Biodiversity Management, South Caucasus" (IBiS).

[58] According to the 2017 report of the LEPL Agency of Protected Areas (APA).

Tab 6.3: Reintroduction of goitered gazelles in Georgia

Uncontrolled and illegal hunting, as well as habitat acquisition for commercial purposes, have led to the extinction of the goitered gazelles (Gazella subgutturosa) in Georgia in the last century. The goitered gazelles lived in the southeastern part of the country in the semi-desert and their area was still in the 40s of the twentieth century. It reached Rustavi.

The Agency for Protected Areas has been carrying out a reintroduction project in the historic habitat of Goitered gazelles for several years. Restoration of the animal species in natural conditions is a difficult and lengthy process. Thus, Georgia has also had unsuccessful attempts to reintroduce goitered gazelles .

Picture 8.2: Goitered gazelle in Samukhi Valley

Source: APA, Annual Report, 2017

In 2013, at the initiative of the German Ministry of Cooperation and Economic Development (BMZ), Azerbaijan's Ministry of Ecology and Natural Resources, and the World Wildlife Fund (WWF), several individuals of goitered gazelles were released into the historic habitat of Vashlovani Protected Areas. Since 2013, more than 70 individuals from Azerbaijan have been introduced in the historic area. In 2018, the third generation of goitered gazelles was born in Georgia. Currently their number reaches 100 individuals.

The records[59] of the East Caucasian Tur in Lagodekhi Protected Areas revealed an increase in the tur population.

Picture 6.3-6.4: East Caucasian Tur at Lagodekhi Reserve

Source: APA, Annual Report, 2017

A number of Besoar Goat individuals were first observed in the Lagodekhi Nature Reserve by a photo trap. Besoar Goat is found only in Tusheti and Pshav-Khevsureti Protected Areas in Georgia and its total population does not exceed 300 individuals.

[59] The study was carried out by the Centre for Biodiversity Conservation & Research (NACRES) with the support of Caucasus Nature Fund (CNF).

6.3.2 FOREST ECOSYSTEMS

Forest ecosystems are particularly important for biodiversity conservation. 2.69 mln ha is covered by forest, which is 38.7% of the territory of Georgia[60]. More than 90% of forests are in mountainous regions and they are important in reducing the risk of erosion, landslides, avalanches and other natural disasters. Therefore, use of forests that are distributed on steep slopes (35^0 and more) for commercial purposes is restricted. Many endemic and endangered species depend on forest ecosystems. Both broadleaf and coniferous forests are common in Georgia. Subalpine, arid meadow and floodplain forests are represented. Broad-leaved forests account for 81% of forest cover, and coniferous forests account for about 19%. The forests of Georgia are mainly composed of the following species: beech, fir, spruce, fir, oak, chestnut and pine.

312 745 ha of forest area, or only 11.6% of forest ecosystems, is under various categories of protected areas[61]. Outside protected areas, the special protection regime applies to special functional areas (floodplains, subalpine forests, etc.).

The main threats to forest ecosystems are: illegal and unsustainable extraction of forest resources, excessive grazing, climate change, spread of pests, forest fires, spread of invasive alien species, energy and infrastructure projects. Open pit mining is considered as one of the growing threats to forest ecosystems.

In 2015-2017, forest restoration activities were carried out on an area of 476 ha. The LEPL National Forestry Agency (NFA) has restored approximately 105 ha of fire area adjacent to the village of Daba (from the area destroyed by a fire in 2008). But the aforementioned reforeted area was almost completely destroyed by the fires in Borjomi on August 20-26, 2017.

Forest fires are caused by frequent and prolonged droughts in recent years.

Table 6.1: Forest and field fires in the forest fund managed by NFA

	2014	2015	2016	2017
Number of fire cases, units	66	72	42	55
The area affected by the fire, ha	722,3	205,4	183,5	1545,4

Source: NFA

In 2015-2017, there were 8 cases of fire in the area of Adjara forest covering 34.3 ha.

During 2014-2017, 47 cases of forest fires were recorded within the protected areas, covering an area of 1,373,775 ha, though mostly dry grass and bulk woods were burnt. The process of reforestation of the forest is going on naturally.

Forest fires are often caused by irresponsibility or improper management of forests. The widespread practice of burning agricultural land and pastures is also often a cause of fires in the surrounding forests. Despite recent experience, the system of detecting and combating forest fires is still ineffective.

The spread of pests and diseases is also a major threat to Georgia's forest ecosystems. In recent years, 26,000 ha of forest have been damaged by pests in the Borjomi, Bakuriani, Akhaltsikhe, Aspindza-

[60] Statistical publication "Natural Resources and Environment of Georgia 2017".

[61] Source: APA.

Akhalkalaki and Adigeni forest areas. The massive box tree withering was observed in the forest areas of Lanchkhuti, Tkibuli, Tsageri, Ambrolauri, Tsalenjikha, Chkhorotsku, Kolkheti and Martvili, where a box tree moth (*Cydalima perspectalis*) damaged 550 ha of forest. The box blight (*Cylindrocladium buxicola*) damaged 120 ha of forest area within the Kolkheti, Mtirala, Machakhela, Kintrishi and Imereti Caves Protected Areas. Since 2014, there has also been a spike in the Batsara-Babaneuri protected areas. The massive box tree withering on Adjara forest areas is caused by perspectalis and buxicola as well. Significant damage to the Adjara and Borjomi-Kharagauli spruce groves is caused by the European spruce bark beetle (*Ips typographus*) that is more or less spread in about 52,000 ha of Adjara including densely spread area of 1500 ha. In Tusheti and the outskirts of Tbilisi there is a massive pine tree drying caused by a common (*Tomicus piniperda*) and a lesser (*Tomicus minor*) pine shoot beetle. An alarming situation is in chestnuts, where chestnut blight (*Endothia parasitica*) is widespread. It is noteworthy that measures against chestnut blight spread are being actively implemented in Adjara through hipovarulence method by the introduction of hypovirulent strains into the wood of diseased trees. Timely detection and prevention of forest pest disease requires field and laboratory research, monitoring and active intervention, which is complicated by the lack of financial and technical capacity.

Information on the impact of forest use on forest ecosystems is provided in the section "Agriculture and forest use".

Detailed and complete data on the state of forest ecosystems are not yet available, since forest inventory have not been carried out since the 1990s. The state, in cooperation with international donors, has resumed forest management level inventory work since 2013 on the basis of which forest management plans are developed. At present, forest management plans are developed in Adjara, Samtskhe-Javakheti and Guria regions, as well as in Kharagauli forestry district. The forest inventory of the forests managmed by the LEPL Protected Areas is completed in the Kolkheti, Machakhela, Katsoburi and Ajameti protected areas. Forest Inventory has also been completed in the Tusheti Protected Landscape that is managed by Akhmeta Municipality.

In addition to the forest management level inventory, during 2017-2018, with the financial support of the German Government and with the support of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), a methodology of National Forest Inventory was developed and tested. National Forest Inventory field work is planned for 2018-2021. Therefore, it will take several years to finalise the work and recive the updated information on forest.

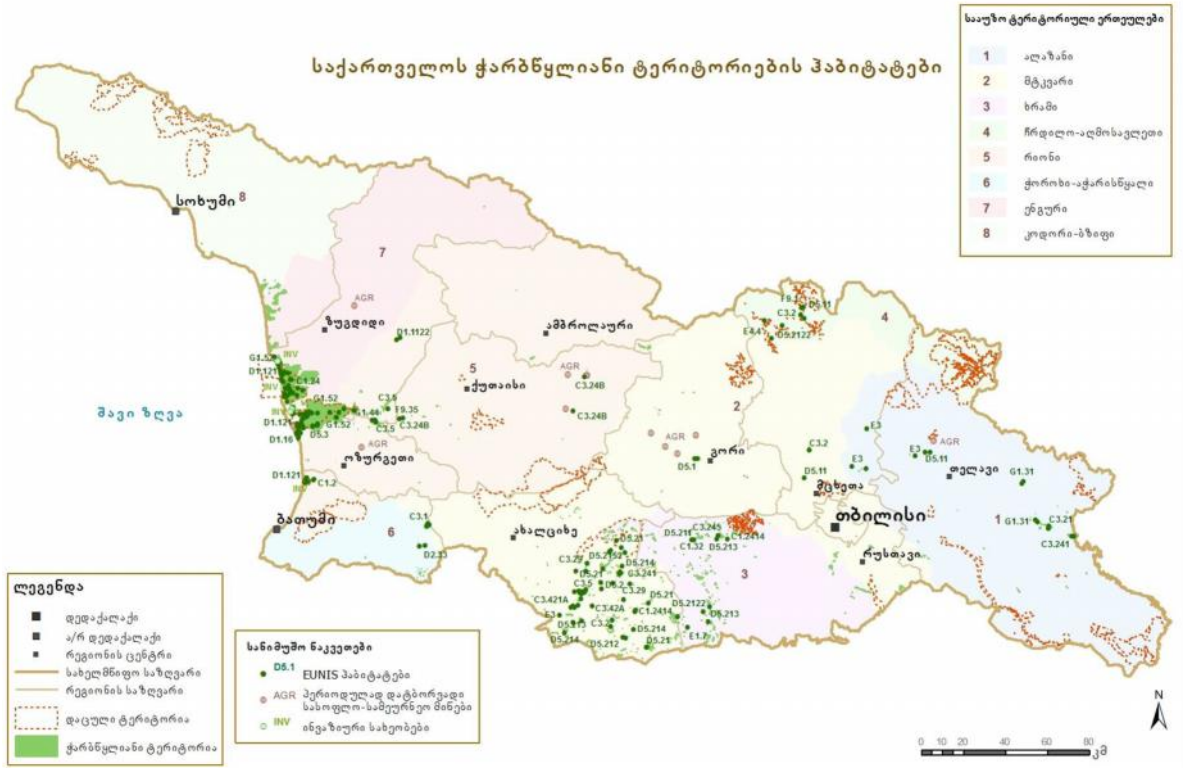
It is noteworthy that information on forest cover changes, forest management, fires, and timber extraction in Georgia is already available through the Georgian Forest and Land Use Atlas (atlas.mepa.gov.ge). Atlas was created in 2017-2019 by the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) in partnership with the World Resources Institute (WRI), with the financial support of the Global Environment Facility (GEF) and the United Nations Environment Program (UNEP). Atlas includes data from government agencies as well as information from partner NGOs and global data from the Global Forest Watch platform. Global Forest Watch is a platform created by WRI, which provides tools and data needed to monitor forests (www.globalforestwatch.org).

6.3.3 FRESHWATER AND WETLAND ECOSYSTEMS

Wetlands in Georgia are mainly present in Kolkheti and Javakheti. Despite strong anthropogenic impacts, fragments and habitats of wetlands still remain in eastern Georgia. In total, wetland ecosystems in Georgia extend to 51 500 ha, and the number of individual sites (hydrologically

isolated units) reaches 1 040[62]. Of particular interest are the peat-dome wetlands of Colchis, where unusual communities of boreal, endemic and relict flora are present. In addition to floristic features, the Spani and Imnati wetlands are characterized by hydrological uniqueness, which is reflected in their percolation features. Wetlands include 258 species of plants. There are six leading families by species: Cyperaceae (40 species), Poaceae (29 species), Rosaceae (20 species), Asteraceae (16 species), Fabaceae (10 species), Juncaceae (10 species). The number of endemic species is 14 species, 4 of them - Georgia (Hibiscus ponticus, Rhynchospora caucasica, Rubus caucasigenus, Trapa colchica), 10 species of Caucasian (Alnus glutinosa subsp. Barbata, Carex transcaucasica, Swertia iberica, Thymus collinus, Ranuncul, Alanus caucasica Rubus caucasicus, Ruscus colchicus, Euphrasia caucasica, Valeriana tiliifolia) endemic. Of the identified wetland ecosystems, only several are naturally preserved. Relatively untouched wetlands remain only in the territory of mountainous Adjara. Most wetland habitats are drained, irrigated and used as pastures. Such areas actually lack conservation values and water regulatory functions. Unfortunately, wetland habitats are perceived by the population as 'negative', which is a major cause of their poor condition. Such an approach is not a historical legacy, as wetlands in the past have often been used as water bodies. A good example of this is the marsh on Meskhetian terraces, which for centuries was protected by a stone wall surrounded by villagers.

Map 6.1: Georgian wetland habitat



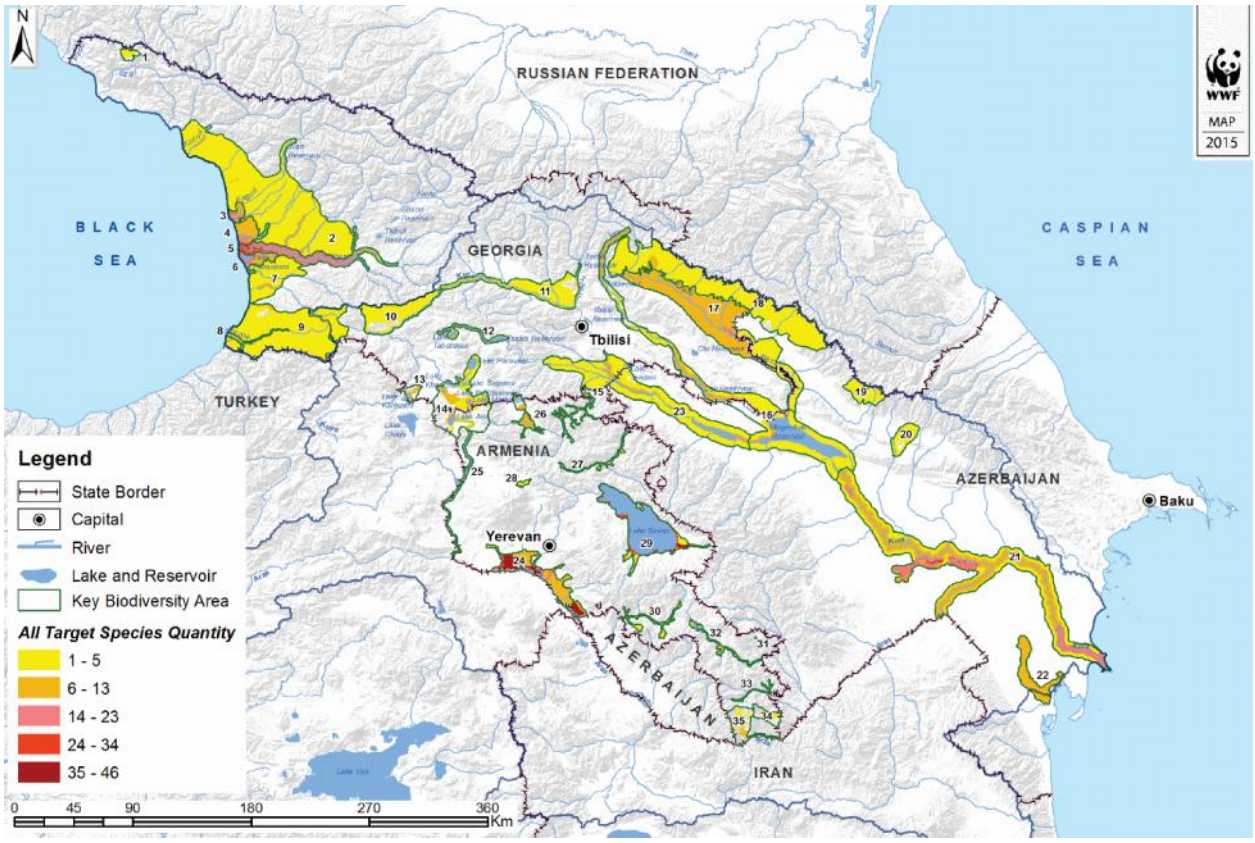
Source: "Wetlands of Georgia, Identification, Delineation and Classification", Ilia State University, GIZ, 2017

Freshwater ecosystems make up 8.5% of the Caucasus ecoregion. These ecosystems host more than 150 species of endangered and nesting birds, including globally endangered and vulnerable species.

[62] Identification, delineation and classification of Georgia's wetlands through the EUNIS (European Nature Information System) Habitat Classification System implemented by Ilia State University with the support of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) Program "Integrated Biodiversity Management in the South Caucasus" in 2016-2017.

Rivers and lakes inhabit more than 70 species of fish, 14 of which are endemic to the Caucasus. Based on the standard methodology of Key Biodiversity Areas, 18 critical freshwater areas with total area of 2 422 241 ha were identified in Georgia.[63]

Map 6.3: Critical areas for endangered freshwater biodiversity



Source: „*Freshwater Ecosystems and Biodiversity, Critical Sites for Threatened Freshwater Biodiversity in the Southern Caucasus" WWF, 2015*

[63] Assessment of freshwater ecosystems and critical habitat identification was carried out in the framework of the Sustainable Development of Hydropower Resources and Reservoirs Project in the Caucasus with the support of the Norwegian Government and World Wildlife Fund (WWF), 2015.

6.3.4 STATE OF THE BLACK SEA

The Black Sea is much poorer in biodiversity than the Mediterranean. This is due to a number of factors, including less saltinity of the Black Sea, cold water, and poor oxygen content due to the high concentration of poisonous sulphur (H_2S). That is why heat-loving species and deep-water organisms, abundant in the Mediterranean, are not found in the Black Sea. Instead, the Black Sea is biologically more productive than the Mediterranean Sea. The Black Sea wildlife is characterized by the simultaneous presence of the Mediterranean Sea, fresh water and relict forms. Mediterranean forms predominate: from 201 species and subspecies 112 are mediteranean species and 31 are freshwater species.

The flora and fauna of the Black Sea are represented by 1 888 species of algae (phytoplankton), sea grass and mushrooms, 1677 benthic species, 1910 plankton and 201 fish. Three endemic dolphin species live in the Black Sea, assigned the following status by the International Union for Conservation of Nature (IUCN): Black Sea Boar (*Phocoena phocoena relicta*) - Endangered (Black), Black Sea Short-dolphin (White-tailed dolphin, *Delphinus delphis ponticus*) Vulnerable, Black Sea Horse Dolphin (Afalina, *Tursiops truncates ponticus*) - Endangered (EN). In the Black Sea, the only representative of finfish is Monachus monachus, almost extinct, and found in small numbers on the shores of Bulgaria and Romania.

Mammals: According to the monitoring results of all three species of Black Sea mammals (Harbour porpoise, Short-beaked common dolphin and Bottlenose dolphin) in the Kolkheti National Park, from 3 500 to 16 700 Harbour porpoise and from 663 to 11 039 Short-beaked common dolphin individuals were hibernating in Georgian Black Sea waters in 2014-2017. The number of Bottlenose dolphins varied between 30-100 individuals. The highest density of dolphins was observed in the marine area of Kolkheti National Park, from the river Rioni Delta to the Khobi Delta. The Harbour porpoises form groups of several thousand individuals in the marine area of the Kolkheti National Park during the winter, which is characteristic of this area only and is not found elsewhere in the Black Sea. The Kolkheti National Park's marine aquatic conservation area is one of the most important areas in the Black Sea. The estuaries of the Chorokhi, Supsa, Rioni, Khobi and Churia rivers are also important for Cetaceans.

Map 6.3: Important places for sea mammals

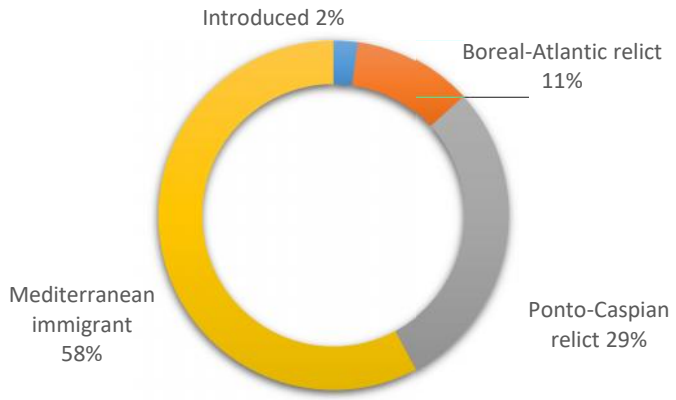
Source: Implementation of the Black Sea Mammal Management Plan, Institute of Ecology, Ilia State University, 2017[64].

Picture 6.5: Short-beaked common dolphin

Source: Gurielidze Z, Kopaliani N, Devidze N, Dekanoidze D, Ninua L, Javakhishvili Z, Kerdikoshvili N, Paposhvili N. 2015. Black Sea Cave Monitoring Program[65].

Ichthyofauna: As a result of monitoring from 2014-2017, 27 families and 45 species of fish were recorded in the Black Sea coast of Georgia. Of these, 18 species are benthic or seabed, can be found mainly on the seabed and near the seabed, 18 species are bentho-pelagic, i.e. can be found both on and near the seabed and in water thickness, the remaining 9 species are pelagic, ie mainly in the water thickness. 26 species of ichthyofauna belong to the eco-faunistic complex of Mediterranean immigrants, which means that their presence in the Black Sea is related to the Mediterranean ichthyofauna, 5 species are Boreal-Atlantic relict, i.e. their existence is related to glacial processes; The 13 species are the Ponto-Caspian relict, that is, an indigenous form; One species - So-iuy Mullet (Pilengas), was introduced from the Japanese Sea in the 80s of the last century (see Figure 6.3.2).

Figure 6.3.2: Black Sea Ichthyofauna Complexes



Source: NEA

[64] Prepared with the support of Kolkheti Protected Areas Development Fund.
[65] Prepared with the support of Kolkheti Protected Areas Development Fund.

In Ichthyofauna, the dominant species are European anchovy, Mackerel, Blunt-snouted Mullet and Whiting. Other forms occur in much smaller quantities. Five of the species observed during the reporting period (representatives of the sturgeon family – starry sturgeon, Persian sturgeon, Russian sturgeon, beluga and representative of the gobiidae family - Monkey goby) are included in the Georgian Red List. Mackerel and Blunt-snouted Mullet occur throughout the year. Significant concentrations of mullets are observed in May-June and August-October. Black sea shad is mainly found in December-March. Black Sea turbots are harvested from March to May and from October to December, in May and June fishing on turbots is forbidden. Anchovy, the fish with the most massive population, form concentrated groups appealing for commercial fisheries from November to April. Gobiidae family fish are mainly caught in March-April and October-November.

There are 58 fish species / subspecies belonging to 23 families in the contact watersheds. Of these 58 species, 18 species reach the sea by accident at the confluence of rivers, i.e. the main ichthyofauna of contact water bodies can be defined as 40 species. The contact watersheds contain 6 endemic species of Colchic and Colchic-northeast Anatolia, as well as numerous species of Caucasian, Black Sea endemic and Pontic-Caspian relicts. There are 5 introduced and 1 invasive forms in contact watersheds.

Tab: 6.4: Species of sturgeon in Georgia

All six species of sturgeon, historically common in Georgia, (Beluga (*Huso huso*); Russian sturgeon (*Acipenser gueldenstaedtii*); Starry sturgeon (*Acipenser stellatus*); Bastard sturgeon (*Acipenser nudiventris*); European (Atlantic) sea sturgeon (*Acipenser sturio*); Persian Sturgeon (*Acipenser persicus colchicus*)) are on the verge of extinction. Of these, European sea sturgeon is a critically endangered species. Sturgeon species are at risk of extinction not only in Georgia but throughout the world. According to the International Union for Conservation of Nature (IUCN) Red List, all species of sturgeon spread in Georgia are in critically danger of extinction globally. Consequently, sturgeons represent the most vulnerable and endangered species in Georgia.

The reasons for the catastrophic decline in the number of sturgeon are the regulation of rivers flow due to the construction of reservoirs and dams, fragmentation of habitats and destruction of places for spawn, poaching and bycatch of newborn individuals.

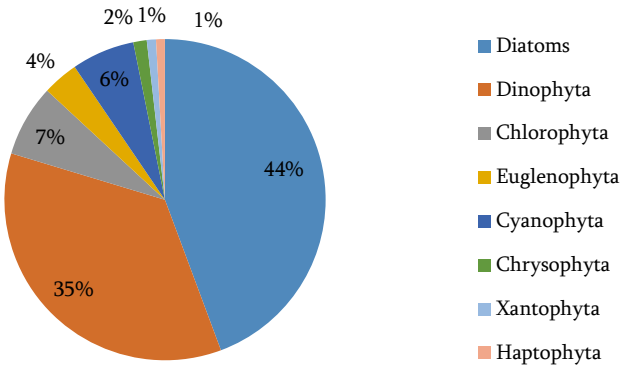
At present, only two rivers of the Black Sea Basin - Rioni and Danube – constitutes a natural environment for the reproduction of sturgeon. On the east bank of the Black Sea Basin, Rioni is the only and indispensable place to breed in natural conditions. Because of the above mentioned river Rioni is a habitat with high conservation value and is of particular national, regional and global importance for the survival of sturgeon and the restoration of their viable populations. Establishment of protected areas, which include the confluence of the Rioni river, the adjacent seawater area and the section of Rioni river within the boundaries of Samtredia Municipality, is planned to protect important breeding sites for sturgeon. The confluence of the Rioni river and seawater area is important for growth, wintering and spawning migration of sturgeons. The section of Rioni river in Samtredia is the only preserved place for the breeding of sturgeon in Georgia.

Phytoplankton[66]**:** In 2014-2017, the Black Sea coastal algae of Georgia was represented by 8 groups (Diatoms, Dinophyta, Chlorophyta, Euglenophyta, Cyanophyta, Chrysophyta, Xantophyta, Haptophyta) of algae (Phytoplankton) with 221 species and varrieties. The most numerous groups are Diatoms and Dinophyta, they are represented by 98 and 78 species and account for 79% of total phytoplankton. There are relatively few species of green (Chlorophyceae) - 24 species and blue-

[66] Plankton is called an organism living in the pelagic zone of the watershed, unable to cope with currents and waves and passively changing location. Plankton of plant origin is called phytoplankton, zooplankton of animal origin, and bacterioplankton of bacterial origin.

green algae (Cyanobacteria) - 14 species. Other species of the unit group are also found (see Figure 6.3.3).

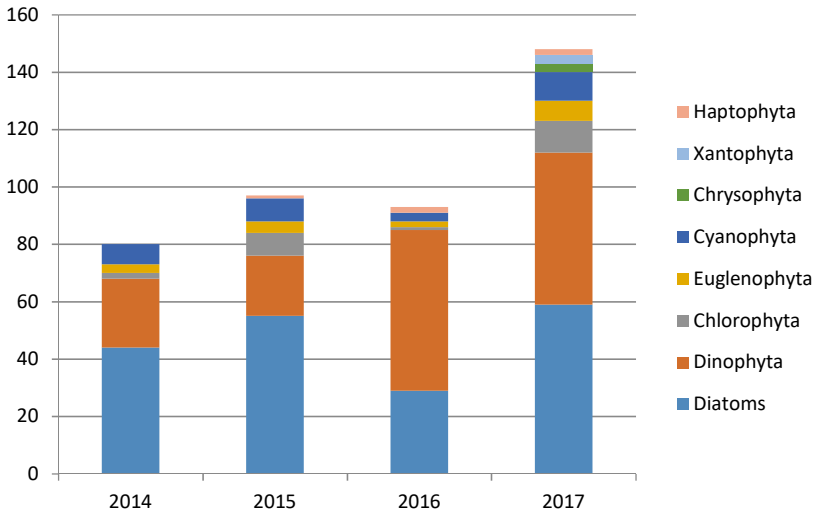
Figure 6.3.3: Percentage composition of phytoplankton main groups of the Black Sea coast of Georgia in 2014-2017



Source: NEA

In recent years there has been an increase in the number of species in the qualitative composition of phytoplankton. About 100 species were recorded in 2014-2016, and in 2017 the species diversity of phytoplankton reached 150. It should be noted that the species composition of diatomaceous algae in 2014-2015 was twice that of dinophytes, and in 2016-2017 these figures were almost equal (see Figure 6.3.4).

Figure 6.3.4: Quantitative composition of phytoplankton main groups of the Black Sea coast of Georgia in 2014-2017



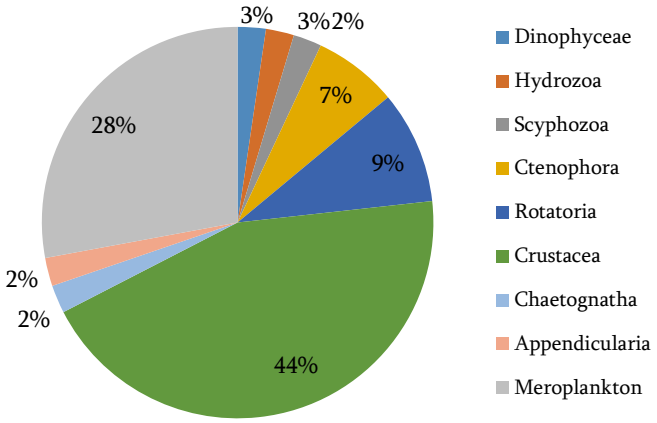
Source: NEA

The average amount of phytoplankton in the Black Sea coastal waters of Georgia during the reporting period was 0.44 mln cells / l and biomass of 2.82 g / m^3. The maximum average annual biomass and biomass was recorded in 2014 (0.68 mln cells / l and 4.42 mg / m^3) and the minimum in 2017 (0.17 mln cells / l and 1.15 mg / m^3). The high number of phytoplankton and biomass in 2014-2015 was due to the rather large diatonic Pseudosolenia blossoming.

Zooplankton: In 2014-2017, the mesozooplankton of Georgia's Black Sea coastal waters was represented by more than 40 species, most of which are widespread in the Black Sea. Among

them the most diverse are crustaceans (Crustacea - 19 species), they constitute 44% of zooplankton species. Thirteen species of crustaceans come on Copepoda and 6 species on cladocera. A diverse group of zooplankton is also the larval forms of the meroplankton - benthic organisms, of which 12 species are common (see Figure 6.3.5).

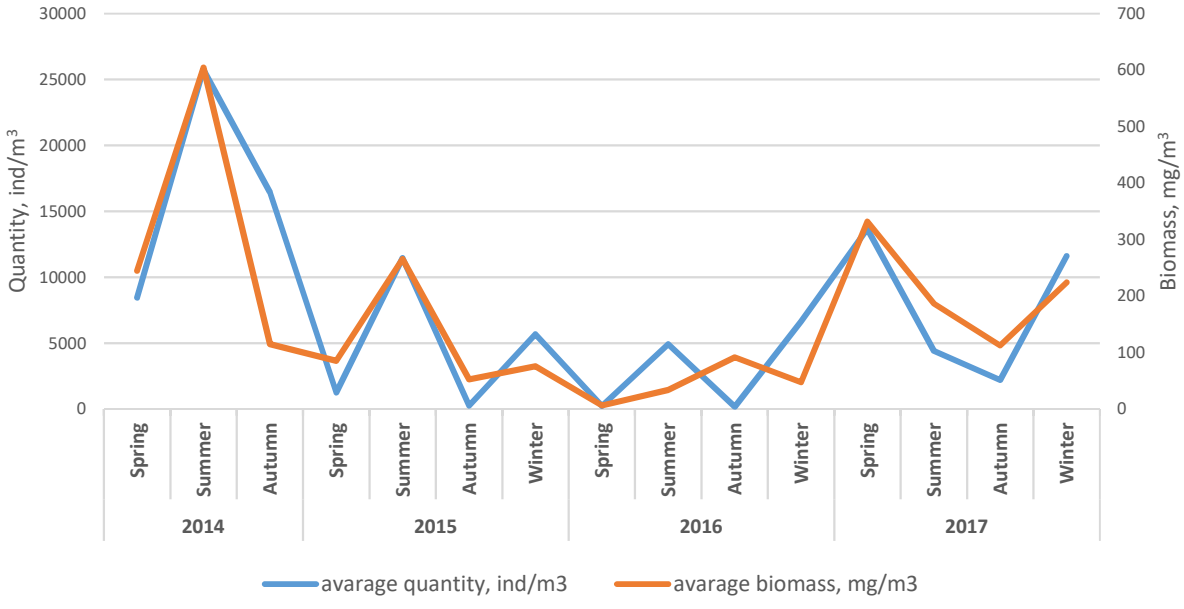
Figure 6.3.5: Percentage composition of Mesozooplankton species on the Black Sea coast of Georgia in 2014-2017



Source: NEA

In recent years, there has been a marked increase in the number of mesozooplankton species in coastal waters of the Georgian Black Sea. In 2014-2015, 25-28 species were recorded at the Black Sea coast of Georgia, and in 2017 more than 40 species were identified. The quantitative characteristics of mesozooplankton are highly variable and vary seasonally according to monitoring stations. The minimum annual average number and biomass was recorded in 2016 at 2 997 ind/m³ and 44.91 mg/m³ respectively, and the maximum (16 875 ind/m³ and 321.27 mg/m³) in 2014, respectively. The lowest mesozooplankton biomass is recorded in November-December, and the maximum - during spring-summer period (see Figure 6.3.6).

Figure 6.3.6: Seasonal dynamics of quantity and biomass of mesozooplankton in Georgian Black Sea coastal water in 2014-2017

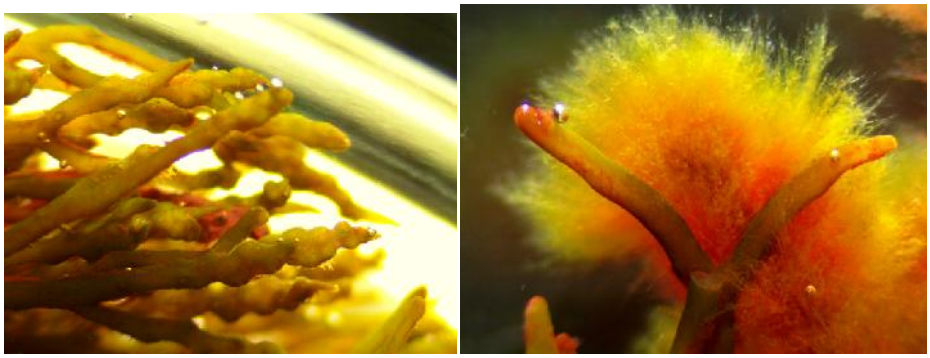


Source: NEA

Macrophotobenthos[67]: Black Sea Macrophytes are represented by three major taxonomic groups: Chlorophyta, Ochrophyta and Rhodophyta. Currently, 25 species of all three groups are identified at the Black Sea coast of Georgia. The most common of these are the aquatic plants of the group Chlorophyta (9 species). The most diverse group is Rhodopyta, with 13 species and Ochrophyta with 3 species.

The rocky shores of Sarpi and Green Cape are distinguished by the diversity of macrophytes, with a total of 16-16 species. There are observed 10 species at Tsikhisdziri and 9 species at Batumi port. It should be noted that the monitoring points differ not only in the number of species but also in the dominant species and their ecological status. Sarpi and Tsikhisdzir stations is dominated by the biocenosis of the perennial chestnut-coloured algae Cystoseira barbata, which is a sensitive bioindicator and its presence or absence indicates the ecological status of the given water area. Cystosira cannot adapt to eutrophicated waters saturated with biogenic elements. The biomass of Cystoseira barbata varies according to the seasons, with the minimum recorded in March at Sarpi and 0.73 kg / m^2 and the maximum in October (2.08 kg / m^2) (see Figure 6.6).

Figure 6.6: Macrophytic species of the genus Cystoseira - a) Cystoseira barbata; (B) Cystoseira barbata with the accompanying epiphytic algae Acrochaetium secundatum



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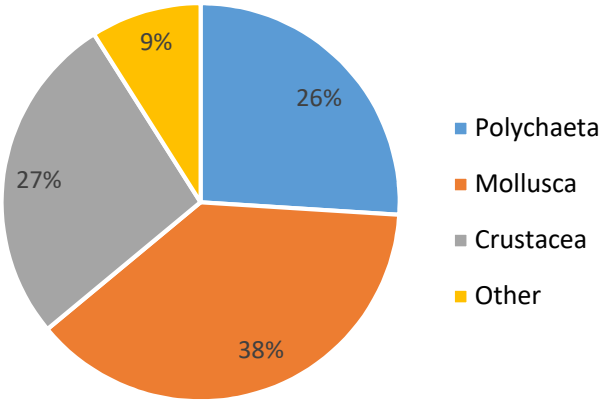
Source: NEA

Macrozoobenthos: The Black Sea coastal fauna of Georgia in 2014-2017 was represented by 77 species of three major groups (Polychaeta, Mollusca, Crustacea). Of these, the most numerous (38%) are molluscs, represented by gastropods (15 species) and bivalves (14 species). The dominant species of molluscs is Lentidium mediterraneum, which accounts for 58% of the total number of molluscs. The numbers of bristle worms (Polychaeta) and crustaceans are 19 and 20 respectively (see Figure 6.3.7).

[67] Benthic organisms, or "benthos," follow the mobile or immobile way of life on the seabed. Such a complex of organisms of plant origin - phytobenthos, and of animal origin is called zoobenthos.

Figure 6.3.7: Percentage composition of Macrozoobenthic Key Groups in the Black Sea Coast of Georgia, 2014-2017



Source: NEA

The natural rocky habitat fauna of the Black Sea coast of Georgia was represented by 43 species that are united in 8 types and 12 classes. Species are dominated by polychaeta and crustacea (13-13). Molluscs are represented by 10 species and different hydrobionts (Demospongiae, Turbellari, Nemertea, Nematoda, Oligochaeta, Larvae of Insects, Bryozoa) by 7 species. (Photo 6.7).

Photo 6.7: Rocky habitats of the Black Sea coast of Georgia: a) Sarpi; B) Green Cape; C) Tsikhisdziri

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Source: LEPL NEA; Photo: A. Curakin.

The Green Cape epifauna, with its 31 species, was dominant in comparison with other monitoring stations, followed by Sarpi - 28 species and lastly 17 species - Tsikhisdziri. The number of epifauna individuals at the research stations is on average 41 604 ind/m^2. The molluscs dominate by a population of 33 577 ind/m^2, which is 80.7% of the total epifauna individuals. The population of polychaeta is 5 636 ind/m^2 (13.5%), and the population of crustaceans is 2054 ind/m^2 (4.9%). Other species accounted for only 0.8% of the fauna (336 ind/m^2). The number of epifauna individuals is maximal in Tsikhisdziri (102 268 ind/m^2) and minimal in Sarpi 10 926 ind/m^2 rocky deposits.

It is noteworthy that the population of bivalve mollusc Chamelea gallina, which was widespread decades ago, significantly reduced due to negative impact of rapana. In 2014-2015, this species has an average of 103 ind/m^2. Based on the 2016 survey, there was already a decline in the number and in 2017 only 3 ind/m^2 of Chamelea gallina were recorded at Green Cape.

Another widespread mollusk species, Anadara inaequivalvis, retained almost the same population. The cause of this, based on scientists considerations, is the massiveness of the sink and the ability

to seal it hermetically, which allows the mollusk to get over hypoxia in case of oxygen deficit in the seabed water. However, the average Anadara population in 2017 at Green Cape was 42 ind/m^2, and only a few of them were recorded on the Batumi Port benthic habitats. As with other bivalves, there may be a negative impact of rapana.

In 2014-2017, seabed populations averaged 1187 ind/m^2, with a predominant mass of 62% for molluscs and 27% for polychaeta. The average perennial benthic population in 2014-2016 was 720 ind/m^2, and in 2017 it increased almost threefold and reached 2 597 ind/m^2, mainly at the expense of the Lentidium mediterraneum (1 099 ind/m^2) increase. This mollusc is particularly abundant an the Green Cape coast, accounting for 77% of the total zoobenthos population.

6.3.5 EMERALD NETWORK

The Emerald Network is an ecological network of areas of special conservation importance that aims to ensure the long-term survival of plant and animal species by protecting and preserving their habitat.

The Emerald Network provides protection for plant and animal species whose survival is essential for their habitats through special measures. The list of these species includes about 1,000 species common in Europe. Of these, 199 species are found in Georgia, including mammals - 21, birds - 125, reptiles - 7, amphibians - 1, fish - 8, invertebrates - 20, and plants - 17.

The development of the Emerald Network also serves to identify and protect natural habitats that are rarely present in Europe due to their modifications. About 200 different types of habitats have been identified, of which about 80 are also present in Georgia.

Tab 6.5: European Convention on the Conservation of Wildlife and Natural Habitats (Bern Convention)

All living organisms, plants, and animals need certain environmental conditions for nourishment and reproduction. The best conditions for the species to exist are in their natural habitats. Today, however, natural habitats are significantly altered due to urbanization, industrial development, pollution and climate change. Due to habitat degradation, the number of species inhabiting it is rapidly decreasing, and thus biodiversity. This is why effective measures are needed to preserve and restore natural habitats, which in turn are essential for the survival of plant and animal species. The European Convention on the Conservation of Wildlife and Natural Habitats (Bern Convention), which came into force in 1982, serves this purpose. Georgia joined the Bern Convention in 2008. To date, there are 51 countries to the Bern Convention, including 28 EU member states, 19 non-EU member states and 4 North African countries.

Under the Bern Convention, the establishment of the Emerald Network began by Council of Europe in 1989. By the end of 2017, the Emerald Network has 1 041 territories from the 5 parties to the Bern Convention, and 11 countries have nominated 2 079 territories. Their total area exceeds 700,000 km2 and is 12% of the territory of 16 countries.

In order to comply with the requirements of the Berne Convention in 1992, the Council of Europe adopted Directive 92/43 / EC on the Conservation of Natural Habitats and Wild Fauna and Flora in accordance with its requirements for the development of the Natura 2000 ecological network of the Emerald Network in EU Member States. The Directive has identified areas throughout Europe that are important for the conservation of habitats and species protected by the Bern Convention.

As of 2016, the Natura 2000 network covers over 27,000 territories with a total area of approximately 1 150,000 km2, which is about 18% of the EU Member State territory.[68]

[68] http://ec.europa.eu/environment/nature/natura2000/

Identification and evaluation of suitable areas for establishing the Emerald network in Georgia has been underway since 2009. In 2017, 3 territories - Lagodekhi, Vashlovani and Batsara-Babaneuri Protected Areas, namely Batsara State Reserve, were included in the Emerald Network. In 2018, the status of Emerald Territory was granted to more 36 sites and in 2019 another 7 sites were added to the list. Consequently, as of December, 2019, the Emerald Network of Georgia covers 1 030 491.5 ha. In addition, scientific researches are being carried out on the proposed 12 sites (255 481.1 ha) to determine their compliance with the criteria set by the Bern Convention.

32 of the Emerald sites of Georgia (563 274 ha, or 55%) fall within the Protected Areas of various categories. Emerald sites falling within existing Protected Areas shall be subject to a protection regime corresponding to the category of Protected Area. The management plan of the Protected Area should take into account the objectives of the Emerald Network and plan appropriate measures to maintain or achieve favorable conservation status of species and habitats spread throughout the area.

Table 6.2: Emerald Network sites in Georgia as of December 2019

Site name	Site area, ha	Number of species and habitats protected by the Bern Convention within the territory		
		Birds	Other species	Habitats
Lagodekhi	22 367.7	14	20	3
Arkhoti	79 786.0	20	17	4
Chachuna	5 431.0	50	16	4
Madatafa	1 398.0	29	5	3
Bughdasheni	215.6	18	7	2
Kolkheti	44 605.0	75	22	6
Vashlovani	38 166.0	41	17	3
Tusheti	114 375.4	14	17	9
Kazbegi	9 216.6	27	12	7
Borjom-kharagauli	82 958.0	18	28	11
Algeti	7 125.0	21	23	4
Kintrishi	13 437.4	15	21	4
Batsara	2 986.0	13	13	2
Mtirala	15 699.0	24	23	3
Khanchali	727.0	35	6	5
Ajameti	4 838.8	11	10	3
Gardabani	3 734.0	21	16	1
Mariamjvari	1 023.0	15	14	2
Amtkeli	8 078.5	0	9	3
Ilto	28 466.9	0	7	2
Bichvinta-miusera	23 794.5	0	9	4
Gumista	13 641.5	0	10	4
Liakhvi	6 555.8	0	7	3
Machakhela	6 103.0	0	14	3
Pskhu	25 702.7	0	12	4
Ritsa	38 079.2	0	12	4
Artsivis Valley	100.0	31	8	2
Dashbashi Canyon	669.0	28	18	2

Ktsia-tabackuri	22 101.0	0	21	6
Prometheus Cave	47.0	0	14	1
Gliana Cave	0.1	0	14	1
Samshvilde	475.0	18	18	4
Kvernaki	13.0	40	13	3
Saguramo	21 038.0	13	11	5
Chorokhi Delta	2 232.0	86	0	88
Borjom-kharagauli 2	18 465.0	18	28	12
Samegrelo 2	85 676.2	10	20	8
Racha-lechkhumi	43 162.1	9	21	5
Svaneti-racha	59 114.6	9	13	10
Racha 1	14 636.0	24	23	3
Svaneti 1	37 390.0	20	18	4
Samegrelo	38 838.38	11	20	5
Racha 2	26 649.0	24	24	3
Racha 3	11 544.0	24	26	7
Racha 4	14 305.0	24	25	9
Svaneti 2	45 225.0	20	18	5

Source: MEPA

Table 6.3: Potential areas for inclusion in Emerald Network

Site name	Area, ha
Alazani	11 611.53
Goderdzi	5 145.00
Gombori	66 571.35
Kvareli-Shilda	25 890.18
Surami 1	29 043.00
Surami 2	11 165.00
Surami 3	11 489.00
Surami 4	2 992.00
Surami 5	4 897.00
Kotsakhura	38 447.00
Kistauri	4 397.00
David-Gareja	0.26

Source: MEPA

After the country has identified areas that may be involved in the Emerald Network, scientific data on species and habitats within it are sent to the Secretariat of Bern Convention, where the quality of the data is assessed in detail. The decision to include an area in the Emerald Network is made if the area is to serve conservation of species and their habitats protected by the Bern Convention. In addition, each area should preferably meet the following criteria:

- The area contributes significantly to the protection of endemic and endangered species and / or species listed in Annex I and II of the Bern Convention;
- The area is located in a region particularly rich in biodiversity and represents a habitat for a significant number of species or one or more species of particularly rich populations;
- Is a typical habitat area of endangered habitat or covers a significant portion of such habitat;
- Includes a distinctive example of any habitat or mosaic of different habitats;

- Is an important site for one or more migratory species;
- Or in any other significant way contributes to the achievement of the objectives of the Bern Convention.

The development of the Emerald Network is one of the obligations under the Association Agreement between Georgia and the European Union, under which Georgia must complete the identification, evaluation and inclusion of relevant areas in the Emerald Network within 4 years of its entry into force. After the designation of area as a Emerald site, the area should be managed in accordance with the objectives of the Emerald Network, and the effectiveness of management measures should be evaluated on a regular basis.

The development of the Emerald Network is a new opportunity for biodiversity conservation as well as for integrating nature conservation issues in other sectors. Establishment of Emerald sites will facilitate continuous and long-term access to ecosystem services such as clean drinking water, prevention of soil degradation, mitigation of natural disasters, preservation and development of tourism and recreational potential.

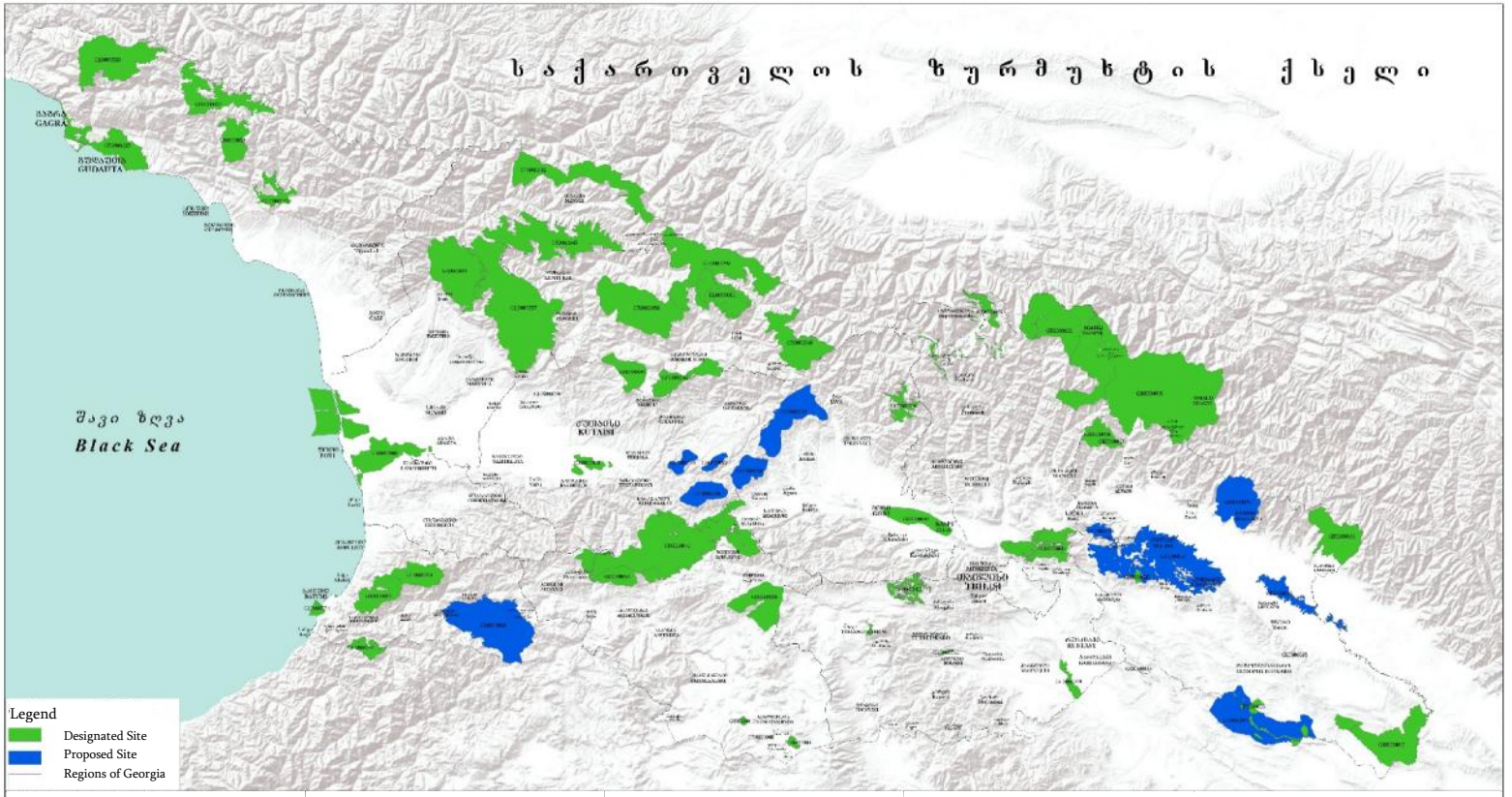
The purpose of Emerald sites management is to maintain and restore "favorable conservation status" of species and habitats within it. "Favorable conservation status" implies that the habitat is sufficiently large and in such a state, and that the number of species is as high as possible for their long-term existence, given current and potential threats.

Strict protection of the emerald areas is not necessary. Moreover, no specific activities have been identified that would be prohibited in the Emerald sites. However, there are obviously some restrictions on the Emerald sites. Activities that may adversely affect the "favorable conservation status" of the species or habitats for which the area is included in the Emerald Network shall not be permitted. Within the Emerald site, natural resources or other agricultural activities may be used if they do not affect protected species and habitats. The State shall ensure the protection of the Emerald sites and prevent the development of projects directly or within its vicinity that would adversely affect protected species or habitats.

During the 6 years after the designation of the Emerald site, a management plan of the site should be developed and approved.

The country is required to monitor species and habitats protected by the Bern Convention both within and outside the Emerald Network. In 2018, monitoring of 8 types of habitats, 5 species of plants (*Drepanocladus vernicosu, Marsilea quadrifolia, Paeonia tenuifolia, Ligularia sibirica, Agrimonia pilosa*), 4 species of animals (wolf, bear, otter, western barbastelle), 12 species of birds (corncrake, horned owl, black stork, common (gray) crane, etc.) and 4 species of invertebrates started in Georgia. Based on the results of monitoring the report will be prepared in 2019.

Map 6.4: Emerald Network of Georgia, December, 2019



GE0000001	Lagodekhi	GE0000013	Algeti	GE0000025	Bichvinta-miusera	GE0000037	David-Gareja	GE0000050	Surami 3
GE0000002	Arkhoti	GE0000014	Kintrishi	GE0000026	Goderdzi	GE0000038	Ktsia-tabackuri	GE0000051	Kotsakhura
GE0000003	Chachuna	GE0000015	Batsara	GE0000027	Gombori	GE0000039	Prometheus Cave	GE0000052	Surami 4
GE0000004	Madatafa	GE0000016	Mtirala	GE0000028	Gumista	GE0000040	Racha 2	GE0000053	Surami 5
GE0000005	Bughdasheni	GE0000017	Khanchali	GE0000029	Kvareli-shilda	GE0000041	Racha 3	GE0000054	Chorokhi Delta
GE0000006	Kolkheti	GE0000018	Ajameti	GE0000030	Liakhvi	GE0000042	Racha 4	GE0000055	Kistauri
GE0000007	Vashlovani	GE0000019	Gardabani	GE0000031	Machakhela	GE0000043	Gliana Cave	GE0000056	Borjom-kharagauli 2
GE0000008	Tusheti	GE0000020	Mariamjvari	GE0000032	Pskhu	GE0000044	Samshvilde	GE0000057	Samegrelo 2
GE0000009	Kazbegi	GE0000021	Samegrelo	GE0000033	Ritsa	GE0000045	Svaneti 2	GE0000058	Racha-lechkhumi
GE0000010	Borjom-kharagauli	GE0000022	Alazani	GE0000034	Surami 1	GE0000046	Kvernaki	GE0000059	Svaneti-racha
GE0000011	Racha 1	GE0000023	Amtkeli	GE0000035	Artsivis Valley	GE0000047	Saguramo		
GE0000012	Svaneti 1	GE0000024	Ilto	GE0000036	Dashbashi Canyon	GE0000049	Surami 2		

Source: MEPA

6.3.6 PROTECTED AREAS

Development of a network of protected areas is of particular importance for the conservation of Georgia's unique biodiversity, the conservation of endangered species of flora and fauna. Protected areas provide diverse ecosystem services and contribute significantly to the country's sustainable development.

A modern network of protected areas has been established in Georgia since the 90s of the last century, which today comprises 14 nature reserves, 12 national parks, 20 nature reserves, 40 nature monuments and 1 protected landscape. The total area of these protected areas is 666 107 ha.

Pshav-Khevsureti National Park (75 842.72 ha), Asa Managed Reserve (3 943.4 ha), Roshki Natural Monument (122.4 ha) were established in Georgia in 2014, Birtvisi Natural Monument (514.8 ha) was established in 2016, Kazbegi National Park was expanded in 2018 (78 204 ha), and in 2019 the Pontine Oak Managed Reserve (443 ha) and Kintrishi National Park (10 406 ha)were established.

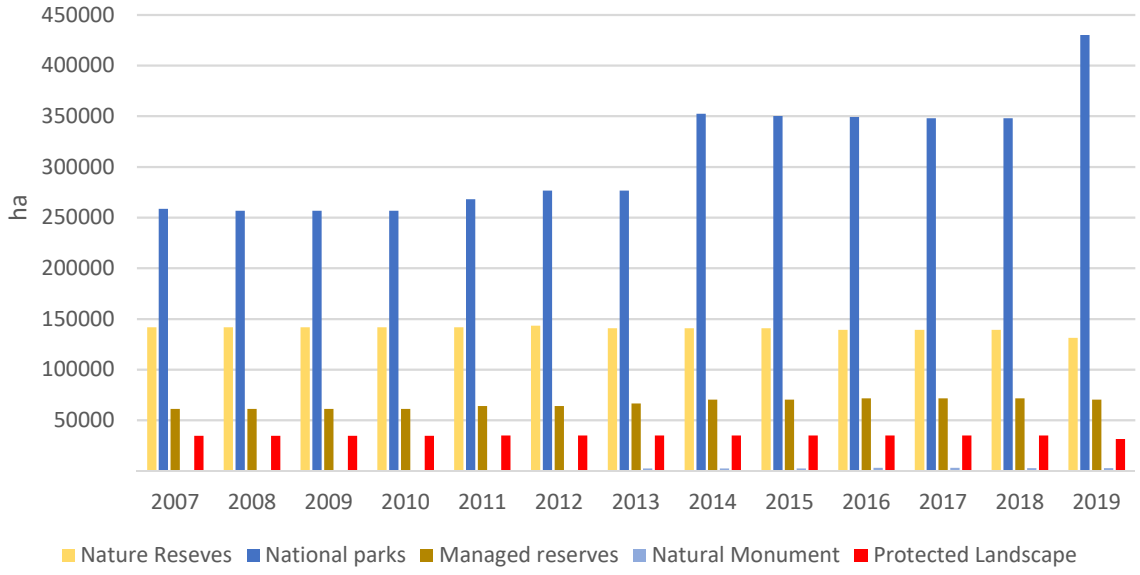
Table 6.4. Protected Areas of Georgia as of 2019

Protected Area	IUCN category	Quantity	Area (ha)
Nature Reserve	I	14	131 300.7
National Park	II	12	430 202.429
Natural Monument	III	40	2 748.99
Managed Reserve	IV	20	70 336.45
Protected landscape	V	1	31 518
all		87	666 107

Source: APA

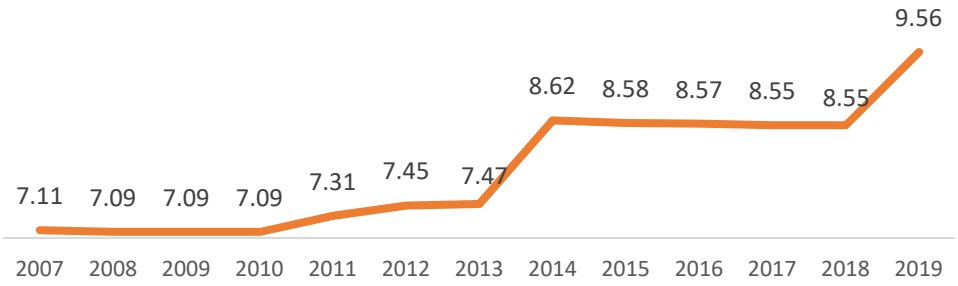
The protected areas of Georgia are different from each other in terms of management goals and approaches, area of the territory, landscapes and habitats within them. In 2007-2019, Georgia mainly developed national parks (II category of IUCN), whose area increased by 34% during this period. The number and area of natural monuments have also increased significantly (almost 9 times). 561 503.13 ha (84% of the total area of protected areas) is the area of nature reserves and national parks whose main purpose is the protection and preservation of nature and natural processes. The share of reserves and protected landscapes is relatively small.

Figure 6.3.8: Development of Protected Areas in 2007-2019 (ha)



Source: APA

Figure 6.3.5. Change in the share of protected areas in the country (%)



Source: APA

The Georgian National Biodiversity Strategy and Action Plan (2014-2020) pays particular attention to the further development of the Protected Areas network. By 2020, at least 12% of the country's land area and 2.5% of the Black Sea area is planned to be included in protected area networks, enhancing the effectiveness of protected area management, initiating the creation of ecological corridors linking them and integrating protected areas into broad land and marine landscapes.

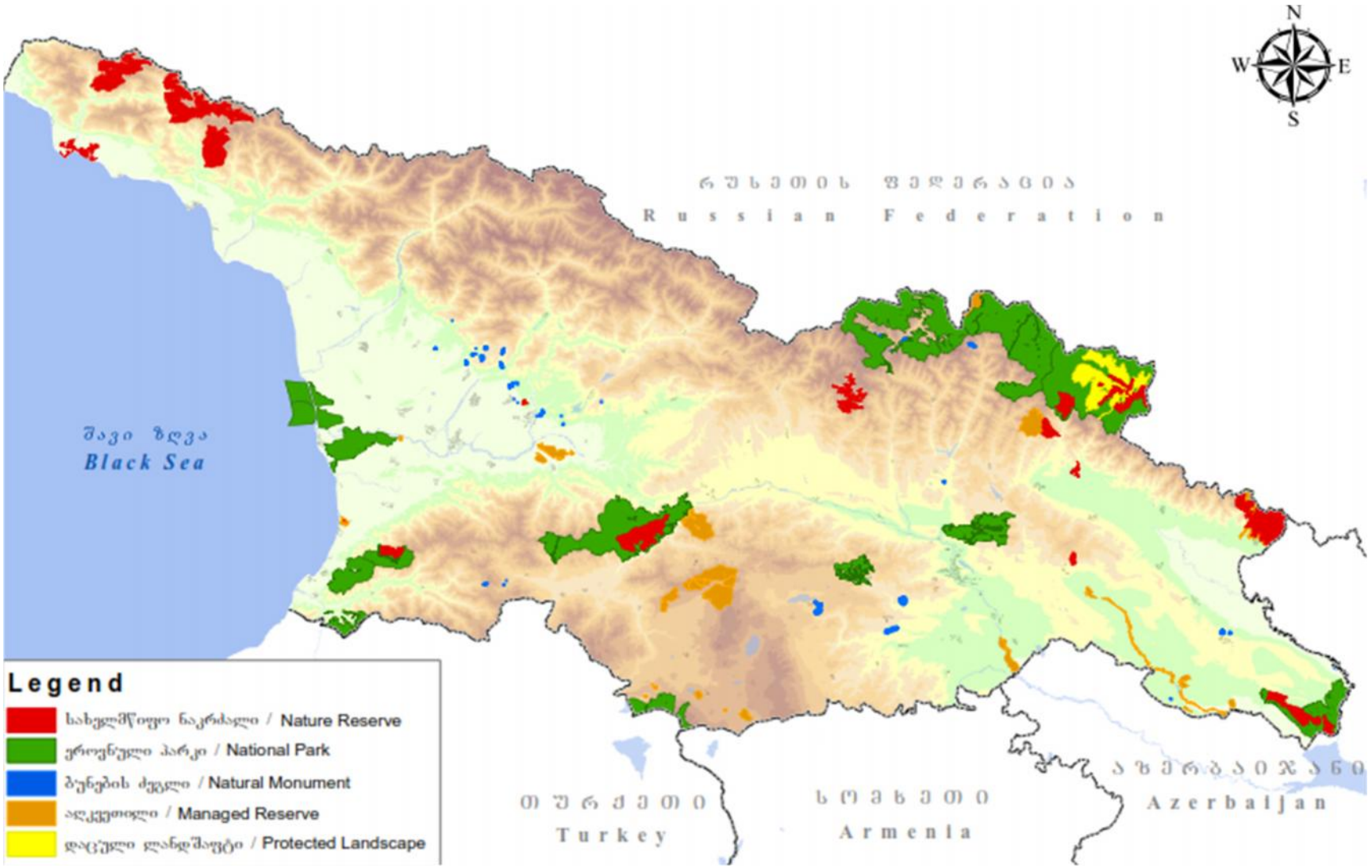
Presently, 9.33% of the country's land area is covered by protected areas, while only 15 276 ha of the Black Sea area is included in the Kolkheti National Park. Appropriate research and procedures have already been initiated for the establishment of new terrestrial protected areas and the expansion of existing ones to ensure the conservation and preservation of biodiversity, unique and rare ecosystems. However, the development of marine protected areas is needed to achieve the national objective of 2020.

Table 6.6: Planned Protected Areas

Planned Protected Areas	**Estimated area, ha**
Racha National Park	78 266,8
Erusheti National Park	11 680.5
Truso Gorge Protected Landscape	7 007
Aragvi Protected Landscape	99 802
Protected Landscape of Machakhela Gorge	4 295.5
Rioni Reserve	598
Extension of Kolkheti National Park	220.1 ha of land area and 556 ha of marine area
Svaneti Planned Protected Area	108 823.9
Samegrelo Planned Protected Area	39 112.9
Javakheti Planned Expansion	5 151

Source: APA

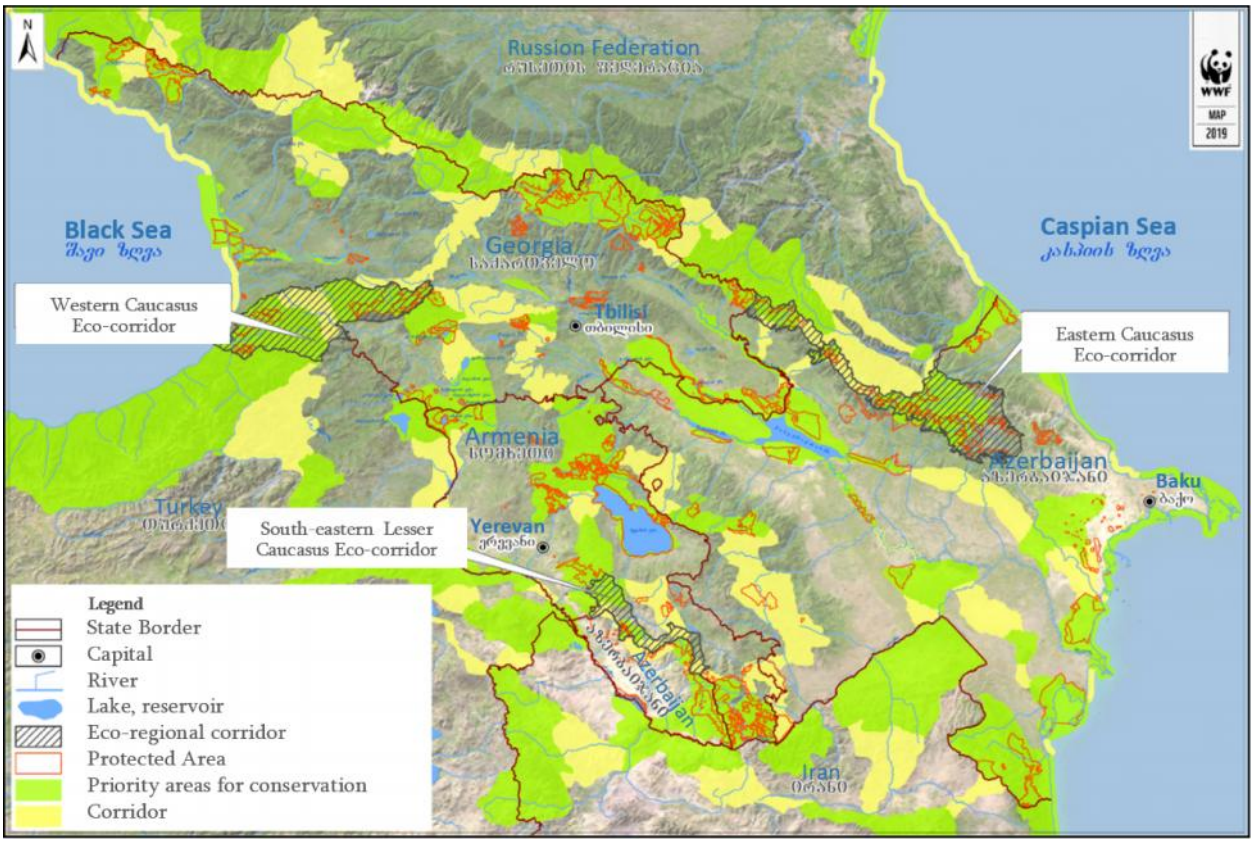
Map 6.5: Protected Areas of Georgia, 2019



Source: APA

In order to achieve the goals of designing protected areas, it is important that they be managed effectively, in accordance with management plans developed using a collaborative process based on scientific information. The management plan identifies key conservation objectives and threats for each area, as well as measures to be taken to protect and restore specific species populations, sustainable use of natural resources and the involvement of local populations in ensuring the functioning of the protected area. Develop positive attitudes towards the protected areas and increase responsibility. The management plans of the following Protected Areas were approved in 2014-2019: Borjomi-Kharagauli, Tusheti, Lagodekhi, Vashlovani, Javakheti, Imereti Caves, Kobuleti Protected Areas, Mtirala, Tbilisi, Machakhela National Parks, and Ajameti Managed Nature Reserve. The Management plans of Kolkheti, Algeti, Kazbegi, Pshav-Khevsureti and Kintrishi Protected Areas are also being developed. The rest of the Protected Areas are governed by a temporary regulation. The scarcity of scientific research and biodiversity monitoring programs, as well as the lack of databases and limited capacity of administrations, are important barriers to adaptive management of protected areas. The development of a monitoring system for protected areas is supported by an ecoregional conservation program with the assistance of the German Government and the German Development Bank (KfW). The Caucasus Nature Fund (CNF) is also contributing to the establishment of a biodiversity monitoring system in protected areas.

Map 6.6: Priority areas for conservation and eco-corridors in the Caucasus ecoregion

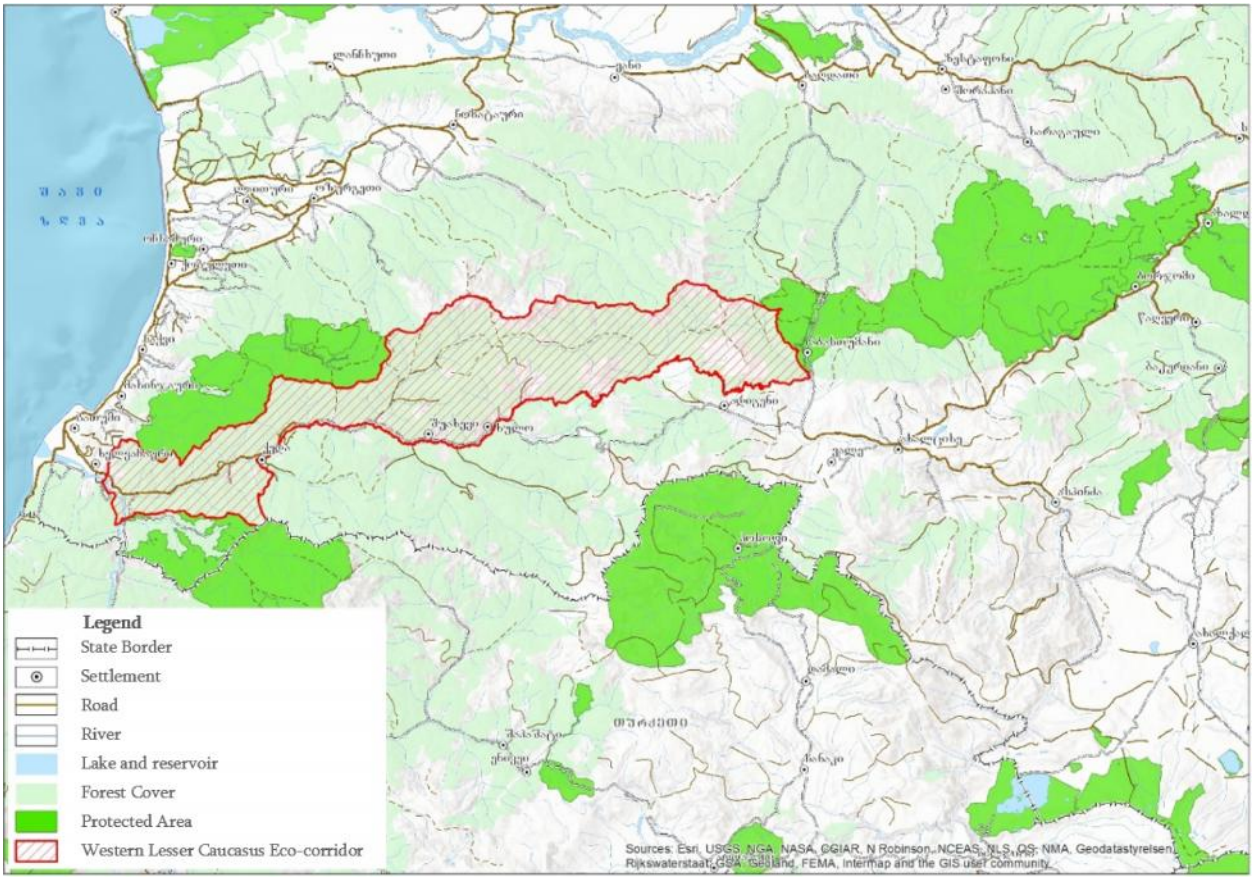


Source: Ecoregional Conservation Plan for the Caucasus[69], 2012, WWF Caucasus programme office

[69] Visit. http://wwf.panda.org/?205437/ecoregion-conservation-plan-for-the-caucasus-revised

It is also important to develop a unified network of protected areas, that is, a system of interconnected and integrated environments. Currently Protected Areas are isolated from each other. Creating corridors between them is important for the migration of large-scale animal populations, as well as for reducing species vulnerability to climate change and environmental modification. Priority areas and corridors for biodiversity conservation have been identified throughout the Caucasus ecoregion over the years. And in 2015, within the framework of the Eco-Corridors Fund for the Caucasus program[70], formation of Eco-Corridor was started in the western part of the Lesser Caucasus. This area connects Borjomi-Kharagauli National Park with Protected Areas of Adjara. The main objective of the program is to introduce sustainable land and forest use practices within the environmental corridors, to conserve biodiversity at the landscape level, and to promote sustainable social and economic development in the region. The program envisages active involvement of local people in the preservation and development of the existing landscape, conservation of species populations and protection of their habitats. At this stage, there are about ten conservation agreements (up to 10 years) in the municipality of Adigeni.

Map 6.7: Pilot Ecocorridor in Georgia



Source: Caucasus Ecosystems Foundation, https://www.ecfcaucasus.org/georgia

[70] The program has been implemented by WWF Caucasus Program Office since 2015, with financial support from BMZ and KFW and co-funded by WWF Germany. For more information, please visit:https://www.ecfcaucasus.org/

Biosphere reserves of the United Nations Educational, Scientific and Cultural Organization (UNESCO) are also promising tools for the implementation of a common practice of conservation and sustainable land use. The Global Network of Biosphere Reserves has been developing under the UNESCO Man and Biosphere Programme (MAB) since 1971 and currently covers 702 reserves in 124 countries. As a result of the Assessment of Biosphere Reserve Development Opportunities in Georgia, implemented with the support of the Mikhail Zhukov Foundation, the Kakheti region has been given the highest priority and is ready for the development of the biosphere reserve. The Vashlovani and Tusheti Protected Areas and their surrounding landscapes, which share traditional nomadic livestock, are considered a priority for further research. The establishment of the biosphere reserve will ensure the sustainable development of the wider landscape connecting protected areas and, at the same time, bring greater recognition and international and national recognition to the region.

Tab 6.6: European diploma in protected areas

In 2015 Vashlovani National Park was awarded the prestigious International Award - European Diploma for Protected Areas. The European Diploma is granted for 5 year period to properly protected and exemplary managed natural areas important for the conservation of Europe's biological, geological and landscape diversity. The European Diploma was first granted to the three protected areas in Belgium, France and the United Kingdom in 1965. Currently, 74 protected areas hold European Diploma in 29 European countries. The European Diploma for Protected Areas is an important impetus for the effective protection of an area of European importance. The European Diploma for Vashlovani National Park expires in 2019 and measures are being taken for its prolongation.

Tab 6.7: Kolkheti forests and wetlands

Kolkheti forests and wetlands are the most important refuge for plant relict species in Western Eurasia, or Refugium. There are still thermophile and moisture lover species that were widespread until the Ice Age. Kolkheti ecosystems are also distinguished by the abundance of endemic species. Kolkheti forests represent high humid forest ecosystems of the temperate climate zone that are extremely rare in the world. The Kolkheti wetlands host tens of thousands of migratory birds each year, some of which live in the wetlands. In addition to waterfowl, there are more than a million birds of prey in Batumi and surrounding areas in the fall and spring.

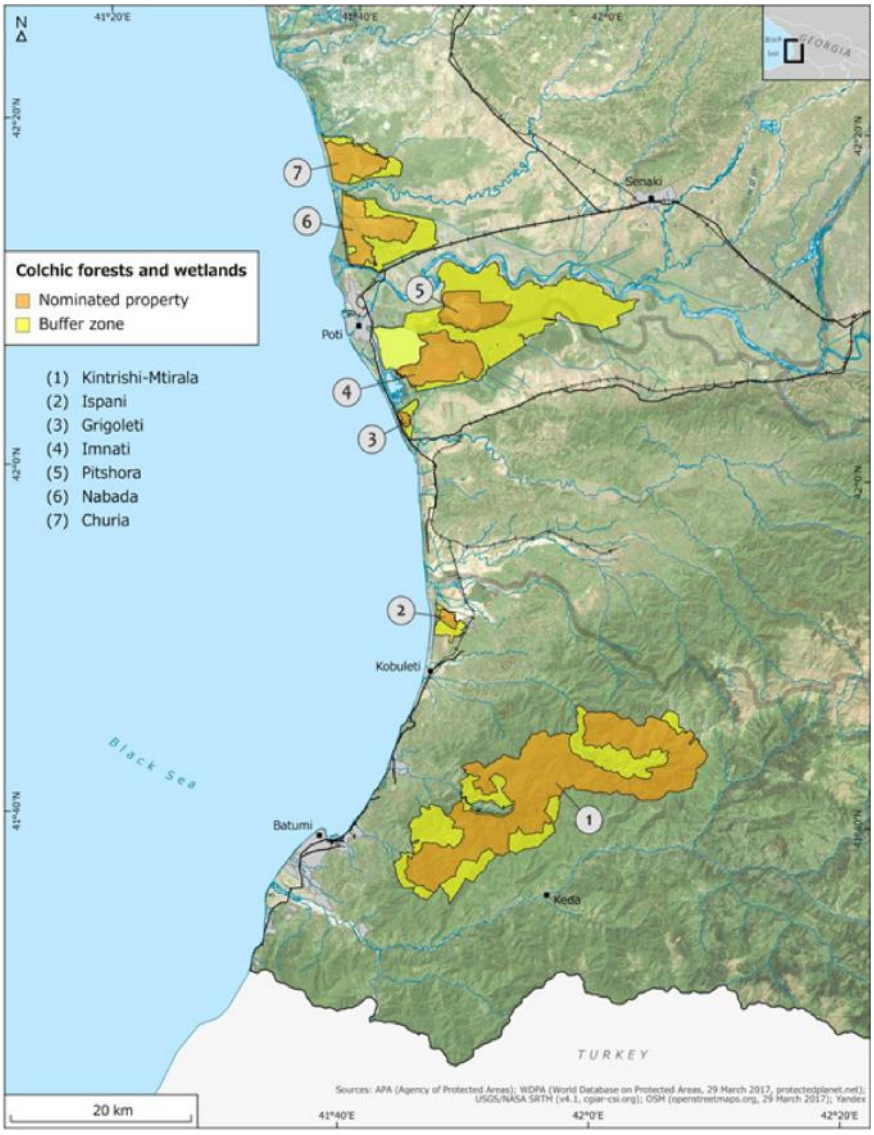
Due to these characteristics, unique Kolkheti wetland ecosystems (peatbogs of Ispani, Imnat, Nabada and Churia, Paliastomi Lake and Colchic forests), which are protected in the Kolkheti National Park, Kobuleti Nature Reserve and Managed Reserve, have been recognized as a wetland of international importance in 1997 under the Convention on Wetlands of International Importance especially as Waterfowl Habitat (Ramsar Convention).

In 2007, Colchis forests and wetlands were included in the preliminary list of UNESCO World Heritage Sites as distinct ecosystems of universal value. Based on the subsequent studies, carried out with the support of the German Government, the Mikhail Zhukov Foundation and the World Wildlife Fund, Mtirala, Kolkheti, Kintrishi and Kobuleti Protected Areas were submitted to UNESCO for nomination. The records of these Protected Areas were also submitted to UNESCO and the issue of nomination is being discussed. In addition, the biodiversity and existing state of the nominated areas was studied and assessed in 2019.

Nomination of protected areas as a World Natural Heritage Site is an important event for the country. Inclusion of the area in UNESCO World Heritage Site List is a recognition of the uniqueness of these ecosystems internationally, contributing to the country's popularity and consequently attracting a new stream of tourists.

At present three monuments from Georgia are listed in the UNESCO World Heritage List: Historical Monuments of Mtskheta, Gelati Monastery and Zemo Svaneti.

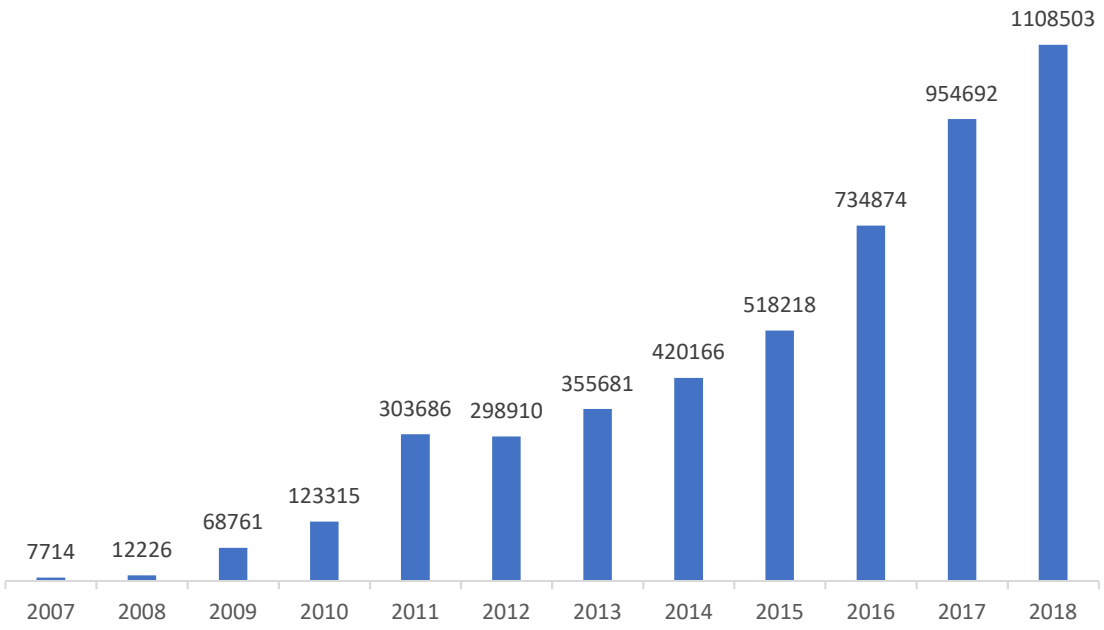
Map 6.8: Territories nominated for UNESCO World Heritage Site



Source: World Wildlife Fund (WWF)

Protected areas contribute significantly to the development of ecotourism, which in turn has a positive impact on the socio-economic status of the surrounding communities. In 2018, the number of visitors to Georgia's protected areas exceeded one million. This, in turn, is a new challenge that requires strategic planning of protected areas in view of their ecological capacity, as well as the development and improvement of relevant infrastructure and services.

Figure 6.3.6. Number of Visitors to Protected Areas by Years



Source: APA

In 2017, 57% of visitors were Georgian (52% in 2018) and 43% foreign (48% in 2018). Tourists were particularly interested in Prometheus and Sataplia Caves, Martvili and Okatse Canyons, Kazbegi and Borjomi-Kharagauli National Parks in 2017.

The development of the Protected Areas system is supported by substantial financial support from the German Government and the German Development Bank (KfW). In order to long-term preserve the unique biodiversity of the Caucasus ecoregion and ensure the sustainability of the investments financial cooperation continues in the following main areas: support for a single Protected Area, sustainable financing of Protected Areas, sustainable management and modernization of ecocorridors in line with international standards. The Caucasus Nature Fund (CNF), set up in 2008, provides co-financing of current expenditures, and implementation of monitoring and ecotourism programs in Vashlovani, Tusheti, Mtirala, Lagodekhi, Borjomi-Kharaguli, Javakheti, Kazbegi, Pshav-Khevsureti, Kintrishi and Algeti Protected Areas. The Transboundary Joint Secretariat in South Caucasus (TJS) assists management authorities of Protected Areas in improving regional cooperation. With the support of TJS, the reintroduction program of goitered gazelle is implemented. TJS supports the implementation of tourism and monitoring programs in various Protected Areas. The Support Programme for Protected Areas in the Caucasus assists Georgia in establishing the Pshav-Khevsureti National Park, expanding and developing the Kazbegi, Algeti and Kintrishi Protected Areas.

6.4 MAIN CHALLENGES

The key challenge for Georgia's biodiversity conservation is the increased pressure on natural habitats by energy and infrastructure projects, minerals extraction and agricultural development. The incorporation of biodiversity values into spatial and sectoral development plans and projects at an early stage of their development is essential for the preservation of natural habitats, species and ecosystem services. Strategic Environmental Assessment and Environmental Impact Assessment of planned activities are key tools for integrating biodiversity issues. Another new tool – Impact assessment on Emeral Sites - is planned under the draft Law on Biodiversity. The relevant assessment has been in place for many years to ensure the conservation of biodiversity in Europe. Effective implementation of these tools requires significant capacity building of stakeholders (government agencies, investors, the scientific sector), accumulation of relevant knowledge and experience, as well as development and implementation of appropriate mechanisms to ensure enforcement.

It is important to speed up the process of harmonization of national legislation with EU directives in the field of nature protection and biological resources utilization, which provides legal basis for the development of the Emerald Network at national level, for the proper protection of species and habitats of European importance, and for the achievement of sustainable use of biological resources.

Significant projects have been undertaken in recent years to support the development of biodiversity monitoring and reporting system of biological resources utilization (logging, fishing in the Black Sea, including illegal use). However, significant efforts are still needed to ensure regular collection, systematization and availability of data on various components of biodiversity.

Many important areas of biodiversity protection have not yet been secured, including in the central Caucasus (Svaneti, Racha, Lechkhumi). Protected areas do not form a network of interconnected and integrated landscapes, which are essential for their effective functioning.

The adoption of appropriate legal basis and mobilization of relevant technical and financial resources are needed for ensuring proper management of Emerald Sites on the one hand by the elaboration and implementation of management plan, and for establishment monitoring and reporting system for species protected in Emerald Sites and by Bern Convention on the other hand that will be in line with the EU requirements.

In the field of biodiversity, Georgia is a party to all multilateral agreements, except for the Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization. Ratification of this agreement is especially important for our country, as there are many endemic species in Georgia, native varieties / landraces of cultural plants and their related wild species.

CHAPTER III. OTHER ENVIRONMENTAL ISSUES AND RISKS

III/7 CLIMATE CHANGE

Global climate change represents the rise in average global temperature. Studies confirm that the Earth's climate has changed, with a 95% probability that this is due to an increase in greenhouse gas (GHG) concentrations in the lower layers of the atmosphere, which is largely attributable to intense consumption of fossil fuels.

The Global Economic Forum's 14th Global Risk Report, together with cyber security and terrorism, addresses the major challenge of the modern world. In the last two decades, the number of disasters caused by climate change has increased significantly, which is considered one of the hindrances to economic development.

Georgia, as a State Party to the United Nations Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Paris Agreement, is obliged to respect the principles set out in the above-mentioned international agreements and to implement its Nationally Detemined Contribution (NDC) obligations.

7.1 MAIN QUESTIONS AND MESSAGES

1. ***What are the trends of GHG emissions in recent years in Georgia?***
   - Georgia's total GHG emissions in 2015 amounted to about 17,589,000 tonnes of CO_2 eq., 62% of which were from the energy sector, and 38% for non-energy related GHG emissions, comprising 18% of the agricultural sector, 12% of industry sector and the waste sector - 8%. The average annual increase in GHG emissions for the period of 2010-2015 is 6.3%.

2. ***What is the impact of climate change in Georgia?***
   - As a result of climate change in Georgia, the average annual temperature during the period of 1961-2010 has been increasing. During this period the average annual temperature increased by 0.4-0.5^{0}C. The highest trend of increase in temperature was observed in Dedoplistskaro (0.7^{0}C) and Poti (0.6^{0}C);
   - In the period of 1961-2010, the annual precipitation in western Georgia increased by 5%, while in eastern Georgia it decreased by 0.1%. The highest - 14% increase was observed in the lowlands of Svaneti and the Adjara highlands, with the highest decrease in the central part of the Likhi Range - 8% and in Meskheti 6%.
3. ***What obligations has Georgia assumed under the Paris Agreement and what is the significance of the Paris Agreement for our country?***
   - By joining the Paris Agreement, Georgia has undertaken to limit emissions on its territory by an unconditional 15% compared to the baseline level (traditional business development scenario), and to increase its commitment of the limitation to 25% in case of international support;
   - To reduce the climate change related risks, Georgia should maintain and strengthen the access to the resources of international foundations and various partner organizations, as well as the new Market Mechanism under the convention allow Georgia to introduce a progressive, future technologies, which reduce GHG emissions and adaptation potential, together with the sector to spur economic development in a sustainable, environmentally friendly products, green job creation and poverty reduction.

7.2 CAUSES AND CONSEQUENCES OF CLIMATE CHANGE

Permanent emissions of GHG cause profound changes in the components of the Earth's climate system, which are likely to have a serious, large-scale and irreversible impact on humans and ecosystems.

The cumulative effect of carbon dioxide emissions in the lower layers of the atmosphere appears to be the main risk factor for climate change deepening since the second half of the 21st century. Forecast scenarios for GHG concentrations vary widely, depending on the direction of socio-economic and climate change policy implementation.

Despite various scenarios for GHG emissions, the average temperature in the lower layer of the troposphere will rise in the 21st century, increasing the likelihood that heat waves will occur more frequently and increase the duration of the event. It is also expected to increase the uneven distribution of precipitation, which will result in a large amount of rainfall that is not typical for a particular area. However, there is an increase in the frequency and intensity of excess rainfall. Sea level rise, ocean warming and acidity will most likely continue. The risks associated with climate change are unevenly distributed worldwide, but the likelihood of countries' sustainable development taking into account these risks is equally high worldwide.

An analysis of the effects of global climate change in Georgia shows that forest ecosystems, mountainous and mountainous regions are particularly vulnerable to climate change. It is also important to assess the impact of climate change on agriculture, health and other sectors.

The increase in average temperature and precipitation in western Georgia has had some impact on the forest ecosystem over the past 50 years. For example, there are favorable conditions for the spread of endothelial cancers in the relatively low zone of Adjara. Increased numbers of hot days and tropical nights in the region are likely to promote favorable conditions for further activation of pests in Adjara forests.

Amid the heat waves and especially hot days in eastern Georgia, the intensity of forest fires and the spread of pests have increased. Between 1960 and 2010, summer temperatures in the Borjomi-Bakuriani region increased by about 1^0C, with precipitation falling by 14%. Also, droughts and hot days have increased in almost all time scales.

Given the diversity of climate zones and landscapes in Georgia, the impact of climate change on the agricultural sector varies by region. E.g. As a result of the increase of wet days in Adjara region, erosion and fertile soil washing processes are intensified. Increasing the number and intensity of drought days in the Kakheti region increased the risk of crop failure. Also, the damage caused to farmers has increased due to the frequent hail.

The increase in the duration and intensity of heat waves caused by climate change in the healthcare sector has increased the incidence of cardiovascular disease in various regions of Georgia.

Global climate change mitigation requires intensive and sustained measures to reduce GHG emissions and enhance adaptation capabilities to minimize climate change risks.

Adaptation and mitigation of GHG emissions (mitigation, softening) are considered as interconnected measures in managing climate change risks. Consistent reductions in GHG emissions during the 21st century may slow down the process of climate change. Effective adaptation measures will reduce the damage caused by extreme weather and reduce long-term costs of reducing GHG emissions.

The Intergovernmental Panel on Climate Change's 2014 report states that existing mitigation and adaptation efforts worldwide are not sufficient to slow down the climate change process. Without additional effort, the risks and impacts of climate change risks will increase significantly. Climate

change measures, despite their multifaceted positive impacts, do not reduce the risks that enhanced climate change can bring, given the magnitude of natural disasters and catastrophes.[71].

Although adaptation measures can reduce the risks of natural disasters caused by climate change, however, in the event of a profound and irreversible climate change, there is a high likelihood that the immediate costs of adaptation measures will be extremely high. Consequently, timely and incremental vulnerability mitigation measures increase the likelihood that costs will not be catastrophically high if extreme and urgent adaptation is required.

Despite many alternatives to GHG emission reduction scenarios, the overall trend is a consistent and sustained reduction in emissions over the next few decades, and by the end of the century global GHG emissions should be close to zero. The realization of such a recommendation in a scientific report is linked to technological, economic, social and institutional challenges that hinder the implementation of GHG mitigation measures. To date, the most effective yet integrated climate change management policy is climate change[72].

Effective adaptation and identification efforts require investment in innovative green technologies and infrastructure, sustainable and environmentally sound lifestyles, and more.

Thus, climate change is a threat to the sustainable development of countries. Consequently, by integrating mitigation and adaptation measures into economic development programs and strategies, climate change risks can be mitigated, whereby the harm and damage would be significantly higher.

7.3 INTERNATIONAL ACTIVITIES / ACTIONS AGAINST CLIMATE CHANGE

within the framework of UNFCCC, on December 12, 2015, in Paris, 196 countries have adopted the Paris Agreement, the main aim of which is to strengthen global efforts against the threats of climate change, with a view to sustainable development and poverty reduction. This international treaty calls on the signatory countries to set ambitious goals to reduce GHG emissions.

However, according to the 20st Conference of the Parties (COP20) decision 1/CP.20 of the paragraph 13, Parties to the Convention were required to submit a document of Intended Nationally Determined Contribution (INDC) to the Convention Secretariat before COP21. Accordingly, Georgia submitted its INDC document on September 25, 2015, stating that the country has committed itself to unconditionally reduce GHG emissions by 15% by 2030 compared to traditional business development scenarios, and if supported internationally, the commitment of reduction may be increased by an additional 10%. On June 7, 2017 Georgia officially joined the Paris Agreement.

Given the complexity of the climate change issue and the difficulty of achieving the goals of the Paris Agreement, in 2016 the 22nd Conference of the Parties to the Framework Convention on Climate Change established the Coalition of Countries and Organizations, NDC Partnership, to

[71] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp. (page 17)https://www.ipcc.ch/report/ar5/syr/

[72] Nakicenovic, N.et.al.Special Report on Emissions Scenarios. IPCC, Cambridge, 2000.

assist developing countries in seeking international support for their implementation of the Paris Agreement and respective obligations provided.

The Coalition provides technical support to member developing countries, depending on their needs. Georgia became a member of NDC Partnership in 2017 and is working with the Coalition to discuss INDC implementation with partners.

In addition, since 2017, Georgia has begun working with the Green Climate Fund (GCF) to develop a Country Program Document in the framework of the Readiness Program in order to identify and attract funding for climate change partnerships.

In 2017, Georgia joined the Environmental Integity Group (EIG), which aims to promote the principles and values set out in the Paris Agreement in subsequent decisions. By joining the negotiating team at the Conference of the Parties to the Framework Convention on Climate Change, Georgia is even more actively involved in decision-making.

The contribution of local authorities to the implementation of climate change policies by the central authorities of countries is also seen as an important measure. There are several initiatives around the world that unite municipalities and cities to reduce GHG emissions and increase adaptation at the local level.These include the EU Initiative - Covenant of Mayors, which was created in 2008 and added an adaptation component in 2016. As of 2017, there were 16 municipalities that signed the Covenant of Mayors in Georgia. Four of them have joined the new initiative of the Covenant of Mayors at the end of the reporting period - the Covenant of Mayors for Climate and Energy, which also includes an adaptation component. The process continues and more and more municipalities in Georgia are committed to reducing GHG emissions under the Covenant of Mayors.

Other municipalities in Georgia can also join the EU's new initiative and promote climate-friendly development at the local level, by identifying mitigating needs for municipalities and adopting clean technologies.

7.4 THE REFLECTION OF CLIMATE CHANGE IN GEORGIA

Several important studies were conducted to assess the impact of climate change in Georgia in 2014-2017. Notable among these are Georgia's Third National Communication and the National Climate Change Adaptation Plan for the Agriculture Sector. The results of the above studies indicate that climate change has many manifestations in Georgia and their study is associated with high costs due to the complexity of the impact assessment and the scarcity of data.

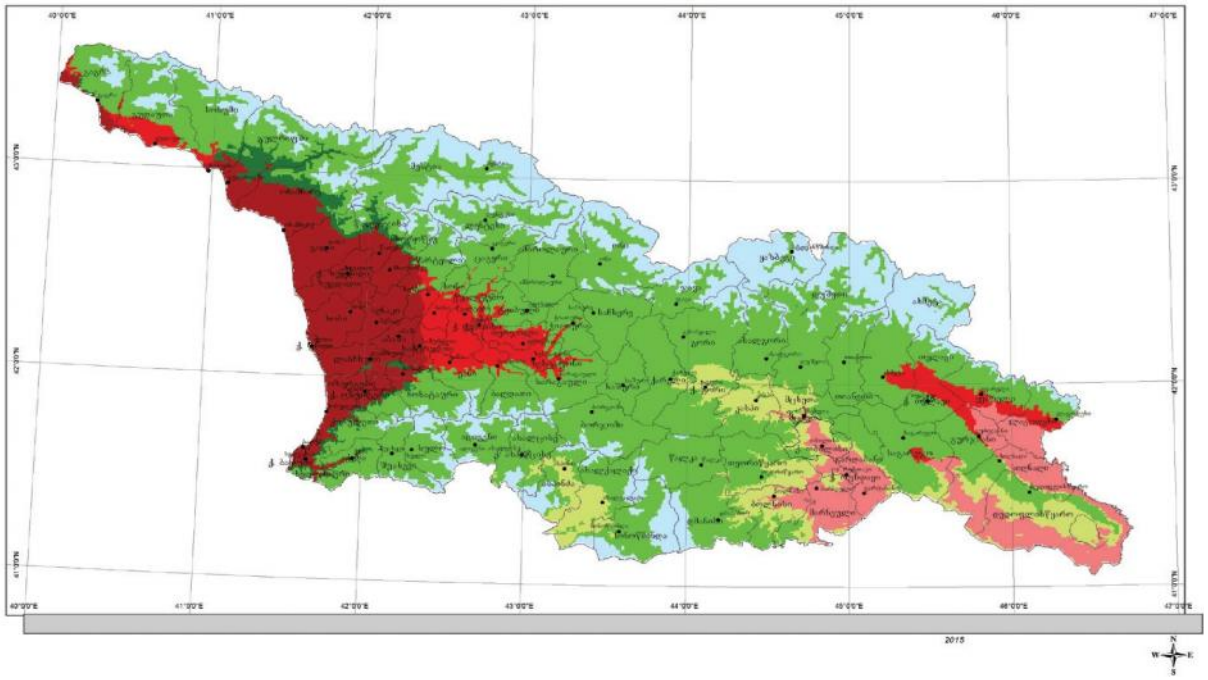
Research carried out within the framework of the project "National Climate Change Adaptation Plan for Georgia's Agriculture Sector" revealed the following trends: changing agricultural zones, reducing productivity in the agricultural sector, reducing agricultural land and reducing irrigated land.

The change in agricultural zones is largely driven by the increase in average temperature and precipitation, which is a consequence of climate change. Changing agricultural zones can have a significant impact, both negative and positive, on the agricultural sector and the economy as a whole. It is expected that some changes due to climate change will affect agricultural parameters such as: area of agricultural land, vegetation period, amount of irrigation water, number of diseases and more.The maps below show changes in agricultural climate zones for three periods: 1961-1990, 1991-2015, and

2071-2100 (see map 7.1). It is noteworthy that dry climates and humid areas are expected to increase in the future, both in the eastern and western parts of the country.

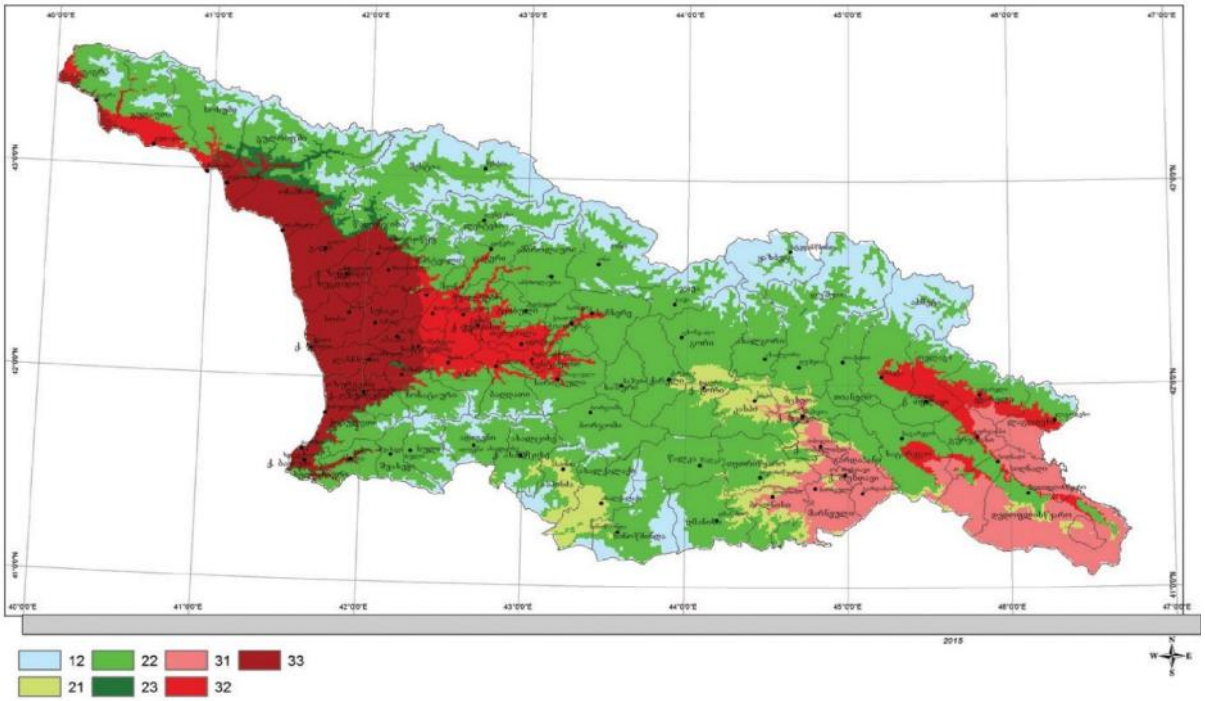
In the agricultural sector, productivity is the utmost important in the country's life, as it depends on both the food security of the population and the income of a large part of the population.The number of crops in agriculture depends on many factors, including wind speed, precipitation and distribution, frequency and duration of heat waves, water availability and evapotranspiration rate.[73] The link between all these factors in Georgia and climate change has been identified. Studies carried out when developing the National Agricultural Adaptation Plan indicate that productivity in the agricultural sector is declining due to the deterioration of the factors listed above.

Map 7.1: Changes in Georgia's agricultural climate zones a) 1961-1990. b) 1991-2015. c) 2071-2100.

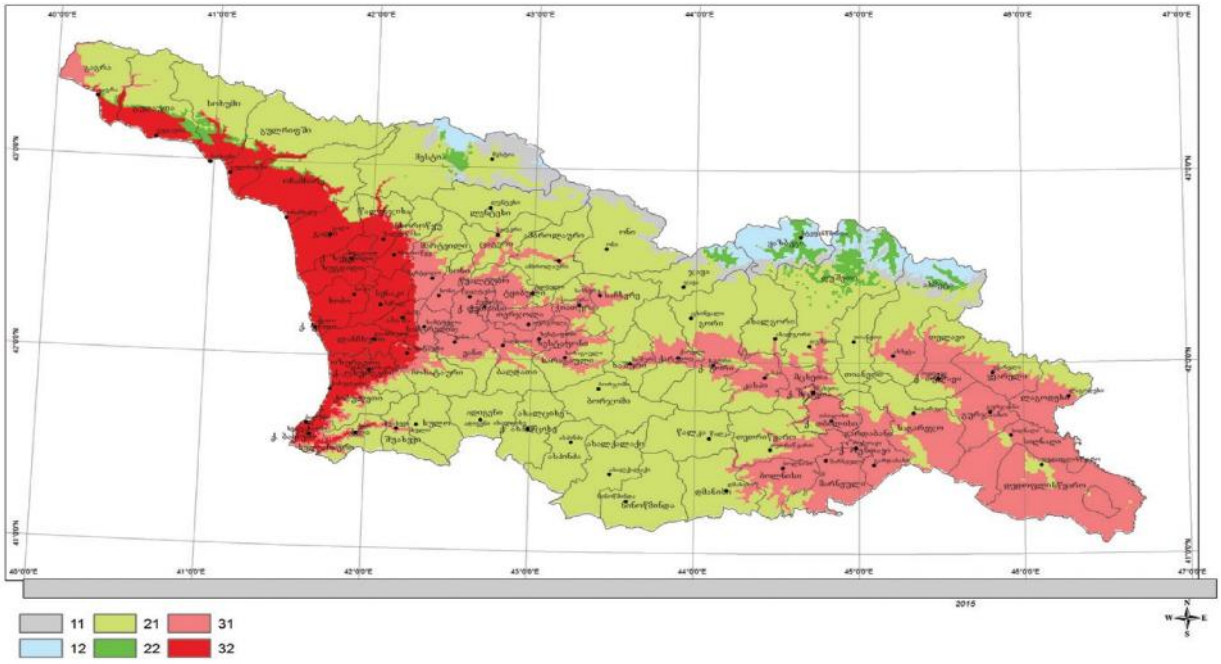


a)

[73]Total evaporation of water from the unit of area by plants and soil surface over a period of time



b)



c)

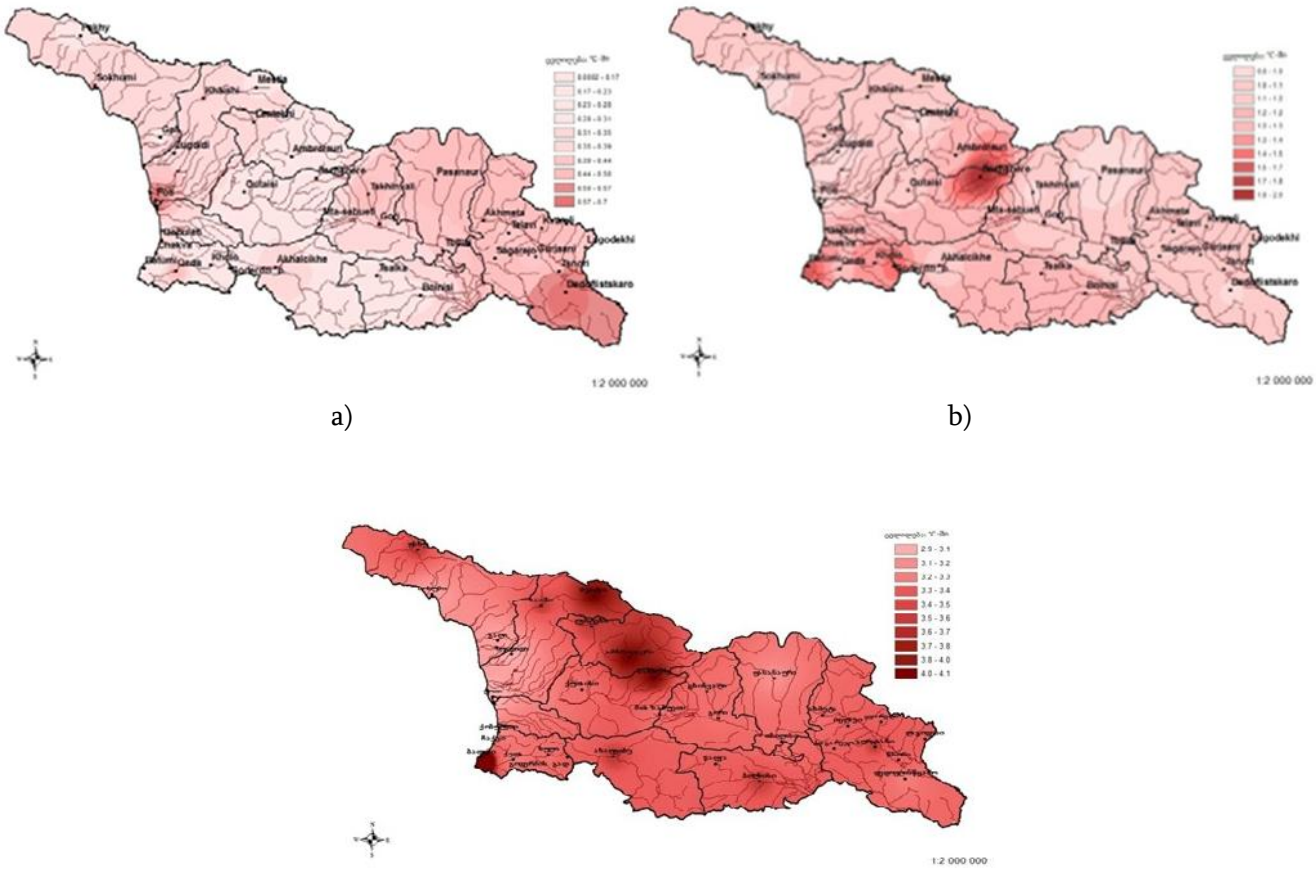
Source: National Climate Change Adaptation Plan for Georgian Agriculture Sector

Georgia is expected to reduce agricultural land due to natural disasters such as landslides, floods, mudslides, etc. An increase in their frequency may adversely affect soil fertility. It is also worth noting that the activation of these natural phenomena can deepen the erosive processes of the land, which also have a negative impact on the productivity of the sector.

There have been many natural disasters in Georgia over the last 30 years due to climate change. Studies in the framework of Georgia's Third National Communication on Climate Change have identified changes in frequencies of continuity of the average annual air temperatures, annual precipitation totals, relative humidity, precipitation regimes, wind speeds, frosty days and nights, very hot days and tropical nights, high rainfall days, and dry and rainy days in the whole area.

The average annual temperature in the whole territory of Georgia during the period 1961-2010 is mostly characterized by an increasing trend. The average temperature was highest in Dedoplistskaro (0.7^0C). The Figure 7.2 (a) shows the mean temperature change for different periods. As shown in the map, the areas near Poti and Dedoplistskaro district are characterized by the highest warming. As for the long-term forecasts (see map 7.2: b, c), temperatures are expected to raise across the country. The highest warming is expected in Batumi.

Map 7.2: Changes in Mean Annual Temperature Values a) difference between the periods of 1986-2010 and 1961-1985; b) 2021-2050 and 1986–2010; c) 2071-2100 and 1986–2010.



a) b)

c)

Source: Third National Communication of Georgia

One of the prominent manifestations of climate change is the change in the amount and distribution of precipitation. Precipitation in Georgia (Annual Sum) between 1961-1985 and 1986–2010 periods increased especially in western Georgia (Svaneti lowland zones (+ 14%), Adjara highlands (+ 14%), Poti

and Imereti highlands (+ 10%)). In general, in western Georgia, with few exceptions, precipitation is increasing. In the east, precipitation declines significantly in the eastern part of the highlands of Adjara (-17%) and in Meskheti (-6%), in the Likhi ridge. In the central part (- 8%), Javakheti and Kvemo Kartli it is noteworthy that in the long term (by 2100) precipitation is expected to decrease throughout the country and in the medium term (up to 2050) the trend of precipitation will continue to increase only in western Georgia.

The average annual wind speed throughout Georgia was significantly reduced, with the largest decrease being sustained training at stations (Mount Sabueti, Poti), which, according to the Wind Atlas, are considered the most promising sites for wind energy development. By the end of the 21st century, average wind speeds in almost the whole Georgia continue to decline with some probability. By the end of the century, the wind speed on the mountain Sabueti can be reduced from about 9.2 m/s to 4.3 m/s.

As research statistical analysis shows the natural disasters have increased dramatically in Georgia over the last 20 years and in different ecosystems (forests, water, soil, etc.). Changes in variables related to climate parameters are observed; Frequent landslides, floods, avalanches, rivers; In some areas (Dedoplistskaro, Gardabani, Sagarejo) the desertification process was more pronounced; Some areas (eg Lagodekhi) have moved from semi-humid climate zone to humid zone.In many cases, anthropogenic factors play an important role in the development of extreme geological events, land degradation and deterioration in forest quality, and climate change contributes to accelerating processes. Consequently, it is difficult to clearly distinguish between the contribution of the primary and additional impacts that require further scientific research.

The number of forest fires has increased dramatically over the last 10 years. For example, the average annual number of fires in 2014-2017 in forests managed by LEPL National Forestry Agency (NFA) was 60, while the corresponding figures for 2006-2009 and 2010-2013 were 35 and 18, respectively. As for the areas covered by fires, there is also an upward trend: during 2014-2017 period, in the same territory the area covered by fires totaled 2 656.6 ha, while the similar figure was around 665 ha in 2010-2013. Imereti, Kakheti, Samtskhe-Javakheti, Shida Kartli and Adjara are the most at risk. It is also noteworthy that climate change is indirectly linked to forest fires, as one of the contributing factors to global fires is global warming. The causes of forest fires in Georgia are called negligence and the deliberate burning of agricultural land, and high temperatures and prolonged drought periods are seen as favorable conditions.

Over the past 20 years, there has been an increase in climate change events on the Black Sea coast. The average sea level rise on the Adjara coast has exceeded 20 cm. The number of storms on the Batumi coast is increasing. From the 1970s to 2010, the number of five-point storm days has almost doubled and the six-point storm has tripled.

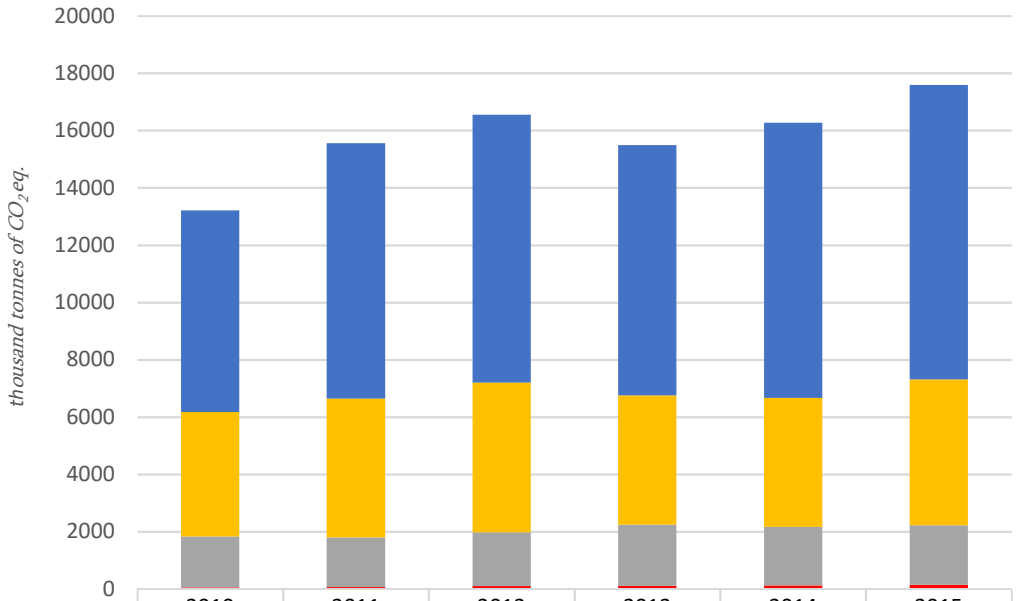
One of the most negative impacts of climate change is the increase in drought, water depletion and land degradation. These factors can have a major impact on the country's economic life in the future, as much of the population depends on agriculture. Changes in the number of droughts in the Kakheti region in the framework of surveys designed to elaborate the third national notification were estimated using the Standardized Precipitation Index (SPI). In general, the number of agricultural droughts during 1985–2010 was highest in Sagarejo (+14 ocassion) and then in Dedoplistskaro (+7 ocassion), while extreme droughts were highest in Dedoplistskaro (+11 ocassion) and then in Kvareli and Telavi (+8 ocassion).

An analysis of satellite imagery from 2000 found that in the central part of the Caucasus, which includes the river. Even in the Enguri basin, the average glacier retreat is about 8 meters per year. However, the relation of glacier retreat velocity with their dimensions has been revealed. Specifically, for large glaciers with an area greater than 10 km^2, the retreat rate is 12 m/year, and for small glaciers with an area less than 10 km 2, the average retreat rate does not exceed 6 m/year.

7.5 GEORGIA'S CONTRIBUTION TO THE WORLD GREENHOUSE GAS EMISSIONS

Information on GHG emissions causing climate change for the reporting period is available until 2015, based on Georgia's Fifth Inventory. The current chapter presents the dynamics of GHG emissions for the period of 2010-2015, which calculates the National Greenhouse Gas Inventory data of the previous 2010-2013 national report on the environment according to the 2006 Intergovernmental Council on Climate Change Guidelines. Georgia's total GHG emissions in 2015 amounted to about 17,589,000 tonnes of CO_2 eq., that is greater by 8.1% compared to 2014. In 2013, the GHG emissions decreased by 6.4% compared to 2012, and the emissions in 2013 increased again. The average annual increase in GHG emissions for the 2010-2015 period is 6.3%. Figure 7.5.1 shows the emission trends of GHG emissions in Georgia for the period of 2010-2015.

Figure 7.5.1: Dynamics of GHG emissions for 2010-2015 (thousand tonnes of CO_2 eq.)

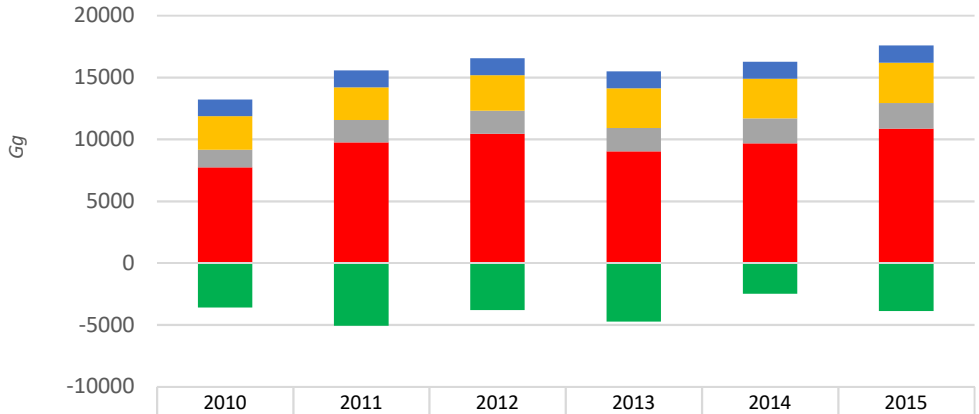


	2010	2011	2012	2013	2014	2015
Carbon Dioxide (CO2)	7027	8918	9341	8732	9609	10277
Methane (CH4)	4353	4849	5237	4511	4505	5088
Nitrous Oxide (N2O)	1773	1732	1877	2139	2041	2084
Hydrofluorocarbons (HFC)	54.07	64.21	92.98	104.26	120.55	139.39
Sulfur Hexafluoride (SF6)	0.22	0.25	0.27	0.28	0.3	0.32

Source: Georgia's Second Biennial Update Report

The GHG emission/removal sources can be combined by the economic sectors. In 2015, about 62% of the country's total GHG emissions come from the energy sector, which includes energy generation and transmission, energy consumption in the transport, industry and building sectors. The non-energy emissions of GHG accounted for 18% from the agricultural sector, 12% from the industry and 8% from the waste management sector, respectively. In the same year, the land use, land use change and forest sector absorbed 22% of the country's total GHG emissions. The information is shown graphically in the Figure 7.5.2.

Figure 7.5.2: GHG emissions/removal for 2010-2015 (Gg)

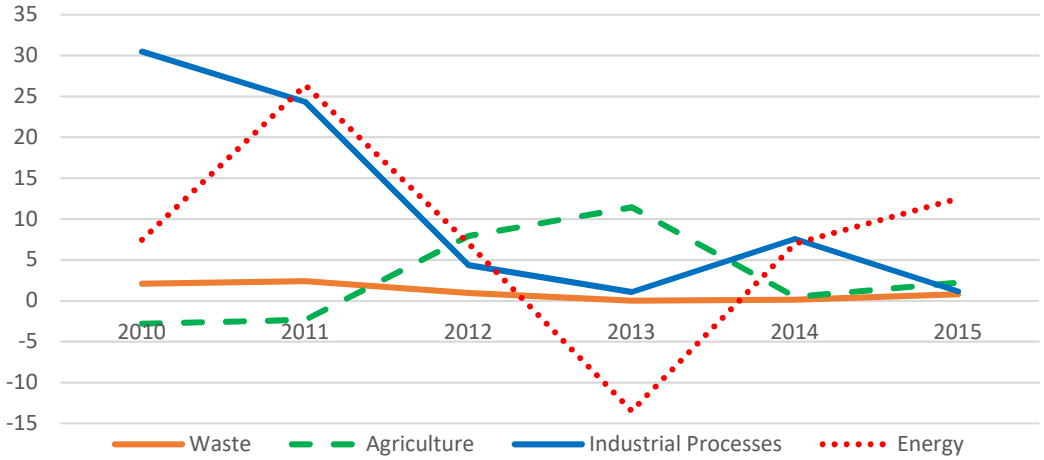


	2010	2011	2012	2013	2014	2015
Waste	1330	1362	1375	1375	1377	1388
Agriculture	2712	2649	2859	3186	3201	3271
Industry	1443	1794	1872	1892	2035	2058
Energy	7722	9758	10443	9034	9665	10874
Land Use, Land-Use Change and Forestry	-3612	-5073	-3811	-4737	-2498	-3882

Source: Georgia's Second Biennial Update Report

It is noteworthy that GHG emissions by economic sectors are characterized by different fluctuations in the period of 2010-2015. The emissions from the energy sector have been the highest in the last six years, while emissions from the waste sector are the most stable compared to other sectors (see figure 7.5.3).

Figure 3.5.3: Growth Rate of Sectoral Emissions of Georgia (%).



Source: Georgia's Second Biennial Update Report

Worldwide emissions in 2015 amounted to about 49 billion tonnes of CO_2 equivalent, 0.04% of which was Georgia's share. 2010-2015 For the period, global emissions growth averaged 2%, which is about three times lower than Georgia's growth rate.

7.6 MAIN CHALLENGES

Key challenges in Georgia's climate change policy are as follows: reducing GHG emissions, increasing the country's adaptation potential and developing a transparent reporting system.

The updated Nationally Determined Contribution (NDC) of Georgia has been elaborated since 2018. As previously mentioned, by the Intended Nationally Determined Contribution (INDC) document Georgia accepted to reduce its GHG emissions compared to the baseline development scenario by 15% unconditionally, and by 10% in the case of the international support. According to the updated NDC document, the emission limit will be determined relative to the base year. The base year is 1990, just like for the EU.

In order to achieve the mitigation policy goal fo the INDC, it is necessary to define the energy sector through energy diversification, alternative energy sources and energy efficiency contributing to the transition to concrete measures, of which the total effect is consistent with the objectives and will contribute to the country's energy independence and to the low operating costs of the economic activities.

Also, given the potential of the emission reductions in the agricultural sector, it is important to define a climate-friendly development action plan, which will outline mitigation measures that promote the production of environmentally friendly, high quality agricultural products and sustainable development of the sector.

Within the framework of the cooperation between Georgia and the Federal Republic of Germany, for the purpose of climate change mitigation implementaton, the guidelines for Climate Change Action Plan (CAP) preparation has been developed. During the development process of the guidelines, the need for determining the mitigation measures for several economic sectors, including energy and agriculture, was once again identified. With the support of the Federal Republic of Germany, the development of CAP for the period of 2021-2030 is planned to define these measures.[74].

According to the INDC document, an increase in carbon stock potencial in the forestry sector is determined. However, to implement this idea, it is necessary to mobilize the country's internal resources and international support, for which the Ministry of Environmental Protection and Agriculture of Georgia (MEPA), together with the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), has prepared and submitted the relevant project application to the GCF.

Changes in the amount and nature of precipitation caused by climate change, changes in the temperature regime specific to a particular area, frequency of heat waves and increase in glacier retreat speeds contribute to floods, mudslides, landslides, spreading forest fires, storm surges, etc. The recent increase in the number of natural disasters in Georgia has made it a priority to improve the resilience of Georgia's high-risk regions to the hydro-meteorological threats posed by climate change. As a result,

[74]The action is being implemented by the German Federal Ministry of Environment, Nature and Nuclear Safety (BMUB), funded by the project "Capacity Building of Eastern Partnership Countries to Ensure Compatibility with EU Indicators on Climate Change". The project is implemented by GIZ.

a number of adaptation activities have been implemented in the framework of the project "Development/Implementation of Flood and Flood Management Climate Protection Practices for Vulnerable Population in Georgia"[75] in the 2012-2016 period in the Rioni Basin.

In cooperation with UNDP, the Ministry of Environment and Natural Resources Protection of Georgia has developed a project application for submission to the GCF based on the experience gained in the abovementioned project. In 2018, GCF awarded Georgia with a $27 million grant to implement the large-scale project "Introducing Multi-Hazard Early Warning System Across the Country and Using Climate Information in Georgia." The goal of the project is to avoid possible adverse effects (human casualties and economic loss) caused by natural disasters caused by climate change in Georgia due to natural-meteorological and geological events (flood-flood, drought, hail, strong wind, snow avalanche, landslides, mudslides). See these events an early warning system to create. The project is being co-financed by the Swiss Government for $ 5 million.

Presently, the adaptation plan has been prepared for the agricultural sector. However, the country's adaptation plan, which highlights the link between sectors, resources and disasters, is in preparation. It also identifies the vulnerabilities and risks associated with the negative impacts of climate change on different sectors of the economy. The material prepared in the framework of the Third National Communication of Georgia clearly identifies the adaptation areas and directions, where it will be possible to reduce the damage and damage to the population, which can reach 25-30 billion GEL in 2021-2030. In 2018, the Ministry, together with UNEP, began preparatory work to develop the national adaptation plan (NAP).

In order to achieve the mitigation and adaptation goals set out in the INDC document, it is necessary to develop the existing reporting system in order to enable the transparent progress tracking mechanism. On the basis of the summary report prepared by a technical team at the UNFCCC international consultation and analysis process, the Ministry, in cooperation with UNDP, submitted the project "Capacity Building Initiative for Transparency of Paris Agreement Implementation in Gerogia" application to the Global Environment Facility (GEF).

Thus, the climate change action plan is being developed with partner agencies and organizations to identify and implement the climate-friendly low-emission development measures for each sector of the economy. NAP application is being developed to strengthen the country's adaptation policy, which will include the Sustainable Resource and Disaster Management Action Plan. There is also the transparent mechanism to track the progress of the nationally determined contribution implementation that will allow us to monitor the trend of the GHG emission limitations and the country's adaptation capacity growth.

[75]The project was funded by the Adaptation Fund (AF) by UNDP.

III/8 NATURAL DISASTERS

Due to the complex terrain and the specific geographical location, natural disasters are widespread in Georgia, with recurrence - frequent and hazard risk - high. In recent years, it is observed increase of hazards which is due to global climate change and adverse impact of human activity, such as deforestation, degradation of pastures, private land acquisition without proper geological assessment, etc.

Since natural disasters are highly endangered by the country's population, infrastructure and economy, their management is a matter of particular concern. In order to minimize economic loss and human casualties, a system of early warning of impending natural disasters is being developed based on monitoring, analysis and forecasting of these events.

8.1 MAIN QUESTIONS AND MESSAGES

1. ***What is the tendency of natural disasters in Georgia and what harm does it have to the economy and people of the country?***
   - Z The magnitude and incidence of landslide-gravitational and mudflow processes have increased significantly in the country. Specifically, there were about 1000 landslides in 2010-2013, up from 3300 in 2014-2017. The incidence of mudflow has increased from 300 to 680. As a result, the economic damage caused by landslides and mudflows has increased. According to available data, more than 4400 buildings and structures were damaged and 33 people were dead;
   - Z Prior to 1995, the average number of floods ranged from 3-5, to 4-20 in 1995-2006, and 7-27 in 2007-2017. Since 2013 there has been an increase in flood incidence (from 8 to 27). In the period 1950-2017, it was in 2017 that the highest number of floods (27) were reported (27). The frequency of drought has almost tripled in recent years compared to earlier periods. However, there were no cases of drought in From 2016-20172008 there is a growing dynamics of hail days. In 2017 there were 36 hail days, the highest since 1990. There is also an increasing trend in terms of persistent snow avalanches. Compared to the previous four years (2010-2013), the number of snow avalanches has increased by 2.3 times in the reporting period. The number of strong winds also increased sharply during the reporting period. It was in 2014 and 2017 that most cases of strong winds were recorded in Georgia (35 and 37). According to incomplete data, a total of 322 mln GEL losses were caused by the disastrous hydro-meteorological events in 2014-2017 and 40 people were killed.
2. ***What is the state of natural geological and hydrometeorological monitoring?***
   - Z In 2014-2017, the number of hydrometeorological observation points increased by 43 units to 137 observation points. Currently there are 55 hydrological checkpoints, 47 meteorological checkpoints and 43 meteorological stations (145 observation points in total). The number of field surveys required for conducting planned geological monitoring has been increased twice a year since 2014, in spring and autumn. The modern early warning system of natural disasters was installed in the Devdorak-Amali valley.

8.2 STATE REGULATION

Georgia is actively involved in international processes aimed at disaster risk reduction and mitigation. From these processes, the 2002 UN World Summit in Johannesburg (South Africa) and the international conferences in Hyogo in 2005 (Japan) and 2015 in Sendai (Japan) should be distinguished. The main purpose of the decisions made at these conferences was to identify risks, evaluate them, monitor them, identify hazards, set up emergency measures and implement an early warning system where possible. The existing strategy of disaster management at LEPL National Environmental Agency (NEA) is based on the principles of implementation of the mentioned framework programs.

NEA under the Ministry of Environment Protection and Agriculture of Georgia is responsible for monitoring and scientific research of current meteorological, climatic, hydrological and geological events. The Agency annually publishes a geological process bulletin, which presents data and analysis of current geological processes, as well as forecasts of expected hazard. The agency also prepares short-, medium- and long-term weather and hydrological forecasts and warnings of anticipated natural disaster hydrometeorological events. Since 2014 NEA has been working on geological survey and preparing state geological maps with relevant reports.

The Emergency Management Service is a state department within the Ministry of Internal Affairs of Georgia that provides emergency prevention, unified system preparedness, emergency response, including disaster response and emergency response recovery. Implement the National Civil Security Plan to address civil security objectives. The Service is the main liaison body that coordinates the activities of all government agencies. The main purpose of the service is to ensure the safety of citizens in the event of specific threats - prevention, rapid response, decision-making and saving lives in emergencies.

The Department of Spatial Planning and Construction Policy of the Ministry of Regional Development and Infrastructure of Georgia is responsible for the development, implementation, coordination, management and monitoring of policies in the field of spatial planning and construction activities, including the development of methodologies and guidelines.

Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia is responsible for developing a natural disaster management (eco-migration) management system. The Ministry monitors and predicts migration processes and ensures that the disaster risk-based resettlement process is implemented.

The main legal act in the field of natural hazards is the 2018 Law of Georgia on Civil Security, which defines the functions and competencies of various state agencies in emergency preparedness, response and prevention stages and in the immediate response phase. It is worth noting Resolution N508 of the Government of Georgia of September 24, 2015 on the Approval of the National Civil Security Plan defining the activities of administrative bodies in the field of civil security.

In 2015, the Government of Georgia adopted the 2015-2018 Threat Assessment for Georgia. A document "which, among other threats, includes the dangers of natural disasters. To reduce these risks, the Government of Georgia adopted Resolution # 4 of January 11, 2017 on Georgia's National Disaster Risk Reduction Strategy 2017-2020 and its Action Plan, which is an important strategic document in the field of natural disaster risk management.

The Association Agreement between Georgia and the European Union contains the provisions of the Directive on Flood Risk Management (2007/60 / EC), which provide for the development of flood risk management legislation, as well as the preparation of flood risk assessments and the preparation of flood risk maps.

These international, legislative and strategic documents create the legal and policy framework for disaster risk reduction.

8.3 NATURAL DISASTERS IN GEORGIA, DYNAMICS OF DISASTER FREQUENCY CHANGES, AND TRIGGERING FACTORS IN FREQUENCY OF DISASTERS

Natural Geological Processes

Georgia is one of the most prominent regions in the mountainous world due to the magnitude of natural geological disasters, the frequency of recurrence, and the adverse effects on the country's population and economy.

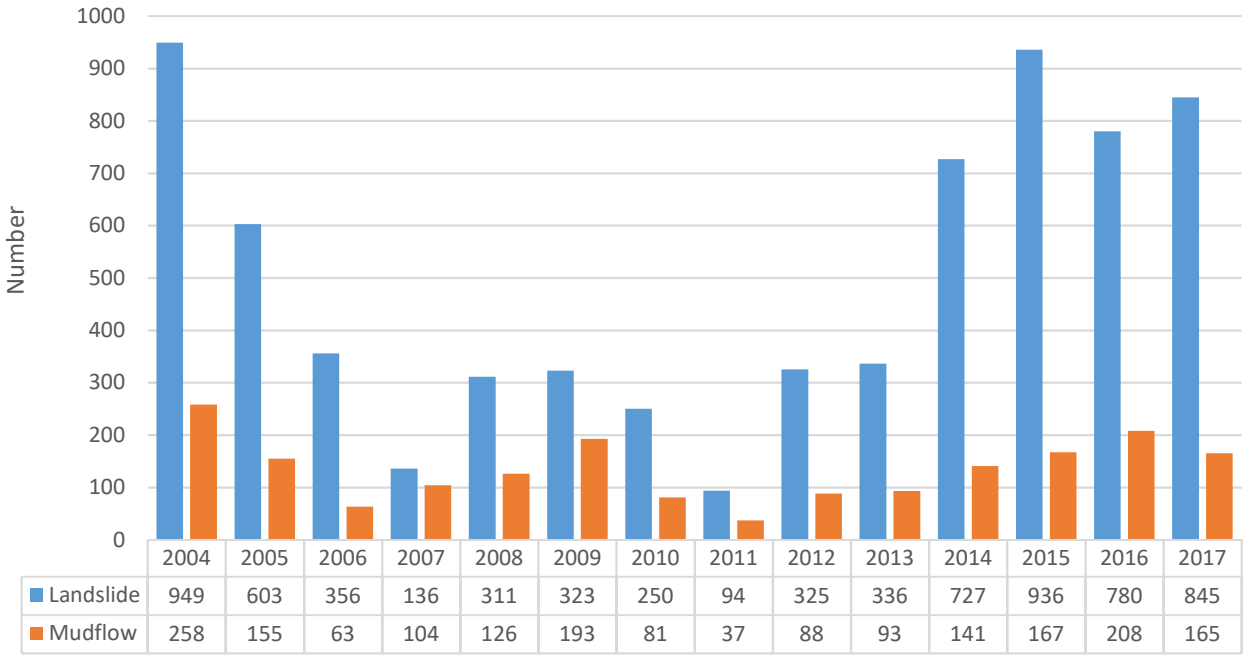
Thousands of settlements, land plots, roads, oil and gas pipelines, high-voltage power transmission towers, hydraulic-amelioration facilities, mining-tourist complexes, etc. are periodically affected by the geological disaster. Almost all landscape-geographical areas - from the seaside to the alpine-nival zone, where the geoecological situation is complicated from "tense" to "crisis" - are located in the disaster area.

Picture 6.1, 6.2, 6.3: Extreme geological phenomenas -landslide near Sheshelidze Street in Tbilisi; landslide in Khulo Municipality; Mleta Mudflow Ravine in Dusheti Municipality

Source: NEA

According to the data provided by the NEA, in 2014-2017 the magnitude and quantification rates of landslide-gravitational and mudflow processes have increased significantly in the country (see Figure 8.3.1). As of 2017, 18% (647) of Georgia's populated areas are under high risk of geological processes (see Figure 8.3.2).

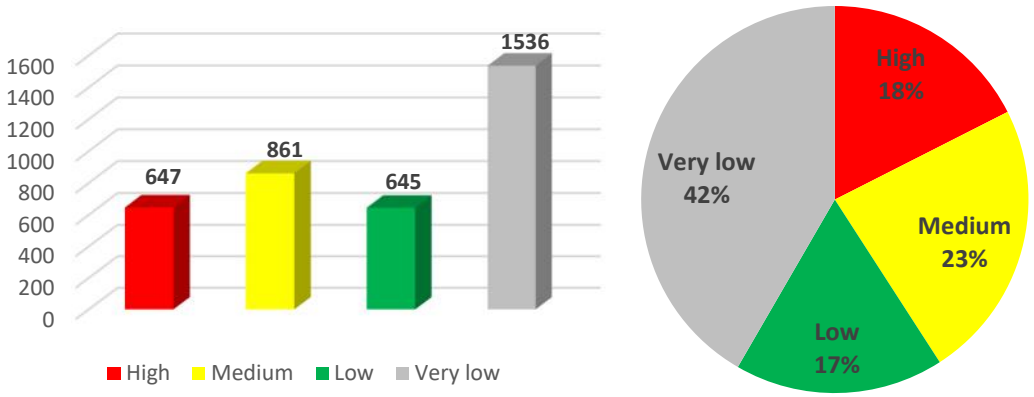
Figure 8.3.1: 2004-2017 Landslide and mudflow processes observed on the territory of Georgia over the years



	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Landslide	949	603	356	136	311	323	250	94	325	336	727	936	780	845
Mudflow	258	155	63	104	126	193	81	37	88	93	141	167	208	165

Source: NEA

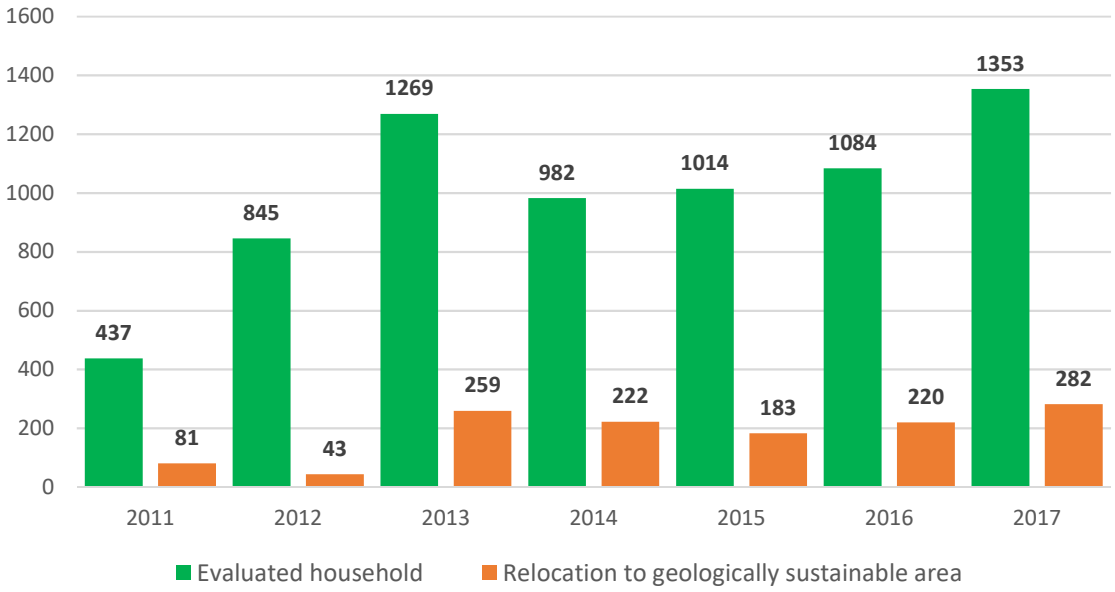
Figure 8.3.2: Settlements under threat of geological processes



Source: NEA

Particularly difficult is the situation in mountainous regions, where extreme disaster activation often requires the evacuation of people from historically settled housing and sometimes relocation to other municipalities. In 2014-2017, 907 families (households) were subject to relocation of 4 433 households as eco-migrants from the NEA (see Figure 8.3.3). By the second half of the twentieth century, dozens of mountain villages were deserted and desolate. Most alarming is that these events are often accompanied by human casualties. In 1995-2017, 141 people died as a result of the geological disaster, and the estimated economic loss amounted to 1.7 billion GEL.

Figure 8.3.3: 2011-2017 Number of families (households) evaluated and relocatedfrom the disaster zone over the years



Source: NEA

All of this, in the light of the extremely sensitive geological environment, is caused by: global climate change; Increasing the load on anthropogenic impacts on the geological environment; The Caucasus region has a high seismic background (which results in periodic intensification of high-intensity earthquakes) and a low level of public awareness of the danger of geological disaster. It should be noted that if the intervals of return period and activation of landslide-gravitational processes in the early period were due to the sensitivity of the geological environment from 3-5-8-11, since the beginning of the 21st century, this regularity is disrupted, no longer having cyclicity and thus activating processes above background exceeds almost every year .

According to the scale of development and the risk of danger in Georgia, landslide-gravitational and mudflow events are on the highest register and their risk is increasing every year.

As of 2017, there are over 50,000 affected or anticipated activated sites of landslide or gravitational events of varying magnitude, with a risk area of up to 2000 settlements and up to 25-30% of highways and pipelines. Landslide-gravitational events in Georgia occur in almost all landscape-geomorphological zones, in different geological environments - from seas coast to highlands.

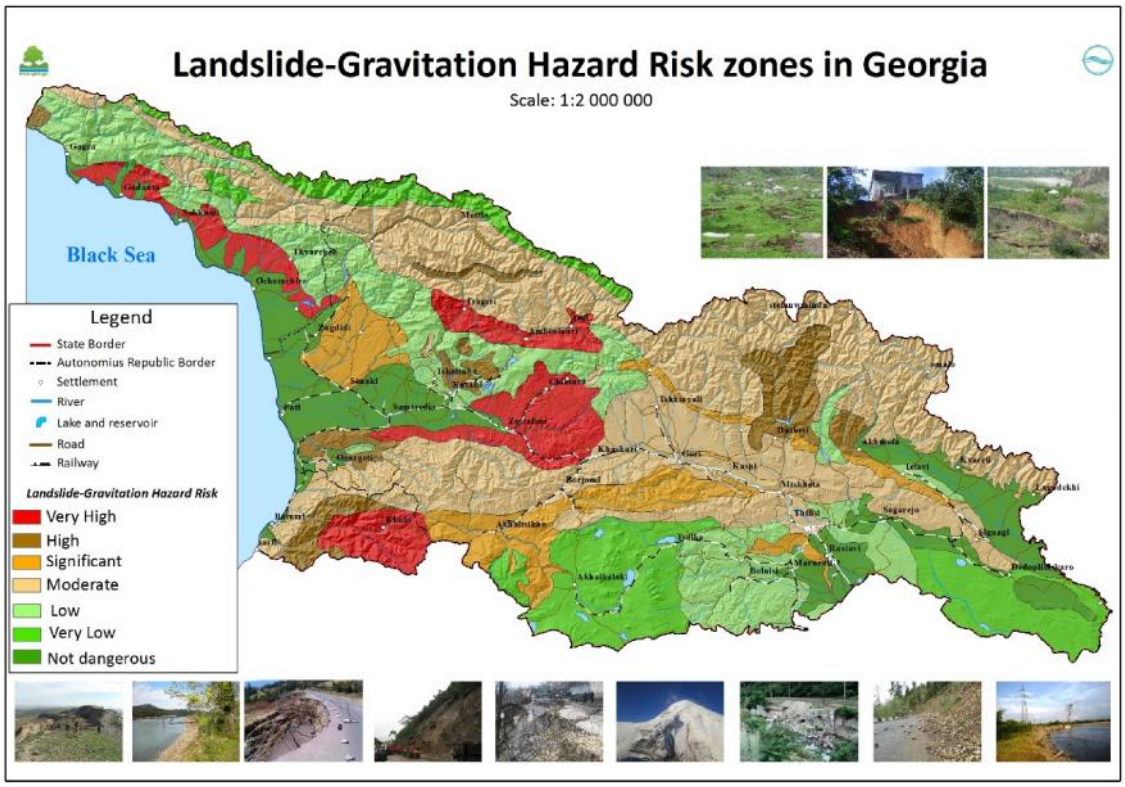
The danger zone covers 1.5 mln ha of the country's territory. The economic loss caused by the development / activation of landslide-gravitational processes in 1995-2017 amounted to GEL 951.80 mln, killing 47 people (see Table 8.1).

Table 8.1: Intensity of landslide and mudflow events recorded in Georgia in 1995-2017 and their casualties and estimated economic losses

Year	Landslide			Mudflow			Total loss (GEL mln)	Damaged buildings and structures
	Re-activated and new	Approximate Direct Loss (GEL mln)	Human casualties	Transformed into separate valleys	Approximate Direct Loss (GEL mln)	Human casualties		
1	2	3	4	5	6	7	8	9
1995	670	132.00	6	250	96.0	12	228.0	195
1996	610	80.30	3	165	27.0	5	107.3	626
1997	871	102.00	2	335	44.0	7	146.0	227
1998	543	67.00	5	173	20.0	6	87.0	159
1999	56	12.00	1	27	4.5	0	16.5	314
2000	65	13.00	1	23	3.0	0	16.0	207
2001	75	15.00	0	26	4.0	0	19.0	127
2002	69	13.80	1	23	2.5	2	16.3	193
2003	71	14.50	3	28	4.0	0	18.5	207
2004	949	147.00	4	258	28.0	2	175.0	6 042
2005	603	96.00	0	155	9.0	4	105.0	3 682
2006	356	70.50	1	63	9.0	0	79.5	2 066
2007	136	20.50	0	104	11.5	1	32.0	707
2008	311	48.00	8	126	15.0	8	63.0	1 198
2009	323	63.50	1	193	16.5	3	80.0	2 696
2010	250	21.70	3	81	5.5	2	27.2	822
2011	94	Unknown	3	37	9.8	8	23.8	463
2012	325	Unknown	1	88	54.3	5	54.3	845
2013	336	Unknown	0	93	Unknown	0	Unknown	1 269
2014	727	Unknown	0	141	165.0	10	165.0	962
2015	936	35.0	4	167	210.0	19	245.0	1 014
2016	780	Unknown	0	208	Unknown	0	Unknown	1 084
2017	845	Unknown	0	165	Unknown	0	Unknown	1 353
Total	***10001***	***951.80***	***47***	***2929***	***738.60***	***94***	***1704.35***	***26458***

Source: NEA

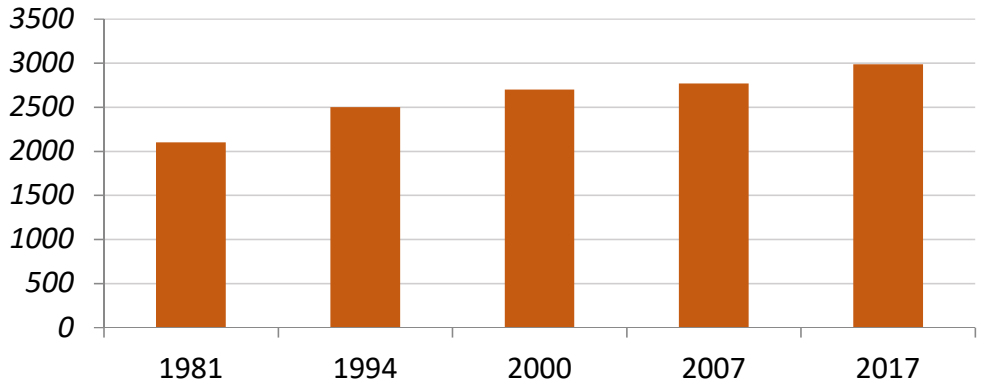
Map 8.1: Landslide Risk Zones Map of Georgia, by probability and damage



Source: NEA

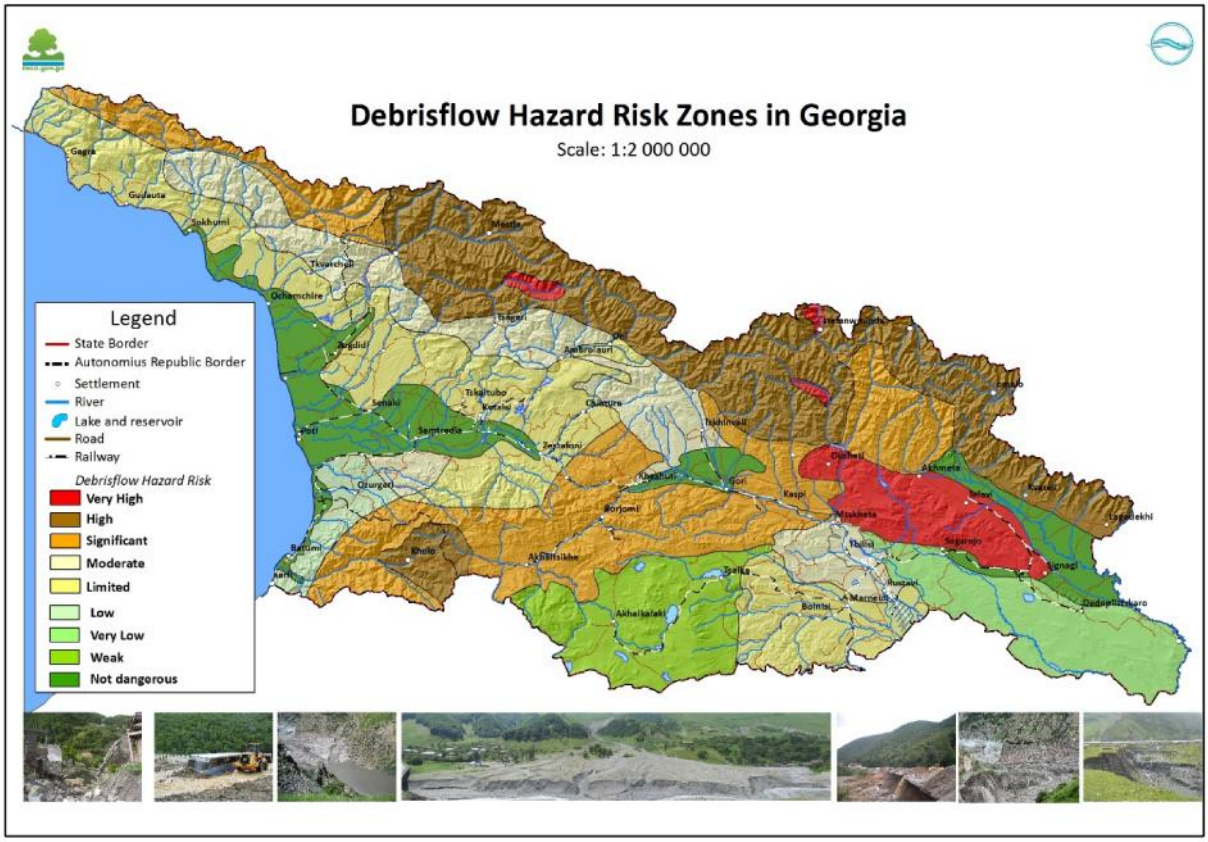
Mudflow events - Mudflow events, which are characterized by heterogeneity of development, magnitude of damage to the area, frequency of recurrence and economic damage, create an even greater risk for the safe operation of the Georgian population's life-threatening and engineering facilities. Mudflow events occur in all climatic-morphological zones of the mountainous territory of the country and in conditions of appropriate geological structure - from the foothills to the highlands. All populated areas in the floodplain and surrounding area of the river valleys, as well as the population and their infrastructure located in the Tsiv-Gombori, Saguramo-Ialno ridge and Kakheti foothills are at risk of mudflows. Mudflows periodically damage roads, other types of irrigation facilities, agricultural fields and more. In Georgia, mudflows are recorded in up to 3,000 waterways (see Figure 8.3.4). In 1995-2017, 94 people were killed by mudflows and the economic loss reached 738 mln GEL (see Table 8.1).

Figure 8.3.4: Mudflows in various years on the territory of Georgia



Source: NEA

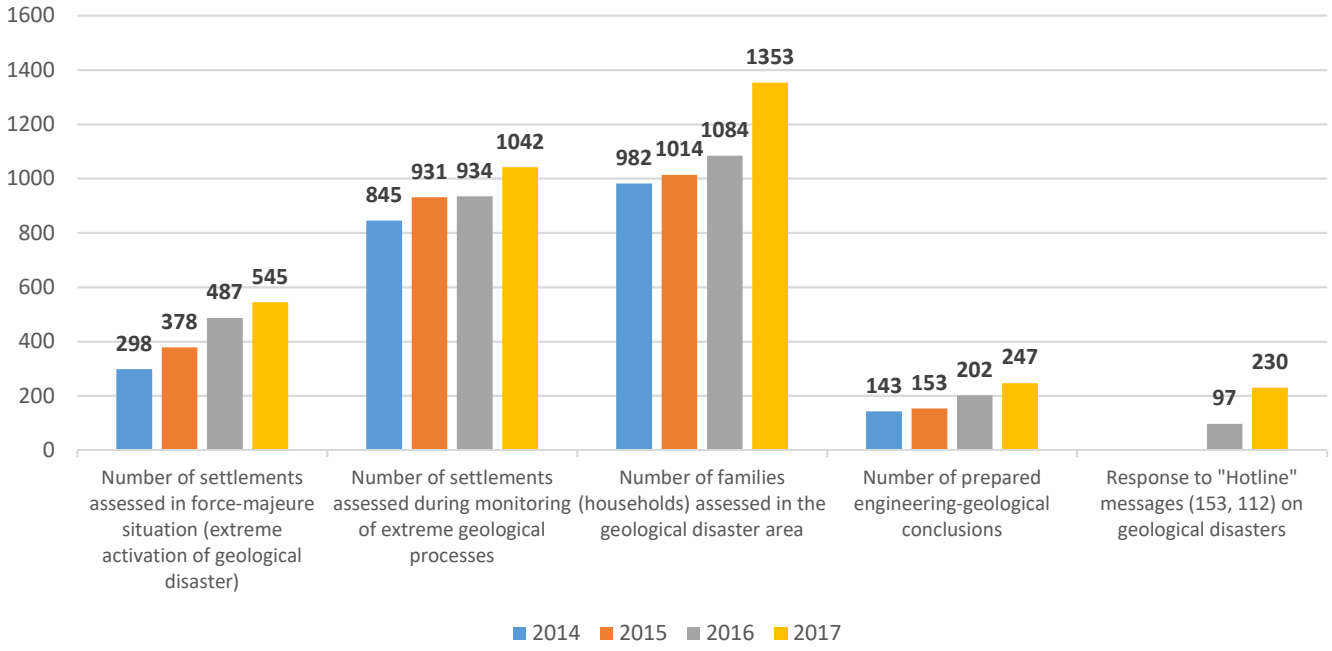
Map 8.2: Debris/Mudflow Risk Zones Map of Georgia, by probability and damage



Source: NEA

Dynamics of the work carried out by the NEA in 2014-2017, indicating the trend of large-scale disaster activation, directly related to the assessment and prevention of disaster in geological processes (see Figure 8.3.5).

Figure 8.3.5: Extreme geological events management activities implemented by the Department of Geology of NEA in 2014-2017



Source: NEA

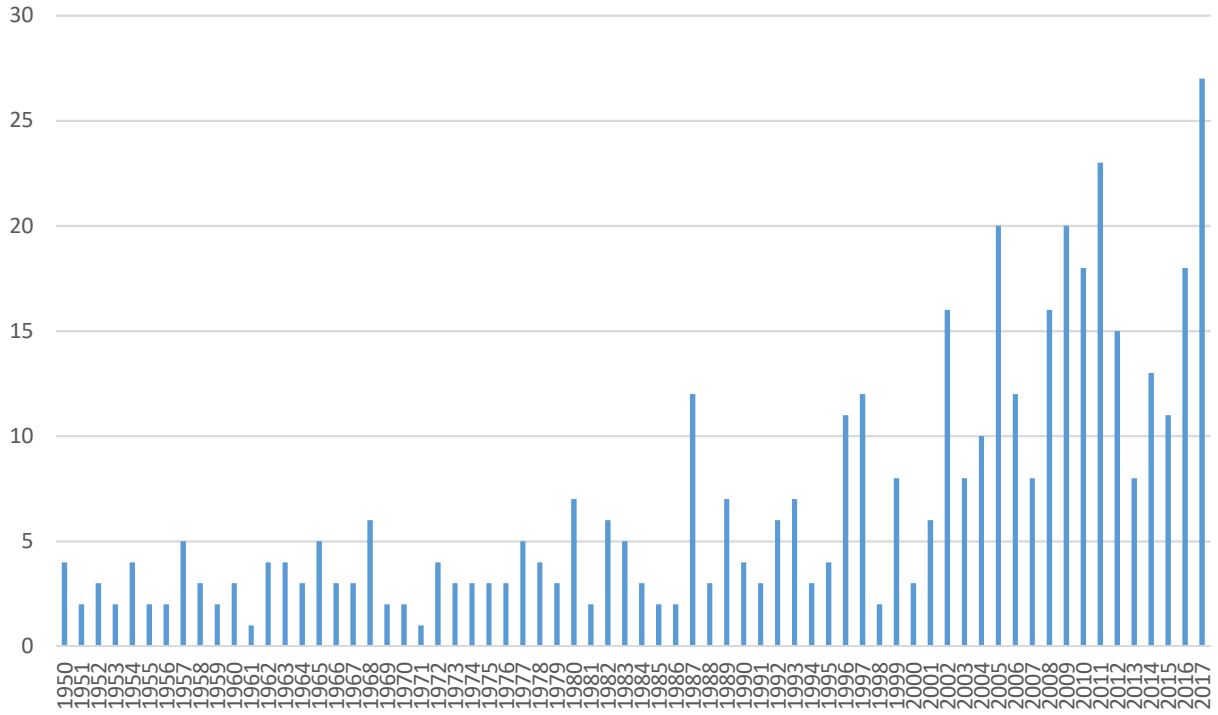
Natural hydrometeorological disaster events

According to scientific studies, in recent decades, amid the global climate change, there has been a noticeable increase in the frequency and intensity of natural disaster hydrometeorological events.

The peculiarities of the geographical location of the territory of Georgia and its complex terrain contribute to the aggravation of general atmospheric circulation processes and the formation of natural meteorological and hydrological events (floods, droughts, snow avalanches, strong winds, hail). Frequent floods, heavy rainfall, droughts, snow avalanches, hail, strong winds and more are often noted here.

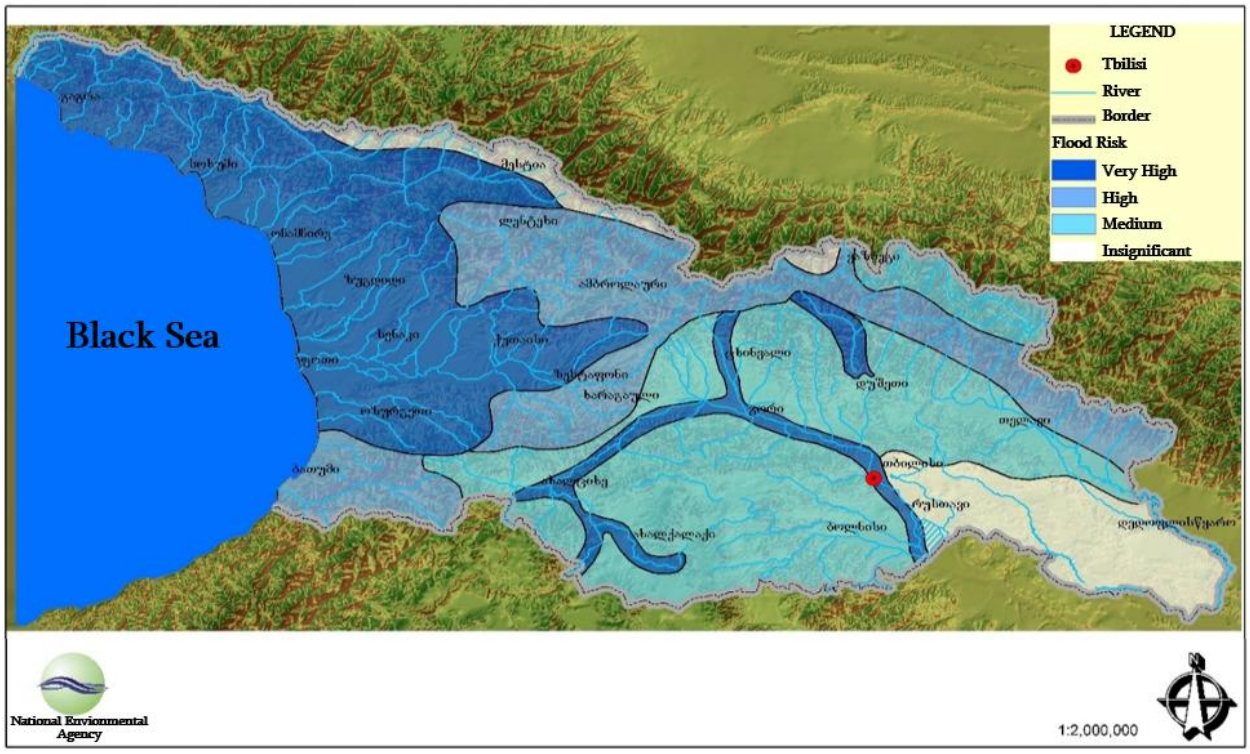
Floods - Analysis of multi-year data shows that floods are characteristic of almost all rivers in Georgia. Among them are particularly high risk: Imereti, Samegrelo, Guria, Mtskheta-Mtianeti rivers, as well as rivers. Areas adjacent to the river Mtkvari and left bank of river Alazani. The average number of floods before 1995 ranges from 3-5, from 4-20 in 1995-2006 and from 7 to 27 in 2007-2017. The damage caused by floods in the last 4 years has reached about GEL 147 mln. 26 people died.

Figure 8.3.6: Dynamics of the number of significant floods recorded on the territory of Georgia, which caused notable damage to the country's economy during the period of 1950-2017.



Source: NEA

Map 8.3: Distribution of flood risks on Georgian rivers

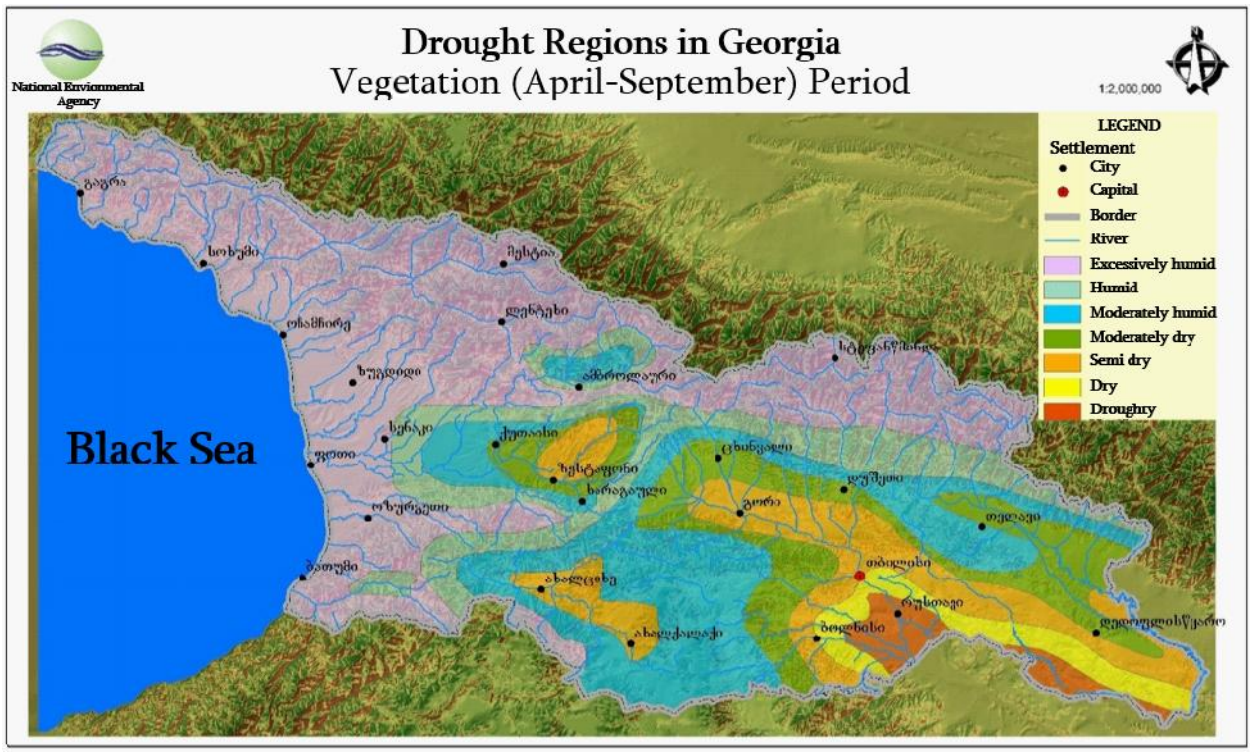


Source: NEA

Drought - The drought is taking place almost throughout the country. This event is particularly pronounced in Shida Kartli, Kakheti and Zemo Imereti regions. If early droughts in the country were observed once every 15-20 years, the incidence of this event has almost tripled in recent years. From 1995-2017, the damage caused by the drought alone amounted to 445 mln GEL.

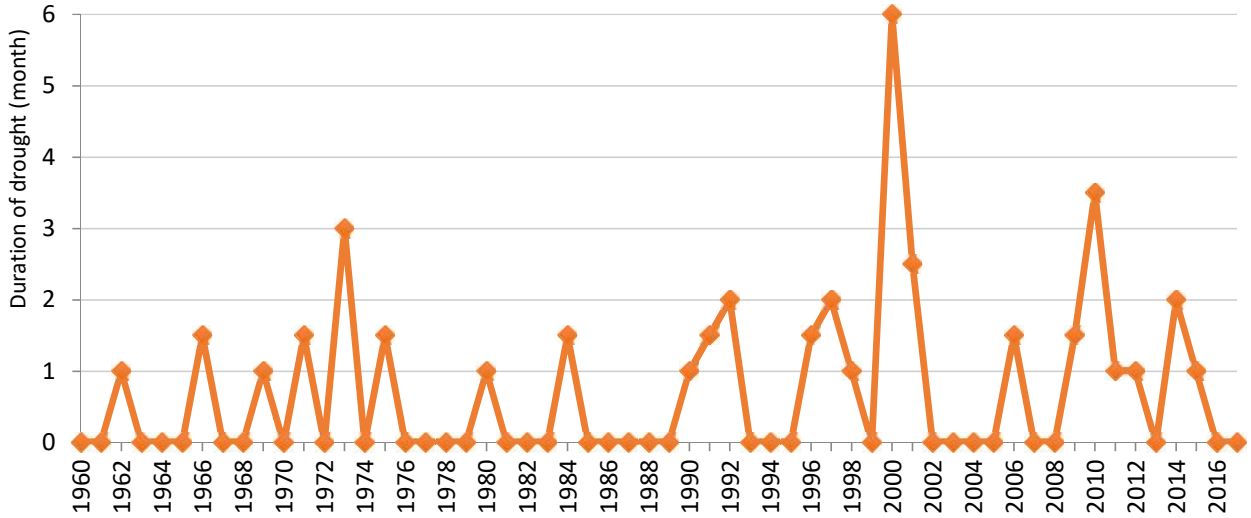
It is noteworthy that in 2016-2017 there was no drought in the country.

Map 8.4: Drought regions of the territory of Georgia



Source: NEA

Figure 8.3.7: Dynamics of changes in the duration of drought periods in the territory of Georgia in 1960-2017

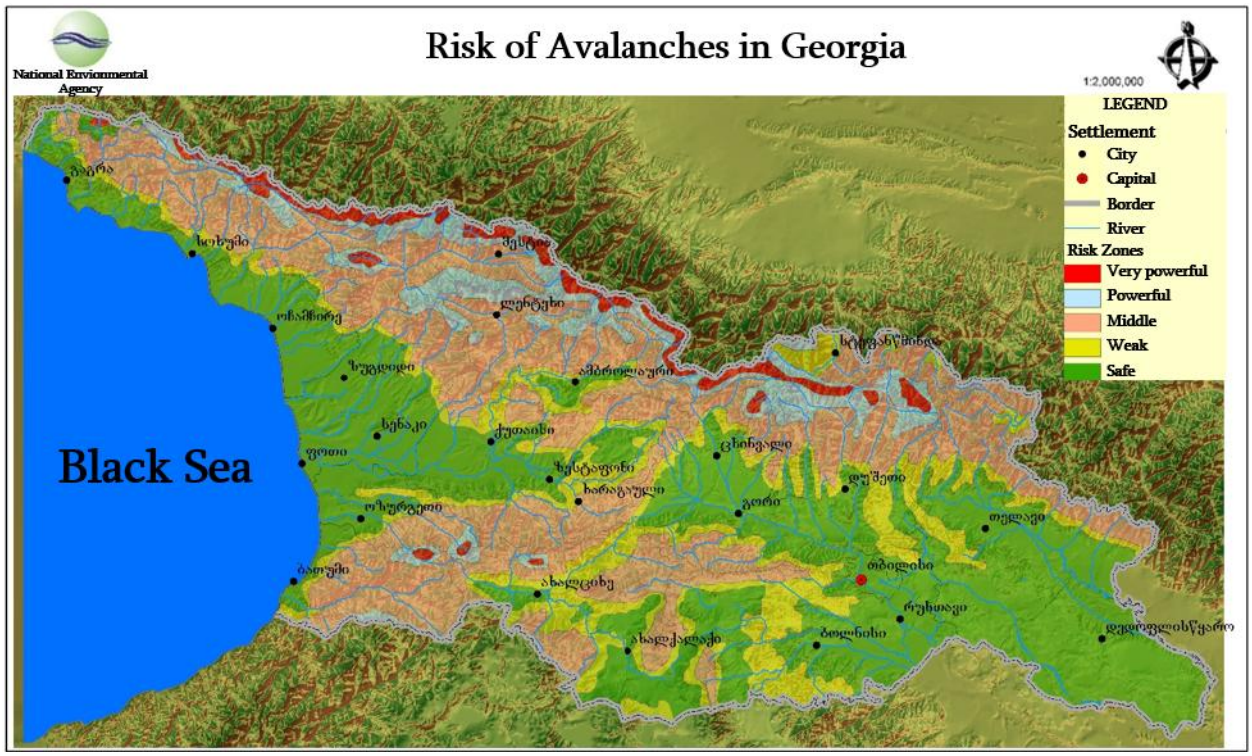


Source: NEA

Snow avalanches - In terms of snow avalanches, more than 50% of Georgia's mountainous territory is in the avalanche zone. This phenomenon is particularly intense in the middle and highland areas. The western and central parts of the Caucasus and Guria-Adjara are distinguished by the highest risk of avalanches in the country. The frequency and intensity of avalanches has increased since the 1970s. Their massive arrival is recorded in the cold periods of 1970-1971, 1975-1976, 1986-1987, 1991-1992, 1996-1997, 2004-2005. The population of Svaneti, Mountainous Adjara, Tusheti, Kazbegi and Dusheti municipalities was particularly affected by snow avalanches.

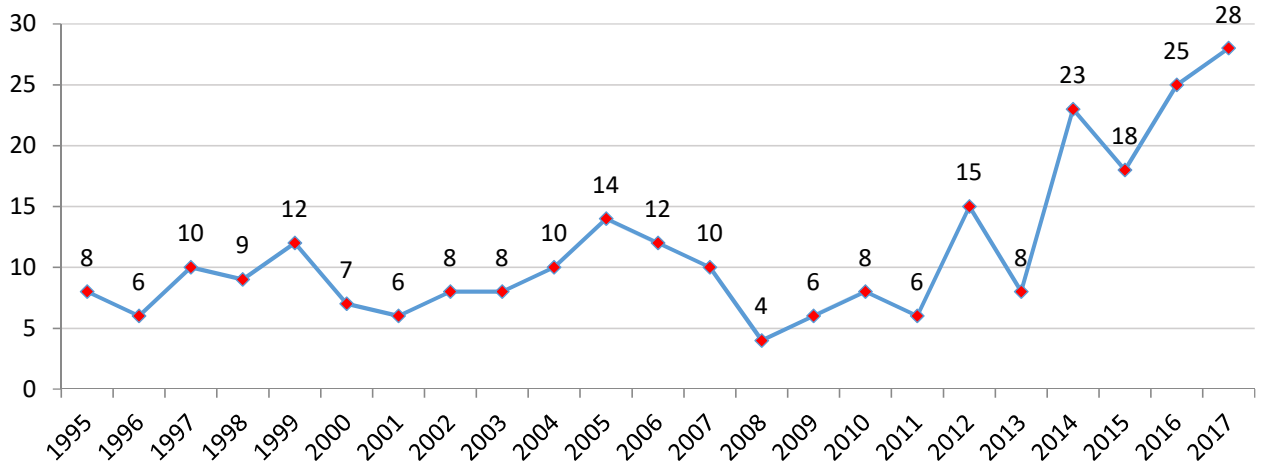
According to incomplete data, the loss exceeded $ 750 mln. 176 people were killed. About 20,000 people were forced to relocate because of these avalanches during the 1970-1987 period. 151 cases of snow avalanches were recorded during 2007-2017. 19 people died.

Map 8.5: Distribution of avalanche hazards on the territory of Georgia



Source: NEA

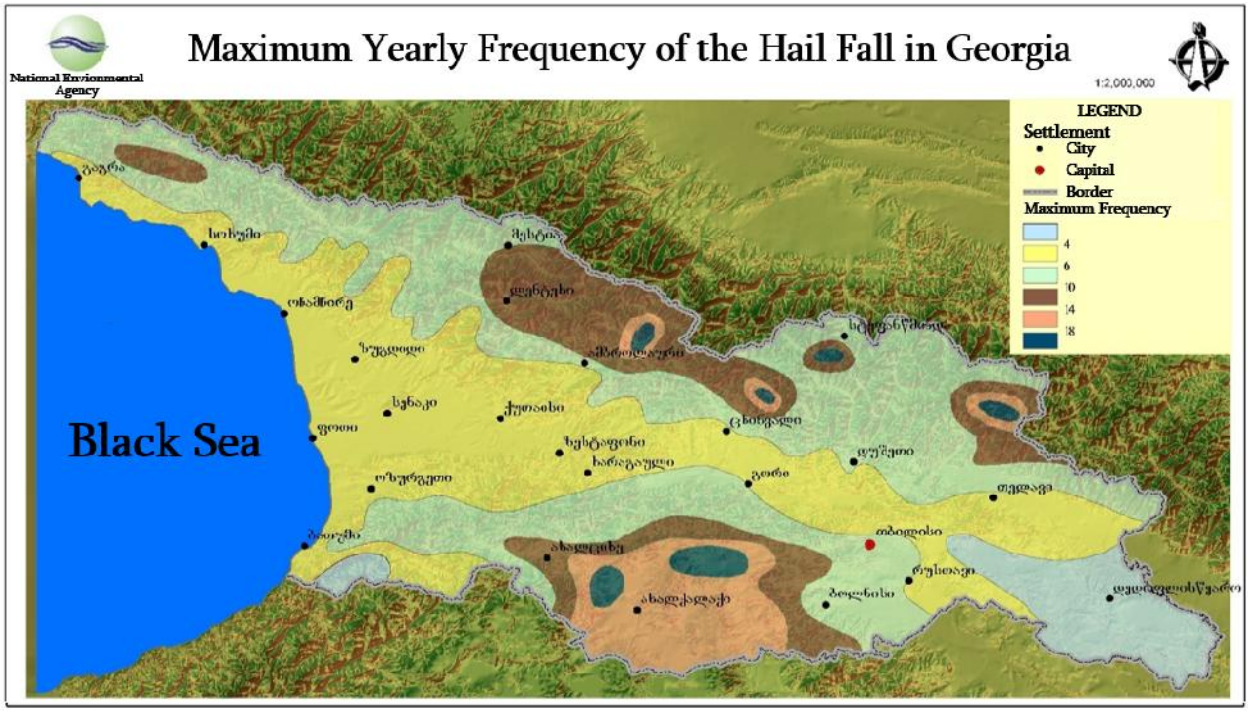
Figure 8.3.8: Number of snow avalanches recorded in the territory of Georgia in 1995-2017



Source: NEA

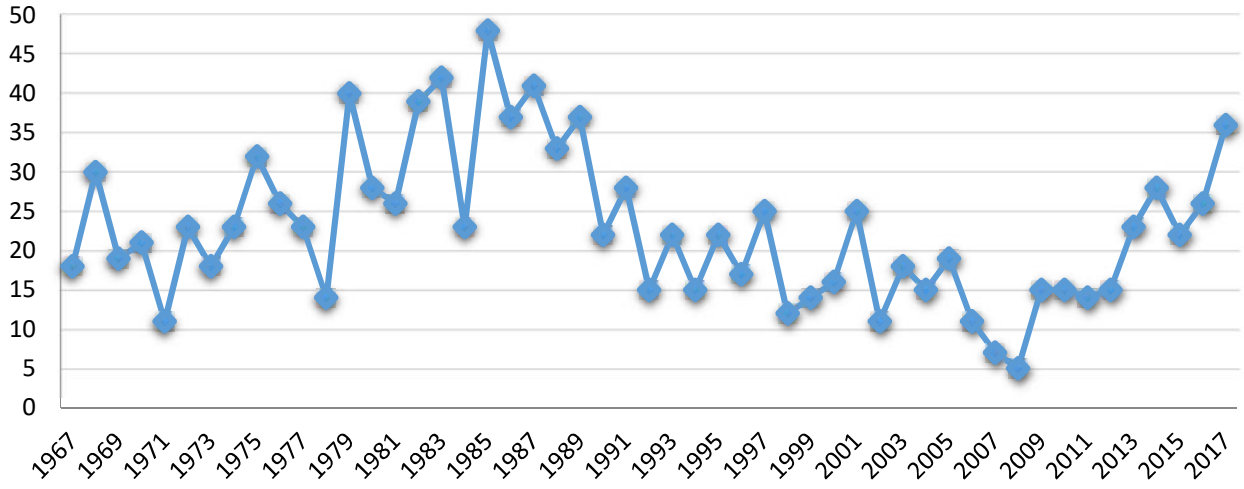
Hail - Hail is found throughout the country. Its intensity and frequency is high in eastern Georgia. The years 1983, 1987, 1993 and 1997 were particularly intense with regard to hail. According to incomplete data, the damage caused by the hail to the country in the last 15 years exceeded GEL 235 mln. There were 206 cases of hail in 2007-2017 and the damage caused by the hail during this period amounted to approximately GEL 203 mln.

Map 8.6: Distribution of hail danger in the territory of Georgia



Source: NEA

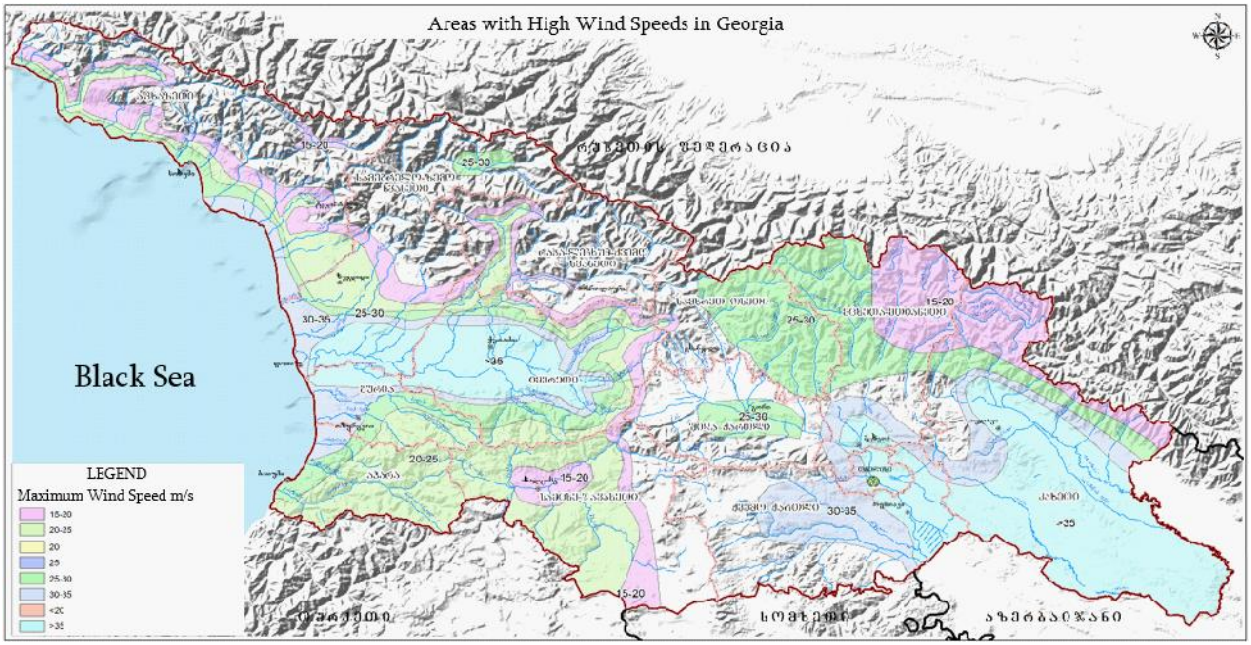
Figure 8.3.9: Dynamics of the number of hail days recorded on the territory of Georgia from 1967 to 2017



Source: NEA

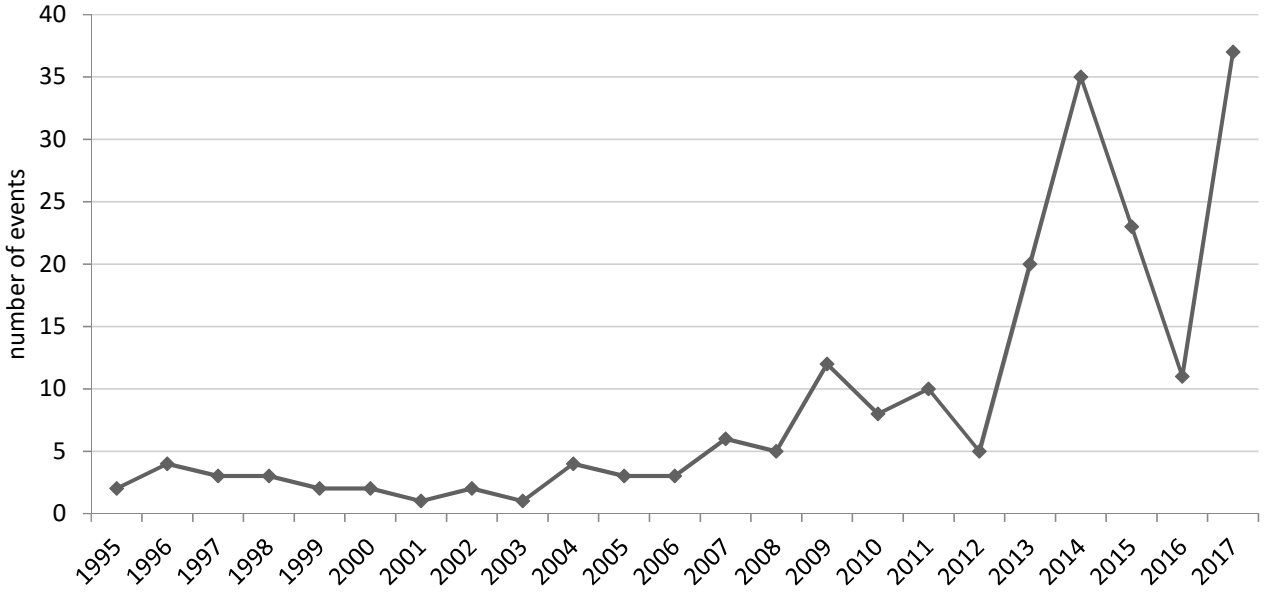
Strong winds – strong winds repeatability was spotted in various regions, Kolkheti Lowland, Zemo Imereti, Shida Kartli. Tbilisi, Kakheti and Samtskhe-Javakheti are distinguished. The number of strong winds recorded during the period 1995-2006 ranged from 1 to 4 per year, while in 2007-2017 the same figures were in the range of 6-37. According to incomplete data, the damage caused by strong winds during this period amounted to GEL 262 mln. 14 people were killed.

Map 8.7: Regionalization of Georgian territory by maximum speed of winds



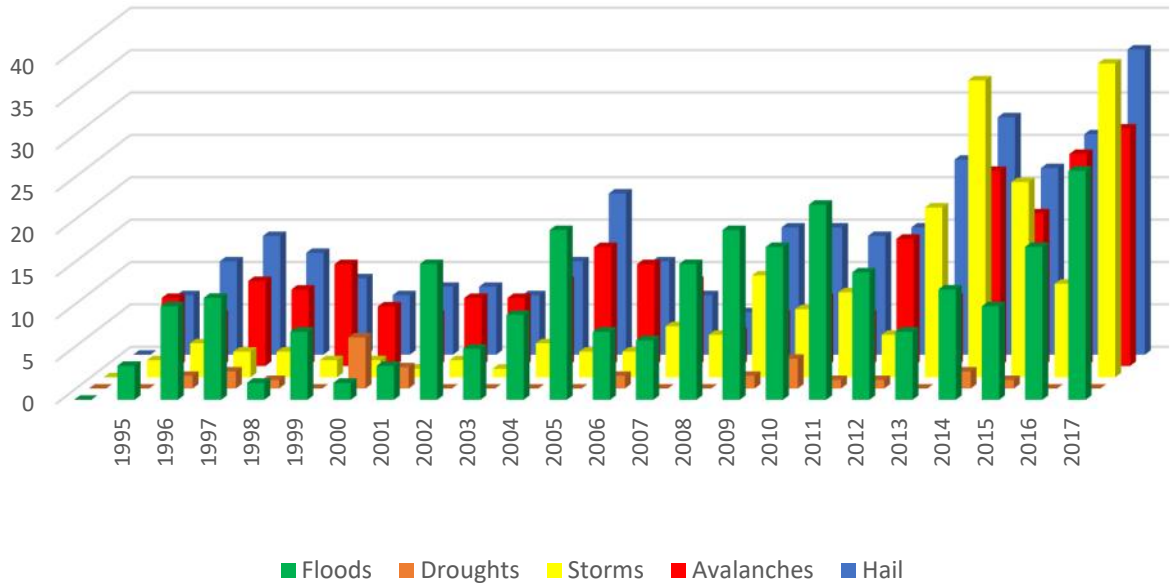
Source: NEA

Figure 8.3.10: Dynamics of strong wind events in Georgia 1995-2017



Source: NEA

Figure 8.3.11: Extreme hydro-meteorological phenomena identified in Georgia between 1995 and 2009



Source: NEA

Table 8.2: 1995-2017 Natural hydrometeorological events recorded on the territory of Georgia during the years and their negative consequences

Year	Floods			Droughts			Storms			Avalanches			Hail			Total Damage	
	Number of occurances	Damage		Duration (month)	Damage		Number of occurances	Damage		Number of potential occurances	Damage		Number of occurances	Damage			
		Mln GEL	Casualty		Mln GEL	Casualty		Mln GEL	Casualty		Mln GEL	Casualty		Mln GEL	Casualty	Mln GEL	Casualty
1995	4	3.2	1	0	0	0	2	0.5	0	8	3.2	2	7	12.7	0	**19.6**	**3**
1996	11	28.5	1	1.5	17	0	4	4	5	6	3.8	3	11	17	0	**70.3**	**9**
1997	12	38	0	2	26	0	3	1	0	10	4.2	0	14	35	0	**104.2**	**0**
1998	2	2	1	1	6	0	3	72	5	9	3.9	2	12	8.5	0	**92.4**	**8**
1999	8	30.5	1	0	0	0	2	3.5	0	12	3.7	1	9	6.9	0	**44.6**	**2**
2000	2	2	0	6	300	0	2	1	0	7	2.1	1	7	5.8	0	**310.9**	**1**
2001	4	4.1	0	2.5	21	0	1	0.1	0	6	3.5	1	8	10.4	0	**39.1**	**1**
2002	16	78.7	0	0	0	0	2	0.6	0	8	1.5	0	8	6.8	0	**87.6**	**0**
2003	6	4.2	2	0	0	0	1	0.1	0	8	2.1	2	7	6	0	**12.4**	**4**
2004	10	20.5	1	0	0	0	4	0.8	0	10	4.8	1	11	12.5	0	**38.6**	**2**
2005	20	80	4	0	0	0	3	0.4	0	14	4.5	3	19	6.9	0	**91.8**	**7**
2006	8	15	1	1.5	5	0	3	0.3	0	12	2.5	0	11	6.2	0	**29**	**1**
2007	7	40.3	1	0	0	0	6	1.1	1	10	3	1	7	5	0	**49.4**	**3**
2008	16	38	3	0	0	0	5	2.9	0	4	1.9	0	5	2.9	0	**45.7**	**3**
2009	20	30	5	1.5	6	0	12	8	8	6	2.8	2	15	9.5	0	**56.3**	**15**
2010	18	20.7	3	3.5	45	0	8	2.5	1	8	2.4	1	15	6.9	0	**77.5**	**5**
2011	23	35.1	9	1	3	0	10	0.95	0	6	1.9	1	14	6.2	0	**47.15**	**10**
2012	15	32	5	1	1	0	5	140	0	15	3.6	1	15	42	0	**218.6**	**6**
2013	8	20	0	0	0	0	20	60	3	8	1.2	0	23	40	0	**121.2**	**3**
2014	13	10	3	2	15	0	35	25	0	23	8	4	28	30	0	**88**	**7**
2015	11	112	22	1	0	0	23	8	0	18	4	1	22	15	0	**139**	**23**
2016	18	10	1	0	0	0	11	2.5	0	25	6	3	26	25.7	0	**44.2**	**4**
2017	27	15	0	0	0	0	37	12	1	28	4	5	36	20	0	**51**	**6**
სულ	252	654.8	64	24.5	445	0	165	335.25	23	233	74.6	30	294	317.9	0	**1878.6**	**123**

Source: NEA

There were several catastrophic events in the territory of Georgia in 2014-2017, which unfortunately was accompanied by human death Notable of these:

- On May 17, 2014, a rockavalanche-type landslide collapsed, along with rocky material, plunged the glacier-snow mass into a mudflow, creating a 30-meter-high ditch at the confluence of the Amali-Devdorak and Tergi rivers. The volume of torn mass was about 5 mln m^3, out of which 2 mln m^3 fell into the floodplain of the Tergi River. As a result, 8 people died at the confluence of Tergi;
- On August 20, 2014, as a result of heavy rainfall in the Devdoraki River, an excessive amount of material accumulated during the May 17, 2014 event in the valley in the form of a mudflow that killed two personnel working at the Tergi River hydroelectric power station. The processes that took place on May 17 and August 20 caused major damage to the country as a whole, disrupting Georgia's military highway, 700 and 1200 mm North-South gas pipelines, damaging high-voltage power transmission towers, vehicles, offshore border guards, customs point, causing damage to patriarch's residence and posed big problems to their staff;
- On June 13-14, 2015, activation of flashfloods,landslides and mudflows on the Vere River and its tributaries resulted in disruption of the Tskneti-Betania, Tskneti-Akhaldaba and Kojori-Manglisi highways. The low-rise housing estates, various infrastructure facilities, buildings and buildings of the Zoo in Tbilisi have been severely damaged and / or destroyed. According to the latest data, 20 people are killed and three are missing;
- On January 7, 2017, rock avalanche was activated near Shorapani, which temporarily blocked the Tbilisi-Senaki-Leselidze central highway at 188 km and created a hazardous damage to a residential home built on a slope

Photo 6.4, 6.5, 6.6, 6.7: Catastrophic Disasters in the Territory of Georgia in 2014-2017 – Debris/mudflowto Dariali Gorge, Akhaldaba Landslide In the Vere valley, rock avalanche-landslidenear Shorapani and landslide in Tskneti.

Source: NEA

State of the Black Sea coast of Georgia

Problems on the Black Sea coast of Georgia have been similar for years, though the coastline has become more pronounced than in previous years. Rubbish brought by the rivers on the Georgian seaside will be driven by storm surges along the coast. The same waves created every beach today. For centuries, the largest, storm surges created generations of high shoreline currents, sprawling beaches, thereby securely shielding the shorelines from washout.

The present mechanism for delivering nutrients to the river is completely disrupted. E.g. Due to the blockage of hydrotechnical structures, the rivers with several mln m3 of solid runoff - Enguri and Chorokhi – are not washing almost at all on the coast. The Enguri River was fed by a steady flow from the coastal Ganmukhuri to Kulevi, while the river Chorokhi fed the banks from Gonio to Kobuleti. The Rioni River still has an average annual solid runoff of about 1,500,000 m^3, but due to overcrowding in its Nabada site, it is unable to feed its dynamic system beaches and also impedes the operation of two ports simultaneously by accessing the Poti and Kulevi ports. Not even better on the small rivers - although the average annual solid runoff of the Rivers and Kintrich rivers does not exceed 60,000 m^3, the riverbeds of these rivers still retain mlns of m^3 of material.

As a result of construction, centuries-old shorelines are massively destroyed and beaches are being used, e.g. there are no perennial shorelines and beaches of natural size in the Georgian coastline. The drainage is either significantly degraded or the structure and road are additionally cultivated. The beaches are, at best, are 1/3 the width of natural dimensions. This is the case, for example, the new boulevard of Batumi, built on the ruins and the beach, which was destroyed after the first storm. There are also some buildings already under construction and some under construction that do not exceed 20-40 m in front of the protective beach, while for example Adlia should be 90-120 m and 60-70 m on other Adjara beaches. There is also a disadvantage in Grigoleti, where in some places there is no beach at all.

Currently, coastal protection works are carried out in two ways - a rocky shoreline with deformed berms and reclaimed beaches from quarries. For example, berm is used everywhere where highways and railways are required (Sarpi, Kvariati, Adlia, Chakvi, etc.). This is a good method, as in the case of deformation the shore is not lined with concrete scraps and it is easy to recover with the addition of boulders. However, the shore fortified by this method loses beaches and recreational value. In order to preserve the beaches, inert quarries of the appropriate fraction and quality are brought to the beach and artificially restored (Sarpi, Adlia, Kobuleti, Anaklia, etc.).

Significant measures have been taken since 2013 to improve the status of the coast:

1. On the Sarpi-Kvariati section was constructed 800 m long berm;
2. The boulder in front of the Adlia Wastewater Treatment Plant was extended to the runway of the Batumi International Airport;
3. Rehabilitation of the coastline from the runway of Batumi International Airport to the Cape of Batumi. Work is currently under way on the beach north of the airport;
4. Construction of a small military port near the Batumi Railway Station, where coast guard boats control all sailing vessels operating in the Georgian maritime area, both for safety and for the entire coastal zone and protected areas in an ecological manner;
5. Rehabilitation of Rioni watershed has begun. The stability of the coastline from Poti City Channel to Maltakva-Grigoleti depends on the work of this section;
6. On the south shore of the port of Kulevi, along with the construction of the terminal, berm rock was started in 2000, after which the berm length of the berm was continuously added. This 800 m stretch is subject to constant washings as it is directly bordered by a 300 m wide and 14 m deep access channel;
   Construction of the deep-sea port of Anaklia started on the Enguri River. To the south of the port under construction, at Patriot Camp, 100,000 m3 of ash were deposited on the beach to restore the washed up beach. This material will also protect the seafront areas (wetlands) south of the Churi River, up to the Khobistskali River from seawater infiltration.

8.4 MAIN CHALLENGES

Development of a natural disaster risk monitoring system, enhanced disaster preparedness, timely awareness of the population and relevant state agencies and development of an effective disaster response system necessary to mitigate and prevent adverse effects caused by natural disasters.

Considering the difficult terrain and geographical conditions of the territory of Georgia, the prerequisite for objectively assessing hydrometeorological and geological events, identifying and managing expected threats is a significant expansion of the hydrometeorological and geological observation network. In this regard, the following events in the field of geology 2014-2017 are noteworthy:

- The number of field surveys required for the planned geological monitoring at NEA has been increased twice a year since 2014 in the spring-autumn format;
- In Devdoraki-Amali river valley has been installed modern early warning system for natural disasters, with the aim of a military road (Dariali Gorge) moving vehicles, as well as Lars border crossing points or hydroelectric power station employess to early notify about the disaster;
- Geological assessment of selected vulnerable areas was carried out and maps of geological hazard zoning were prepared (for 6 municipalities[76], bordering Rioni River basin, for 6 communities[77] of Mestia municipality, Aragvi gorge in Dusheti Municipality[78] and Gldani

[76] Adaptation Fund (AF) funded and the United Nations Development Program (UNDP) implemented project "Developing Climate Resilient Flood and Flash Flood Management Practices to Protect Vulnerable Communities of Georgia".

[77] Swiss Agency for Development and Cooperation funded project "Landslide, Mudflow and Stoneware Hazard Assessment and Territory Zoning in Mestia Municipality".

[78] Within Czech Development Agency (CzDA) funded project "Evaluation of Landslide Susceptibility in the Mountainous Parts of Georgia on the Example of Endangered Settlements, International Roads and Energy Conduits in Dusheti Municipality"

river gorge[79]). Observation points were set up in landslide areas along the river. In the Rioni Basin - 3, on the river. In Aragvi basin - 3 and in Tbilisi - 3;

- Since 2016, mapping and monitoring of geological hazards (landslides, mudslides, rocks, rocks, etc.) has been carried out on the territory of Tbilisi;
- Since 2014, after a long break, the geological survey has been resumed - mapping / updating state geological maps. At this stage sheets of Tbilisi (K-38-XXI), Khashuri (K-38-XX), Kazbegi and Dariali (K-38-XV-IX) papers have been developed.
- According to the scenario developed in Kvareli municipality for flood hazard, the simulation training was conducted with the participation of the Emergency Management Service.[80].

In the future, detailed, large-scale mapping of hazard zoning and creation of a network of monitoring and early warning systems in high-risk areas remains a major challenge for the prevention of natural geological processes.

Hydrometeorological observation network in Georgia is incomplete. The number of standard, land-based hydrometeorological observation points has been substantially reduced compared to the 1990s. Aerological (vertical atmospheric sensing), radar and satellite observations have not been introduced. As well as, there is a lack of operational systems for the dissemination and distribution of hydrometeorological surveillance data and forecast products at national and international levels, the development of well-established hydrometeorological information processing and high resolution weather forecasting software (software and software, skills, etc.)

Accordingly, technical and technological re-equipment of hydrometeorological activities is necessary. According to the study[81], the economic impact of the development of hydrometeorology annually exceeds 8-10 times the amount spent on these activities.

In recent years, a number of hydrometeorological activities have been undertaken by international organizations and donor countries, as well as funds allocated from the state budget. The following are noteworthy:

- In 2014-2017, the number of hydrometeorological observation points increased by 43 units, including 3 specialized automated road meteorological stations;
- Operational practice introduced the use of meteorological radar information from the Delta, Sakaeronavigatsia and Turkish Meteorological Service for forecasting heavy rainfall and floods / floods in Georgia;
- Automatic agro-meteorological stations have been installed and maintained in all municipalities of Kakheti region to reduce the risks of natural disasters;
- An early warning system for agricultural frosts has been introduced and operates on the territory of Georgia.

To improve natural disaster risk management, with the financing of the Green Climate Fund (GCF) and co-financing by the Swiss Government, the project "Expanding the Multi Hazard Early Warning System and Using Climate Information in Georgia" is planned. The goal of the project is to avoid possible adverse effects (human death and economic loss) caused by natural disasters caused

[79] Supported by the United Nations Development Program (UNDP) and the Government of Sweden

[80] Supported by the Ministry of Foreign Affairs of Poland, within the framework of the Polish Center for International Aid, the project "Anti-flood early warning and prevention systems in Georgia: special focus on Kabali and Duruji rivers".

[81] Results of a 2006 World Bank Survey on the Economic Efficiency of Hydro-Meteorological Activities in Georgia.

by climate change in Georgia due to the disastrous hydrometeorological and geological events (flood, drought, hail, strong wind, snow avalanche, landslides, debris/mudflows) and to implement an early warning system for those events.

During 2014-2017 NEA actively participated in international projects, which significantly contributed to the implementation of modern methodologies of natural disaster research and its implementation.

III/9 WASTE

Along with the economic development of the country, the amount of waste generated also increases. Problems caused by improper waste management are specific and at the same time complex. Uncontrolled disposal of domestic and hazardous waste or landfills existing without proper standards pollute the soil and water, and methane generated by the decomposition of organic waste has a negative impact on climate change processes. Improper waste management, such as the burning of used oils and plastics, generates toxic gases in ambient air, posing a threat to human health and the environment. Waste management with modern standards and prevention of pollution caused by waste are one of the major priorities of Georgia. Given the increased public awareness and environmental requirements of the EU-Georgia Association Agreement (AA), the waste management sector in Georgia is being improved in recent years. Waste prevention and recycling is Georgia's vision in the long term.

9.1 MAIN QUESTIONS AND MESSAGES

1. ***Does Georgia fullfill its obligations within the AA in the field of waste management?***

Z In the field of waste management, the Waste Management Code was adopted in accordance with the requirements of Directive N 2008/98/EC. According to the Code, the National Waste Management Strategy (2016-2030) and the National Action Plan (2016-2020) were approved. 12 bylaws have also been adopted and initial drafts of 6 technical regulations have been developed. In accordance with the obligations of Directive 1999/31/EC, the Technical Regulation „on Construction, Operation, Closure and After-care of Landfills" has been adopted. The first draft of the Biodegradable Municipal Waste Strategy has also been developed.

Z The Waste Management Code defines the competent authorities in the field of waste. The basic requirements for the preparation of waste management planning and prevention programs have been established in accordance with the five-step hierarchy. Waste classification, permiting, registration, accounting / reporting (electronic) and control systems were also established. It has become possible to classify landfills. Standards for construction, operation, closure, after-care and monitoring of landfills, etc. have been established. Accordingly, the obligations considered by the AA are fulfilled in accordance with the deadlines.

2. ***What is the state of waste management in the country?***

Z More than 900,000 tonnes of municipal waste is generated annually in the country, which at this stage are disposed on old landfills without further processing. Biodegradable waste accounts for the largest share of municipal waste. Approximately 78% of the total amount of municipal waste is generated in urban areas and 22% in rural areas. Waste management infrastructure is gradually improving. There are 58 official landfills in total and 34 of them are operational. 31 landfills were renovated in 2014-2017, 5 transfer stations were built and 23 landfills were closed.

Z There is still no proper waste management infrastructure in the country. As of 2017, municipal waste is not being separated. Municipal waste management services throughout the country are not yet provided and there are still natural landfills. Excessive plastic bags are consumed. There are no precise data on the amount and composition of the various types of hazardous and non-hazardous waste generated and processed in the country. The management of historical hazardous waste remains a challenge.

Z Municipal waste separate collection will be introduced gradually from 2019, as well as extended producer responsibility (EPR), which should ensure the separate collection of specific waste, transportation and processing in accordance with environmental requirements. More than 1,000 company waste management plans have been agreed. About 4,000 companies appointed environmental managers. All municipalities of Georgia have developed and approved a 5-year municipal waste management plan. Since 2018, an electronic waste management system has been put in place, through which waste management activities subject to registration activities are registered by operators, hazardous waste transportation forms are filled / submitted, and annual

waste accounting / reporting forms are submitted as well. The system will enable availability of precise data on the amount of generated and processed waste by species and codes in the near future. Since 2018, the import, production and sale of plastic bags has been phased out gradually. It is planned to adopt a biodegradable waste management strategy. Municipalities will have to liquidate the natural landfills by 2020. By 2025, construction of 8 regional landfills and closure of existing landfills is planned. During the reporting period, historical arsenic-containing waste in Ambrolauri municipality was safely disposed, but continued monitoring and control is still needed. Measures are under way to safely dispose of arsenic-containing waste in the Lentekhi Municipality.

9.2 STATE REGULATION

Waste management issues in Georgia fall within the scope of several ministries.

The competence of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) is to: develop and implement a unified state waste management policy; develop national waste management strategies, national plans and coordinate their implementation; regulate waste import, export and transit within its competence; regulate waste management, implement state accounting/reporting and produce database on wastes within its competence; fulfill the obligations Georgia under international agreements in the field of waste management within its competence; identify priority areas of environmental measures in the field of waste management and coordinate their implementation; develop state targeted waste management programs and coordinate their implementation within its competence; coordinate management of hazardous and specific waste; promote waste prevention, separation, pre-treatment, re-use and recycling; register waste management activities; execute state waste management control.

The competence of the Ministry of Regional Development and Infrastructure of Georgia is to construct, manage and close non-hazardous waste landfills throughout the country (except for Tbilisi Municipality and Adjara A/R. Also, the construction and management of waste transfer stations falls within the competence of the mentioned agency. Construction, operation and closure of non-hazardous waste landfills on the territories within the administrative boundaries of Adjara A/R and Tbilisi Municipality is the competence of the relevant bodies of the government of Adjara A/R and Tbilisi City Hall.

LEPL Revenue Service of the Ministry of Finance of Georgia carries out customs control of transboundary waste transportation. The Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia, within the scope of its competence, regulates and controls the management of medical waste. The Ministry of Economy and Sustainable Development of Georgia (LEPL Land Transport Agency) is responsible for issuing admission certificates for means of transport to transport hazardous waste.

Municipal waste management (including development of municipal waste management plan) is the compentence of municipalities in the field of waste management, as well as the cleaning of streets, parks, squares and other public places in municipal areas is the responsibility of local authorities.

The Law of Georgia on Waste Management Code is in force since 15 January 2015. The Code is in full compliance with the requirements of the EU Directives provided by the AA. The purpose of the Code is to: protect the environment and human health; create legal bases in the field of waste management; prevent and reduce waste generation and its negative impact; establish effective waste management mechanisms; promote an efficient use of waste as a resource.

The Waste Management Code provides for the introduction of a 5-step hierarchy system (1. waste prevention; 2. Preparation for re-use; 3. recycling; 4. other types of recovery including energy

recovery; 5. disposal); requirements and obligations for collection, transportation, recovery and disposal of hazardous, non-hazardous and inert waste, including subjects related to planning, accounting, registering, permit issuing and control of waste management. The law defines the competences and general obligations of the state bodies involved in waste management, which were not precisely defined at the legislative level in Georgia until 2015.

The Code defines administrative offenses and prosecution related to waste management and waste disposal in line with international law standards and European experience. The maximum amounts of financial sanctions and general rules applicable to all waste-related violations are set.

The National Waste Management Strategy and National Action Plan were approved by the Government Resolution N160 of April 1, 2016. The National Strategy sets out the country's waste management policy and strategic direction for a 15-year period (2016-2030). The strategy is based on the AA requirements and international waste management principles. The strategy defines the strategic vision, goals and objectives of the country. Accordingly, the goals and objectives of the strategy are formulated, on the one hand, to address urgent problems in the field of waste management, and on the other, to achieve the basic conditions necessary for a long-term vision.

The National Action Plan outlines the measures related to the establishment of a modern waste management system in Georgia. The plan covers a 5-year period (2016-2020) and includes the measures and objectives required by the National Waste Management Strategy of Georgia, including implementation deadlines, responsible state structures, estimated costs and potential funding sources.

In order to improve the municipal waste collection system, in accordance with the Waste Management Code, the National Waste Management Strategy and the National Waste Management Action Plan, all municipalities of Georgia have developed and approved a 5-year municipal waste management plan.

Also, in accordance with the Waste Management Code, a natural or legal person, whose activity generates more than 200 tonnes of non-hazardous waste, more than 1,000 tonnes of inert waste or any amount of hazardous waste during the year, is obliged to develop and submit to MEPA the waste management plan of the company. The purpose of the regulation is to improve the management of waste generated during industrial process. At this stage, the Ministry has agreed a waste management plan for more than 1,000 companies describing information on waste generated by them and further management activities. About 4,000 companies have designated environmental managers responsible for preparing and updating the company's waste management plan, organizing the implementation of the plan, and exercising internal control over compliance with the requirements of Georgian waste management legislation. The Department of Environmental Supervision (DES) supervises the enforcement of the company waste management plans.

A number of bylaws have been adopted under the Waste Management Code, in particular:

- Resolution N426 of the Government of Georgia of 17 August 2015 “on the Definition of List of Waste and Classification of Waste According to its Types and Characteristics”;
- Resolution N422 of the Government of Georgia of August 11, 2015 “on Approval of the Technical Regulation on the Form and Content of Keeping a Record of Waste and Reporting”;
- Resolution N421 of the Government of Georgia of 11 August 2015 “on Approval of the Technical Regulation on Construction, Operation, Closure and After-care of Landfills”;

- Order N211 of the Minister of Environment and Natural Resources Protection of Georgia on August 4, 2015 “on Approval of Procedures for Review and Approval of the Company Waste Management Plan;
- Resolution N159 of the Government of Georgia of April 1, 2016 “on Approval of the Technical Regulation on Municipal Waste Collection and Processing”;
- Resolution N144 of the Government of Georgia of 29 March 2016 “on the Rules and Conditions for Registration of Waste Collection, Transportation, Pre-Treatment and Temporary Storage”;
- Resolution N145 of the Government of Georgia of 29 March 2016 “on Approval of the Technical Regulation on Special Requirements for the Collection and Treatment of Hazardous Waste”;
- Resolution N143 of the Government of Georgia of 29 March 2016 “on Approval of the Technical Regulation - Waste Transportation Rules”;
- Resolution N294 of the Government of Georgia of 16 June 2017 “on the Approval of the Technical Regulation - Medical Waste Management;
- Resolution N605 of December 29, 2017 of the Government of Georgia of 29 December 2017 “on Approval of Technical Regulation on Rules for Health of Non-Food Products of Animal Origin (including Animal Waste) and Secondary Products not Designed for Human Use, and for the recognition of business operator associated with that activity ”.
- Resolution N325 of the Government of Georgia of 8 June 2018 “on Approval of the Terms of Waste Incineration and Co-incineration”[82];
- Resolution N472 of the Government of Georgia of September 14, 2018 “on Approval of the Technical Regulation – Regulation Rules of Plastic and Biodegradable Bags”[83].

Cross-border shipment of waste in Georgia is regulated by the requirements of the Law of Georgia on Waste Imports, Exports and Transit (Law adopted in 1995, last amend in 2017) and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Georgia accessed in 1999). According to the law, the import and transit of hazardous waste is prohibited, and the export of hazardous waste is carried out in accordance with the Basel Convention procedures. As for non-hazardous waste, the import of non-hazardous waste is permitted only for their subsequent recovery. Permit for export and transit of non-hazardous waste is not required by the Ministry unless it is required by the country of import or transit. In addition, the Resolution N259 of the Government of Georgia dated June 9, 2016 approved the "List of Waste Allowed for Import into Georgia, Export from the Territory of Georgia and Transit the the Territory of Georgia". In order to fully comply with the requirements of the Basel Convention and the relevant EU regulation, a draft Law on Waste Import, Export and Transit has been developed.

9.3 CURRENT SITUATION IN GEORGIA

9.3.1 WASTE GENERATION

The waste is mainly generated from industry, agricultural services and household sectors. Depending on the properties, the waste can be hazardous or non-hazardous. However, waste by characteristics can be inert (stable), biodegradable, etc.

[82] Approved in 2018.
[83] Approved in 2018.

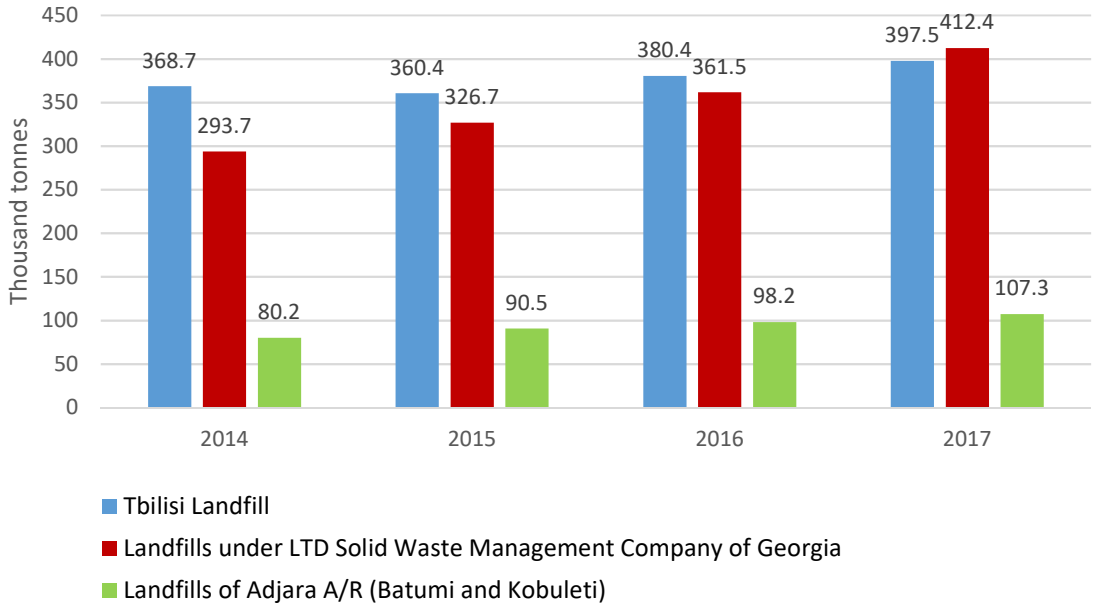
Municipal waste

Municipal waste is domestic waste (household waste), as well as other waste that is similar to household waste by its characteristics and composition. Other sources of municipal waste are offices, shops and malls, supermarkets, markets, administrative buildings, schools, restaurants, hotels and more.

According to the number of waste disposed on the existing/operational non-hazardous waste landfills, as of 2017, more than 915,000 tonnes of municipal waste is generated in the country. However, given that waste management services throughout the country are not yet fully provided and there are still natural landfills, the amount of municipal waste generated in the country is expected to exceed given number.

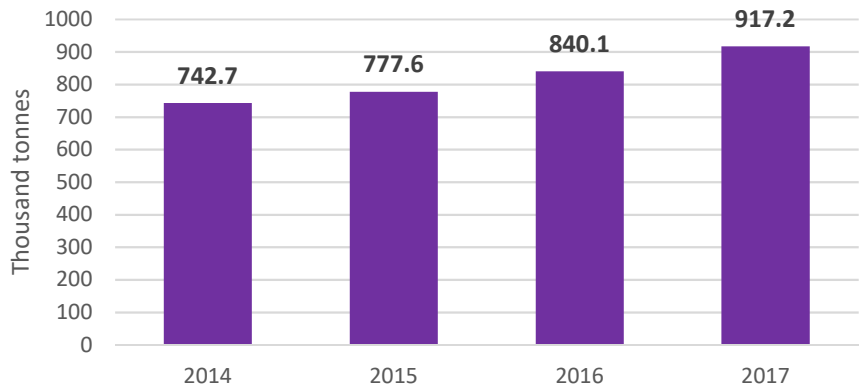
The figures below show the dynamics of waste disposed in Georgian landfills by years.

Figure 9.3.1: Amount of waste disposed in Georgian landfills in 2014-2017 (thousand tonnes)



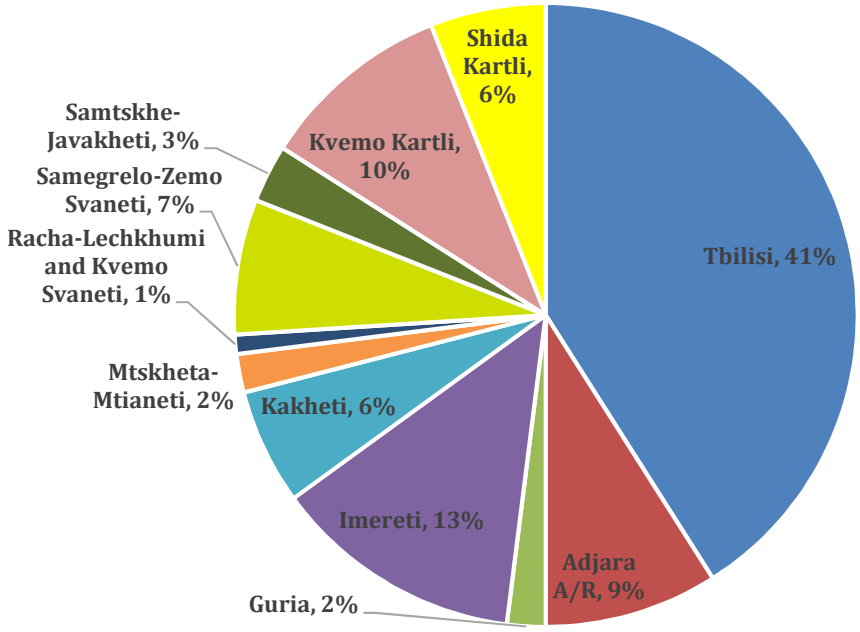
Source: LTD Tbilservice Group of Tbilisi City Hall, LTD Sandasuftaveba (Adjara A / R), LTD Solid Waste Management Company of Georgia

Figure 9.3.2: Total amoun of waste dumped on Georgian landfills in 2014-2017 (thousand tonnes)



Source: LTD Tbilservice Group of Tbilisi City Hall, LTD Sandasuftaveba (Adjara A / R), LTD Solid Waste Management Company of Georgia

Figure 9.3.3: Distribution of Municipal Waste by Regions of Georgia, 2018



Source: Materials of the draft Biodegradable Waste Strategy[84]

In 2015-2016, within the framework of the Caucasus Environmental NGO Network (CENN) project "Waste Management Technologies in Georgia", a seasonal morphological study of municipal waste was carried out in 3 regions of Georgia (Kakheti, Shida Kartli, Adjara A/R). The study revealed that morphological composition of the waste in all three regions is similar and 10 major waste categories were identified as well.

Table 9.1: Morphological composition of municipal waste in three regions of Georgia in 2015-2016 (%)

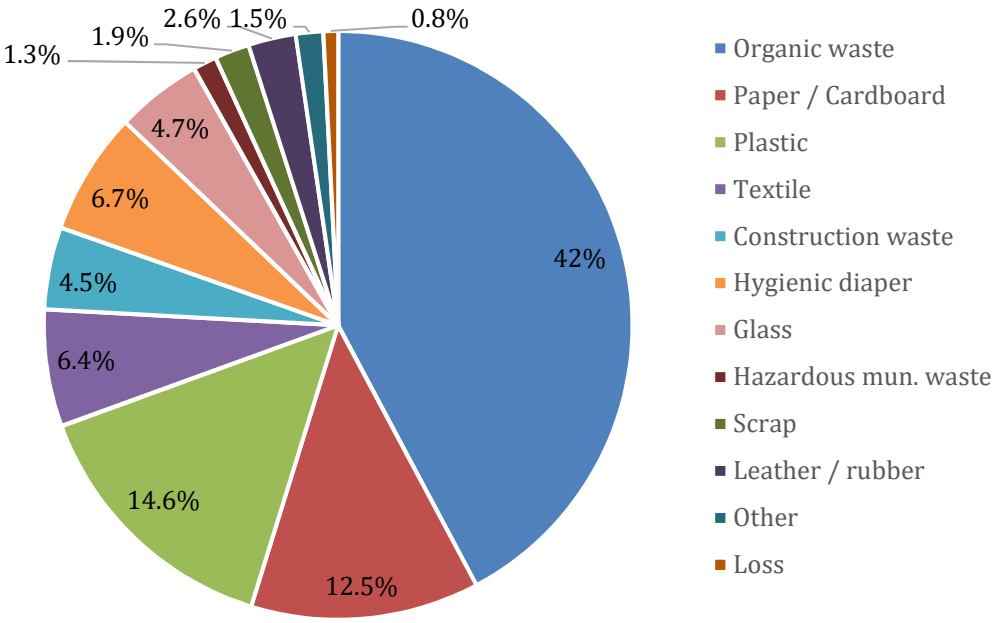
	Waste category	Kakheti %	Shida Kartli %	Adjara A/R %	Average %
1	Organic waste	42.71	46.725	36.61	42.015
2	Paper / Cardboard	11.19	11.72	14.7	12.5
3	Plastic	12.84	14.257	16.68	14.59
4	Textile	6.11	6.235	6.81	6.38
5	Construction waste	3.17	4.365	6	4.51
6	Hygienic diaper	8.71	5.477	5.89	6.69
7	Glass	5.95	3.25	5.02	4.74
8	Hazardous municipal waste	1.12	1.012	1.81	1.314
9	Scrap	2.27	1.825	1.73	1.941
10	Leather / Rubber	3.25	2.45	2	2.56
11	Other	2.2	0.85	1.4	1.483
12	Loss	0.43	0.605	1.3	0.778

Source: Seasonal study reports for the determination of morphological composition of solid household waste[85]

[84] Development of the Biodegradable Waste Strategy is being implemented within the framework of the EU project "Technical Assistance for the Improvement of Waste Management Systems in Georgia".

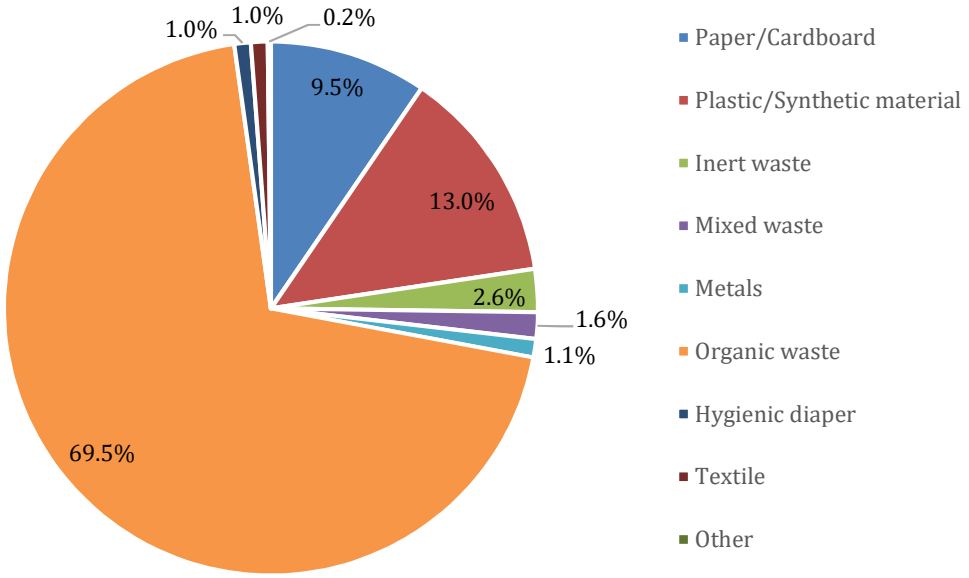
[85] The study was conducted within the framework of the project "Waste Management Technologies in Georgia", which was funded by USAID and was implemented by the CENN.

Figure 9.3.4: Average morphological composition of municipal waste in three regions of Georgia in 2015-2016 (%)



Source: Seasonal study reports for the determination of morphological composition of solid household waste

Figure 9.3.5: Average morphological composition of Tbilisi municipal waste (2014,%)



Source: LTD Tbilservice Group[86]

Studies show that biodegradable waste (kitchen, garden and park paper and similar waste), followed by plastic waste, accounts for the largest percentage of municipal waste.

According to the municipal waste management plans submitted, the average rates of municipal waste generation are: in the city - 0.77 kg / person / day; In the village - 0.31 kg / person / day. These figures are similar to those of Eastern European countries: 0.7 kg / person / day in the city

[86] The survey was carried out by LTD Tbilservice Group at Tbilisi Municipal Waste Polygon in October-December, 2014.

and 0.3 kg / person / day in the rural area. Approximately 78% of the total municipal waste is generated in cities and 22% in rural areas[87].

Medical waste

In the field of waste management, the medical waste management system is one of the most well established in Georgia. Separate waste collection is carried out at medical facilities, which for further transportation and disposal is transferred to the companies with the relevant registration / permit. Approximately 1,500 tonnes of medical waste is produced annually in the country, of which waste classified as hazardous is decontaminated in incinerators with appropriate permits.

Waste of electric and electronic equipment

According to the study conducted within the project "Supporting the Introduction of Extended Producer's Responsibility (EPR) Principle as Required by Waste Management Code"[88], 9 categories of electronic waste (refrigerators, household air conditioner, washing machine, dishwasher, electric stove, TV, mobile phone, portable computer), amounted to approximately 14 700 tonnes in 2017 in Georgia, while the number of all types of electronic waste – to 29 100 tonnes (7.8 kg per capita). Research conducted within the same project revealed that only 1% of electric and electronic equipment is made in Georgia and 99% is imported. However, the electric and electronic equipment market is concentrated in Tbilisi (48%) and in big cities - Batumi (13%) and Kutaisi (11%).

Historical hazardous waste management

In Ambrolauri (Uravi) and Lentekhi (Tsana) municipalities arsenic extracting and processing plants were built and operation was started in the 30s of last century. Enterprises stopped operation in the early 1990s, ores extracting and processing were stopped as well. Around 120,000 tonnes of arsenic waste have been abandoned without any control, posing a threat to the environment and human health.

Uravi Site

Within the framework of the project "Arsenic-containing Mining Waste Management in Georgia"[89] the situation in Uravi village in Ambrolauri municipality was evaluated and an action plan for safe disposal of waste was developed in 2014-2015. With the funding of the project and the support of Ambrolauri Municipality, 8 heavily contaminated monolithic buildings were dismantled and two new sarcophagi were constructed (on Uravi 1 and 3 sites), where arsenic-containing waste, contaminated soil and inert materials from Uravi 1, Uravi 3 and Uravi 4 sites were placed. At this stage, Ambrolauri Municipality is carrying out additional works on Uravi 4 site.

Tsana Site

3 sites for waste disposal have been identified in the River Tskhenistskali Gorge within Lentekhi Municipality. The first site (Tsana 1) is located on the right bank of the River Tskhenistskali, 5 km away from Mele village. The second site (Tsana 2), where waste is left open in the damaged metal barrels, is 0.5 km far from Tsana 1. The area is partially covered with land, bushes and forest. The third site (Tsana 3) is 20 km from Tsana 1 and is located in the vicinity of the village Tsana (Korulda), near the headstream of the River Tskhinistskali. Due to its proximity to the river, these arsenic-containing wastes pose a particular threat to the environment and human health.

[87] Source: Materials of the draft Biodegradable Waste Strategy

[88] The project was funded by the Swedish International Development Agency (SIDA) and the United Nations Environment Program (UNDP). The project was implemented by Georgia's Environmental Outlook (GEO).

[89] The project was funded by the Government of Netherlands and cofinanced of Georgia.

For the purpose of protecting arsenic-containing waste disposal area from flooding, the LEPL Municipal Development Fund constructed a protective wall in 2014 and fenced the waste disposal area on Tsana 1 site. The Tsana 2 and Tsana 3 sites were fenced within the framework of the project "Arsenic-containing Mining Waste Management in Georgia".

Within the framework of cooperation with the OSCE[90], for safe disposal of arsenic-containing waste, the construction project of two burials on Tsana 1 and Tsana 3 were prepared with the appropriate cost estimates. According to the OSCE recommendation, arrangement of 3 burials in the Lentekhi municipality is reasonable. One of them – on Tsana 1 with a volume of 12 154 m^3, where arsenic-containing wastes and remains of contaminated buildings from Tsana 1 and Tsana 2 will be placed, and another two – on Tsana 3 site, one for hazardous waste with 30 903 m^3 volume, where arsenic-containing wastes and the remains of contaminated buildings located on the same site will be placed, and another for non-hazardous waste with the volume of 3 215 m^3.

In line with the recommendations of international experts invited by the OSCE, the Ministry has developed a sub-program "Ensuring Safe Disposal of Arsenic-containing Waste for Human Health and the Environment", covering 2018-2021, with a total cost of approximately GEL 6 mln. This sub-peogram envisages the construction of a sarcophagus at site 1, where arsenic-containing waste from Tsana 1 and Tsana 2 will be located; Also, construction / modification of the river protective / erosion control wall is planned on the same site. Two sarcophagi will be built on Tsana 3 site to accommodate up to 30,000 m^3 of waste.

9.3.2 WASTE RECYCLING

According to the Waste Management Code, waste treatment (recovery / disposal) is subject to an environmental impact permit / environmental decision. As of February 2018, 43 companies in the country have received appropriate permits for hazardous and non-hazardous waste treatment. Plastic, paper, rubber and elastomeric waste (including tires), glass are treated. Private companies are also actively engaged in the collection and treatment of hazardous waste such as used oils, lead-containing accumulators, etc.

9.3.3 DISPOSAL OF WASTE

Diposal on landfills

Municipal waste collected throughout the country is dumped entirely on landfills. There are 58 official landfills (57 landfills fall under State/municipal management and 1 is private property), 34 of which are in operation and only 2 landfills (Tbilisi and Rustavi) have permits (another one is Borjomi landfill, which is not operational; closing procedures are underway). Permit is issued for constuction and operation of Batumi regional non-hazardous waste landfill and Kutaisi regional landfill. Preliminary works for the construction of both landfills are currently underway.

There are still many unauthorized and uncontrolled natural landfills in the country. In many cases they are located on the banks of the rivers or close to the population, and thus endanger human health and the environment. According to the National Waste Management Strategy and National Action Plan, municipalities are responsible for the closure / remediation of natural landfills by 2020,

[90] The title of the project is "Addressing Emergency Environment and Security Threats at the Arsenic Mining Site in Tsana, Georgia".

as set out in their waste management plans. The process has already begun, though precise data on the number of closed natural landfills in the whole country is not available at this time[91].

Also by 2023 all existing unauthorized old landfills should be closed and 8 regional landfills planned to operate by 2025.

There are no landfills with official permits for inert waste in the country. Accordingly, inert waste, including construction waste, is partially disposed of on non-hazardous waste landfills or used for filling / repairing works during the construction of certain infrastructure facilities.

In 2015-2017, the Department of Environmental Supervision (DES) identified 4,147 cases of violations of waste management legislation, about 44% of which constituted littering of environment by municipal waste. The number of cases of littering the environment with construction or other inert waste and burning of non-hazardous waste in the open air or inside inappropriate burning equipment were also significant (818 in total). The fine imposed on these violations amounted to approximately GEL 550 thousand.

Incineration

Waste is also disposed of/decontaminated in incinerators, with more than 20 incinerators are permitted to construct/operate. Most of these incinerators incinerate medical waste, though some incinerators incinerate other types of hazardous and non-hazardous waste.

9.4 WASTE MANAGEMENT INFRASTRUCTURE

Municipal waste collection services are provided by local municipalities to the population, however, such services are not yet fully available in remote settlements. According to the National Waste Management Strategy and National Action Plan, municipalities are responsible for achieving 90% of municipal waste collection by 2020 and 100% by 2025.

The number of containers in the Tbilisi Municipality as of July 1, 2018 was 33 126 units, which were emptied daily by LTD Tbilservice Group, and several times per day as required and needed for certain facilities. In 2017, 230 garbage trucks operated in the city.

To improve municipal waste management services, 155 vehicles and 19 600 pieces of 1 100-liter container were delivered to municipalities in 2016-2017. However, it is still not sufficient to provide proper municipal waste service.

As mentioned above, the waste will be disposed of on existing landfills. In 2014-2017, 31 landfills under the management of Solid Waste Management Company of Georgia were renovated, 5 waste transfer stations were built and 23 landfills were closed.

Tbilisi is served by one domestic waste landfill operated by LTD Tbilservice Group. The landfill is located in the vicinity of Didi Lilo village and covers an area of 84 ha. According to the Feasibility Report (2010), landfill operation without a sorting plant is defined for 25 years and in the case of a sorting plant - for 50 years. Waste separation at the landfill is not carried out due to the absence of a sorting plant.

Since 2019, municipalities will gradually start separate collection of minicipal waste (paper, plastic, glass and metal). At this stage pilot separate waste collection projects have been implemented in

[91] In 2015-2019, 23 natural landfills were closed in Adjara A/R and Kakheti Region, with total area of 8.5 ha, as part of the project "Waste Management Technologies in the Regions" implemented by CENN (funded by USAID).

Tbilisi and Municipalities of Adjara A/R, where 45 separate waste collection sites were placed in which residents can put paper, plastic, glass and metal.[92].

There are no landfills for hazardous and permitted inert (including construction) waste in the country. Only a small number of existing landfills have special cells for waste such as asbestos waste.

Inert waste, including construction, will be partially disposed of in non-hazardous waste landfills or used for filling / repairing works during the construction of certain infrastructure facilities.

9.5 MAIN CHALLENGES

In spite of the positive steps taken in the field of waste management in Georgia in recent years, additional efforts are needed to establish appropriate standards of waste management at national level addressing the problems that have accumulated over the years. It is necessary to continue to implement the actions set out in the Waste Management Strategy and Action Plan and to provide necessary capacity for this.

There is still no proper waste management infrastructure in the country. There are also no hazardous and inert (including construction) waste landfills. Municipal waste management services throughout the country are not yet fully provided and there are still natural landfills. In addition, there is a need to raise public awareness on waste management issues.

If municipal biodegradable waste is collected separately and properly managed, it will become a valuable product from which compost can be produced or energy can be recovered. Moreover, if biodegradable waste is properly managed, the landfill will contain much less waste, allowing the landfill to extend its lifecycle. In order to facilitate the implementation of this practice, the first draft of the National Strategy on Municipal Biodegradable Waste Management (2020-2050) has been developed.

As already mentioned, since 2019 obligation for municipalities to collect municipal waste separately enters gradually into force. Also, as of December 2019, there is an Extended Producer's Responsibility (EPR) obligation, which implies that producers (including importers) and marketers of such products by using of which specific waste is generated, will be obliged to take care of the collection, transportation and management of such waste in accordance with environmental requirements. EPR applies to packaging waste, batteries, electric and electronic waste, oils, tires, vehicles removed from use. Waste recycling rates will increase significantly after these commitments take effect.

Excessive consumption of plastic bags is another major challenge for municipal waste management. As of 2014, one citizen of Georgia consumed an average of 525 single use plastic bags a year, compared to 14 in Ireland, for example, and 4 in Denmark and Finland. Since 2018, the import, production and sale of plastic bags has been gradually phased out in order to prevent plastic waste and reduce its negative impact on the environment.

There is no accurate data on the amount and composition of the various types of hazardous and non-hazardous waste generated and treated in the country. In response to the challenge the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) in 2018 launched an electronic waste management system, where operators, whose waste management activities are subject to registration, fill/submit hazardous waste transportation forms, present the company's waste management plans, sumbit and approve application on activities subject to registration, and

[92] With the frame of the project "Waste Management Technologies in Georgia" funded by USAID and implemented by CENN.

submit the annual waste accounting/reporting forms (including annual reports of waste generation, waste disposal on landfills, waste collection and treatment). 650 organizations have been registered in the system, and precise data on the amount of waste generated and treated by them will be made available after submission of the above-mentioned reporting forms to the Waste Management System.

A significant source of environmental pollution is historical waste, including arsenic-containing mining waste. Despite the steps taken towards the safe disposal of these waste, the problem remains urgent and appropriate action is needed. Therefore, the Ministry is taking measures to minimize the negative impact of arsenic-containing waste on the environment and humans.

III/10 CHEMICALS

Consumption of various natural and artificial chemicals in industry, agriculture and household farming is an integral part of modernity. However, misuse and mistreatment of chemicals can cause serious harm to human health and the environment. Therefore, proper management of chemicals to reduce environmental pollution (source of pollution) and risks to humans and ecosystems is one of the most important issues.

10.1 MAIN QUESTIONS AND MESSAGES

1. ***How are chemicals regulated in Georgia?***

Z Since misuse of chemicals can cause serious harm to human health and the environment, their proper management is a major concern worldwide. Along with national legislation, it is important that Georgia regulates the issue of chemicals management by fulfilling its obligations under relevant multilateral frameworks, international processes and commitments under the Association Agreement between Georgia and the European Union. Namely, Georgia is a party to the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, the Vienna Convention for the Protection of the Ozone Layer and the Stockholm Convention on Persistent Organic Pollutants. Georgia has also signed the Minamata Convention on Mercury and internal state procedures for accession to the Convention are underway. Georgia is also involved in the implementation of the Strategic Approach to International Chemicals Management (SAICM).

2. ***What is the state of affairs regarding the management of persistent organic pollutants (POPs), mercury and ozone depleting substances (ODSs)?***

Z There is no production of POPs in Georgia. Their importation is prohibited by national law. The main source of its existence in the country is the obsolete pesticides containing up to 2700 tonnes of Soviet-era models, some of which were exported from the country in 2014-2017. In 2004-2014, the level of emissions of dioxins and furans into the environment was reduced by almost two-fold, largely due to the elimination of open and uncontrolled combustion practices;

Z Georgia does not produce mercury (Hg) or Hg-containing products. Significant quantities of elemental Hg are not imported into the country. However, according to calculations, the emissions of mercury into the environment in Georgia are quite high - up to 4 200 kg per year. About 45% of these sources are primary metal production, mainly gold mining. About 50% of the released Hg is in the soil;

Z Georgia does not produce ODSs. It is prohibited to import all except two ODSs in the country. One of these two ODSs is permitted only for quarantine and pre-shipment consumption, while the other is quoted and the quota is reduced each year. Import-export of ODSs is regulated by the permit system. The quoted ODS consumption for 2017 decreased by 57% compared to the baseline level.

10.2 STATE REGULATION

Issues related to the management of chemicals in Georgia fall within the scope of several ministries. The Ministry of Environment Protection and Agriculture of Georgia manages the chemicals in accordance with the requirements of national legislation and a number of international agreements with Georgia. The Ministry shall issue permits for the import, export, re-export and transit of ozone-depleting substances, as well as the screening procedure for the chemical manufacture of the intermediate product by chemical processing of the intermediate product and the arrangement and operation of the chemical product repository. The functions of the Ministry include: control of import, transportation, sale, marking, storage, use, production (packaging) of pesticides and agrochemicals, quality control of pesticides and agrochemicals placed on the market; Detection and control of violations in the trade of chemicals and pesticides. The Ministry also controls the permit conditions. The Ministry participates in the development of the legislation on chemicals management and is the main competent authority for fulfilling the obligations under relevant international agreements. The National Food Agency of the Ministry is responsible for the registration of agrochemicals and pesticides and the production of a state catalog of registered pesticides and agrochemicals.

The Ministry of Internally Displaced Persons from the Occupied Territories, Labor, Health and Social Affairs of Georgia, within its competence, establishes the classification of chemicals and the rules for the classification of toxic and hazardous chemicals, as well as the requirements for labeling. The competence of the Ministry also includes the determination of permissible quantities of pesticides and other agrochemicals in food and drinking water, the establishment of hygienic norms of hazardous chemicals in ambient air, soil and workplace, and the rules and regulations for the use of disinfectants and their control.

The LEPL Revenue Service under the Ministry of Finance of Georgia is responsible for regulating / controlling cross-border shipments of chemicals. The Emergency Management Service of the Ministry of Internal Affairs of Georgia conducts first analysis to identify possible hazardous substances, assesses potential hazards caused by chemicals and responds to incidents nationwide. The Service is also involved in the process of control on chemicals management.

Interagency Coordination Council on Combating Chemical, Biological, Radiological and Nuclear (CBRN) Threats is operating at the State Security Service of Georgia to better coordinate issues related to chemical substances (and other areas of risk). The competence of Council is the development, periodically update and implementation control of the National Strategy for the Reduction of CBRN Threats. It is noteworthy that the relevant state agencies of Georgia fulfill obligations under the international documents on the management of CBRD threats and non-proliferation and contribute to the strengthening and deepening of cooperation in multilateral and bilateral formats.

In addition to government agencies, the management of chemicals involves accredited research laboratories that, on request, participate in the identification and concentration of chemicals in different products or environments.

Chemicals legislation is incomplete - Georgia has no framework law on chemicals management. Georgia's Law on Hazardous Chemicals (1998) was invalidated in 2010 and no new law has been developed since. Some aspects of chemicals are regulated by the Laws on Pesticides and Agrochemicals (1998), on Ambient Air Protection (1999) and on Licenses and Permits (2005),

although these laws regulate chemicals consumed in Georgia. Only a small part of the substances. The bylaws governing specific matters arising from these laws also apply.

An important national strategic document in the field of chemicals management is the National Strategy for the Reduction of CBRN Threats and Action Plan for its implementation (2015-2019). approved by the Resolution No. 164 of 14 February 2014 of the Government of Georgia. The document sets out measures for the prevention, detection, preparedness and response of specific chemical hazards, some of which are also aimed at enhancing international cooperation.

Georgia is a party to the following environmental conventions: the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (Georgia joined in 2006), the Vienna Convention for the Protection of the Ozone Layer (Georgia joined in 1995), and the Stockholm Convention on Persistent Organic Pollutants (Georgia joined in 2006). On October 10, 2013, Georgia signed the Minamata Convention on Mercury.

Within the framework of the Global Environment Facility (GEF) funded project[93] - "Strengthening National Decision Making towards Ratification of the Minamata Convention", the first assessment of the mercury was carried out and preparatory measures were taken to ratify the Convention. At this stage, internal state procedures for accession to the Convention are underway. Georgia is also involved in the implementation of the Strategic Approach to International Chemicals Management - SAICM (Georgia has been participating since 2006), which creates a unified framework for chemicals management for participating countries.

The Stockholm Convention aims at protecting human health and the environment from the harmful effects of POPs by preventing and reducing their production and use. The Convention envisages elimination and restriction of certain types of pesticides, industrial chemicals and co-products. A national report is prepared once every 4 years and submitted to the Convention Secretariat. The Stockholm Convention obliges the Parties to develop a National Implementation Plan (NIP) that describes the current state of affairs in the country with a view to POPs and identifies measures to improve their management. Georgia's first NIP was approved in 2011 and it included measures for 2011-2015.[94]

Tab 10.1: Persistent Organic Pollutants

Persistent Organic Pollutants (POPs) are called organic compounds that are characterized by: high toxicity, enhanced resistance to decomposition, and ability to accumulate in biological organisms or ecosystems.

Migratory species of air, water or fauna transport these substances over long distances. Due to its durability, POPs can withstand this transition, do not deteriorate and retain toxic properties. They escape from the air or water far from their source of emission (for example, pesticide dichloro-diphenyl trichloroethane (DDT) is found even in Antarctica) and damage terrestrial and aquatic ecosystems.[95]

In recent years, new POPs have been added to the Stockholm Convention, which has become necessary, and with the initiation of the Convention Secretariat, countries have begun developing / updating national action plans in the light of new POPs. Accordingly, The "National implementation plan on Persistent Organic Pollutants (POPs) for 2018-2022 years" has been developed and approved by the Governmental Decree N247 of May 23, 2018.

[93] The project was implemented by UNDP in 2015-2017.

[94] Decree N907 of the Government of Georgia of 21 April 2011 on the Approval of the National Action Plan on Persistant Organic Pollutants

[95] Source: Stockholm Convention on Persistent Organic Pollutants
https://matsne.gov.ge/ka/document/view/1245079?publication=0

Cross-border shipment (import, export, transit) of chemicals and pesticides provided for by the Rotterdam Convention shall be governed by the procedures provided for by the Convention. Based on the Rotterdam Convention, Governmental Decree of 13 June 2016 "on Rule of Import and Export of Certain Hazardous Chemicals and Pesticides and Implementation of Prior Informed Consent Procedure" has been adopted. The Decree also meets the requirements of the Stockholm Convention and implements EU Regulation (EC) No 689/2008 Concerning the Export and Import of Dangerous Chemicals.

The Vienna Convention for the Protection of the Ozone Layer and its Montreal Protocol on Ozone Depleting Substances oblige Member States to gradually reduce the production and consumption of ODSs in order to cease. In 2016, the hydrofluorocarbons (HFCs) were added to the Montreal Protocol regulation list which are not only ODSs but have very high global warming potential and are used in the same sector where ODSs are. According to this amendment, Georgia should restrict consumption of HFCs by 2024. One of the main requirements of the Montreal Protocol is the existence of an import-export permit system in the country.

Production of all and import of all ODSs other than two are forbidden according to the Law of Georgia on Protection of Ambient Air (1999) and its subsidiary Government Resolution No. 266 of 17 June 2016 „On Procedures of Permit Issuance for Import, Export, Re-export and Transit of Ozone Depleting Substances and Yearly Import Quota Allocation". One of these two substances is methyl bromide, which is permitted only for quarantine and pre-shipment consumption purposes, and the other - chlorodifluoromethane (HCFC-22) is quoted. Based on the aforementioned laws and bylaws, the import, export, re-export and transit of ODSs can only be carried out on the basis of a relevant permit issued and controlled by the Ministry of Environmental Protection and Agriculture of Georgia (MEPA). The next year import quota i.e. amount allowed for import is established every year for quoted substance. Import permits for this substance is also issued within the established quota.

In order to better regulate the consumption of ODSs and their emission into the atmosphere, in 2016 an amendment was made to the Law of Georgia on Protection of Ambient Air. A number of regulations were introduced based on the amendement for the refrigeration and air-conditioning sector (which is a major sector of ODSs consumption), including reporting obligations on ODSs consumption.

10.3 CURRENT STATE

Persistent Organic Pollutants

There is no production of pesticides and industrial chemicals containing POPs in Georgia. However, the importation of POPs regulated by the Rotterdam and Stockholm Conventions is prohibited by national legislation. The source of the POPs pesticides in the country is mainly the obsolete pesticides accumulated during the Soviet period.

For the disposal of obsolete pesticides a special burial site was operating in Georgia in1976-1985 (eastern Georgia, near Rustavi, in Marneuli district, on the Iaghluji mountain). Up to 2 700 tonnes of obsolete pesticides, mainly chlororganic pesticides that were abandoned without any control and endangered human health and the environment were disposed on the burial are of 4ha.

In 2014, 230 tonnes of pesticides were collected, packaged and exported from the Jaglouja Mod-Pesticide Landfill for disposal in Belgium and France. Awareness raising activities have been carried out for the local population. A plan for the remediation of the Iaghluga poisonous chemicals (pesticides) landfill was developed with three conceptual scenarios. Fence was built around the

burial area with warning signs. However, the burial site is still not protected from External exposure. In addition, in 2016, 208 tonnes of obsolete pesticides were exported to France for disposal.[96]

Tab 10.2: Polychlorinated biphenyls

Polychlorinated biphenyls (PCBs) - is a cumulative name for one class of chlorine-containing organic matter, comprising 209 substances. These are synthetic substances used in a variety of industrial applications, including dielectric fluids in transformers and large electrocondensers, as well as thermal insulation liquids and paint additives.

Polychlorinated biphenyls are toxic, cause skin and eye damage, endocrine, immune, reproductive problems, and delay the development of children. These substances have the ability to bioaccumulate and accumulate in large quantities in grain and fish fat.

One of the key priorities under the Stockholm Convention is the study, collection and disposal of oils containing PCBs in old electrical transformers and other equipment. Studies in various projects have shown that more than 20% of inventoried oils contain polychlorinated biphenyls (PCBs) in excess of the maximum permissible limit (50 ppm) specified in the Convention. In addition, it should be noted that companies purify and re-use the used transformer oils without checking the content of polychlorinated biphenyls, which creates a high risk of so-called "cross-contamination".

For the safe implementation of safe management of PCB containing oils in Georgian electricity distribution system, the Global Environmental Facility (GEF) project is being implemented, The aim of the project is improvement of the legislative and institutional system, capacity Building and safe management of PCB-contaminated oils in the electricity distribution system of Georgia (inventory, collection, packaging, disposal, technology transfer, public awareness raising).[97]

Tab 10.3: Dioxins and furans

Dioxins and furans are a group of highly toxic organic substances, which represent combustion by-products.. Dioxins are generated by certain combustion processes such as: the waste incineration, the combustion of solid and liquid fuel in industrial (electricity generation) and domestic appliances (burning in ovens and fire places), as well as open burning of waste, fires, etc. These substances are volatile and stable, can be transported over long distances by air, precipitated with atmospheric precipitation, get in the food chains of living organisms and accumulate in living tissues.

Exposure to dioxin-furan causes skin damage, immune, endocrine, reproductive system disorders, developmental problems, cancers.

By inventory of unintentionally released (co-generation) POPs[98] of dioxins and furans it was determined that in 2014, emissions from dioxins and furans from all major sources in Georgia

[96] These activities were implemented within the framework of the following projects: Demonstrated and proportionally increased availability of sustainable DDT alternatives for dichloro-diphenyl trichloroethane (DDT) to control vector diseases in South Caucasus and Central Asia; Enhance the capacity to reduce the impact of oblolete pesticides in the countries of the former Soviet Union; Review and update the National Action Plan for the Stockholm Convention on Sustainable Organic Pollutants in Georgia.

[97] The Ministry of Environmental Protection and Agriculture of Georgia, in cooperation with the United Nations Industrial Development Organization (UNIDO) and the Caucasus Regional Environmental Center (RECC), is implementing a project funded by the Global Environmental Facility (GEF) "PCB-free electricity distribution in Georgia"

[98] Inventory was held in the framework of the Global Environment Facility (GEF / UNEP) project "Review and Update of the National Action Plan for the Stockholm Convention on Sustainable Organic Pollutants in Georgia"

amounted to 33.4 g of toxicity equivalent (TEQ), the largest share of which was for the production of ferrous and non-ferrous metals. The level of emissions into the environment has almost doubled since 2004, largely due to the elimination of open and uncontrolled combustion practices (see Tables 10.1 and 10.2).

Table 10.1: Total emissions of polychlorinated dibenzo-dioxins (PCDD) and polychlorinated dibenzo-furans (PCDF) (2004 inventory)

N	Emission Source (Category)	Yearly emmisions (g tec/year)				
		Air	Water	Soil	Products	Waste
1	Burning of waste	31.15	0	0	0	5
2	Ferrous and non-ferrous metallurgy	0	0	0	0	0
3	Electricity Production, Heating	6.47	0	0	0	0.6
4	Production of mineral materials	1.016				0.001
5	Transport	0.045	0	0	0	0
6	Uncontrolled combustion processes	22.713	0	0.761	0	0
7	Manufacture and consumption of chemicals and household items	0	0	0	0.018	0
8	Different	0.009				0.032
9	Waste disposal	0	0	0	0	0
10	Potential hot spots	0	0	0	0	0
	Total	61.403	0	0.761	0.018	5.633
	In general					**67.815**

Table 10.2: Total emissions of polychlorinated dibenzo-dioxins (PCDD) and polychlorinated dibenzo-furans (PCDF) (2014 inventory)

N	Emission Source (Category)	Yearly emmisions (g tec/year)				
		Air	Water	Soil	Products	Waste
1	Burning of waste	4.6	0		0	0.5
2	Ferrous and non-ferrous metallurgy	3.0	0	0	0	13.6
3	Electricity Production, Heating	0.6	0	0	0	0
4	Production of mineral materials	1.3				0
5	Transport	0.6	0	0	0	0
6	Uncontrolled combustion processes	0.2	0	0	0	0
7	Manufacture and consumption of chemicals and household items	0	0	0	0.1	2.2
8	Different	0				0.1
9	Waste disposal	0	2.4	0	0	4.3
	Potential hot spots	10.3	2.4	0	0.1	20.6
	In general					**33.4**

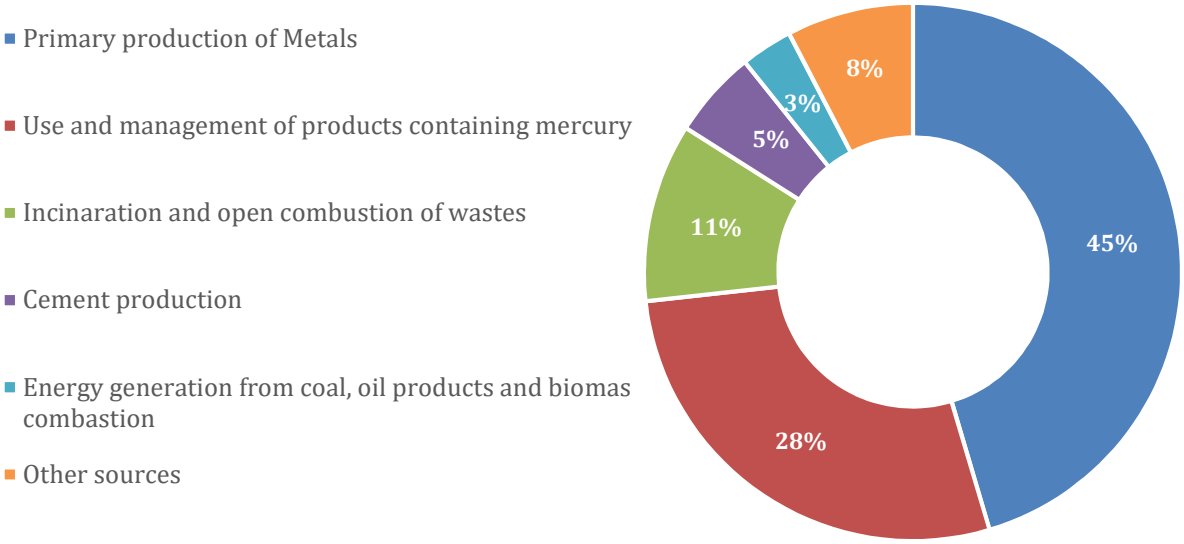
Also, preliminary inventory and evaluation of the new POPs revealed that Georgia had never manufactured these POPs and And materials containing them. However, products containing the above mentioned substances were being imported into the country.

Mercury

Mercury (Hg) endangers human health and adversely affects the environment. In scope of the initial mercury assessment for the ratification of the Minamata Convention on Mercury, the first

mercury inventory[99] was carried out in Georgia, the results of which proved that the sources and emissions of mercury and its compounds in the country are quite high. According to assesment, in 2014 in Georgia approximately 4 200 kg of mercury was released, about 45% of which is the primary metal production, in particular, gold mining. One of the major sources of mercury separation is use and disposal of mercury-added products, in which the largest share falls on circuit breakers and thermometers. In addition, Hg emissions are high in cement production, energy consumption and open burning processes of healthcare and other waste (see Figure 10.3.1).

Figure 10.3.1. Share of economic activities in the emission of mercury into the environment as of 2014 (%)



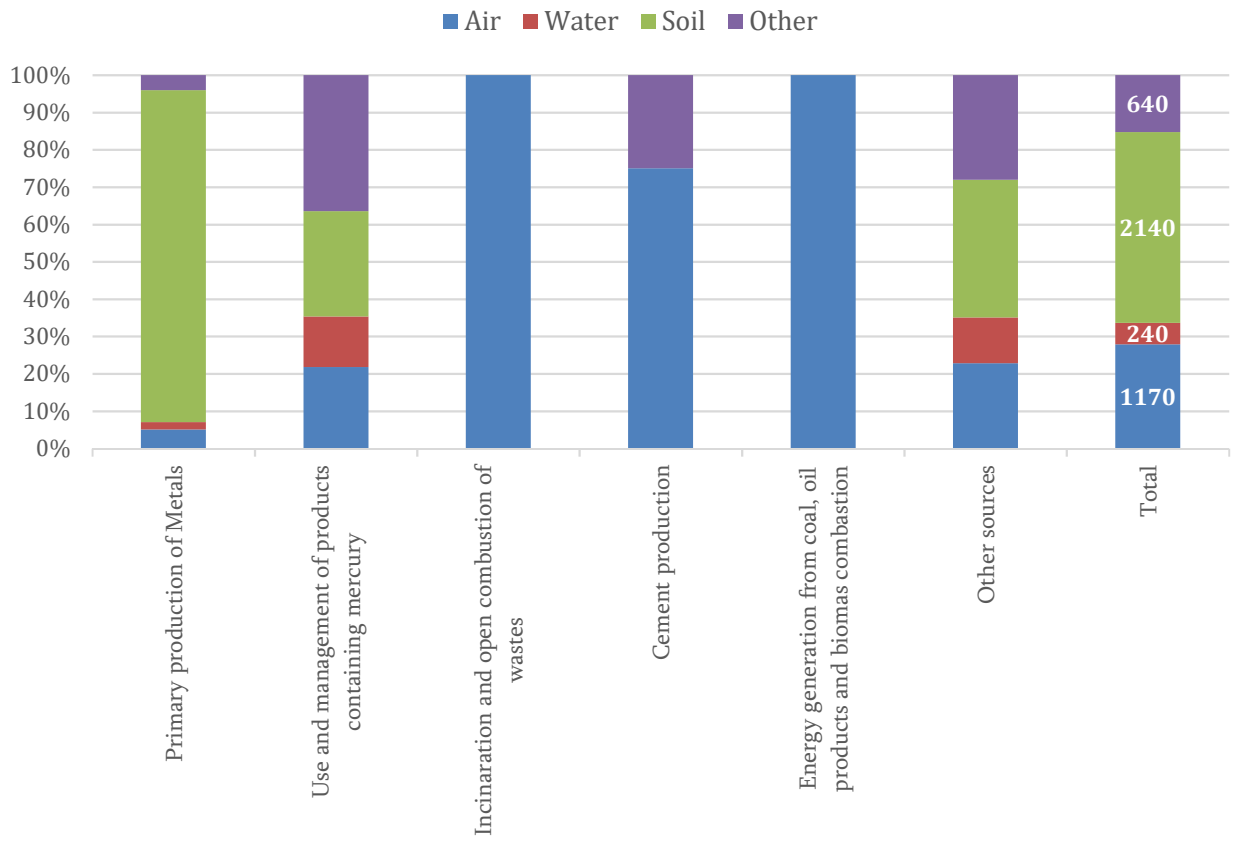
Source: Mercury Initial Assessment Report

According to Geostat data, Georgia does not have primary production of mercury in Georgia and also does not produce mercury-containing products. Import records do not show a significant amount of elemental mercury imported into the country.

The inventory found that mercury is released into the environment in four different ways: airborne emissions, direct water discharge, direct discharge into the soil, and "other ways" that include Hg emissions from intermediate products, common and specific waste. As shown in Figure 10.3.2, approximately 50% of the total mass of mercury released into the environment as of 2014 is in the soil. The main source of emissions in this regard is the gold mining industry. 1 170 kg of mercury (about 28% of total emissions) is released into the environment by airborne emissions. The main polluting activities in this area are: waste incineration; Consumption and disposal of Hg-containing products; Production C of cement, gold and cast iron; Burning of coal and firewood.

[99] The national mercury inventory in Georgia was developed using the UN Environment Toolkit for Identification and Quantification of Mercury Releases, Level 1 approach.

Figure 10.3.2. 2014 Emissions of mercury into environmental components by sources (kg,%)



Source: Mercury Initial Assessment Report

The major sources of mercury in water are Hg-containing products such as thermometers, laboratory chemicals and measuring devices, as well as wastewater collection and purification systems. A small amount of mercury is also flowing into the water from gold production, which is mainly the result of crushing, drilling and washing of gold. Other sources of mercury dissolved in the "other way" environments include Hg-containing products (circuit breakers and relays, thermometers, etc.), waste produced from primary gold processing and cement production.

Ozone Depleting Substances

There is no production of ODSs in Georgia. Imports are prohibited except for two, one of which is allowed only in exceptional cases and the other is quoted.

Tab 10.4: Ozone Depleting Substances

Earth's Ozone Layer Depleting Substances (ODSs) are several classes of chlorine and bromine-containing synthetic organic compounds that are volatile, persistent, airborne, reach the upper atmosphere, and react with the ozone contained therein. As a result, ozone concentration in the Earth's upper atmosphere layer decreases.

Ozone-depleting substances are used as refrigerants (refrigerators and air-conditioners), propellants in fire extinguishers and aerosols, in the manufacture of solid or plastic foams (so-called foam plasters and parallons), as fungicides and laboratory solvents. In order to protect the Earth's ozone layer, they are being replaced by alternative substances and technologies.

The consumption of the most hazardous ODSs in Georgia (substances specified in Annexes A and B to the Montreal Protocol) ceased in 2008, two years before the Montreal Protocol deadline. Since

2012, only one ODS - chlorodifluoromethane (HCFC-22) has been imported into the country. The import of the above mentioned is quoted and is gradually reduced year by year in order to meet the reduction schedule set by the international obligation under the Montreal Protocol.

According to the obligations under the Montreal Protocol, the consumption of substances specified in Annexes A and B (CFC-12, Halons 1211 and 1301) should have been ceased by 2010, consumption of methyl bromide specified in Annex E - for 2015 (except for quarantine and pre-shipment consumption), and consumption of HCFC-142b - for 2016. The timetable for reducing and eventually terminating consumption of HCFC-22 by years is as follows:

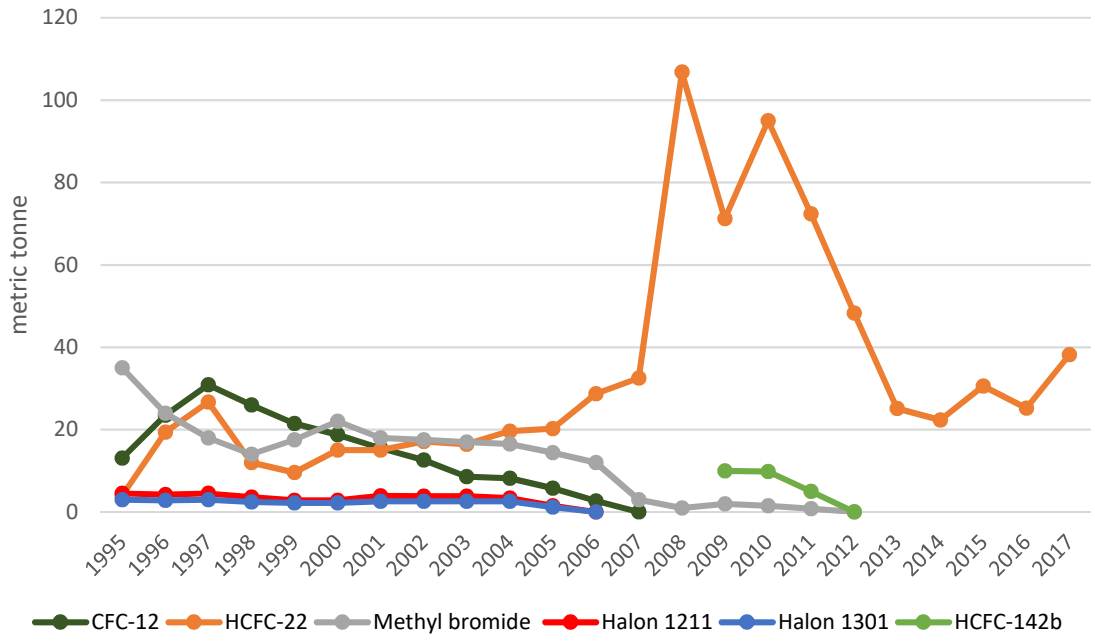
Table 10.3: Chart of reduction of consumption of chlorodifluoromethane (HCFC-22)

2009-2010	2013	2015	2020	2025	2030
Basic use	100%	90%	65%	32,5%	100%[100]
83.1 t	83.1 t	74.79 t	54.02 t	27.01 t	0 t

Source: MEPA

These commitments is being successfully implemented, facilitated by activities carried out with the assistence of numerous implementing agencies (UNDP, UNEP, UNIDO) within the financial support of the Montreal Protocol Multilateral Fund.

Figure10.3.3. Consumption of ODSs in Georgia (Metric tonne)

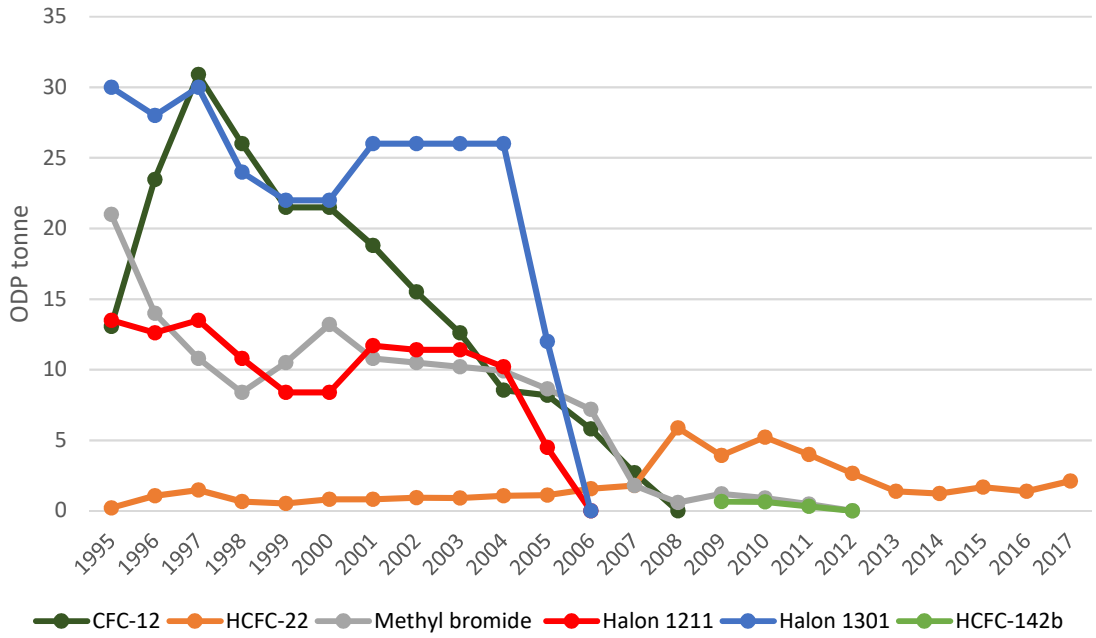


Source: MEPA

Figure 10.3.3 shows that the consumption of ODSs in the country appears to have increased instead of decreasing as a result of the sharp increase in consumption of HCFC-22. However, each ODS has a different potential to decompose the ozone layer. Therefore, for each ODS, its ozone depletion potential (ODP) is determined. Hydrochlorofluorocarbons in general, including HCFC-22 have much lower ODP than halons and chlorofluorocarbons. As a result, although consumption of physical mass (in metric tonnes) of ODSs increased, but in reality, in terms of ozone depletion, consumption of ODSs decreased, as illustrated in Figure 10.3.4.

[100] Consumption of 2.5% of the basic level is allowed until 2040 for services only.

Figure 10.3.4. Consumption of ODSs in Georgia (ODP tonne)



Source: MEPA

Since 2011, Georgia, with the support of UNDP, has been implementing a plan to remove hydrochlorofluorocarbons, which aims to ensure that by 2020, the country will meet its key obligations under the Montreal Protocol, with a 35% reduction in the consumption of HCFCs compared to 2009-2010 levels.

10.4 MAIN CHALLENGES

Chemicals in Georgia are not properly managed. An incomplete legislative framework (with the exception of legislation on the management of ODSs, pesticides and agrochemicals) and lack of information are major challenges hampering the implementation of European chemicals management practices in Georgia.

The Association Agreement between Georgia and the EU imposes specific obligations on the country in terms of improving chemicals management. In particular, the Association Agreement, according to the national legislation in line with EU regulations Concerning the Export and Import of Dangerous Chemicals, On the Classification, Labelling and Packaging of Substances and Mixtures (CLP Regulation) and the Directive On the control of major-accident hazards involving dangerous substances (SEVESO III).

For the implementation of the Association Agreement with the European Union, the National Action Plan on CBRN Threat Reduction (2015-2019) and NEAP 3, legislation on chemicals management should be developed and adopted:

- Law of Georgia on Chemicals;
- legislative acts on classification, labeling and packaging of substances and mixtures;
- the Law and the By-Laws according to Directive 96/82 / EC of 9 December 1996 On the control of major-accident hazards involving dangerous substances
- By-law on mercury (the process of ratification of the Minamata Convention is under way, after which the Convention's obligations must be reflected into the national legislation).

It should be noted that the EU policy on chemicals is also set out in the EU Regulation on the Registration, Evaluation, Sanctioning and Restriction of Chemicals (REACH), which should pay particular attention to the process of establishing a system for the management of chemicals in Georgia.

At this stage, with the support of the Czech Development Agency (CzDA), the project "Strengthening Sustainable Management Capacities of Chemicals" is being implemented, which aims at bringing the chemicals management system into line with the European model, developing legislation and capacity building at national level.

Georgia does not have the information resources needed to manage chemicals. Implementation of an effective integrated system (preferably an online system) will significantly facilitate the exchange of information on cross-border movement and consent / permits. The system will also contribute to enhancing the effectiveness of various agencies involved in chemicals management.

In the process of designing a proper chemicals management system, certain chemicals should be considered together with their particularly dangerous effects. Such substances are POPs (pesticides, PCBs, dioxins, furans, etc.) and ODSs that need proper treatment to reduce the risks they pose to the environment and human health. Mercury is also a threat to human health, so it must be properly managed. By signing the Minamata Convention, Georgia reaffirmed its willingness to take the necessary measures to implement modern mercury management practices. It is important for Georgia to ratify this convention in order to establish standards and capacities for managing mercury and its compounds in accordance with international requirements.

Taking concrete measures with respect to the chemicals listed above and improving their management practices will also facilitate the fulfillment of obligations under relevant international agreements in the field of specific chemicals and enhance international cooperation.

Chemicals pose a particular threat to the environment and human health in the event of industrial accidents. To reduce the risk of these threats, it is necessary to create a legal framework and strengthen the capacity of the relevant state agencies. An integrated system of hazardous industrial facilities inspection should be set up in accordance with the SEVESO III Directive. In addition, resolving the issue of Iagluja's poisonous chemicals burial site requires appropriate remediation measures to control the environmental risks associated with it, requiring additional financial and technical resources.

There is no possibility for elimination of ODSs waste in the country. Therefore, management and safe elimination of ODSs waste is one of the major challenges.

III/11 IONIZING RADIATION

Ionizing radiation is a type of radiation that is capable of producing ion pairs in the environment.[101] There are both natural and artificial sources of ionizing radiation. Ionizing radiation affects biological organisms both positively and negatively. The use of radiation and nuclear technologies in medicine, industry, agriculture, energy and other scientific or technological fields has the potential to benefit the public. So, for example, ionizing radiation is used in medicine for diagnosis and treatment, including for the treatment of oncological diseases. Therefore, its proper use can save lives and / or improve the quality of life. Of no less practical importance is ionizing radiation in the areas listed above. However, in the case of improper, unlicensed treatment, given its potential for harmful effects, ionizing radiation can have a significant adverse effect on the environment and human health, and therefore related activities must be regulated.

In addition, the use of nuclear energy for military purposes and nuclear terrorism remains one of the major challenges for the security of the modern world. In response to these challenges, there is a need for an effective system of nuclear and radiation control at the national level.

11.1 MAIN QUESTIONS AND MESSAGES

1. ***In what populated areas of Georgia is the background radiation of the environment monitored and what is the background radiation?***

- The natural background radiation is monitored in 15 settlements of Georgia, including 14 cities and area of Pasanauri. These cities are: Akhalkalaki, Akhaltsikhe, Batumi, Bolnisi, Gori, Dedoplistskaro, Zestaponi, Tbilisi, Telavi, Lagodekhi, Mestia, Sachkhere, Poti, Kutaisi. As a result of the monitoring, no elevation of background radiation was detected in any of the settlements, which would endanger human and the environment.

2. ***Where is the radioactive waste disposed and does the radioactive waste present in the country pose a threat to the population?***

- Currently, radioactive waste is located in the Radioactive Waste Storage Facility (adjacent to Mukhatgverdi village of Mtskheta Municipality) and in the Radioactive Waste Disposal Facility (near Saakadze Village in Gardabani Municipality). The storage and disposal facilities are managed by the LEPL Agency of Nuclear and Radiation Safety;
- Radiation monitoring equipment is located at the territories of storage and disposal facilities, physical protection is enhanced to prevent illegal penetration, and 24-hour remote monitoring is also provided at the territory of storage facility;
- As a result of the managing the storage and disposal facilities in accordance with international standards, radioactive waste present on the territory of Georgia does not pose a threat to the environment and the population.

11.2 STATE REGULATION AND CONTROL

Significant reforms have been implemented in the field of ionizing radiation, i.e. nuclear and radiation safety in 2014-2017 in terms of institutional arrangements, legislation and infrastructure. The fundamental changes are the basis of the basic principles of safety established by the International Atomic Energy Agency (hereinafter referred to as "IAEA"), according to which an effective legislative and executive framework for nuclear and radiation safety, including an independent regulatory authority, should be established and maintained in the State.[102]

International treaties and agreements play an important role in defining national policy in the field of nuclear and radiation safety. In particular, Georgia has signed an agreement with the IAEA on

[101] Paragraph 14 of Article 3 of the Law of Georgia on Nuclear and Radiation Safety.
[102] Principle 2: Role of Government, Basic Principles of Security, International Atomic Energy Agency Safety Standards Series № SF-1, International Atomic Energy Agency, Vienna, 2006.

the use of safeguards in connection with the Nuclear Non-Proliferation Treaty, as well as an additional protocol to that agreement. Georgia also is party to the following conventions: the Convention on "Physical Protection of Nuclear Material ", the Joint Convention on "the safety of Spent Fuel Management and on the Safety of Radioactive Waste Management", Convention on "Early Notification of a Nuclear Accident" and the Convention on the "Assistance in the Case of a Nuclear Accident or Radiological Emergency". The Association Agreement between Georgia and the EU also sets out specific obligations in the field of nuclear and radiation safety.

State regulation of nuclear and radiation safety is implemented by the LEPL Agency of Nuclear and Radiation Safety (hereinafter referred to as "ANRS") under the Ministry of Environmental Protection and Agriculture of Georgia (MEPA). The ANRS was created as a result of Amendments of 2015 into the Law of Georgia on Nuclear and Radiation Safety (2012) on the basis of a former Department of Nuclear and Radiation Safety at the Ministry of Environment and Natural Resources Protection and took the responsibility of State management of the radioactive waste (including radioactive waste storage and disposal facilities), of the state regulation of nuclear and radiation activities. The establishment of such a system has made it possible to restore state control over radioactive waste, which is important in terms of protecting human and environment from harmful effects of ionizing radiation. On November 11, 2015, Georgia adopted the Law on Radioactive Waste, which establishes the basic requirements for the treatment of radioactive waste throughout their existence - from cradle to grave. It should be noted that there was no such regulation in Georgia until that time.

Currently, as a result of the changes, nuclear and radiation safety is regulated at the level of legislation by the following normative acts:

- Law of Georgia on Nuclear and Radiation Safety;
- Law of Georgia on Radioactive Waste;
- Law of Georgia on Licenses and Permits;
- Resolution N756 of the Government of Georgia of 31 December 2014 "On Approval of the Technical Regulation -" Rules for Radiation Monitoring of Metal Scrap ";
- Resolution N689 of the Government of Georgia of December 14, 2014 on "Approval of the
- Technical Regulation - Categorization of Sources of Ionizing Radiation, creation and maintenance of registry of authorization, sources of ionization radiation and radioactive waste ";
- Resolution N450 of the Government of Georgia of August 27, 2015 "On Approval of the Radiation Safety Norms and Basic Requirements for the Treatment of Sources of Ionizing Radiation";
- Resolution No. 359 of July 20, 2015 of the Government of Georgia on Approval of the Technical Regulation - "Rule of Individual Monitoring and Control";
- Resolution N317 of the Government of Georgia of July 7, 2016 "On Approval of the Technical Regulation -" Radiation Safety Requirements in Medicine";
- Resolution N558 of the Government of Georgia of December 15, 2016 "On Approving the Radiation Safety Requirements in Industry, Science and Education";
- Resolution N72 of the Government of Georgia of 7 February 2018 on the approval of the Technical Regulation - "Rule on the Transport of Nuclear and Radioactive Substances";
- Order N2-763 of August 9, 2019 of the Minister of Environmental Protection and Agriculture of Georgia on Approval of "the Nuclear and Radiation Activity Inspection Procedure";

- Order N150 of the Minister of Environment and Natural Resources Protection of Georgia of 8 December 2014 on Approving “the Rules of Responding to Illicit Traffic of Nuclear and Radioactive Substances”;
- Order N39 of the Minister of Environment and Natural Resources Protection of Georgia of November 29, 2016 on Approving “the Procedure for Carrying out Activities Connected to Nuclear Non-proliferation Safeguards”;
- 26 Order N26 of 2017 of the Minister of Environment and Natural Resources Protection of Georgia on Nuclear and Radiation Facilities, Radioactive Sources, Radioactive Waste and Other Sources of Ionizing Radiation.

The change was welcomed by the IAEA. Numerous Projects on developing the sphere of Nuclear and Radiation Safety have been planned and implemented for Georgia by the IAEA, the US, the EU and other donors.

A number of strategic documents defining national policy in the field of nuclear and radiation safety were developed in 2014-2017. One of the framework documents in this regard is the National Strategy for the Reduction of Chemical, Biological, Radiation and Nuclear (CBRN) Threats. The National Strategy for Radioactive Waste Management 2017-2031 and its Action Plan 2017-2018 have been developed and approved for institutionalizing radioactive waste management. The document identified effective means of protecting human and the environment from the harmful effects of ionizing radiation at all stages of radioactive waste management. The Georgian State Border Management Strategy provides for an integrated approach to state border management and measures for the control of nuclear and radioactive substances at the border. Another very important document is Georgia's Integrated Nuclear Security Support Plan for 2015-2019, which is a roadmap for improving the cooperation of agencies involved in nuclear security measures.

In 2014-2017, the systems of physical protection and radiation monitoring of the radioactive waste disposal facility near the village Saakadze in Gardabani municipality were upgraded and the existing infrastructure improved. Strategic Research and Safety Assessment of the Radioactive Waste Disposal was carried out in the framework of the EU project from 2012-2015, on the basis of which the report concluded that the existence of the disposal for the next 300 years does not pose a threat to human and the environment.

As for Radioactive Waste Storage Facility (adjacent to the village of Mukhatgverdi, Mtskheta Municipality) falling under the management of the ANRS, it was equipped with a radiation monitoring equipment that detects the γ-radiation in the storage area under the technical cooperation with the IAEA. The building also has physical protection systems.

It is noteworthy that with the support of the IAEA, the decommissioning process of the nuclear research reactor at the Andronikashvili Institute of Physics (operation of the reactor was suspended in 1988) is underway.

E. Andronikashvili's Institute of Physics also owned the subcritical multiplier "Gamamravlebeli-1" containing 1 830 grams of 36% enriched uranium. In recent years, for some technical reasons, the equipment could not be used for research purposes. At the same time, it should be taken into account that the plant contained high enrichment uranium. That is why, on the suggestion of US officials, it was decided to dismantle the facility and repatriate the containing uranium to the Russian Federation. According to the agreement, Georgia will receive compensation in exchange for the equipment.

License to Nuclear and Radiation Activity

Nuclear and radiation activities are subject to authorization from the ANRS. Authorization is interpreted as the procedure of issuing a document (licence and permit) by a regulatory body, granting the authority for performing nuclear and radiation activities.

The Law of Georgia on Nuclear and Radiation Safety provides a list of nuclear and radiation activities for which any interested person must possess a license issued by the ANRS. In particular, the licence to nuclear and radiation activity shall be granted for the following activities:
A) design of high-risk nuclear and radiation facility;
B) operation of a high-risk nuclear and radiation facility;
C) removal from service and decommissioning of high-risk nuclear and radiation facility;
D) production (preparation), possession, temporary retention, use and sale of radioactive materials;
E) the use of a generator of ionizing radiation for medical purposes;
F) use of source of ionizing radiation for medical (therapeutic) purposes;
G) use of radioactive substances (radiopharmaceuticals) for medical diagnosis;
H) use of radioactive substances (radiopharmaceuticals) for medical treatment;
I) the use of generator of ionizing radiation and / or radioactive materials for service delivery;
J) the use of a generator of ionizing radiation for industrial purposes;
K) use of ionizing radiation for industrial purposes;
L) use of a generator of ionizing radiation for scientific research and educational purposes;
M) use of a source of ionizing radiation for scientific-research and educational purposes;
N) maintenance and repair of a generator of ionizing radiation and equipment containing radioactive material;
O) transportation of nuclear materials, radioactive sources and radioactive waste;
P) conditioning, storage and burial of radioactive sources and waste, decontamination of equipment, area and / or storage contaminated with radioactive substance;
Q) Manufacture of containers for the transport and storage of radioactive sources and waste;
R) Expert and instrumental measurements, metrology, adjustment, installation of sources of ionizing radiation.

When granting a license, a natural or legal person undertakes to comply with the license conditions necessary to ensure the safety.

During the reporting period, a total of 317 licenses were issued for the activities listed above:

- 2014 - 92 licenses;
- 2015 - 87 licenses;
- 2016 - 79 licenses;
- 2017 - 59 licenses.

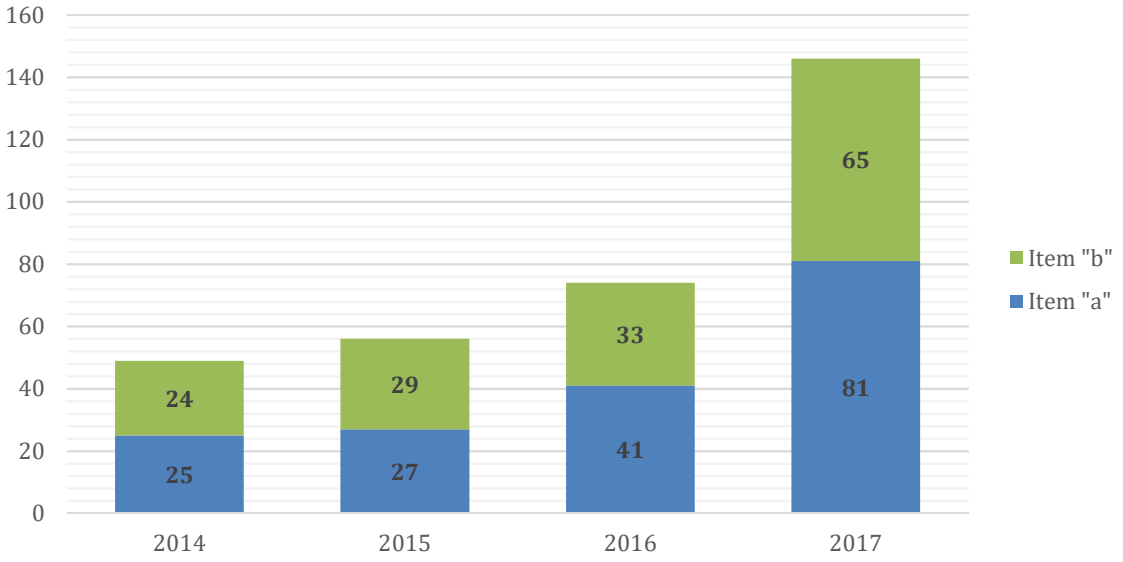
Permits - within the License to Nuclear and Radiation Activity

The ANRS grants permits for following activities:
A) Purchase and transmission of radioactive materials;
B) import and export of radioactive materials, the raw material, from which nuclear material can be obtained or produced, the equipment containing radioactive substances, nuclear technologies or know how, as well as export, import and transit of radioactive sources;
C) export of radioactive waste.

In 2014-2017, a total of 325 permits were issued for activities under paragraphs (a) and (b). It should be noted that the number of permits issued has increased threefold in 2017 compared to 2014,

which is a result of the substantial improvement in public services along with increased turnover and demand.

Figure 11.2.1: Permits Issued in 2014-2017 - Activities under Nuclear and Radiation Activities under Paragraphs 18 (a) and (b) of the Law of Georgia on Nuclear and Radiation Safety



Source: ANRS

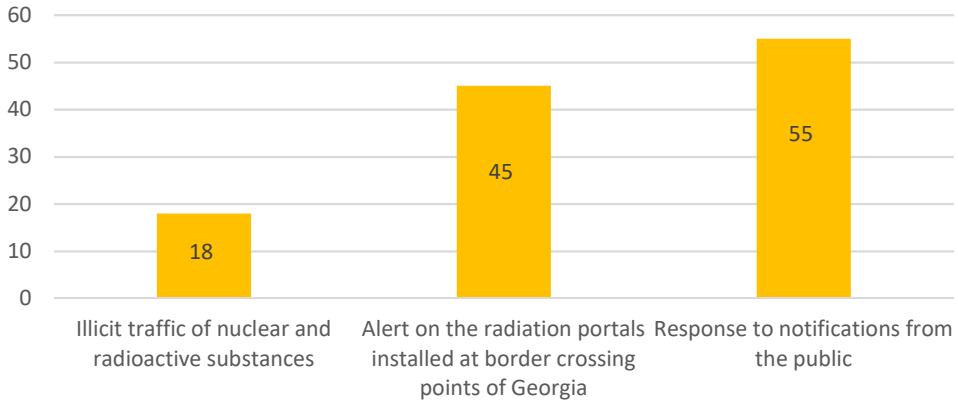
Anyone interested in nuclear and radiation activities can obtain a license and / or permit electronically (via the www.my.gov.ge portal) as well as through using accelerated services.

Nuclear and radiation incidents (if any) and response to them

According to current legislation, the ANRS has the function of responding to nuclear and radiation accidents, incidents, illicit traffick of nuclear and radioactive substances at the check points customs and freight terminals, as well as to received information (alerts).

During the reporting period, the ANRS responded to 137 cases, including 18 cases of illegal traffick of nuclear and radioactive substances; 45 cases of alert on the radiation portals installed at the border crossing points of Georgia (including 30 cases of contaminated scrap, product, equipment, 15 cases of contaminated vehicle); in 55 cases based on the notifications from population (see Figure 11.2.2).

Figure 11.2.2: Nuclear and Radiation Incident Response Statistics 2014-2017 of ANRS



Source: ANRS

Planned and unplanned inspections

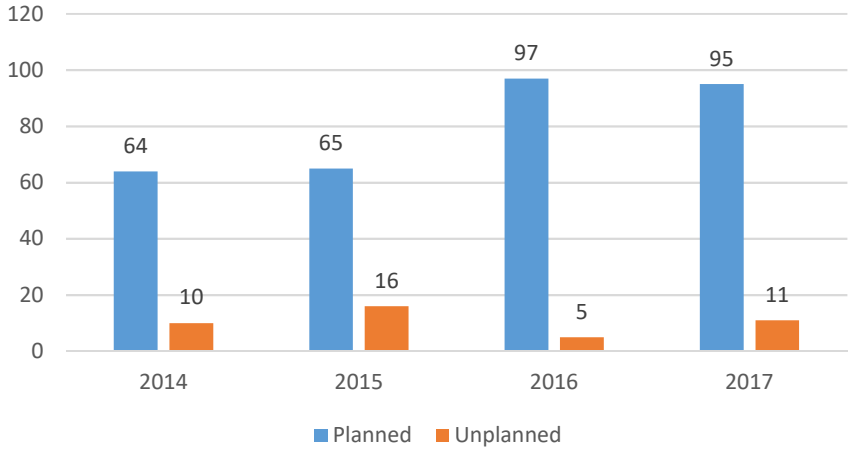
The ANRS conducts inspections, both planned and unplanned, to establish state control in the field of nuclear and radiation safety and to comply with the requirements of Georgian legislation.

Planned inspections are carried out on the basis of an inspection program approved by the Minister at the end of each year upon the submission from the Head of the ANRS.

Unplanned inspections are carried out:

- Upon decision of the Head of the ANRS, based on the analysis of the information available in the Agency;
- Upon the decision of the Head of the ANRS, on the basis of complaints, notifications from state agencies, organizations, citizens;
- Based on information obtained about alleged violation of safety and physical protection (security) of nuclear and radiation activity, license condition and/or legislation of Georgia;
- For verification of information submitted by an authorized natural or legal person on the spot;
- To verify on-site information confirming the action taken within the timeframe specified in the administrative order, in order to eliminate the violation of the license conditions and to fulfill the conditions prescribed by the legislation of Georgia for specific activities;
- for the detection of unlicensed nuclear and radiation activities by a natural or legal person;
- Based on information obtained from breaches of the nuclear and radiation facility observation.

Figure 11.2.3. Dynamics of planned and unplanned inspections carried out in 2014-2017



Source: ANRS

According to the nature of the identified violations, the ANRS carries out the actions envisaged by the Code of Administrative Offenses of Georgia.

11.3 SOURCES OF IONIZING RADIATION

11.3.1 NATURAL SOURCES OF IONIZING RADIATION

There are three naturally occurring sources of ionizing radiation in a human's normal living environment: cosmic rays, terrestrial and internal radiation.

The cosmic rays arise from the nuclear synthesis going on in the Sun and other stars, spreading through space, including the Earth. In spite of the Earth's magnetic field deflecting function, the cosmic rays on the surface contribute significantly to the annual dose of human exposure.

The source of the terrestrial radiation is the earth itself due to its natural radionuclides. Soil and rocks as well as water contain various amounts of uranium, thorium, radium and their radioactive decay products. All organic compounds, like the Earth's biosphere, contain radioactive carbon (^{14}C) and / or radioactive potassium (^{40}k). Airborne radionuclides such as radon are found in the air. In addition to external exposure to the natural background radiation created by the above-mentioned radionuclides, they enter the body through the digestive and respiratory system and cause internal irradiation. Terrestrial radiation is quite different at different points of the Earth, depending on the concentration of naturally occurring radioactive materials in the rocks.

Internal radiation is mainly caused by the presence of radioactive potassium and carbon in the human body. The contribution of internal radiation to the annual radiation dose is significantly smaller than that of cosmic and terrestrial radiation.

11.3.2 ANTHROPOGENIC SOURCES OF IONIZING RADIATION

Ionizing radiation sources are used in both industry and science (Cs-137, Co-60, Sr-90, Kr-85) as well as in medicine (Co-60, Sr-90, Ir-192, I-131, I-125, F-18, Tc-99).

Georgia has more than 2,500 ionizing radiation generators, over 1,800 sealed radioactive sources[103] and over 1,000 unsealed radioactive sources[104]. About 1,500 of these sealed and unsealed radioactive sources have been removed from use and safely stored in a radioactive waste storage facility under regulatory control. Unsealed radioactive source usually has low activity and half-life period and is mainly used for medical purposes.

Sources of ionizing radiation are not produced in Georgia. For the use of sources of ionizing radiation in industry, medicine and science, they are imported in accordance with the legislation of Georgia. After expiry of the use of sealed sources of radiation sources, they are returned to a foreign manufacturer. The export, import and transit of sources of ionizing radiation is governed by the relevant authorization issued by the ANRS, on the basis of which the ANRS maintains complete data on the export, import and transit of radioactive cargoes.

11.4 MONITORING OF RADIATION BACKGROUND IN GEORGIA AND ITS RESULTS

Monitoring of background radiation through automatic stations located in different settlements of Georgia is carried out by the LEPL National Environmental Agency (NEA) of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA). γ-Radiation dose rate is measured in units of μR/h[105].

According to the data processed by NEA, background radiation in Georgia does not exceed natural.

Table 11.1: Results of measurements of automatic stations located in different settlements of Georgia

Cities	2014	2015	2016	2017
Akhalkalaki	12.5	12.2	13	12.6
Akhaltsikhe	11.13	11.0	10.9	10.8
Batumi	9.42	9.0	8.9	8.8
Bolnisi	13.09	13.5	13.4	13.5

[103] **Sealed Radioactive Source -** A source in which the radioactive substance is permanently placed in an airtight capsule or in a solid state.

[104] **Unsealed Radioactive Source -** A source that is not a closed radioactive source.

[105] μR/h– microroentgen per hour

Gori	13.51	13.6	13.8	13.7
Dedoplistskaro	10.55	10.4	10.1	10.0
Zestaponi	10.60	10.3	10.8	11.5
Tbilisi	10.82	10.7	10.6	10.5
Telavi	11.98	11.8	11.7	11.7
Lagodekhi	12.24	12.3	11.9	11.7
Mestia	16.17	16.0	15.9	15.9
Sachshere	10.5	10.7	11	11.0
Pasanauri	11.46	11.5	11.4	11.4
Poti	8.12	8.3	8.4	-
Kutaisi	10.78	10.7	10.4	10.3

Source: NEA

Detailed information on the amount of γ-radiation dose in ambient air on the territory of Georgia is available on NEA website.[106]

11.5 MAIN CHALLENGES

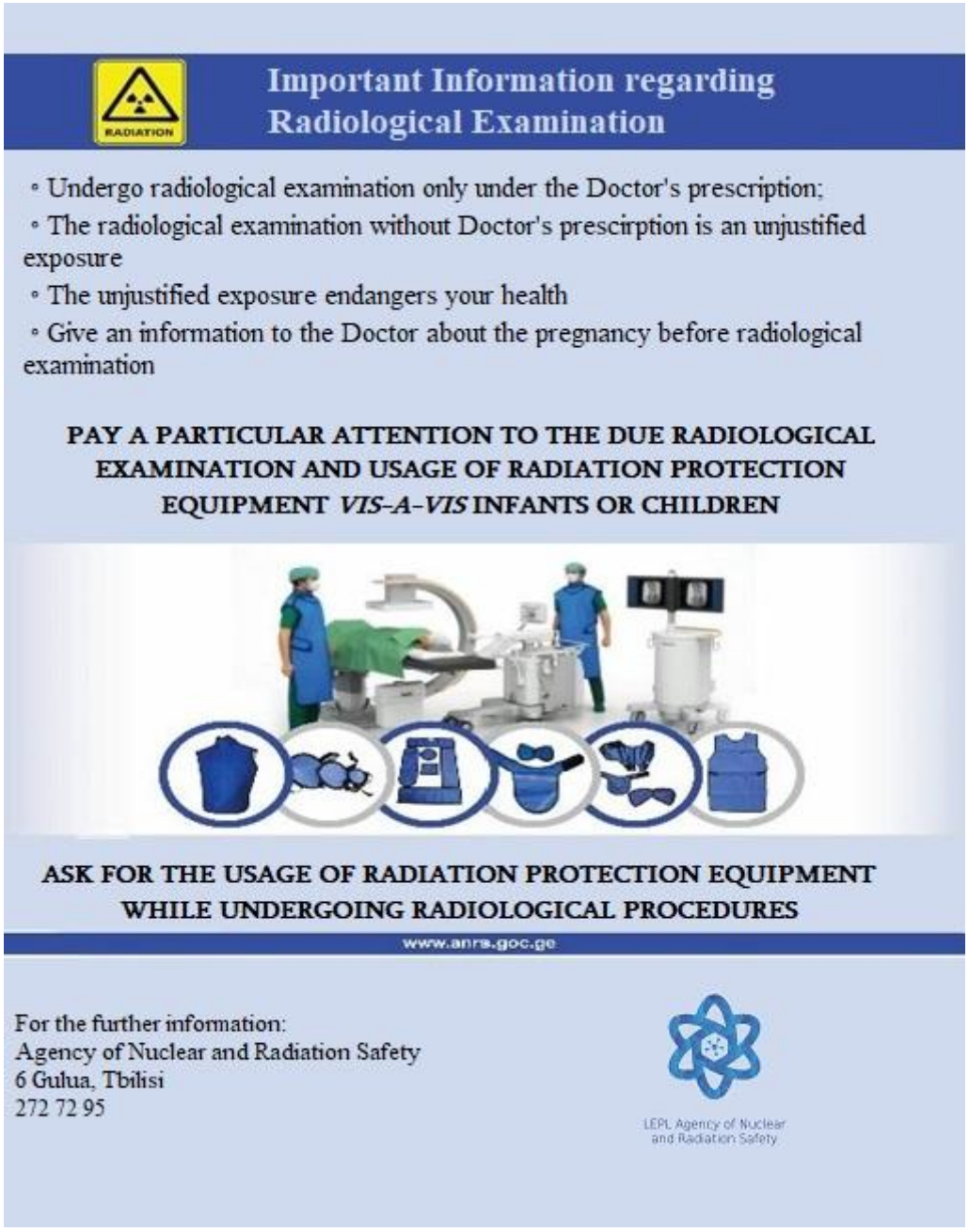
As we have already mentioned, nuclear terrorism is one of the major challenges in the world. Georgia is actively involved in world initiatives in the fight against nuclear terrorism. At the 2016 Nuclear Industry Summit, Georgia, as a state free of highly enriched uranium, received a special Atoms for Peace Award for its contribution to nuclear and radiation safety. Control of the Georgian Border Crossing Points is being continued, using portable detectors installed, and the relevant authorities respond to all alarms reported by the detectors.

As for the national challenges, the issue of storage of radioactive waste is noteworthy. As in national strategy of radioactive waste management over the 2017-2031 was set, taking into account the radioactive safety principles, optimization of administrative and financial resources and centralized approach towards treatment of the radioactive waste, it is reasonable to allocate radioactive waste storage and disposal facilities, as well as the radioactive waste processing facility at one location. It is noteworthy that the radioactive waste storage facility is located in a reconstructed pumping station building of a former nuclear research reactor cooling system, the seismic activity of which was studied in 2016. Also, it should be noted that the radioactive waste storage facility is localized near Mtskheta, which is included in the list of historical heritage sites by the United Nations Educational, Scientific and Cultural Organization (UNESCO). The radioactive waste storage facility is located in close proximity to the central highway and the main railway line, which are adverse security factors.

It is also a national challenge to develop a safety and security culture. Training courses for different target groups were conducted in this direction. About 200 staff members have been trained in radiation safety and security. In addition, the ANRS produced a flyer "Important Information During Radiological Examination" dedicated to inform patients and raise awareness as shown in Figure below. Those medical facilities carrying out radiological examinations were provided with the above flyers for display at a visible place.

One of the main challenges for the successful implementation of the measures necessary to achieve nuclear and radiation safety is the lack of specialized education and qualification system for staff in this field and lack of qualified staff. To this end, it is planned to develop an education strategy in the field of nuclear and radiation safety and raise public awareness.

[106] visit http://nea.gov.ge/ge/service/garemos-dabindzureba/7/biuleteni/ .


RADIATION
Important Information regarding
Radiological Examination
◦ Undergo radiological examination only under the Doctor's prescription;
◦ The radiological examination without Doctor's prescirption is an unjustified exposure
◦ The unjustified exposure endangers your health
◦ Give an information to the Doctor about the pregnancy before radiological examination
PAY A PARTICULAR ATTENTION TO THE DUE RADIOLOGICAL EXAMINATION AND USAGE OF RADIATION PROTECTION EQUIPMENT VIS-A-VIS INFANTS OR CHILDREN
ASK FOR THE USAGE OF RADIATION PROTECTION EQUIPMENT WHILE UNDERGOING RADIOLOGICAL PROCEDURES
www.anrs.goc.ge
For the further information:
Agency of Nuclear and Radiation Safety
6 Gulua, Tbilisi
272 72 95
LEPL Agency of Nuclear and Radiation Safety

Source: ANRS

CHAPTER IV. IMPACT OF ECONOMIC SECTORS ON THE ENVIRONMENT

IV/12 HUNTING AND FISHERY

Excessive use of natural resources, including unsustainable hunting and fishing, is considered as one of the threats to biodiversity. According to the Association Agreement between Georgia and the EU, the country is committed to further develop the law enforcement system against illegal hunting and fishing. Establishing a sustainable hunting system, as well as reducing the pressure on the fishing sector on inland waterways and the Black Sea biodiversity, are set out in Georgia's national strategic plans.

12.1 MAIN QUESTIONS AND MESSAGES

1. What are the challenges in hunting?

- The years of unsustainable hunting and ineffective hunting management in Georgia have dramatically reduced the number of populations of traditional hunting species. Some of them, including Red Deer, Tur, Wild Goat, Chamois, Brown Bear and Lynx, were listed in Georgia's Red List years ago and were completely banned from hunting.
- Illegal hunting remains a problem and is considered a significant threat to Georgia's biodiversity. Although data on the state of hunting species populations are scarce, existing data suggest that their number is much lower than habitats capacity.[107].

2. What are the main challenges in the fishing industry?

- Georgia is rich in hydrobiological resources. The Black Sea and the tight network of inland water bodies (rivers, lakes and artificial reservoirs) create favorable conditions for the sustainable development of fisheries. However, the decline in species diversity and biomass important for fishing in the Black Sea and inland water bodies, which in turn is caused by overfishing, water pollution, eutrophication, invasive species distribution and climate change impacts on marine and inland ecosystems, is a challenge for fishing sector.

12.2 HUNTING (state regulation, state of resources, consumption and its consequences)

In 2014-2017 Georgia did not make any changes in the state regulation of hunting. Hunting is still permitted under the legislation only within hunting farms and on specified species (species allowed for hunting are: Nutria, Hare, Badger, Pine Marten, Stone Marten, Wolf, Golden Jackel, Fox, Raccoon Dog, Wild Cat, Wild Boar, Roe, Common Racoon, Pheasant and Patridge). Hunting farming is one of the forms of forest use and requires a special license or general forest use license issued by auction.

Hunting outside hunting farms is only possible for migratory birds, including the following species: Gray Lag Goose, Gadwall, Common Teal, Mallard, Garganey, Northern Shoveler, Common Coot, Northern Pintail, Eurasian Wigeon, Greater White-fronted Goose, Common Pochard, Eurasian Woodcock, Common Snipe, Common Quail, Common Wood-pigeon, Rock Dove, Stock Dove, Eurasian Turtle-dove. Legislation sets out the terms for hunting on these migratory birds, daily hunting limits, prohibited tools, methods and locations. A hunter must pay an annual fee of 10 GEL to hunt migratory birds.

16 hunting farms operate in Georgia with a total area of 52 565,252 ha. 5 hunting farms were established in 2014-2016. In the same years, 3 hunting farms were abolished, which were owned by Gnoli LTD (Mtskheta Municipality), Loba LTD (Tetritskaro Municipality) and Mamuli LTD (Dedoplistskaro Municipality), while owners were changed in 2 hunting farms.

[107] Drafting a new Hunting Law for Georgia-Pathways and conceptual elements, ECO Consulting Group, Dr. Stefan Mann, March 2016, Integrated Biodiversity Management, South Caucasus (IbiS), GIZ

Figure12.1: Hunting farms in Georgia as of 2017

	Hunting facility	Location	License issue date and period of validation	Area, ha
1.	Fauna LTD	Lagodekhi Municipality, riv. Alazani Gorge, vil. Chiauri	05.06.2002 For a term of 20 years	5 000
2.	Kolagi LTD	Gurjaani Municipality, near vil. Kolagi (riv. Zanguri and Inaboti), Lagodekhi Forestry	21.05.2003 For a term of 20 years	424
3.	Kavkasia LTD	Bolnisi and Marneuli Municipalities, Gorge of riv. Boladauri	10.12.2003 For a term of 20 years	11 583
4.	Alazani Chala LTD	Gurjaani Municipality, adjacent to the village of Kardenakhi (confluence of the rivers Alazani and Inabot), Lagodekhi Forestry	21.05.2003 For a term of 20 years	532
5.	Association "Monkavshiri" Sachkhere Hunters and Fishermen's Club	Sachkhere Municipality, Kvereti Forestry Area	17.03.2003 For a term of 20 years	7 900
6.	Iori Chalebi LTD	Korughi Managed Reserve	10.12.2015-27.12.2035	830
7.	Monadire LTD	Iveri and Chachuna Managed Reserves	10.12.2015-27.12.2035	335
8.	Kapira LTD	Ambrolauri Municipality	25.05.2005 For a term of 20 years	3 489
9.	Miunhausen LTD	Kareli Municipality, Kareli Forestry, Rozdzineti-Tkemlovani Forestry District	29.12.2005 For a term of 25 years	10 181
10.	Iori Resources LTD	Iori Managed Reserve	11.03.2008 For a term of 20 years	834
11.	Hunting Tour Georgia LTD	Tianeti Forestry	14.12.2010 For a term of 20 years	2 325
12.	Borbalo Group LTD	Tianeti Forestry	22.09.2010–26. 12. 2025	2 653
13.	Meidan Group LTD	Gardabani Managed Reserve	23.10.2012-23.10.2061	3 079.4
14.	Alazani 2012 LTD	Gurjaani Forestry	16.10.2014-17.10.2039	669.852
15.	Victoria 2012 LTD	Tsalenjikha Municipality, Odishi Forestry	16.10.2014-17.10.2039	2 292
16.	Eden LTD	Lagodekhi Municipality, Riv. Alazani Gorge	26.10. 2015-05.06.2022	438

Source: NEA

Out of the above hunting farms, the management plan approved by the Ministry of Environment and Agriculture has only Kolagi, Borbalo Group, Victoria 2012 and Meidan Group.

Hunting quotas for various species, including common racoon, golden jackel, fox, hare, wild boar, wild cat, marten, roe, pheasant and other hunting species, were approved based on the data from accounting that was carried out in the above-mentioned hunting farms in 2014-2016. Hunting quotas were not approved for hunting farms Kapira and the Association "Monkavshiri" Sachkhere Hunters and Fishermen's Club in the given years. Despite the approved quotas, only a small number of hunting species were obtained in hunting farms in the reporting period.

The following table shows the total amount of hunting species allowed to be obtained in hunting farms and actual extraction.

Table 12.2: total amount of hunting species allowed to be obtained in hunting farms and actual extraction

სახეობა	2013-2014		2014-2015		2015-2016		2016-2017	
	Quota	Extraction	Quota	Extraction	Quota	Extraction	Quota	Extraction
Wolf	52	0	52	0	47	0	72	5
Hare	175	10	213	10	127	18	229	42
Fox	63	1	91		74	1	106	5
Jackal	337	23	336	67	139	39	179	29
Badger	54	0	86	0	66	2	80	0
Wild boar	200	5	173	12	88	16	131	15
Marten	25	0	66	0	78	0	76	0
Roe	13	0	14	0	14	1	24	2
Raccoon		49		137		27		9
Nutria	15	0	15	0	10	0	20	11
Wild cat	0	0	0	0	0	0	4	
Pheasant	545		392	75	253	57	362	84
Partridge	46		27	5	15	5	93	4

Source: DES

The above data clearly indicates the ineffective functioning of hunting farms. Hunting farms face a number of challenges. Given the dwindling populations of hunting species, successful hunting farm management requires significant initial investment not only in infrastructure but also in animal breeding and conservation. In addition, hunting licenses also specify other requirements, such as control of illegal logging in the hunting area or implementation of measures for the protection and maintenance of forests with high conservation value, fight against pests as well as the development of tourism facilities. Moreover, the rights of the hunting license holders (arrest, seizure, draft the protocol, even request to leave the area) is not defined if they detect illegal hunting or poaching. The Georgian legislation provides for certain benefits, such as the fee for the extraction of animal bred in hunting farms is reduced by 70%. Until 2010, land occupied by hunting farms was exempt from taxation, and since 2014 such lands have been taxed at no more than GEL 3 per ha, much less than other land uses (grazing, mowing, homestead, arable, etc.). This allowance was introduced to encourage the development of hunting farms, but its effectiveness has not been evaluated.

The total number of hunting weapons registered in Georgia in 2014-2017 was more than 100,000 units[108], and the fee for hunting migratory birds was paid by up to 30,000 hunters annually. This indicates that hunting is very popular in Georgia, with the main motive being fun.

Information on the number of tax payers for migratory birds in 2014-2017 is presented in the table below.

[108] Source: Ministry of Internal Affairs

Table 12.3: 2014-2017 fee paid for extraction of migratory birds from the environment (GEL)

Year	Quantity of payers	Paid amount
2014	23 830	359 835,0
2015	27 984	403 565,4
2016	30 068	428 693,0
2017	27 840	387 576,4
სულ	**109 722**	**1 579 669,8**

Source: Ministry of Finance

There is no data on the number of birds hunted during the hunting season. The legislation only stipulates the number of different species of birds that can be hunted in one day (for example, 20 Quail, 10 Wood-pigeon, 5 Geese, 6 Ducks, etc.) are permitted to hunt. However, hunting is permitted every day during the hunting season. Consequently, it is not possible to estimate even the number of migratory birds hunted during the season without special research.

Currently, Georgia's mechanisms to combat poaching are less effective, as evidenced by the number of cases of illegal hunting detected in the past. In 2014-2017, 24 cases of illegal hunting envisaged by the Criminal Code of Georgia were identified. In the same year, 2 823 administrative violations of hunting rules were identified, including 450 cases of hunting with prohibited weapons and methods. In 2014-2017, the following species were identified in the Georgian Red List for the following species: Brown Bear (5 individuals), Tur (3 individuals), Chamois (1 individual), Jungle Cat (1 individual), Eagle (2 individuals), Little Bustard (16 individuals). However, it is widely believed that the scale of illegal hunting is greater.

During the same period, there were 40 illegal hunting cases in protected areas, including several high-profile cases of poaching, such as the killing of reintroduced gazelle. In addition, 308 cases of moving with firearms in the protected areas were identified.

In addition to the facts of illegal hunting and violations of hunting rules, during the reporting period the Department of Environmental Supervision (DES) identified 41 cases of illegal capture of wild animals. As a result, a total of 56 animals, including 17 bears, were confiscated. At this stage there is no state shelter targeted for wild animals confiscated and also removed from the environment. Some of the confiscated animals are returned to the natural environment, and some are placed in temporary shelters and zoos.

Table 12.4: Facts of illegal capturing of wild animals / birds in 2014-2017

		2014	2015	2016	2017
Number of facts		9	7	8	17
Imposed fines (GEL)		650.0	500.0	150.0	2 900.0
Illegally captured animal/bird	Roe	1			
	Bear	3	8	1	5
	Badger	1			
	Wolf			1	
	Fox	2			
	Jungle Cat			1	
	Jackal				1
	Greek Tortoise				9
	Imperial Eagle	1			
	Barn Owl	1			

	Booted Eagle	1			1
	Eagle			3	
	Eurasian Sparrowhawk			1	3
	Eurasian Griffon Vulture			1	
	Northern Goshawk				4
	Peregrine Falcon				2
	Gull				1
	Long-legged Buzzard			1	1
	Northern Long-eared Owl			2	

Source: DES

During the reporting period, only one case of animal maltreatment was identified by DES, indicating the need to increase the effectiveness of such offence detection mechanisms.

The situation in the hunting sector is due to the following reasons:

Restricting hunting areas by hunting farms promotes the spread of illegal hunting. Hunting farms, which are established in only a few regions of the country, are unevenly distributed throughout the country and do not cover sufficient hunting areas. According to the data, hunters rarely visit existing hunting farms. Any case of hunting outside hunting farms (other than migratory bird hunting) is considered illegal hunting under Georgian law.

The country does not have enough resources to enforce legislation. Existing capabilities in hunting planning, monitoring, supervision and control require significant development. Illegal hunting is supervised by APA, NFA[109] and DES. It should be noted that in the wake of tens of thousands of people interested in hunting in Georgia, there were 220 inspectors, 318 rangers and 620 forest guards throughout Georgia as of 2017, whose responsibilities include responding to various environmental offences in addition to poaching.

According to Georgian law, hunters are not required to have special knowledge of hunting rules, regulations, or ethics, except for the test of safe use of firearms. In fact, a hunter can become anyone who has the right to possess hunting weapons. However, Georgian hunting traditions are largely forgotten. The neglect of hunting habits and ethics and the low level of awareness of hunters have led to widespread poaching. Hunters often kill rare and protected species, including birds of prey.

Hunters de-facto have free access to hunting, which encourages unsustainable hunting. Also, they no longer have incentives to invest in hunting management.

The lack / absence of data on the state of hunting species populations significantly impedes sustainable hunting planning.

Conflict between humans and wild animals

In recent years, wild animal attacks on domestic cattle have been on the rise in various regions of Georgia, and there have been reports of damage to crop areas and beehives. According to experts, the causes of the frequent attacks of wild animals are:

- Illegal landfills - household waste, especially of animal origin, dumped in forests and ravines near villages, which attract predatory animals;
- Unprotected cattle (without shepherds and dogs) moving / grazing in forests and outskirts of forests;
- Poorly maintained homestead plots and animal dwellings;

[109] As of 2017. Nowadays LEPL National Forestry Agency does not have this function.

- Offsprings left stray as a result of illegal hunting;
- In some cases food shortages, etc.

Due to the above circumstances, prey animals move to the vicinity of the population where they can obtain food more easily.

According to Georgian law, wildlife can be removed from the environment if it endangers the human being and their property. The animal may be killed instantly at the time of the attack, but should be notified to DES or the Municipality City Hall.

Municipalities, in the event of an increased number of wild animal attacks, can apply to the central government for animal regulation. On the basis of the study, the decision is taken to remove certain preys by the natural environment by the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) through delegating the right to regulate (remove) the number of wild animals to the municipalities.

In 2014-2017, it was allowed to remove 492 Wolves, 184 Jackals, 11 Foxes and 4 Bears in this way, though only 122 Wolves and 55 Jackals were removed. At the same time, despite the municipalities' approval, the Red List did not consent to the removal of some of the individuals listed in the Red List.

Wildlife attacks can be prevented by the following conditions:

- Pets must be properly fenced;
- Household waste should not be disposed on illegal landfilles near villages;
- Domestic cattle should not be let out without herdsmen in the pasture;
- Offsprings of prey animals (eg bear cubs) or mutilated wild animals should not be brought in, it is best to leave them on the ground. Such animals are often thrown into the woods after being raised, but they already have an impaired hunting instinct and fear of humans.

In addition to preventing attacks of wild animals, shelter for animals subject to removal from environment is needed, which in some cases is an acceptable alternative of killing animals. Similar shelters can also be used for confiscated, formerly captured animals.

12.3 FISHERY (State regulation, resource status, consumption and its consequences)

EU-Georgia Association Agreement has identified significant commitments for the long-term conservation and sustainable use of fish resources, taking into account ecosystem approaches. These obligations include the establishment of effective control and monitoring system of fishing, the collection and exchange of the fishing data, the cooperation with regional fisheries management organization, taking effective measures against Illegal, Unreported and Unregulated (IUU) fishing, the improvement of fishery management and introduction of best practices, the development and implementation of the policy that ensures economic, environmental and social sustainability of the fishery sector.

Fishing in the Black Sea

There are currently 9 industrial fishing licenses in the Black Sea owned by 5 companies. These licenses were issued in 2006 for a period of 10 years. In accordance with the Decree N696 of the Government of Georgia dated 22 April 2016 “on Granting Acceptance to the Legal Entity of Public Law - National Environment Agency of the Ministry of Environment and Natural Resources Protection of Georgia for Extention of the Fishing Licenses in the Black Sea and Change License Conditions” fishing licenses in the Black Sea were extended until September 1, 2026. The following license terms were defined by the same Decree:

- The License holder is obliged to possess at least one fishing vessel and one carrier vessel as of January 1, 2020;
- From January 1, 2018, at least 70% of the resource extracted during the fishing season shall be processed as the final product on the territory of Georgia. Including at least 10% of the extracted resource shall be allocated for the production of combined food and at least 5% - for canned food;
- From January 1, 2018 to January 1, 2019, at least 30% of those employed in the fishing industry must be citizen of Georgia graduated from accredited/authorised institute or certified with relevant vocational education. Between 2019 and 2023, the number of such employed specialists should increase to 50%, and from 2023 to the end of license term, the number of specialists should be at least 80%;
- The license holder is also obliged to install an electronic monitoring system on the ship from October 1, 2017 and maintain an electronic fishing log.

In 2014-2016, the above mentioned companies were fishing through 20 seiners, which decreased to 15 during the 2016-2017 season. The maximum number of fishing vessels permitted for licence holders according to the conditions of fishing licenses in the Black Sea is 20 units. To date, there are only three seiners owned by fishing license holders. The remaining seiners are owned by Turkish fishing companies that are leased by Georgian companies. The total capacity of fishing seiners ranges from 147 to 694 tonnes. Fishery is carried out by fishing nets and pelagic trawls.

In addition to the aforementioned fishing seiners, there are 33 medium-sized fishing vessels in the Black Sea, with a total capacity of 10 t to 109 t. Most of these ships were built in the Soviet era and have not been upgraded significantly. 12% of the Black Sea fishing quota is equally distributed among these vessels. Fishery is mainly carried out by the benthic and pelagic trawl.

16 fish species are allowed for industrial fishing in the Black Sea, including Anchovy, Sprat, Whiting, Mackerel, Blunt-snouted Mullet, Flathead Mullet, Spiny Dogfish, Atlantic Stargazer, Atlantic Bonito, Goby, Black Sea Turbot, Shad, Pickerel, Bluefish, Garfish and Common Stingray. However the main object of fishing is Anchovy. Its production in 2014-2016 ranged between 50-70 thousand tonnes, which is almost 99% of the total catches. Mackerel (300-700 tonnes), Whiting (20-66 tonnes), Flathead Mullet (30-55 tonnes) are also found in relatively small but significant quantities.

It is noteworthy that the actual catch of all species of industrial fish is within the limits of fishing quota, and for some species is much lower. The fishing quota is determined annually.

Table 12.5: Volume of industrial fishing in the Black Sea in 2013-2017 (kg)

Fish species	Fishing Season							
	2013-2014		2014-2015		2015-2016		2016-2017	
	Quota, kg	Extraction, kg	Quota, kg	Extraction, kg	Quota, kg	Extraction, kg	Quota, kg	Extraction, kg
Anchovy	85 000 000	70 774 141.720	85 000 000	65 493 458.026	85 000 000	58 548 826	90 000 000	48 972 234
Sprat	80000	-	60 000	22 526	60 000	1 500	60 000	-
Whiting	600 000	21 783.500	400 000	66 102.477	400 000	45 101.123	400 000	19 595
Mackerel	1 500 000	708 019.500	1 600 000	403 824.600	1 600 000	653 652.650	1 600 000	310 040.300
Blunt-snouted Mullet	600 000	29 914.260	500 000	55 858.373	800 000	50 533.600	1 000 000	35 612.800

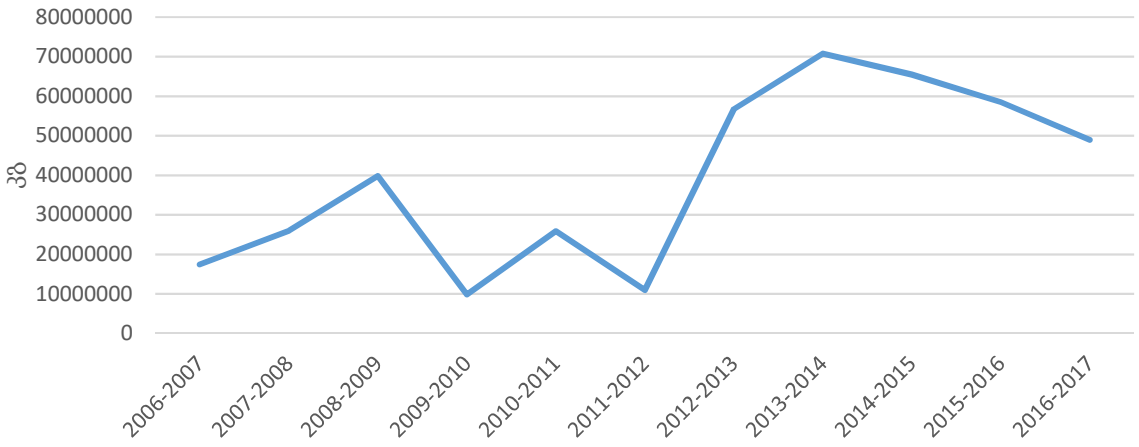
Flathead Mullet	100 000	24.700	100 000	138.500	100 000	560.500	100 000	50
Spiny Dogfish	10 000	39	-	-	-	-	-	-
Atlantic Stargazer	30 000	204	30 000	187.400	30 000	196	30 000	37
Atlantic Bonito	60 000	-	60 000	-	60 000	-	30 000	-
Goby	30 000	74.500	30 000	75.800	30 000	14,300	30 000	9
Black Sea Turbot	20 000	53.700	20 000	433.700	20 000	1 263,800	30 000	451.500
Shad	30 000	582.100	30 000	655.700	30 000	253	30 000	1 364
Pickerel	20 000	27	20 000	529.500	20 000	714,449	20 000	309
Bluefish	100 000	143.500	100 000	1 655.300	100 000	1 303.800	500 000	1 403
Garfish	10 000	-	10 000	-	10 000	2.351	10 000	-
Common Stingray	10 000	1 079.500	10 000	533.500	10 000	513	100 000	770.500
Rapana	500 000	189 271	1 000 000	160 852	500 000	81 831,500	500 000	-
Total	**88 700 000**	**71 725 357.980**	**88 970 000**	**66 206 830.876**	**88 770 000**	**59 386 266.073**	**94 440 000**	**49 341 876.100**

Source: DES

In 2014-2017, some species of fish were caught only during certain seasons. For example, the Sprat extraction for the 2014-2015 season was 22.5 tonnes, and in the following years the Sprat catches was insignificant or not implemented at all. Despite the defined quota, during the period 2014-2017, there was almost no fishing on Dogfish, Bonito and Garfish.

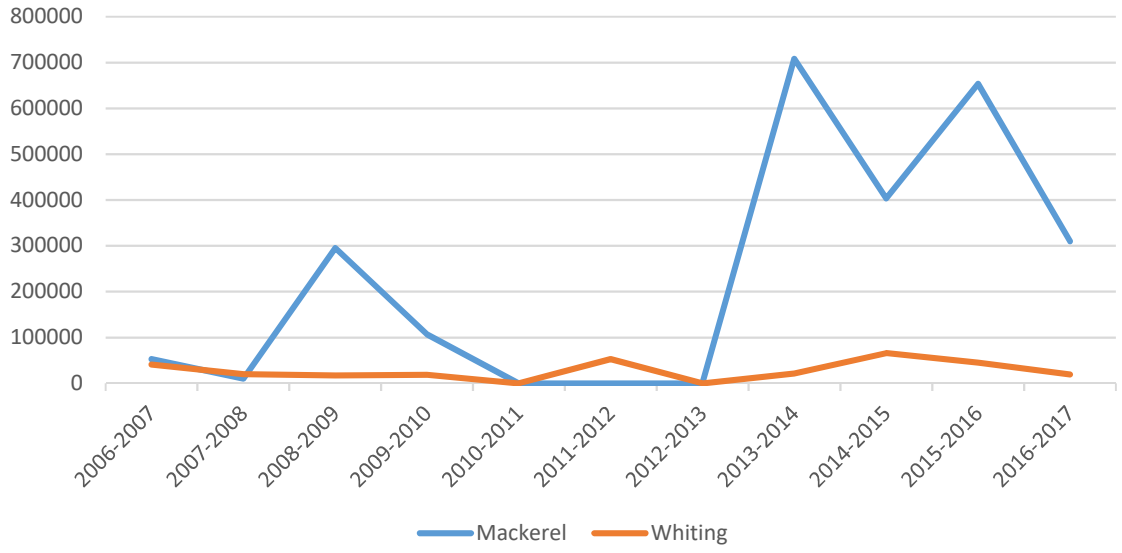
From the 2013-2014 season, industrial fishery on mollusk Rapana's of 500 tonnes per season was allowed. Mollusk Rapana is an invasive species that has spread in the Black Sea since the 30s of the previous century. More than 189 tonnes of Rapana were extracted in the first season, but in the following years its production was significantly reduced (up to 82 tonnes in 2016) and ceased altogether in 2017, as due to the reduction in the size of individuals, it was no longer commercially attractive.

Figure 12.3.1: Anchovy catch tendency in the Black Sea, 2006-2017 (kg)



Source: DES

Figure 12.3.2: Whiting and Mackerel catch tendency in the Black Sea, 2006-2017 years (kg)



Source: DES

In addition to the above, approximately 200 small (up to 8 m in length) vessels (boats, motorboat, etc.) are fishing within one nautical mile (1852 m) off the Black Sea coast. According to Georgian legislation, coastal fishing does not require a fishing license, neither registration of floating vessels nor accounting / reporting of extracted fish resources is required. Only equipments permitted during coastal fishing are restricted to some extent (up to 300m - any legally permissible fishery equipment, and 300m to 1 mile - only with a parachute-like or a 300m long hose type nets). Based on this, there is no official data on the volume of coastal fisheries and the information is based on expert estimates only. Catches are practiced along the entire coastline (except for the marine area of Kolkheti National Park). It is noteworthy that until 2014 coastal fishing was carried out only in the 300 m shoreline, and since 2014 the coastal fishing area has been expanded to one nautical mile. According to expert estimates, the amount of fish resources extracted from coastal fishing is 600-900 tonnes per year, mainly catching Mackerel, Blunt-snouted Mullet, Turbot and Goby.

Since 2017, Black Sea fishing license holders have been required to install onboard vessels an electronic monitoring system for real-time monitoring of fishing and maintain an electronic fishing log. Currently, the electronic monitoring system operates on all vessels fishing in Georgian waters under the special licenses of industrial fishing in the Black Sea. The data are automatically transmitted to DES, which controls fishing in the Black Sea through this system. The introduction of an electronic self-monitoring and reporting system for industrial fishing is one of the obligations under the EU-Georgia Association Agreement.

No cases of illegal fishing were reported in the Black Sea during 2014-2017, although there were 117 cases of fishing rules violations, mainly in coastal fishing.

Tab 12.1: Cooperation with the General Fishing Commission on Mediterranean (GFCM)

Black Sea fish resources are distributed among six countries located around the Sea, therefore, regional cooperation is particularly important for rational management of fishery. Since 2014, Georgia has been actively cooperating with the GFCM (The General Fisheries Commission for the Mediterranean), a regional fisheries management organization established under the auspices of the United Nations Food and Agriculture Organization (FAO). The GFCM has been functioning since 1952 with the aim of ensuring the conservation and sustainable use of marine living resources and the sustainable development of

aquaculture in the Mediterranean and Black Seas. The GFCM currently brings together 23 member states and the European Union and 3 non-member states - Georgia, Ukraine and Bosnia and Herzegovina.

Cooperation with the Regional Fisheries Management Organization is one of the obligations under the EU-Georgia Association Agreement. Fulfillment of fisheries obligations is an essential condition for exporting fish products to the EU market.

Cooperation with the GFCM enables Georgia to receive technical assistance to improve monitoring and control of fishery, including data collection, as well as to harmonize national legislation with EU regulations in the field of fisheries.

Fishing in inland waterways

In Georgia, industrial (licensed) fishing is practised only in four lakes - Jandari, Tabatskuri, Suldi and Nadarbazevi lakes and in four reservoirs - Tsalka, Dali Mountain, Shaori and Zhinvali reservoirs.

Table 12.6: Capacity of fishing in inland waterways by species (tonnes,%)

Species	2014		2015		2016		2017	
	T	%	T	%	T	%	T	%
Vendace	-		0.847	5.6	9.316	19	-	
Prussian carp	79.129	69,6	8.544	57	24.005	49	13.713	72
Common Carp	0.711	0.6	1.352	9	1.880	3.8	0.638	3.3
Transcaucasian Barb	2.500	22	0.642	4	1.021	2	0.655	3.4
Peled	-		-		0.022	0.04	-	
Silver carp	30.932	27	2.558	17	5.744	11.7	2.115	11
Vimba			0.169	1	5.534	11.3	0.601	3.1
Grass carp	0.132	0.11	0.365	2.4	1.071	2.1	1.259	6.6
Bulatmai Barbel	0.208	0.18	0.356	2.3	0.138	0.3	-	
Wels Catfish	-		0.156	1	0.115	0.2	-	
Total	**113.612**		**14.989**		**48.846**		**18.981**	

Source: DES

Table 12.7: Fishing capacity in inland waterways by reservoirs (tonnes)

Water Body	2014	2015	2016	2017
Lake Tabatskuri	-	0.847	-	-
Tsalka Reservoir	79.129	5.105	22.04	10.5
Lake Nadarbazevi	-	2.000	3.200	-
Suldi Lake	-	-	0.064	-
Zhinvali Reservoir	-	0.560	13.735	-
Dali mountain Reservoir	31.383	4.181	2.441	-
Shaori Reservoir	3.1	0.249	3.309	2.936
Jandari Lake	-	2.047	4.057	5.545
Total	**113.612**	**14.989**	**48.846**	**18.981**

Source: DES

Both local (Transcaucasian Barb, Wels Catfish, Bulatmai Barbel, Vimba, Common Carp), and introdused fish species (Vendace, Prussian Carp, Peled, Silver Carp, Grass Carp) are caught in inland

water bodies. In different seasons, Prussian Carp accounts for 50-70% of the harvested fish, while Silver Carp accounts for the rest 11-27%.

One of the major reasons for the decline of aboriginal species in Georgia's lakes and reservoirs is the introduction of Prussian carp in the last century. Prussian carp is a competitor of native fishes in feeding and breeding areas, breeds extensively, completely occupies reservoir space, expells other fish species and adversely affects their populations.

8 licenses have been granted for industrial fishing in inland water bodies for the period of 20-25 years 2005-2013 (Jandari, Tabatskuri, Suldi and Nadarbazevi lakes and Tsalka, Dali mountain, Shaori and Zhinvali reservoirs). In 2015-2016, fishery licenses in Lake Santa and license for captive breeding of Sturgeon fish in Rion, Supsa and Chorokhi were abolished.

The volume of industial fishery varied significantly in licensed inland water bodies throughout 2014-2017, due to the fact that fishing was not carried out at all seasons with an aim to reproducing fishery resources in the water bodies. Fishing license holders, in accordance with the license conditions, annually take measures to breed fish in water bodies.

Amateur and sport fishing is allowed in both, the Black Sea and the inland water bodies of Georgia, which does not require a license and can only be carried out with the appropriate fishing-rods, spinning, casting nets and traps, parameters of which are defined by legislation. Underwater hunting and the collection of hydrobionts are also allowed. From 2016, recreational fishing is also possible, ensuring that caught fish are let off in the water alive and unharmed. Recreational fishing is also allowed on Trout, which is included in Georgia's Red List. The purpose of recreational fishing is to promote the development of sport fishing and fishing tourism. "Catch-and-release" fishing is a popular among sport fishermen.

Illegal fishing and violation of defined fishing rules are often in the inland water bodies of Georgia. 778 criminal offenses related to illegal fishing, falling in the scope of the Criminal Code of Georgia, were identified in Georgia's inland water bodies in 2014-2017. During the same period, there were 2 872 administrative violations of fishery and fish stock protection rules, including 1 392 cases of violation of amateur and sport fishing rules. During the same period, 277 administrative violations of fishing rules were reported related to the use of electrodes, electric shocks, or other prohibited weapons / devices. 3198.58kg of different species of fish were illegally extracted. The main objects of illegal fishing are Transcaucasian Barb, Prussian carp and Flathead Mullet.

Currently, research, education, training and extension in the fisheries sector are at a very low level. There are no special educational programs. Researches are mainly carried out with the help of donors. The country does not have a specially equipped boat for researching fish resources in the Black Sea, and the number of qualified specialists is extremely low.

Aquaculture

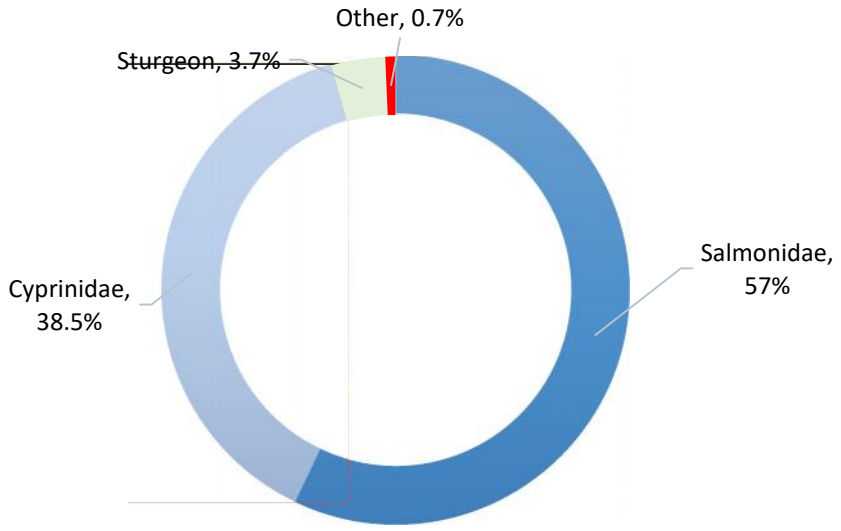
Arrangement of fish farms in Georgia does not require a license. Until 2018, the environmental impact permit was required for the construction of reservoirs with a volume of 10 thousand m^3 and more. And since 2017, arrangement of fish farm with a capacity exceeding 40 tonnes per year, is a subject of screening to determine the need for environmental impact assessment and, therefore, environmental decision-making.

As of 2017, the total area of fishing ponds is 2 224.6 ha, and the area of pools is 27.6 ha. Most of the ponds are located in Kakheti (total area 1 437.5 ha), followed by Samegrelo-Zemo Svaneti (476.2 ha) and Imereti (103.5 ha). Most of the pools are located in Shida Kartli (total area 18.2 ha). The

area of pools in Samtskhe-Javakheti is 3.5 ha, in Adjara - 1.8 ha, in Guria - 1.7 ha, and in the rest of the regions the total pools area does not exceed 2.4 ha.[110]

In 2017, 2 041.7 tonnes of fish were produced in aquaculture farms, most of which are Rainbow Trout and Silver Carp.

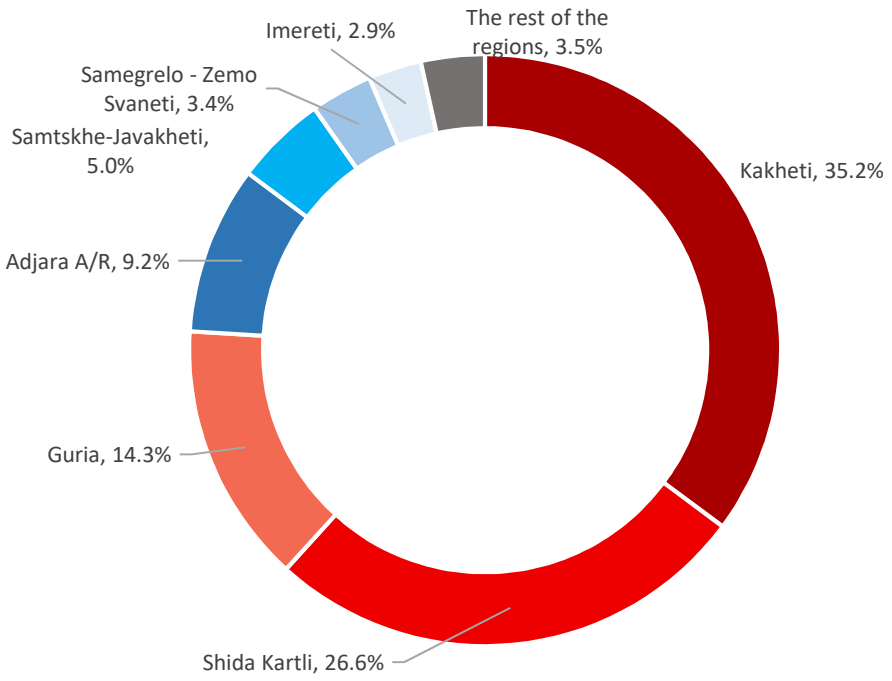
Figure 12.3.3: Fish Production Structure by Fish Families, 2017 (%)



Source: Geostat

In 2017, 35.2% of fish were produced in Kakheti pond and trout farms, and 26.6% in Shida Kartli and 14.3% in Guria.

Figure 12.3.4: Fish Production Structure by Regions, 2017 (%)



Source: Geostat

[110] The source of data on aquaculture is the pilot survey of aquaculture farms conducted by Geostat in 2017.

The main impediment to the development of aquaculture is the lack of good quality foods and fry.

At present, the share of the Sturgeon family in aquaculture is only 3.7%, while in 2014-2017 up to 300 tonnes of live Sturgeon and Sturgeon meat were imported to Georgia.

All species of the sturgeon family are protected by the Convention on International Trade in Endangered Wild Fauna and Flora (CITES), of which Georgia has been a member since 1996. The Convention strictly controls the export and import of protected species in order to prevent the illegal extraction of endangered species. Within CITES, international trade with the specimens of Sturgeon species, including caviar, are regulated and monitored by specially determined permition documentation.

All species of the Sturgeon family, which is widespread in Georgia, are on the verge of extinction and are listed in the Georgian Red List. Consequently, their commercial extraction is prohibited. The Georgian market mainly contains Sturgeons breeded and grown in aquaculture, including Siberian Sturgeon (A.baerii), Russian Sturgeon (A. gueldenstaedtii), Sterlet (A. ruthenus), Amur Sturgeon (A. schrenckii) and White Sturgeon (A. transmontanus). Of these species, only one species - the Russian Sturgeon - naturally appears in Georgia.

12.4 MAIN CHALLENGES

Challenges such as inadequate operation of hunting farms, insufficient law enforcement resources, weakness in hunting planning, monitoring, surveillance and control systems indicate that there is a need for a thorough reform of the hunting system. To this end, the concept of hunting and the relevant legislative act have been under preparation for several years with the stakeholder involvement, supported by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the United Nations Food and Agriculture Organization (FAO).

It is considered that the reform of the hunting sector should be carried out in the following directions:

- Ensure involvement of all stakeholders in hunting management, including local government, population and hunters;
- Promoting hunters' self-organization and forming associations, delegating certain hunting rights and responsibilities to them;
- Strengthen monitoring and inspection and involve the private sector;
- Defining hunting areas (hunting grounds);
- Training and certification of hunters, protection and restoration of Georgian hunting traditions;
- Determination of hunting seasons and quotas based on scientific research and monitoring.

Excessive extraction of fish resources, water pollution, spread of invasive species and climate change impacts on marine and inland ecosystems pose a threat to the diversity of species important for fisheries. Another important challenge is the low level of public awareness in the fisheries, the small number of qualified specialists and the lack of information and research in the field.

Given the challenges facing the fishing sector in the coming years, it is important to:

- Approve the fisheries sector development policy and strategy and implement appropriate legal and institutional changes;
- Strengthen co-operation with the GFCM related to the exchange of best practices and experience in fisheries, in particular, in assessing fish stocks;

- Ensure access to real-time information on fishing process, catches composition and quantity, including fishery in inland water bodies; bring the existing electronic control and monitoring system for fisheries in the Black Sea in line with the EU requirements;
- Develop and implement special educational programs in the field of fisheries.

IV/13 AGRICULTURE AND FOREST USE

Unsustainable agricultural practices can harm the environment and people, cause pollution of land and water, degradation of water ecosystems and land, loss of forest cover, and more. Similar practices may exacerbate the negative effects of climate change. Consequently, it is important to implement sustainable approaches to agriculture to improve the state of the environment in the long run, while not harming human health.

Forest is a significant, valuable natural resource for Georgia that provides important products and services to the population of Georgia. The forest is a source of timber and non-timber resources (timber and firewood, food and medicinal plants) and potable water. The cultural and recreational functions of the forest are important. Forest ecosystems play an essential role in water regulation and soil protection from erosion, natural disasters prevention and the effects mitigation. The forest has an important role to play in reduction and adaptation to climate change impacts.

Sustainable forest management is essential not only for maintaining a healthy environment but also for eliminating social problems and developing the economy.

13.1 MAIN QUESTIONS AND MESSAGES

1. What is the role of agriculture in achieving sustainable development of the country?

- Agriculture is the largest economic sector in Georgia in terms of number of employees and land use. In 2017, 42% of the population lived in rural areas, and 43% were employed in rural, forestry and fish farming. In 2017, the share of the activity in the country's GDP amounted to 8%. Therefore, one of the country's most valuable natural resources, most of the land (40%) is agricultural. Consequently, agriculture plays a vital role in the creation of livelihoods of Georgia, forming the desired ecosystem and providing the necessary basis for sustainable development of the country.

2. How large is the impact of agriculture on the environment and what are the trends in recent years?

- In the 1990s, the scale of agricultural production declined sharply, together with the reduction of the adverse environmental impacts of the activities. However, pollution (use of mineral fertilizers and toxic chemicals), unsustainable consumption of natural resources (land degradation / desertification, increasing water abstraction, water losses, etc.) and negative impacts of agriculture on GHG emissions are still significant;
- Consumption of mineral fertilizers used for agricultural production decreased by 19% in 2017 compared to 2014, due to a 22% decrease in the use of mainly nitrogen fertilizers. The amount of pesticides used for the areas of annual as well as permanent crops increased slightly in 2014-2017 and amounted to 102.7 thousand ha in 2017. As a result of the improvement of the irrigation systems, the number of irrigated areas increased by 46%, and the amount of water used for irrigation has tripled. GHG emissions from the agricultural sector in 2011-2015 are characterized by growing trend, and by 2015, approximately 18.6% of the country's total emissions amounted to 3,271 Gg CO_2 equivalent.

3. What are the main challenges of the forestry sector in Georgia?

- The failed forest sector reforms of the last decade and the unsustainable management of forests have caused today's poor forest ecosystems. For example, the issuance of timber licenses did not violate internationally recognized principles of sustainable forest management, hampered the development of licensing conditions and did not allow for proper control over the definition and subsequent extraction of resources. As a result, long-term licenses for forest use were suspended;
- One of the main types of forest use is the use of timber by the population, which is carried out in the so-called social cuttings. Timber resources allocated within social cutting are exploited by informal and unskilled groups that do not follow logging rules, which significantly damage forest ecosystems, increase the risk of spreading diseases, and endanger human life and health. The utilization of forests for Social Cutting is incomplete due to the difficulties associated with distance and production;

- Large-scale, mostly illegal exploitation has led to the degradation of a significant part of the forest, depletion of forest resources and degradation of recovery capacity;
- There is no accurate and complete information on quantitative and qualitative indicators of timber allocation for timber resources;
- Due to the lack of staff in the controlling bodies, it is not possible to properly identify the facts of transportation, processing and sale of illegally obtained timber.

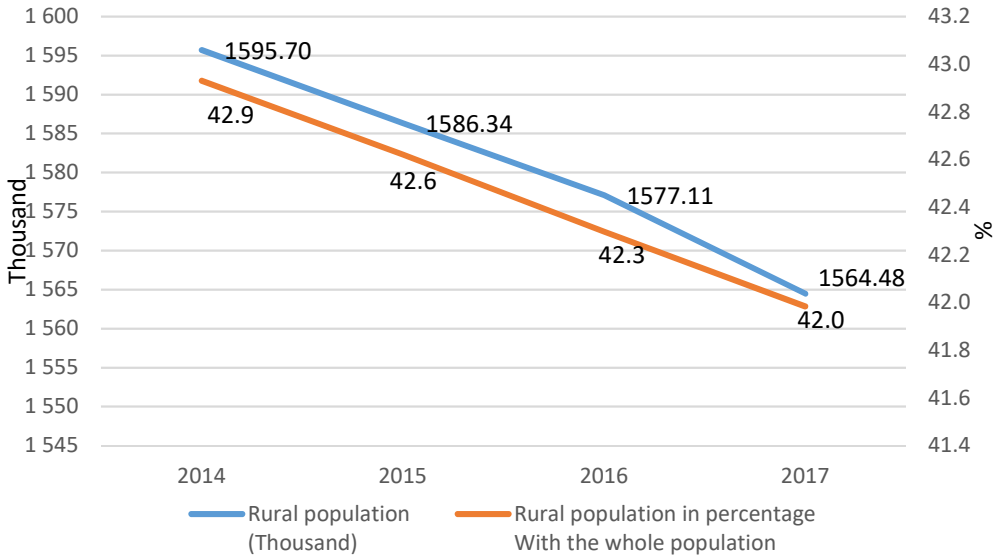
4. What changes are planned to introduce sustainable forest management practices?

- For forestry sector it is necessary to resolve the problems of sustainable forest management system, which provides a qualitative and quantitative improvement in Georgia forests, biodiversity protection, environmental values of forests, taking into account their economic potential and effective use, which is very important A forest management and public participation. To this end, a new draft of the Georgian Forest Code has been developed, which proposes significant changes in forest management and will contribute to the conservation of biodiversity and the sustainable use of the economic values of forests. The Draft Law on Sustainable Forest Management stipulates that they are enforceable at the level of certain norms and reservations. Accordingly, the main point of the bill is the gradual restoration of forestry and the replacement of social cutting with sustainable and multi-purpose benefits;
- The commitment to promote sustainable forest management is reflected in the Association Agreement between Georgia and the European Union, under which the parties recognize the importance of sustainable forest management and the contribution of the forest to the achievement of economic, environmental and social goals. Georgia undertakes to promote the protection of forest cover, to combat illegal logging and related trade;
- The forest information and monitoring system is being developed. The methodology of national forest accounting has been developed and tested and the activities of national forest accounting have begun. Since 2013, forest management activities have been resumed for forest planning.

13.2 AGRICULTURE SECTOR

Agriculture plays an important role in the economic development of the country. Despite the declining trend, as of 2017, almost half (42%) of the population, 1.6 mln persons, live in rural areas (Figure 13.2.1) and are mainly employed in agriculture. In particular, 735.9 thousand people are engaged in economic activities in rural, forestry and fish farming.

Figure 13.2.1: Number of rural population (thousand,%)

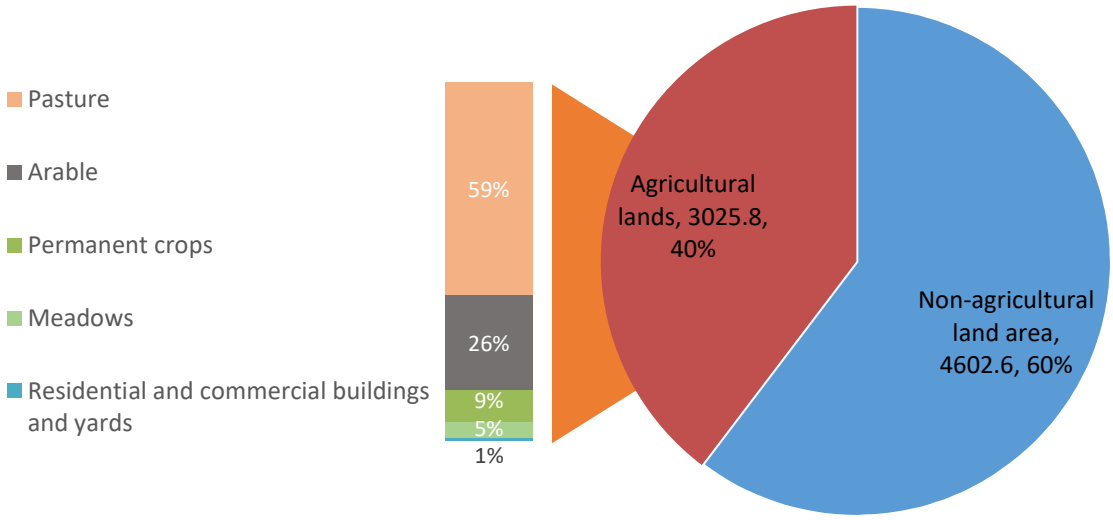


Source: Geostat

Agriculture plays an important role not only in terms of economic activity but also in terms of national security. In particular, it is an important lever for food provision, socio-economic empowerment of rural communities and engaging population in economic activity along the border to prevent depopulation.

However, a significant portion of the land 3 025.8 thousand ha (40%) is for agricultural use[111]. Most of the agricultural lands (59%) are dedicated to pastures, arable lands – 26%, perennials – 9% and meadows – 5%. (See Figure 13.2.2).

Figure 13.2.2: Distribution of Land Fund for Land Users and Agriculture



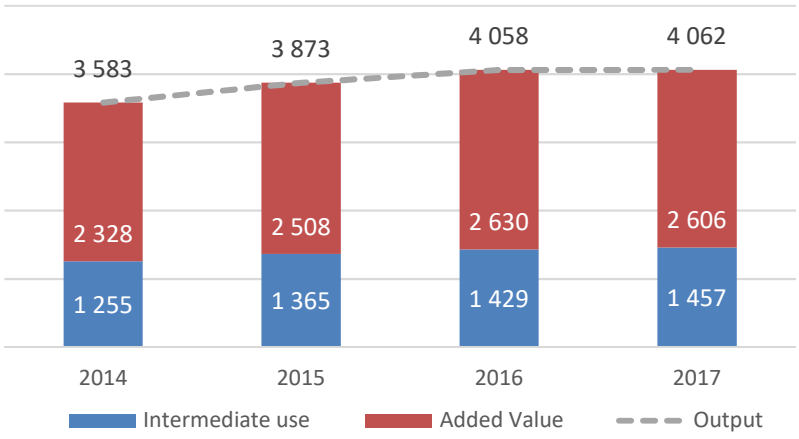
As of April 1, 2004

Source: State Department of Land Management of Georgia

It is noteworthy that the transition to the market economy of the country during the 90s of the last century, armed conflicts and a number of other factors had a significant impact on the economic development of the country and, therefore, on the agricultural sector. In particular, agricultural material and technical base became outdated, Georgia's agricultural workers had little opportunity to learn about the latest advances and technologies in the field for successful business activities. At the same time, competition with the products of the primary or processing industries produced abroad increased and the inadequate preparation of local agricultural production became evident. Mismatch with the quality of regulatory standards and norms for agricultural production, food safety control mechanisms of international markets, shortage of specialists (agronomists, veterans, etc.) and their low qualification was gradually revealed, and negative effected on the development of the sector, which in turn reduced the agricultural production. Looking at the reporting period, output of agriculture, forestry, hunting and fishing increased at current prices, but fell to 0.1% in 2017, and if we exclude intermediate consumption, the added value created the same year fell by 1% compared to 2016.

[111] Source: State Department of Land Management of Georgia

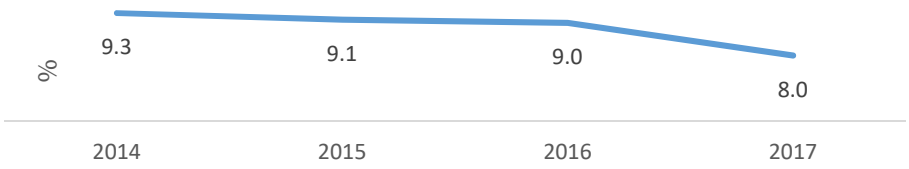
Figure 13.2.3: Output, intermediate consumption and value added dynamics of agricultural, forestry, hunting and fishing products (at current prices, GEL mln)



Source: Geostat

The share of agriculture, forestry, hunting and fishing products economic activity in the gross domestic product (at current prices) has shown a declining trend, if in 2014, it was 9.3%, it was reduced to 8% in 2017.

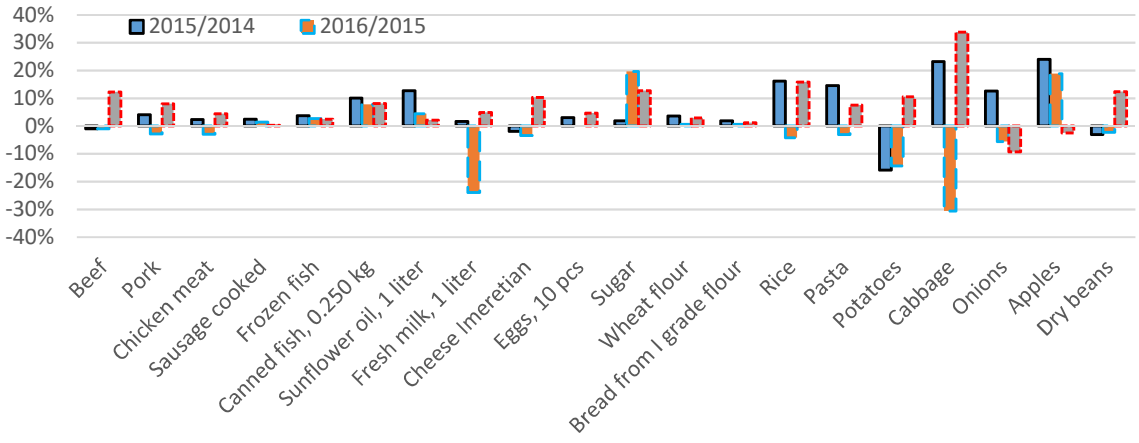
Figure 13.2.4: Dynamics of share of agriculture in GDP (%)



Source: Geostat

If we look at the price statistics, we can notice that in 2017, the prices of agricultural products increased significantly compared to the previous year. Specifically, out of the twenty products listed in the diagram, the price was reduced on only two products, while eleven products price was increase by single-digit percentage, and moreover, seven product price – by double-digit percentage. This fact has a significant impact on the formation of the overall output and indicates that the slight increase in the total agricultural output in 2017 is resulted by the increase in intermediate consumption of the sector and consequently, the increase in prices.

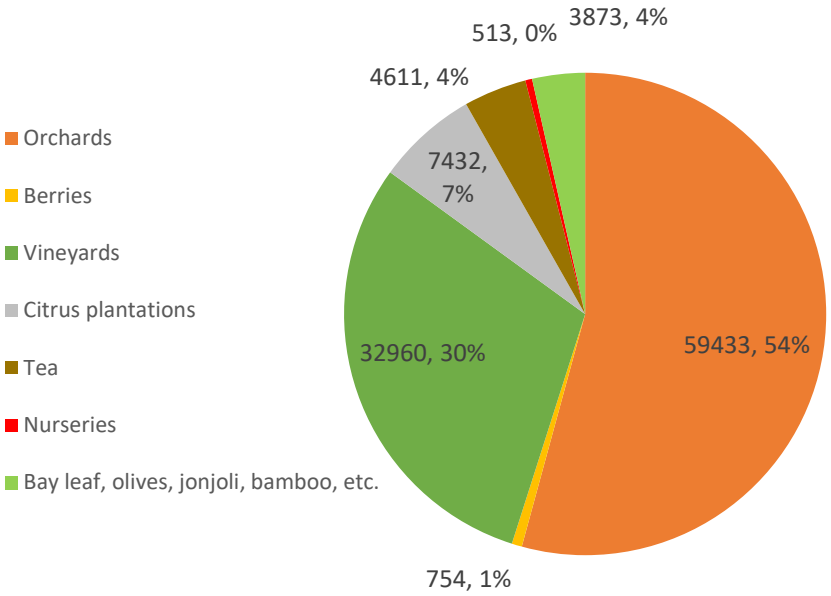
Figure 13.2.5: Average annual increase in food prices (%)



Source: Geostat

Most permanent crops come from orchards (54%), followed by vineyards (30%), citrus fruits (7%) and other categories.

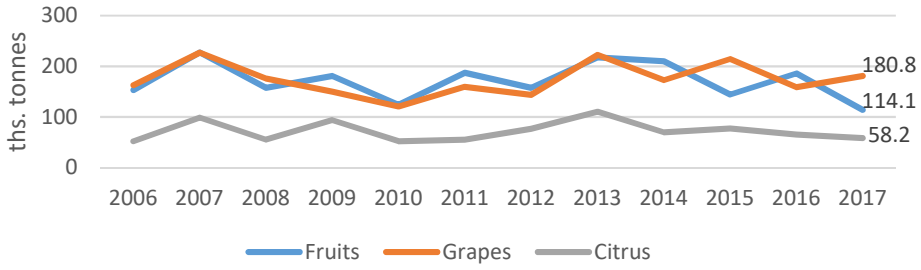
Figure 13.2.6: Land occupied by permanent crops areas (ha,%, 2014)



Source: Geostat

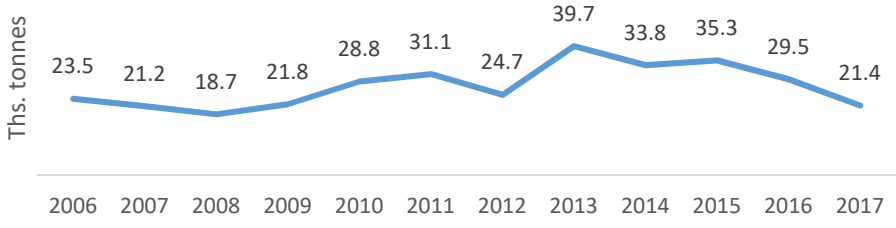
The spread of various diseases and invasive pests has caused significant damage to agricultural crops and their productivity. Consequently, the volume of production of perennial crops decreased compared to 2015. For example, the amount of citrus and fruit was also reduced. Hazelnut crop damage was particularly severe: if the hazelnut harvest amounted 39.7 thousand tonnes in 2013, the crop halved in 2017 (21.4 thousand tonnes).

Figure 13.2.7: Production of permanent crops in Georgia (ths. tonnes, 2006-2017)



Source: Geostat

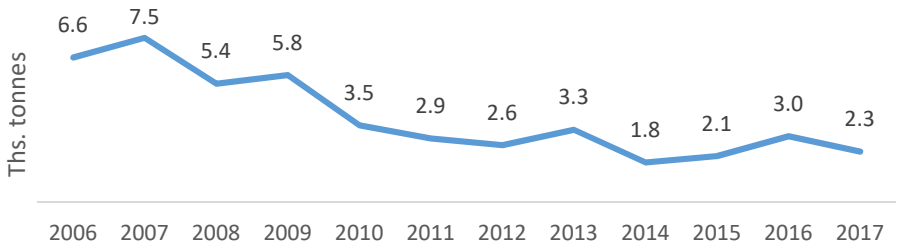
Figure 13.2.8: Hazelnut production (ths. tonnes, 2006-2017)



Source: Geostat

The lowest rate of tea production was recorded in 2014 (1.8 ths. tonnes). In 2015-2016, the figure increased by 67% to 3.0 ths. tonnes, but in 2017 it decreased by 23% to 2.3 tonnes.

Figure 13.2.9: Tea production (ths. tonnes, 2006-2017)



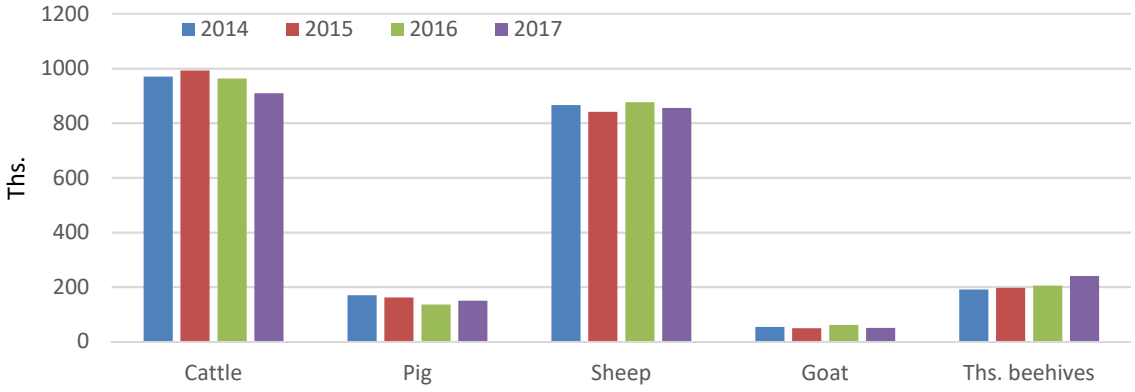
Source: Geostat

According to livestock statistics, the number of cattle in 2017 amounted to 909.7 thousand. Compared to the previous year, this figure increased by 2% in 2015, though in 2016 and 2017, there was a decrease of 3% (29.4 ths. souls) and 6% (53 ths. souls).

In terms of pig farming, it has declined and then increased in the period of 2014-2017. In 2017, 150.7 thousand pigs were accounted for, an increase of 11% in 2017 compared to the previous year, but fell by 11% compared to 2014. The number of sheep and goats declined slightly in the reporting period and in 2017, accounted to 907,000.

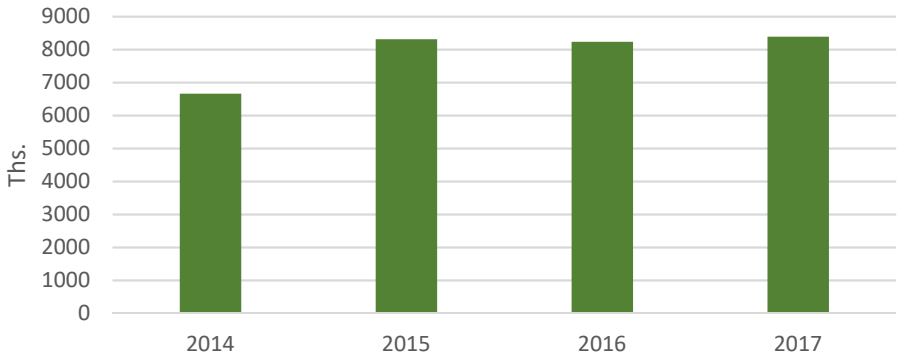
The number of poultry has increased significantly, with 8,386 thousand wings in 2017, 26% more compared to 2014. There has been a clear upward trend of growth in beekeeping, a 26% increase in the number of beehives over the four-year period and 240.6 thousand beehives in 2017.

Figure 13.2.10: Number of cattle and beehives in 2014-2017 (By the end of the year, a ths.)



Source: Geostat

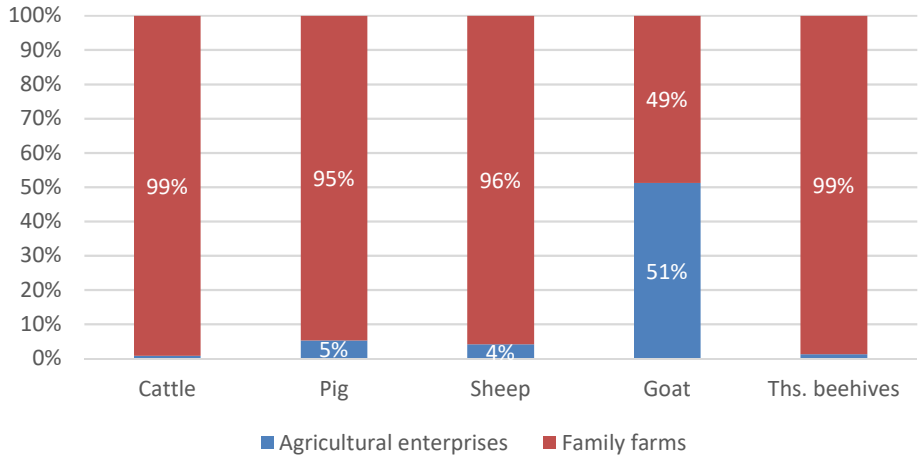
Figure 13.2.11: Number of poultry in 2014-2017 (By the end of the year, ths.)



Source: Geostat

In 2017, the highest share of agricultural enterprises was recorded in poultry farming (51%), followed by cattle breeding (5%) and sheep and goat (4%), as for livestock and beekeeping, their share was about 1%.

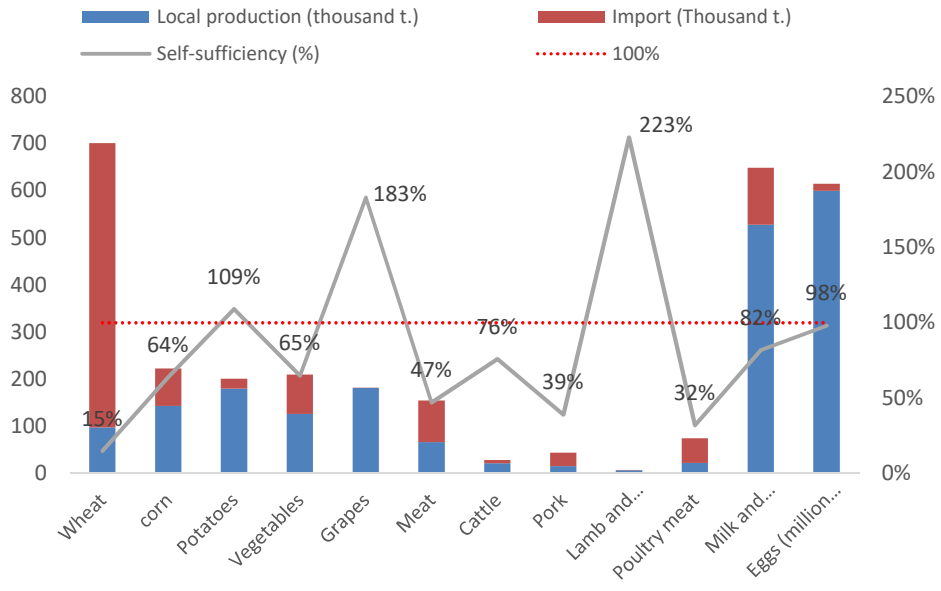
Figure 13.2.12: Share of family farms and agricultural enterprises in the number of cattle, poultry and beehives (2017,%)



Source: Geostat

It is important to note that in terms of local food consumption, self-sufficiency in agricultural production in Georgia is achieved only in the production of grapes, potatoes, sheep and goats and eggs. If non-imported products been available in 2017, only partial demand for locally produced agricultural products would have been met, Specifically, 15% of wheat, 64% of maize, 65% of vegetables, 47% of meat (76% of cattle, 76% of pork 39%, poultry 32%), 82% of dairy products and 98% of the eggs.

Figure 13.2.13: Food production, import and self-sufficiency ratio



Source: Geostat

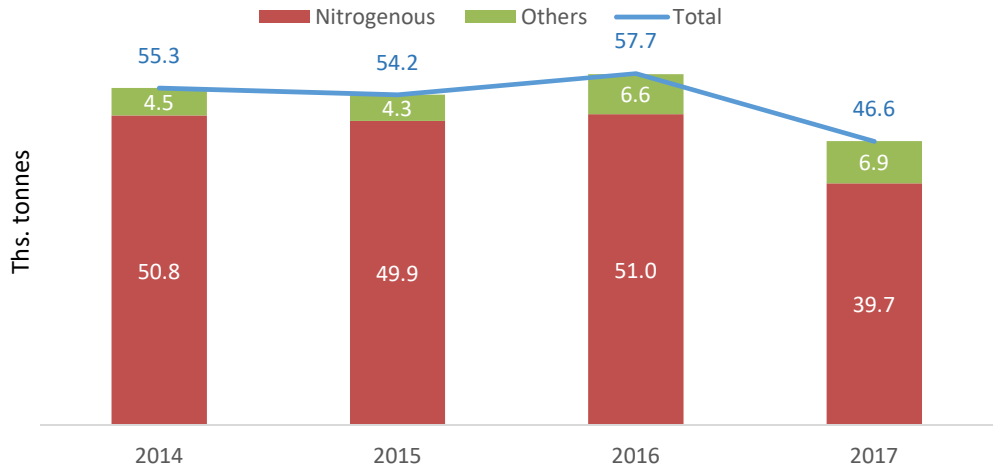
If the demand for agricultural products is met with locally produced products, there is a need to focus on sustainable development of agriculture in order to minimize the potential negative impacts

on the environment. Therefore, it is important to maximally encourage the introduction of sustainable agricultural practices.

13.3 IMPACT OF AGRICULTURE ON THE ENVIRONMENT

One of the important indicators of environmental impact of the agricultural sector is the amount of agrochemicals consumed, especially when the unsustainable practice of using these chemicals is commonly found. Consumption of mineral fertilizers used for agricultural production was almost equal in 2014-2016, decreasing by 19% in 2017, at the expense of a 22% decrease in the use of mainly nitrogenous fertilizers, as other types of fertilizer consumption increased by 5%. Accordingly, the environmental impact of using mineral fertilizers in 2017 has been somewhat reduced at the expense of less use of nitrogen fertilizers.

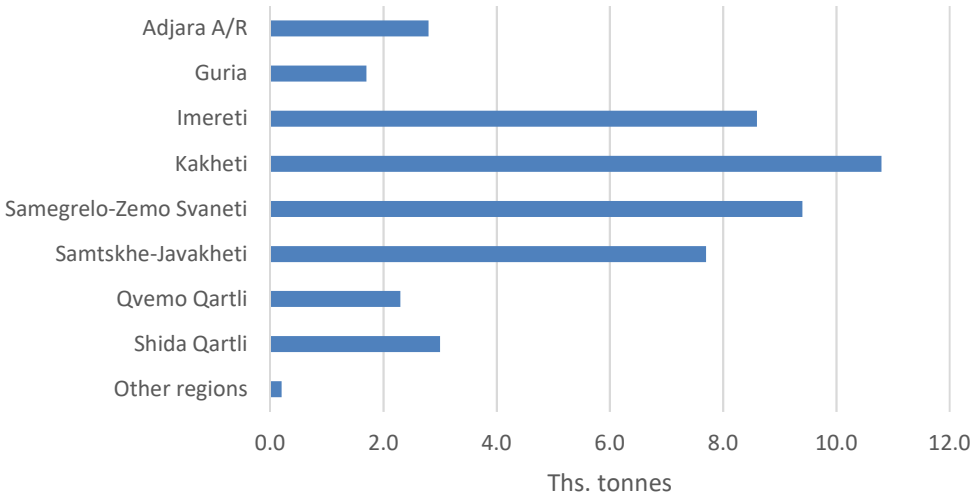
Figure 13.3.1: Mineral fertilizers used by agricultural holdings (thousand t)



Source: Geostat

Kakheti (23%), Samegrelo-Zemo Svaneti (20%), Imereti (18%) and Samtskhe-Javakheti (17%) regions have the highest mineral fertilizer use. Nitrogenous fertilizers are still mostly consumed in these regions (77% in total), while other types of fertilizers are mainly used in Kakheti (52%) and Samegrelo-Zemo Svaneti (30%) regions.

Figure 13.3.2: Mineral fertilizers used in agriculture by regions (ths. tonnes, 2017)

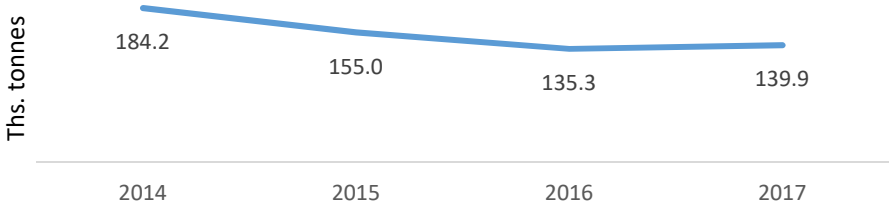


Source: Geostat

It is important to note that, compared to the previous year, in 2015-2016, the use of manure decreased by 16-13%, while in 2017 it increased by 3%. As for the areas where the manure was used for both permanent and annual crops, it declined sharply in 2016-2017.

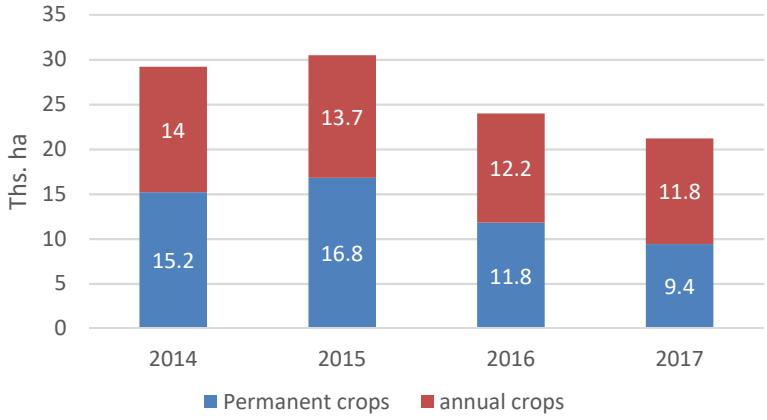
In 2017, Kvemo Kartli (24%), Samegrelo-Zemo Svaneti (21%) and Imereti (20%) are leading the regions in terms of use of manure.

Figure 13.3.3: Use of manure (ths. tonnes, 2014-2017)



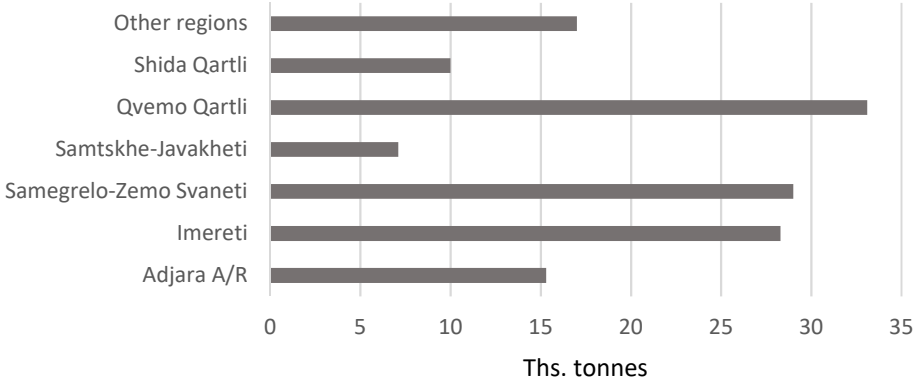
Source: Geostat

Figure 13.3.4: Land area ftreated by manure (ths. ha, 2014-2017)



Source: Geostat

Figure 13.3.5: Manure use by regions (ths. tonnes, 2017 წ.)

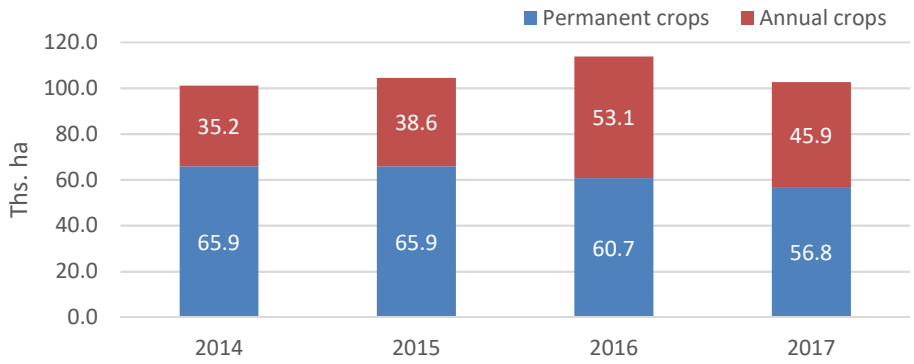


Source: Geostat

The amount of pesticides used by both annual crops and permanent crops reached 113.8 thousand ha in 2016, down from 102.7 thousand ha in 2017 and fell to almost the same level as in 2014-2015. In the 1990s, the use of pesticides was also reduced by the scale of agricultural activity. Consequently, pesticide contamination at this stage is not as large as it was in the 1990s. With the introduction of modern technologies, awareness raising and knowledge sharing, it is possible to

minimize the use of pesticides, which must be implemented in line with sustainable consumption standards. Also, in order to produce biologically pure products, the fight against diseases of agricultural crops by natural means should be maximally encouraged.

Figure13.3.6: Area of pesticide-treated annual and permanent crops (ths. ha)

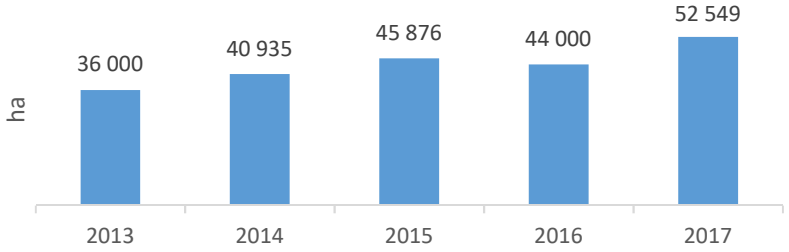


Source: Geostat

Inappropriate practices of use and storage of mineral fertilizers, pesticides and other chemicals, pollute not only agricultural land and agricultural products, but also water bodies, where pollutants are recieved from natural precipitation and irrigation. This has a significant negative impact on maintaining the ecosystem balance of ground and surface water bodies. Contaminated water consumption for drinking or other purposes also has adverse effects on biodiversity, human health and living conditions.

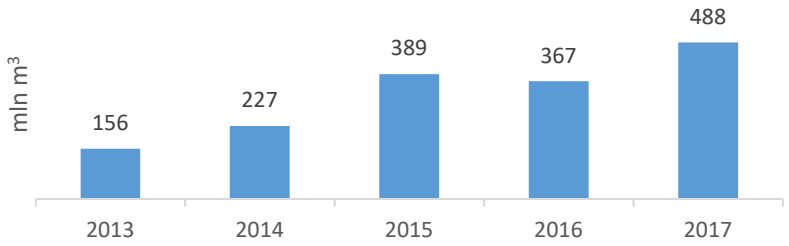
As a result of the improvement of the amelioration systems, the number of irrigated areas has increased significantly. In 2013-2017, total growth rate was 46%. Consequently, the volume of water used for irrigation has tripled, in particular, the figure for 2017 has increased by 3.14 times compared to 2013.

Figure13.3.7: Irrigated agricultural land area (2013-2017 ha)



Source: LTD "Georgian Amelioration"

Figure 13.3.8: Water volume used for irrigation from amelioration systems (mln m³, 2013-2017)



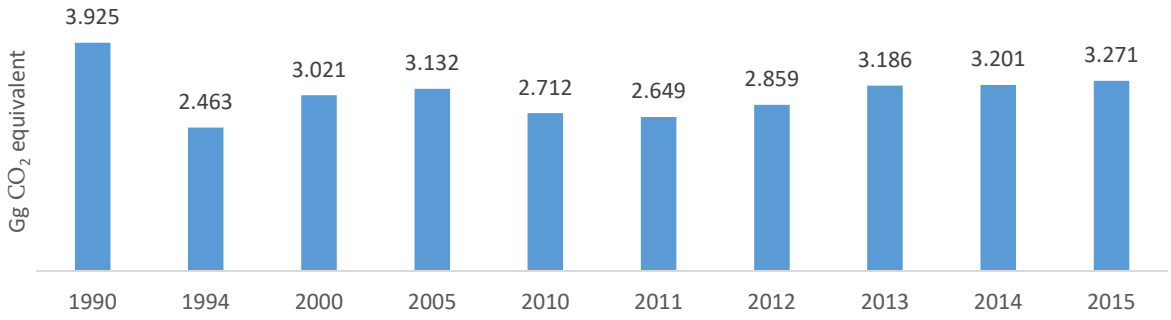
Source: LTD "Georgian Amelioration"

Extensive development of amelioration systems, which is directly related to the increased amount of water abstraction, leads to an increase of a negative impact on groundwater and surface water. In particular, much of the water used for agricultural purposes cannot be returned, and some contaminated will be infiltrated in the groundwater and surface water, resulting in reduced river water flow, partial pollution, and consequently, an alteration of the ecosystem in some water catchment areas. However, it is noteworthy that in some parts of eastern Georgia, there is a tendency for secondary salinization and erosion resulting from excessive irrigation.[112].

It should be noted that the contamination resulted by small-scale family farms with livestock activities are less concentrated in one place and the environmental impacts are even lower. In addition, it needs to be considered that the productivity of small households is relatively low. At the same time, it is intended not only for selling but for sutisfying the needs of the household. Due to the relatively large scale of farming through agricultural enterprises, the risks of contamination in the case of their unsustainable practices are greater. Given these circumstances, to achieve sustainable agricultural development, relatively large scale agricultural production presentsan important subject of environmental impact assessment and related supervision.

Irrespective of the scale of the above activities, total agricultural activity is one of the main sources of GHG emissions in Georgia and is a contributing factor to climate change. The latest available GHG inventory results in Georgia is for 2014-2015. Consequently, this report will be limited to these years[113]. GHG emissions from the agricultural sector have fallen sharply compared to 1990, as the area of arable land has declined substantially, reducing the scale of agricultural production and the use of nitrogen fertilizers (1990 – 1,298 thousand tonnes and 2017 - 46.6 thousand tonnes). Volume of other fertilizers. Between 1994 and 2005, the volume of GHG emissions from the agricultural sector increased, and then there was a significant decline until 2011. In 2015, GHG emissions from the agricultural sector increased compared to the previous year, accounting for approximately 18.6% of the total volume of emissions, equivalent to 3,271 Gg CO_2 (see Figure 13.3.9).

Figure 13.3.9: Dynamics of GHG emissions from the Georgian agricultural sector (Equivalent to Gg CO_2)



Source: Fifth National Greenhouse Gas Inventory Report of Georgia (GHGs), 2014-2015

13.4 FOREST USE AND ITS IMPACT ON THE ENVIRONMENT

The forest area of Georgia is 3 124.2 thousand ha and is now fully state owned[114]. LEPL National Forestry Agency (NFA) of the Ministry of Environmental Protection and Agriculture of Georgia

[112] Third National Environmental Action Program of Georgia, 2017-2021 Soil Protection. pg.107
[113] National Greenhouse Gas Inventory Report of Georgia, 2010-2013
[114] Source: Statistical Publication "Georgia's Natural Resources and Environment 2017".

(MEPA) manages 1 996.9 thousand ha of forest[115]. 596.2 thousand ha of forest is managed by the LEPL Agency of Protected Areas (APA).[116] The forest fund in the territories of the Autonomous Republics is managed by the relevant bodies of the Autonomous Republics. Adjara Forestry Agency (AFA) manages 150.1 thousand ha of forest within the Autonomous Republic. Akhmeta Municipality City Hall manages the forest fund within the Tusheti Protected Landscape (5 029 ha). 11 900 ha of green plantations within the boundaries of the Tbilisi Municipality, which are not included in the forest fund, are managed by the Tbilisi City Hall.

Imereti, Kakheti, Racha-Lechkhumi, Samegrelo and Svaneti regions have more forest cover.

Figure 13.1: Forest under NFA management by regions, 2017 (Thousand ha)

Region	Forest fund area	Forest cover
Guria	86	82.6
Imereti	312.4	301.1
Kakheti	288.4	268.2
Mtskheta-Mtianeti	238	222.9
Racha-Lechkhumi and Kvemo Svaneti	282	268
Samegrelo-Zemo Svaneti	272.7	256.4
Samtskhe-Javakheti	133.4	130.1
Kvemo Kartli	146.7	133.5
Shida Kartli	237.3	213.6
Total	1 999.6	1876.4

Source: NFA[117]

The main direction of forest use is extraction of timber and firewood. Non-timber resources are collected for export - Fir cone, green snowdrop bulbs and eastern sowbread tubers. The local population uses non-timber forest resources such as mushrooms, food and medicinal plants. collecting non-timber forest resources for personal use does not require a license or permit.

For export, fir cones are collected on the basis of long-term licenses (10 years) in Ambrolauri and Borjomi-Bakuriani forests. Fir coin's seeds are exported to European countries to grow Christmas tree. Currently, Fir coin are gathered by 24 companies in Ambrolauri and 10 companies in Borjomi-Bakuriani. The licenses were issued in 2009-2013. 131-371 tonnes of Fir cones are produced annually.

Timber and firewood are obtained on the basis of special licenses for timber harvesting and for non-commercial use through social cutting.

[115] Including uncontrolled areas of Samachablo and Kodori Gorge.

[116] Including the A / R of Abkhazia and the Tskhinvali region.

[117] The information is prepared by the LEPL National Forestry Agency within the limits of the State Forest Fund approved by the Decree # 299 of the Government of Georgia on August 4, 2011, including 191 950 ha of occupied Samachablo and Kodori Gorge.

Table 13.2: Volume of wood obtained by logging, m³

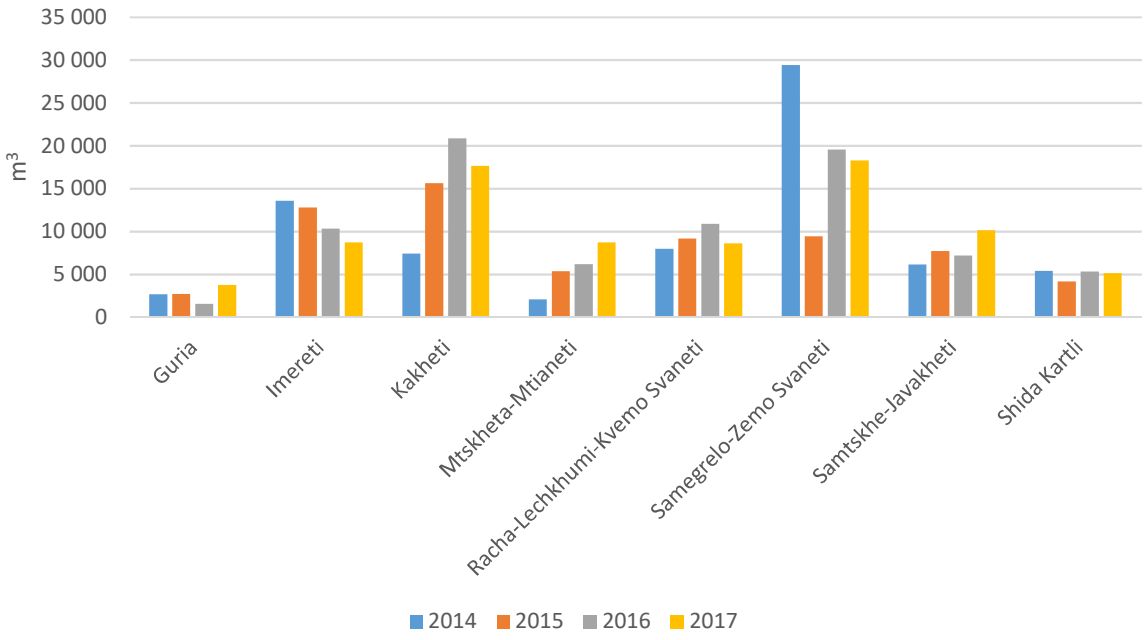
	2014	2015	2016	2017
Commercial cutting	**74 677.6**	**67 029.5**	**81 858.0**	**81 050.7**
Social cutting	**608 475.1**	**635 178.6**	**529 828.6**	**493 015.5**
By NFA	513 414.1	539 193.6	447 053.6	409 980.5
In Protected Areas	17 080	20 475	17 353	14 001
By AFA	77 981	75 510	65 422	69 034
Maintanance Cutting By NFA	**402.8**	**1 716.5**	**2 482.2**	**3 502.3**
Social Cutting	**3 778.1**	**8 156.2**	**13 875.1**	**52 885.6**
By NFA	3 076.8	6 562.0	10 034.8	48 653.9
Other Soecial Cutting	701.3	1 594.2	3 840.3	4 231.7
Total cutting (Commercial+Social+Maintanance+Special	**687 333.6**	**712 080.8**	**628 044**	**630 454**

Source: MEPA, DES, NFA, APA, AFA

Special licenses for timber harvesting have been issued to 38 companies that produce timber in an area of 139 401.7 ha (6.9% of the forest fund managed by NFA). The licenses were issued during 2007-2011 for a term of 10 to 20 years. The longest-running licenses expire in 2029.

The diagram below shows the volume of timber produced by companies licensed for special timber harvesting by regions in 2014-2017.

Figure 13.4.1: Capacity of timber made on licenses, m³



Source: DES

The study of the situation in the commercial timber industry revealed the following major shortcomings:[118]

[118] CENN, Fuel consumption in Georgia, Assessment of supply-demand chain and potential, 2016.

- licenses were issued without forest inventory, which led to significant inaccuracies in the calculating of available resources;
- The licenses do not clearly define the terms and conditions of forest use, which do not ensure effective control of its implementation;
- Auctions for forest use licenses were held in a non-competitive environment and, as a result, the state benefits from issuing licenses were significantly reduced;
- The forest managment plans prepared by the license holders set only general objectives of forest maintenance and do not include specific measures;
- Controls have no preventive nature, license holders are not assessed on the basis of risk assessment, the supervisory authority does not have an effective lever to temporarily suspend the licensee's activities if necessary and avoid repeated violations.

In Georgia, so-called Social Cutting practice in accordance with the Resolution N 242 of the Government of Georgia of August 20, 2010 "On Approval of the Forest Rule" is used to provide the population and public organizations with firewood. Most of the firewood is being allocated within the framework of Social Cutting, a relatively small amount of timber have been allocated as well until 2018. This practice implies the provision of timber resources at low cost to the population and public organizations (5-7 GEL per m^3 of timber production). $7m^3$ firewood will be allocated per household and $15m^3$ in highland regions.

Demand for firewood as an energy source is particularly high in rural areas. 95% of the rural population uses firewood for heating[119]. Natural gas is still not available in most of the villages. Even in gasified settlements, the population still uses firewood for heating, which is due to the low cost of firewood compared to natural gas.

The following table presents data on the volume of timber used within Social Cutting. The general trend has been declining in recent years.

Table 13.3: 2014-2017 Volume of timber allocated and utilized for Social Cutting (m^3)

Years	NFA		AFA		APA
	Volume of allocated timber	Volume of used timber	Volume of allocated timber	Volume of used timber	Volume of issued timber
2014	698 122.4	513 414.1	113 242	77 981	17 080
2015	704 173.7	539 193.6	111 724	75 510	21 436
2016	584 897.5	447 053.6	120 705	65 422	18 110
2017	481 550.2	409 980.5	124 737	69 034	15 690

Source: NFA, AFA, APA

The demand for firewood actually exceeds the amount of allocated timber resouces through the Social Cutting. But at the same time, the firewood is not fully utilized. For example, in 2014-2017 only 73.5-85% of firewood allocated by the NFA was extracted from the forest., This is due to the restricted access to the cutting areas, remoteness and difficulties associated with production/extraction of allocated timber despite the fact that NFA annually rehabilitates and arranges new forest roads.

In addition to Social Cutting, firewood can be provided to the population by other types of cuts, such as logging in areas excluded from the State Forest Fund, special cuts, under a special license

[119] State Audit Office, Timber Commercial Resources Management, Performance Audit Report, 2016.

of timber harvesting. The population also uses timber resources from privately owned areas, the information on its amount is not available. However, the difference between demand and supply of firewood is still significant.

Due to the lack of / high cost of alternative sources of fuel, the population also consumes firewood of illegal origin.

Table 13.4: Volume of wood resulting from illegal logging (m^3)

Years	Volume of illegally obtained resources, m^3	Including protected areas, m^3
2014	45 915	472
2015	44 612	883
2016	28 586	185
2017	35 022	324

Source: Geostat

However, detection of the illegal logging facts is less than actual firewood extraction. The existing system of Social Cut cannot solve the problems related to the demand on firewood and illegal logging.

13.5 MAIN CHALLENGES

Unsustainable agricultural practices have proven to be potentially harmful to the environment and to people, causing land and water pollution, degradation of water ecosystems and land, loss of forest cover, and more. Similar practices may exacerbate the negative effects of climate change. That is why it is important to implement sustainable approaches to agricultural development that will improve the state of the environmental components in the long run, while not harming human health.

In the 90s, the agricultural economic activity scale be substantially reduced, respectively, reduced negative environmental impacts of its less pollution (fertilizers, pesticides and other chemical elements in excess of consumption), natural resources are less intensive use (the land for agricultural purposes Abstract sairigitsio purposes, etc.) and reduction of GHG emissions as a result. However, the trend of land degradation has become evident. Industrial pollution of agricultural land (with heavy metals and industrial chemical waste) and land erosion (flooding, strong winds in eastern Georgia, and mostly water erosion in western Georgia) are significant challenges. 35% out of 3 mln ha agricultural land is degraded as a result of erosion[120]. This is due to various factors, but most importantly climate change, topography, the destruction of windshields and unsustainable human consumption of ecosystem services. In addition, in some places, processes of salinization or desertification have also begun.

With the restoration of the irrigation system and the introduction of new irrigation systems, the use of different uses of water has doubled, which has increased the scale of pesticide contamination used in agricultural practices and the dangers of ecosystem change in the rivers as a result of water abstraction. As a result, the need to introduce internationally proven practices for the sustainable use of water resources and the excessive use of poisonous chemicals has been identified.

That is why it is important to irrigate agricultural land wisely and minimize water use. This can be achieved by sharing widely proven agricultural knowledge (windscreen restoration, drip irrigation systems, mulching, mulching or other technologies). As for the prevention of contamination with

[120] Source: Third National Environmental Action Program of Georgia, 2017-2021. P.107

poisonous chemicals, it is important to take a number of measures that will reduce their demand. natural fertilizers to enrich the soil nutrients is especially important if you practice, or other pests of agricultural crops against diseases and natural methods of introduction, to the succession of cultures and actively introduce various agricultural land resources reasonable (spread of more resistant crops against climate change and deseases, rest and relocation practices, etc.) to use.

Imported foods account for a significant share of the country's food balance. Replacing imported goods with demand for agricultural products in Georgia through local, sustainable production and export oriented products will enhance economic activity in the regions and thus improve the quality of life.

It is noteworthy that during the reporting period a development vision was developed for the purpose of agricultural development, which is reflected in the conceptual policy documents. For example, the 2015-2020 Rural Development Strategy focuses on the environmental aspect. A list of measures has been set out for climate change, environment and biodiversity conservation: Guiding the principles of "good agricultural practices", developing biodiversity and sustainable environmental programs, establishing and managing a genetic bank for the conservation of agrobiodiversity and endemic varieties, and promoting the implementation of climate-friendly agricultural practices. The 2017-2020 Rural Development Strategy provides a more comprehensive look at the environmental aspects and includes issues related to protected areas, biodiversity, sustainable management of natural resources and waste, climate change and other environmental issues.

In addition, it is worth noting that in the process of nationalization of the Sustainable Development Goals (SDGs), Georgia has committed itself to providing sustainable food production systems and implementing sustainable agricultural practices by 2030 to increase agricultural productivity and production capacity (Goal 2, Targets: 2.3; 2.4; 2.5 and 2a) that Rom strengthen the implementation of climate change, extreme weather, drought, flooding and other disasters and the capacity to adapt to gradually improve the quality of land and soil.

With the estimates of the recent years it was confirmed, that commercial production of the timber based on of licenses and Social Cuts are an unsustainable practice of using forest resources, first of all, due to the fact that State does not have complete and accurate information on quantitative and qualitative characteristics of forest that is essential for ensuring the sustainable forest management. Therefore, it is not possible to determine whether the amount of timber resources allocated each year corresponds to the natural incremental capacity of the forest or not.

Issuance of timber licenses without proper forest inventory violated internationally recognized principles of sustainable forest management, hampered the development of licensing terms and conditions, and did not allow to determine the resources to be obtained and the proper control of subsequent extraction. Due to this, long-term special licenses of timber production have not been issued since 2012, and this type of license will be revoked under the new draft of the Forest Code of Georgia.

Studies have shown that Social Cutting is an unsustainable practice of using forest resources.[121] The Social Cutting program only partially fulfills its function, as most beneficiaries do not have the

[121] The impact of the Social Cutting Reform has been assessed by the Committee on Environment and Natural Resources of the Parliament of Georgia and the Budget Office in support of the USAID Democratic Governance Initiative 2018.
The audit of the effectiveness of social use of timber resources was carried out by the State Audit Office in 2016.

financial and technical capacity to cut firewood and extract it from the forest. Because of this, some of them sell tickets to informal groups which extract wood from the forests and sell produced firewood to the population at an already increased price. In turn, these informal groups do not have the proper qualifications for sustainable timber harvesting, do not comply the logging rules, which significantly damage forest ecosystems and increase the risk of spreading diseases, as well as endanger human life and health. The allocated cutting areas for Social Cut are not fully utilized due to the difficulties related to the distance and extraction of wood. 70% of the allocated cutting areas are utilized during the last 4 months of the year when the rural population receive their income. Therefore, the timber that has been cut during that period is difficult to be dried out, reducing its energy efficiency significantly (by 40%). Because of this, about 20% of excess wood is consumed annually.

Due to the lack of staff in the oversight bodies, it is not possible to identify the movement and processing of illegally obtained timber resources.

In response to these challenges, the Georgian National Forest Concept was adopted by the Parliament of Georgia in 2013, which set out the principles of forest management and priority directions for legislative and institutional reforms in the forestry sector.

The Georgian Biodiversity Strategy and Action Plan (2014) identified strategic approaches, national goals and relevant measures for sustainable forestry development to ensure the preservation of Georgia's biodiversity and its ecological functions.

Taking into account these national strategic documents and international commitments of the country, a draft Forest Code of Georgia has been developed, which proposes significant changes in forest management, which will contribute to the conservation of biodiversity and the sustainable use of the economic values of forests. The Sustainable Development Goals of the draft law, in particular the principles of sustainable forest management, are designed to be enforceable at the level of norms and provisions. Accordingly, the main essence of the draft law is gradual restoration of forestry enterprising activities. Replace "social cutting" with sustainable and multi-purpose forest use. Changes proposed in the new draft Forest Code also include forest categorization according to their ecological, social and economic functions and management purposes, forest management bodies and its duties, the types and conditions of use of forest resources, forest inventory, planning, the establishment of the information and monitoring systems in accordance with the new and modern requirements.

One of the strategic directions is to reduce the use of firewood, which will promote sustainable forest management. This can be achieved in a variety of ways, including:

- Promoting the production of fuel briquettes from residual biomass. At present, the potential of residual biomass is unexplored, most of it being burned or desposed in the environment, but various studies have shown that it is possible to reduce the current deficit of the resource in the country by producing briquettes from residual biomass;

- Energy efficient consumption of resources - drying of firewood and use of energy efficient stoves. By consuming raw firewood the energy loss is 30-40%, so the population consumes more resources than is actually needed;

- Eliminate completely unjustified practice of using firewood in public buildings in gasified settlements. In non-gasified settlements, public organizations have to justify the demand for the resource, as unjustified demand on firewood increases the risk of uneconomic consumption. It is noteworthy that in 2017 NFA started providing the firewood to the budgetary organizations.

IV/14 TRANSPORT

Along with the country's development and geopolitical importance, there is a growing local and international demand for high quality transport infrastructure and related services. Diversification and development of different types of transport services are of great importance, quality of transit of cargo service and passenger is constantly improving. However, this process is accompanied by intense environmental impacts, in particular, pollution resulting from intensive consumption of energy, construction and increasing number of vehicles and significant pressures on ecosystems (exhaust, GHG emissions, waste, etc.). Consequently, more attention needs to be paid to the development and implementation of sustainable development policies. These policies should ensure the conservation of resources and the use of clean technologies, which will lead to the sustainable use of natural resources, the maintenance of the livelihoods and vital ecosystems for the sustainable development of the country.

14.1 MAIN QUESTIONS AND MESSAGES

1. ***What are the indicators of development of the transport sector?***

- In 2013-2017, Transport sector GDP grew by 12.9% and it reaches 7.8% in nominal GDP of 2017. Large-scale construction works (highways, pipelines, railways and other construction works) were carried out to develop transit and local transport services, which attracted significant investments, tripled up to 1.67 billion GEL in 2017. Despite the sharp decline in the volume of car re-exports in neighboring countries, the car imports remained quite high. Therefore, the number of registered vehicles increased by 35% in 2013-2017 and reached 1.22 mln units, largely at the expense of second-hand imported cars.

2. ***What challenges do we face in terms of the environmental impact of the transport?***

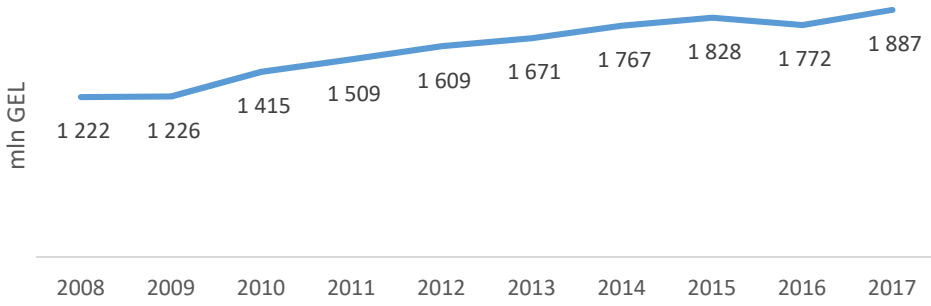
- In Georgia, as in the rest of the world, the transport sector has a great impact on the environment. The scale of negative impacts on the environment becomes more significant due to the construction-rehabilitation of transport infrastructure and the increase of the volume of traffic;
- Significant challenge is the emission rates of used vehicles, which is particularly noticeable in large urban areas, especially in Tbilisi, as 36.5% of cars are registered in the capital. Thefore, in 2017, 91% of registered cars in Georgia were over 10 years old. As a result of the abolition of mandatory technical inspections in 2004, emissions of motor vehicles became a major source of ambient air pollution. To overcome this challenge, the State Program on Enabling Activities to Abate Ambient Air Pollution in Tbilisi was approved, fuel quality standards have been tightened gradually and by 2019, the mandatory requirement for light vehicle techinspection has become fully operative. Except for this, a number of incentives have been introduced to encourage the import of clean and resource-saving technologies in terms of improving custom regulations or public procurement. As a result, imports of electric and hybrid cars increased. The share of hybrid cars in 2015 was 2% of total car imports, while in 2017, it increased up to 26.4%;
- It is noteworthy that according to the latest GHG inventory data, there is a significant increase in transport emissions. In 2015, the share of total emission in traffic was 23.6%, which is higher than in 2013 - 18.4%. However, according to 2015, the volume of transport emissions exceeds the level of 1990 by 9%, while the similar indicators of other economic activities are significantly below the indicator of 1990.

14.2 TRANSPORT SECTOR

The proper functioning and development of the transport sector plays a vital role in ensuring security, quality of life and overall well-being, not only nationally but regionally and globally. The transport sector in Georgia is one of the fastest growing economic activities (see Chart 14.2.1). In 2017, at base prices, 7.8% of the country's GDP (about 2.5 billion GEL at current prices) is allocated to the economic activity of transport. At constant 2010 prices, in 2017 compared to 2013, the total added cost of the same activity increased by 12.9%. The number of employees in the transport

sector is also high - according to a 2017 Labor Force Survey, the number of people employed in the transportation and warehousing sector was 68.8 thousand (4% of total employees).

Figure 14.2.1: Dynamics of total gross value added of transport economic activity at constant 2010 prices (GEL, 2008-2017)



Source: Geostat

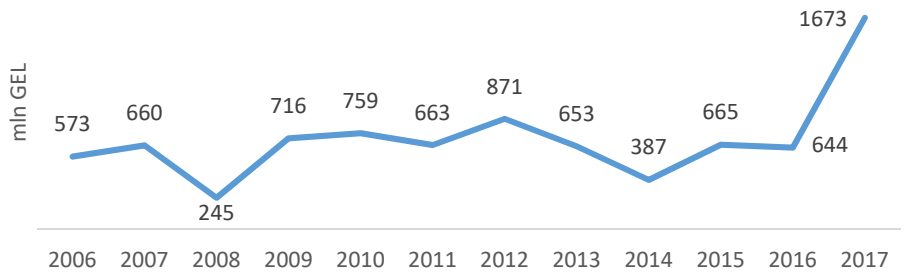
The development of the transport sector is driven by many factors. In particular, the practical steps of large-scale infrastructure or transport policies implemented during the reporting period, planned for the current or future years, are dictated by economic and political factors of local and international importance. With its strategic location in the Caucasus, Georgia plays an important role as a crossroads between North-South and Asia-Europe. Consequently, the development of international transit infrastructure and maximum enhancement of the transport sector stregth in the country is of great interest not only to our country but of our strategic partners. Georgia is still one of the most favorable routes of the Silk Road, which demonstrates the tremendous potential for the development of the sector and, at the same time, poses a significant challenge.

In order to overcome this challenge, a number of large-scale projects are being implemented with the joint efforts of international and local stakeholders:

- *Development of gas and oil pipelines - in terms of economic or energy security, not only for the Caucasus but also for the European countries.*
- *Construction of the Baku-Tbilisi-Akhalkalaki-Kars railway linking Asia-Europe - creates a new opportunity for freight or passenger transportation by rail between Asia and Europe. It is likely to replace somewhat longer-term shipping with relatively more affordable conditions than is possible by air or other land transport. In 2015, the first test train passed the mentioned railway, and in 2017, the railway was officially opened. Large-scale railway works are still underway, which is of great importance in order to increase the efficiency or turnover of the railway.*
- *Construction of the deep-sea Anaklia seaport and its service infrastructure - creating the possibility of large freight cargo vehicles and providing adequate transit services, which will become another important means of diversifying the supply of goods to Europe or other regions.*

The dynamics of investment in fixed assets of transport and warehousing enterprises in 2006-2016, excluding the somewhat delayed transition projects of the 2008 conflict and the 2014 government change, varied between GEL 563-871 mln. In 2017, this figure almost tripled to GEL 1.67 billion (see Chart 14.2.2). In 2018, this indicator has increased significantly and with the help of the EU it is expected to grow even more dramatically, which is related to the construction of highways, rail transport and the Anaklia deep-sea port.

Figure 14.2.2: Dynamics of Investment by Enterprises engaged in Transport and warehousing Activities in Fixed Assets (2006-2017, GEL mln)

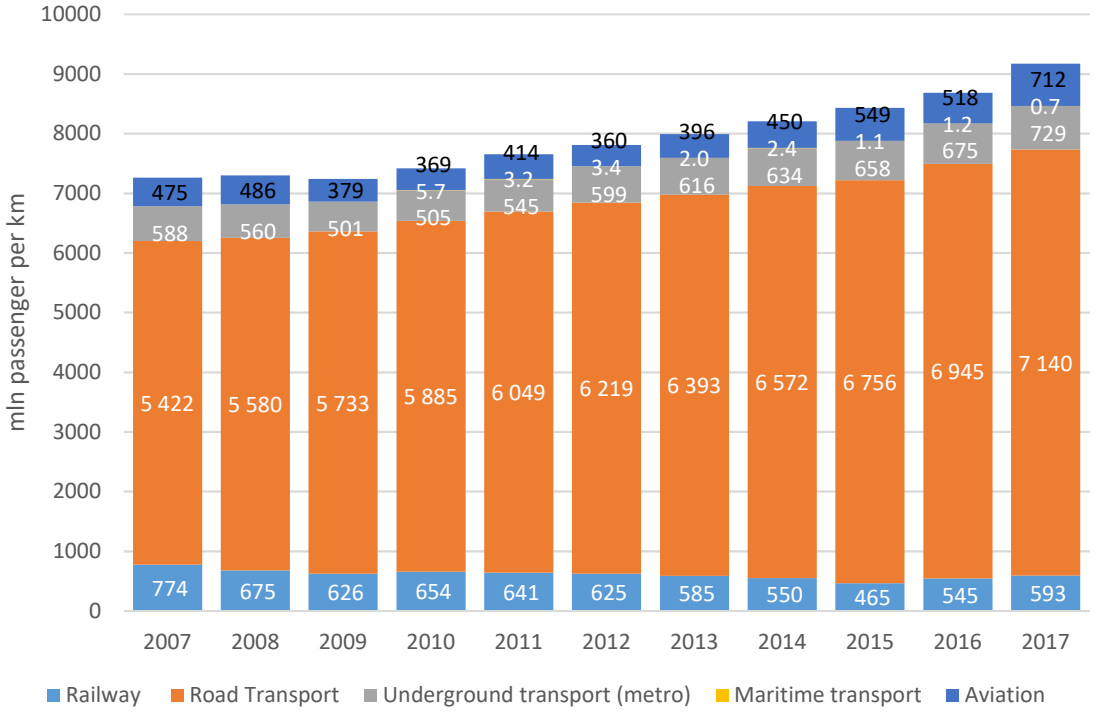


Source: Geostat

In Georgia virtually all major types of transport (road, rail, sea, pipeline or air) are developed.

In 2014-2017 years, passenger statistics significantly increased in automobile and subway transport. until 2014, number of passenger traveling by railway was decreasing due to passenger trains' poor conditions, while after the new railway passenger trains introduction, in 2016-2017, the number of passengers gradually started growing (see. Figure 14.2.3). In 2014 and 2015, air passenger turnover increased by 14% and 22%, respectively, compared to the previous year, decreased slightly in 2016 and continued to grow by 37% in 2017. The latter has also been influenced by the process of visa liberalization with the EU.

Figure 14.2.3: Passenger turnover by types of transport (2007-2017, mln passengers-km)

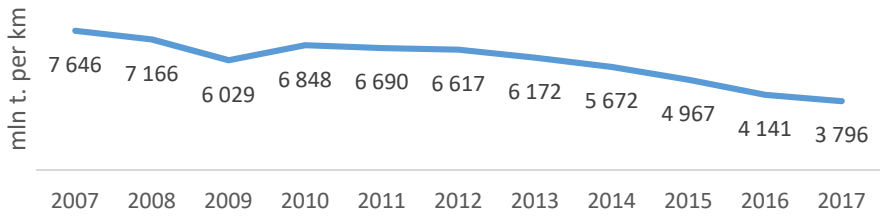


** Through statistical research and expert evaluation*

Source: Geostat

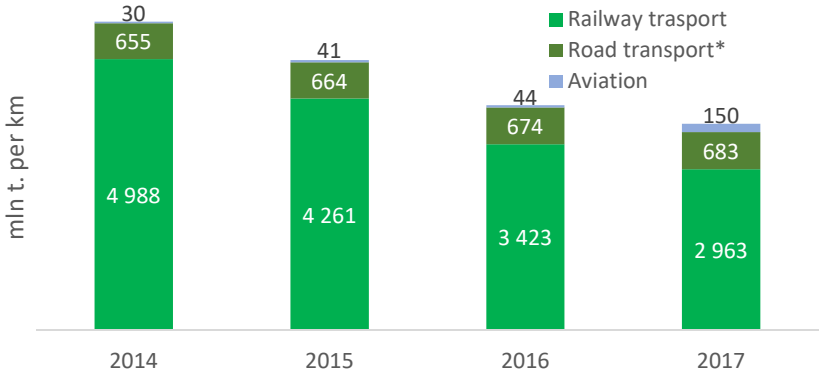
Official statistics indicate a decrease in the total cargo turnover (see Figure 14.2.4). However, if we look at the data by types of transport, in 2014-2017, it is clear that the turover of the cargo is mainly reducded due to railway cargo reduction, while cargo transported by air is five times higher and by motor - 4.3% higher (see Figure 14.2.5).

Figure 14.2.4: Transport cargo turnover dynamics (2007-2017 mln tonnes-km)



Source: Geostat

Figure 14.2.5: Freight turnover by type of transport (mln tonnes-km)

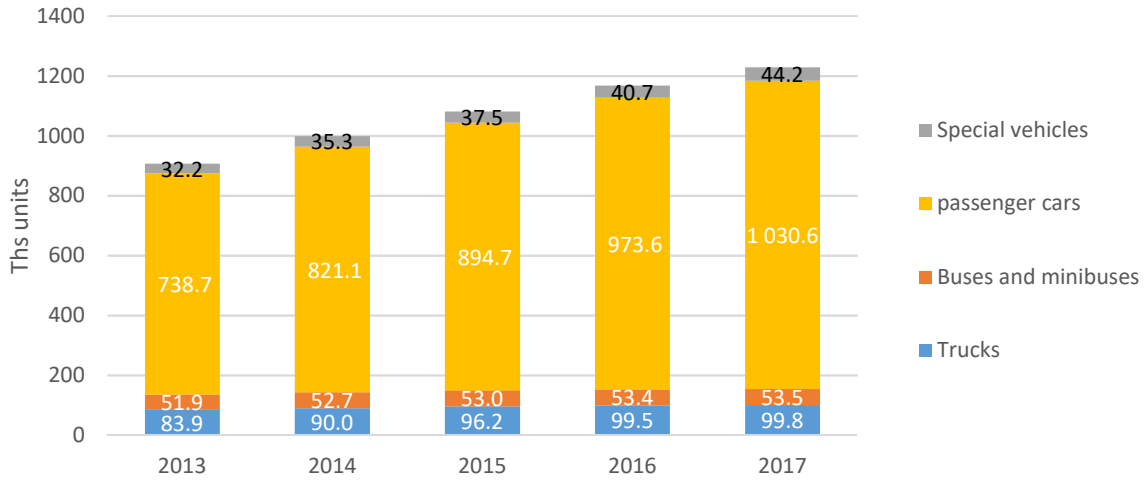


** Statistical studies and expert evaluation*

Source: Geostat

During the reporting period, no vehicles was manufactired in Georgia. Accordingly, the fleet was composed with imported cars, mainly used cars. In 2017, compared to 2013, the number of motor vehicles increased by 35% (annual average growth of 8%) up to 1,228.1 thousand (see Chart 14.2.6). In spite of the tightened auto import policies in neighboring countries (Azerbaijan and Armenia) and the reduced number of vehicles re-exported from Georgia, the third largest export commodity in 2017 was re-export of passenger cars (9%, $ 234.9 mln) after Copper ores and concentrates (15%) and Ferro-alloys (11%). In terms of imports, in 2017, Motor cars import was on the second place (6%, $ 476.9 mln) after commodities of oil and oil products.

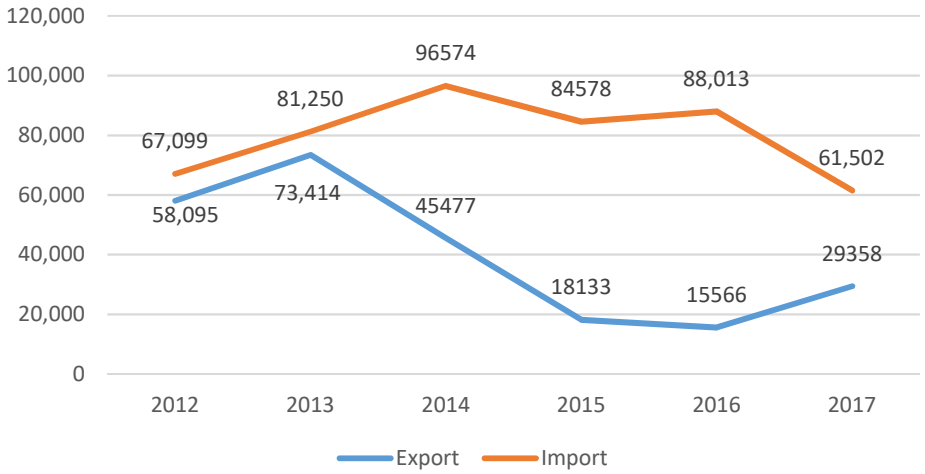
Figure 14.2.6: Number of registered cars in Georgia (ths. units)



Source: Geostat

Despite the significantly reduced re-export rate, in 2015-2016, the import rate remained remarkably high, while in 2017, it was significantly reduced (see Figure 14.2.7).

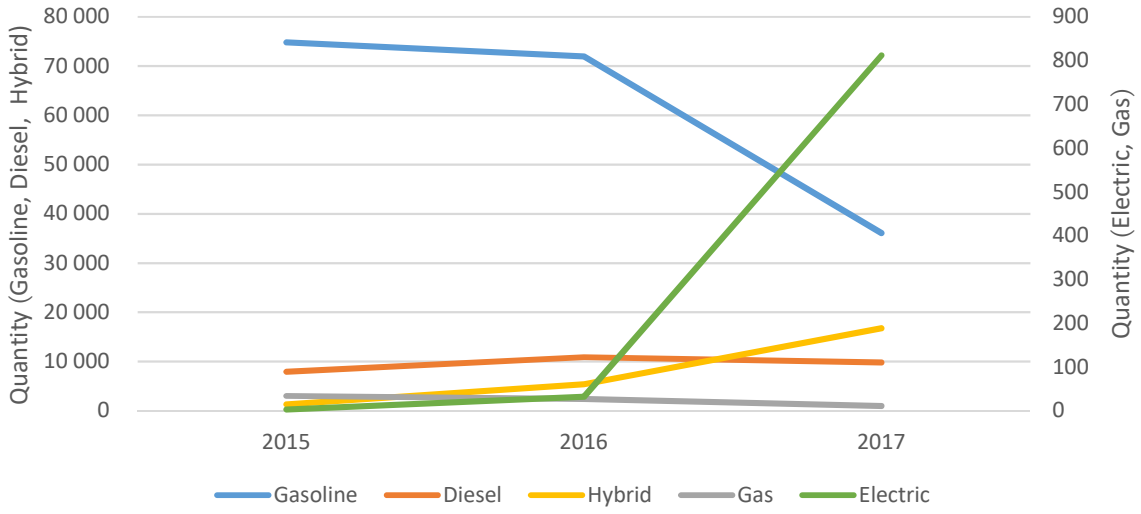
Figure 14.2.7: Export-Import of cars (2012-2017, units)



Source: Geostat

This has led to an increase in the number of used cars in Georgia. In response to this challenge, new regulations were introduced. specifically, from January 1, 2017, the import duty on old cars increased. Consequently, local demand for similar cars has been reduced as a result of the regulation. The new regulations stimulated import of not only new vehicles but automobiles with resourceefficient and environmentally clean technologies, electric and hybrid engines powered vehicles (gasoline excise tax increased by 2 times, diesel is almost 3 times; 6 years or newer hybrid system of motor vehicles custom tax decreased by 60%, for electric engines clearance is zero). Therefore, the development of fast charging electric infrastructure in the country began, so in 2017 the demand for electric cars has increased significantly. As a result, imports of gasoline-powered cars was reduced sharply and imports of electric vehicles and hybrid vehicles was increased dramatically. Specifically, if the share of hybrid cars in 2015 was 2% in imports, it was increased to 6% in 2016, and 26.4% in 2017. However, in 2015, if 3 units of electric vehicles were imported, in 2017 this figure increased to 812 units.

Figure 14.2.8: Import of cars by fuel type (2015-2017)



Source: Ministry of Internal Affairs of Georgia

Due to the lack of technical inspection during the reporting period, the issue of technical malfunction of the car park was a significant challenge, which also had a considerable negative impact on the air pollution in the densely populated urban areas. The mandatory technical inspection of motor vehicles has been partly operational since 2018, and became fully operational since 2019.

14.3 IMPACT OF TRANSPORT SECTOR ON THE ENVIRONMENT

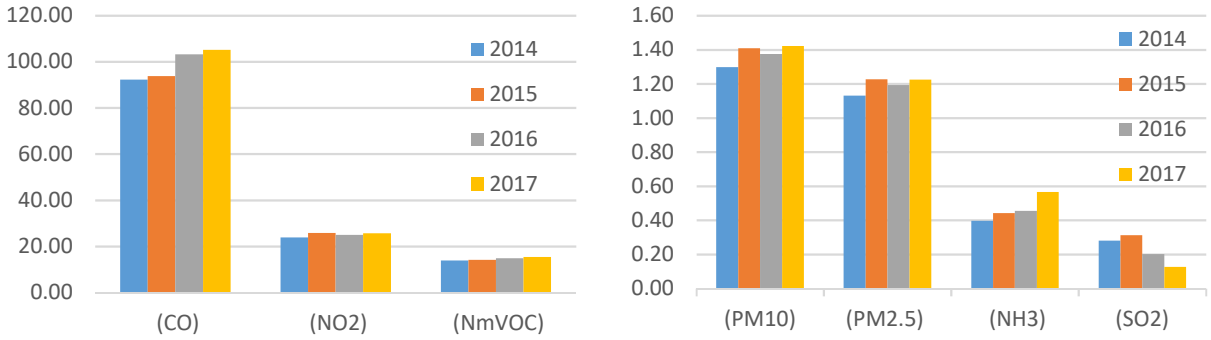
The increasing demand for transport services and the environmental impacts of their delivery are significant and require due attention. Sustainable development of the transport sector is essential for sustainable living, healthy ecosystem functioning, energy efficiency and climate change.

One of the main environmental impacts of transport is ambient air pollution. Ambient air monitoring results show that transport is one of the most important sources of air pollution.

The development of transport infrastructure and the proper functioning of the autopark play an important role in achieving a healthy livelihood. This is especially true in densely populated urban areas and highways with low traffic capacity, where there is usually a large number of vehicles, traffic flows are higher, traffic is congested and greater amount of emissions are emitted. Consequently, transport, in particular light vehicles, is one of the major sources of air pollution.

In 2014-2017, Nitrogen oxide (NOx) pollution increased, accounting for 70% on road transport[122]. Also, 59.1% of volatile organic compounds (VOCs) emission of the energy sector is allocated to transport.[123] (see Figure14.3.1)

Figure 14.3.1: Pollutants emitted into the atmosphere from motor transport (ths. tonnes)



Source: Ambient Air Quality Portal air.gov.ge

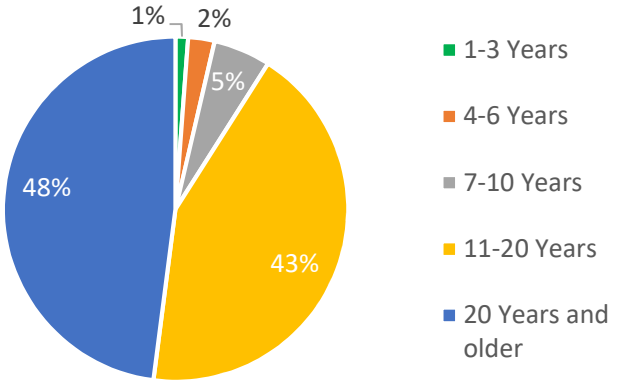
In 2014-2015, motor transport petrol quality standards were significantly tightened, and since 2016, the permissible volumes of benzene and aromatic hidrocarbons in fuel have been reduced to less than 1% and 35% respectively; The permissible volume of sulphur has been reduced to 10 mg / kg since 2017 and has been brought in line with European standards.

With the reduction of these thresholds, the pollution issue has been particularly resolved, but the large number of vehicles, their technical malfunction and associated pollution figures remain a challenge. Outdated cars consititute a major part of the car fleet. Vehicles older than 20 years make up to 48% of the car fleet, 43% are between the ages of 11-20 years, with a total of 91% of cars are over the age of 10 years. As for new cars from 1 to 6 years, in total they do not exceed 4% (see Figure 14.3.2).

[122] Informative Inventory Report of Georgia 2019, prepared under the Convention on Long-Range Transboundary Air Pollution 2007-2017". pg. 17

[123] See also pg. 20

Figure 14.3.2: Distribution of vehicles registered in Georgia by age (2017,%).



Source: Ministry of Internal Affairs of Georgia, Information-Analytical Department, Information Center, 2017

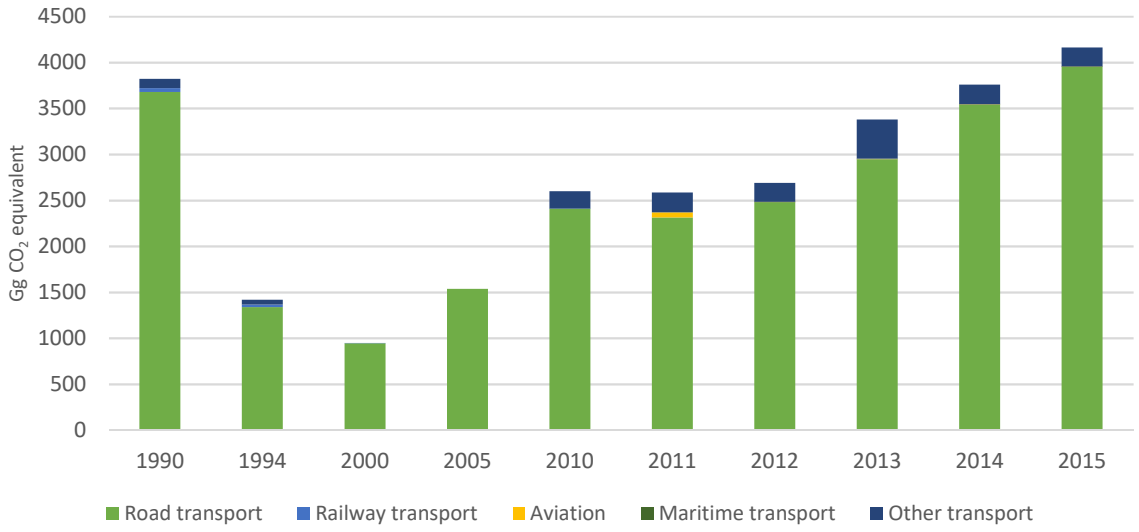
However, it is noteworthy that the largest concentration of traffic flows occurs in large urban areas, which increases the level of air pollution in similar populated areas. E.g. 36.5% of cars are registered in Tbilisi. The influx of cars from the outskirts of Tbilisi to carry out daily economic activities, including the provision of taxi services, creates additional traffic for the capital city.

Therefore, it is important to take into account the environmental impacts of large scale projects. The construction of ports, railways, roads or pipelines, even in the most sustainable form, is inevitably linked to significant changes in the local ecosystem or to significant negative environmental impacts during construction. Before and during the construction as well as during the operation period, proper implementation of the Environmental Assessment Code, Waste Management Code and other environmental legislative requirements is important factor. Environmental impact mitigation and remediation measures should minimize the artificial barriers created by highways, manage waste sustainably and maintain ecosystems.

The impact of the transport service is also significant on the GHG emissions. It is noteworthy that amid increasing number of vehicles and increasing traffic flows, the volume of transport sector emissions is significantly increasing each year and, accordingly, occupies one of the leading places of economic activity. In 2015, 38% of GHG emissions from the energy sector fell on transport and amounted to 4,162 Gg CO_2 equivalent. In 2015, the share of energy sector in total emissions increased to 62%[124] (56% in 2013 [125]), accordingly, the share of transport in total emissions increased to 23.6% (18.4% in 2013). It is also worth noting that GHG emissions from the transport sector in 2015 exceeded the 1990 figure by about 9%. The dominant position in the transport sector is road transport, accounting for 95% of the emissions in the transport sector. Emissions from the railway sub-sector are insignificant, as the railway is fully electrified in Georgia (see Figure 14.3.3).

[124] National Greenhouse Gas (GHGs) Inventory Report of Georgia, Energy Sector, 2014-2015
[125] National Greenhouse Gas (GHGs) Inventory Report of Georgia, 2012-2013

Figure 14.3.3: Dynamics of GHG emissions in the transport sector in Georgia in 1990-2015 (gr. CO_2 eq.)



Source: National Greenhouse Gas (GHGs) Inventory Report of Georgia, 2014-2015

14.4 MAIN CHALLENGES

Construction and rehabilitation of large scale transport infrastructure and solid waste (Particulate matter, construction materials, etc.) and adverse environmental impacts (artificial barriers, ecosystem change, etc.) during the implementation of these activities are one of the major challenges. Within the framework of the EU-Georgia Association Agreement, in order to harmonize the legislation, some new regulations have been adopted in order to reduce the environmental impact of large projects or economic activities: the Environmental Assessment Code, the Waste Management Code and many other regulations, can solves this challenge.

Ambient air pollution and increased GHG emissions are one of the major challenges. As already mentioned, traffic pollution is particularly high in large urban areas, where the majority of the population and therefore most of the traffic flow is concentrated. The following cities are distinguished in this regard: Tbilisi, Kutaisi, Rustavi and Batumi.

During the reporting period, it is noteworthy that a number of actions have been undertaken with the joint efforts of the government of Georgia, the international community and local authorities to reduce ambient air pollution as well as the emission of harmful substances. Of which, measures implemented under State Program on Enabling Activities to Abate Ambient Air Pollution in Tbilisi and within various projects are important. This has included both the tightening of environmental requirements to improve fuel quality and the introduction of appropriate monetary mechanisms stimulating the import of relatively new and resource-saving vehicles. In addition, more attention was paid to reducing public transport emissions and therefore, to the procurement of buses and other vehicles by state agencies based on resource-saving and clean technologies (the introduction of new buses in Tbilisi and Batumi with the support of international organizations, the purchase of cars for public structures, etc.). Except for this, bicycle trails were arranged in Tbilisi and Batumi. The necessary basis for technical inspections of motor vehicles has been gradually introduced, paricially it started in 2018, and then, in 2019 it was fully introduced for all type of vehicles.

IV/15 INDUSTRY AND ENERGY

The impacts of industry and energy on the environment are mainly related to the intensive consumption of natural resources, pollution or GHG emissions. The irrational use and pollution of natural resources needed for the development of industry and energy have a significant negative impact on the environment and cause ecosystem changes. Air, water, land, health, climate change, and a healthy living environment are highly dependent on the development of clean and resource-saving industries or energy.

15.1 MAIN QUESTIONS AND MESSAGES

1. ***What is the general situation of industry and energy sectors in the country?***

- The Georgian industry and energy sector has undergone significant positive changes in the last 15 years. In 2017, the share of industry in GDP declined from 17.3% to 16.7% in comparison with 2013, although in terms of volume it increased 1.11 times in constant 2010 prices. In terms of construction, in 2017 the volume of the sector in constant prices increased by 24% compared to 2013 and its share in nominal GDP increased from 6.7% to 9.8%;
- In the reporting period, along with development of the living standard and economic activities, including the energy-intensive industries, demand for energy resources increased significantly, while local energy production were not able meet increased demand, resulting in an increase of energy dependence on imports. In 2013-2017, the rate of Georgia's energy dependence on other countries increased (from 68.3% to 80.7% share of domestic energy supply). In particular, the volume of imported oil products increased by 33.8% and the volume of natural gas by 27%. However, during the same period, positive change was also observed - coal and biofuels (mostly firewood) production declined by 35.2% and 24.1%, while geothermal, solar and wind energy production increased by 83.8%;
- In response, new energy generation facilities are being built to achieve energy independence, which is linked to intensive use of natural resources and increased emissions. In 2014-2017, 15 hydro (471.5 MW total), 2 thermal (244.4 MW total) and 1 wind (20.7 MW) power plants were put into operation.

2. ***What is the impact of energy and industry sectors on the environment?***

- After the collapse of the Soviet Union, much of the country's energy system went down, most of the plants were shut down, thereby environmental impact of the energy and industrial sectors were significantly reduced. However, since 1995, along with the revival of energy system rehabilitation and industry, negative environmental impacts have gradually increased;
- In 2010-2017, the number of stationary sources of ambient air pollution almost tripled. However, air pollution from these sources in the country is relatively less than 1.5 times, achieved with the use of air purification technologies. In 2017, only 5.6% of harmful substances generated in stationary sources were emitted;
- The discharge of water used in industry into surface water bodies has been significantly reduced. Specifically, this figure was 64% lower in 2017 compared to 2014. Water reuse rates were high in the industry. The water use rate has increased in electricity production and reached its maximum value (about 35 bln m^3) in 2016. As for the amount of contaminated water discharged in surface water bodies by thermal power plants, if in 2014, it was 227 mln m^3, in 2017, it dropped significantly to 33.69 mln m^3.
- According to the latest data, after 1991, GHG emissions from the industrial sector reached their highest level in 2015, almost five times higher than in 1994 and amounted to 2,058 Gg CO_2 equivalent. Emissions have also increased significantly in the energy sector. According to the latest data, GHG emissions in 2015 amounted to 10,874 Gg CO_2 equivalent, which is more than twice the 2005 figures;
- The major part of private or state owned buildings, vehicles and other technologies are not energy-efficient. Also, the economic activities of a number of enterprises are also not energy efficient. Consequently, a significant portion of energy is spent inefficiently.

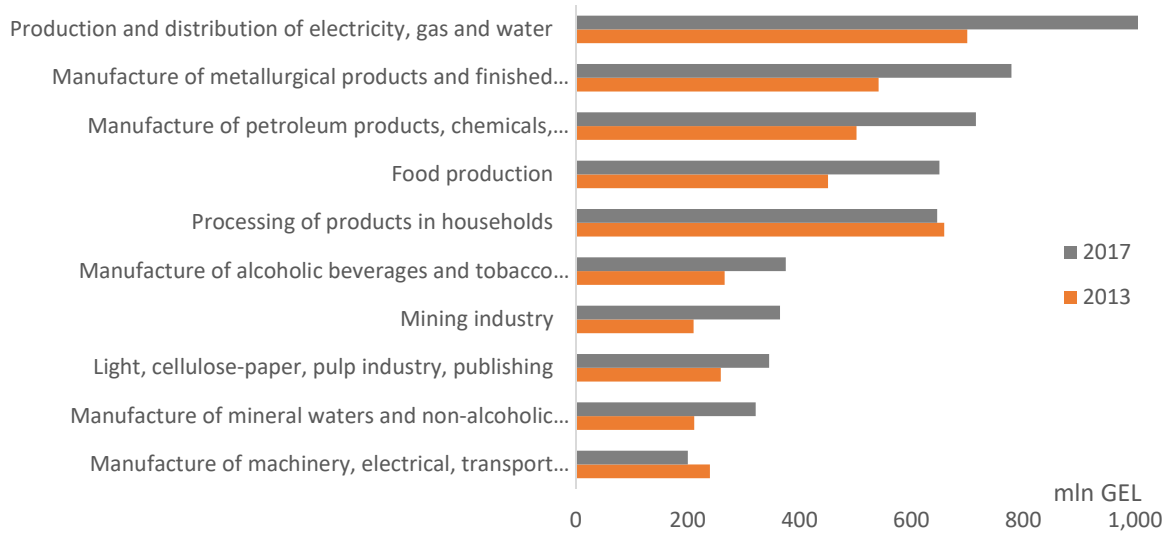
15.2 STATE OF INDUSTRY SECTOR AND ITS IMPACT ON THE ENVIRONMENT

The environmental impacts of industrial activities are multifaceted, although this chapter focuses on air and water pollution, water abstraction, solid waste generation and GHG emissions. The highest environmental impact rate in the Georgian industry sector was recorded in 1990. After gaining independence, the environmental impact of the industrial sector has declined sharply and has been characterized by an upward trend as the economy started revival, although the growth rate of impact is lower than production growth speed. This is due to the introduction of modern technologies over time, improved environmental legislation and more effective monitoring.

The real growth of the industrial sector amounted to 11% in 2013-2017 (see Figure 15.2.2), though its share in GDP fell from 17.3% to 16.7%. As of 2017, the leading sector in the industry is production and distribution of electricity, gas and water (21.1% of the industry sector) with a nominal value of GEL 1 bln. The leading positions in industry by volume of production are occupied by the metallurgical production (GEL 779 mln), followed by petroleum products, chemicals, plastics, minerals and construction materials production (GEL 715 mln), food production (GEL 650 mln) and processing of products by households (GEL 646) (See Figure 15.2.1).

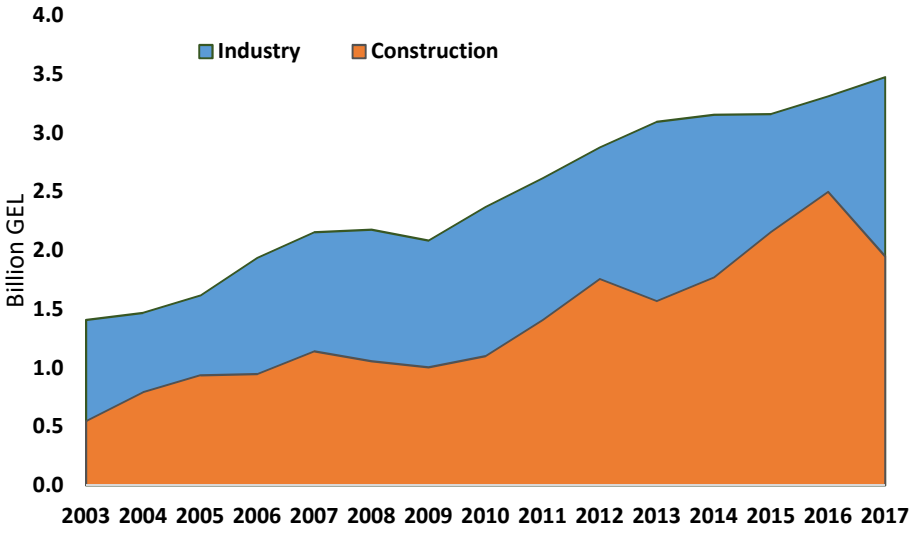
It should be noted that in 2013-2017 the real growth of the construction sector, which has no less impact on the environment, was 24% (see Figure 15.2.2). During the same period, the share of construction in GDP rose from 6.7% to 9.8% in nominal terms. In 2017, the number of employees in the industrial sector was 142 thousand (8% of the employed) and in the construction sector - 83 thousand (5% of the employed).

Figure 15.2.1: Structure and volume of industrial production (GEL, 2013 and 2017 mln)



Source: Geostat

Figure 15.2.2: GDP Dynamics of Industry and Construction (at constant prices of 2010, GEL, 2000-2017)



Source: Geostat

The number of stationary sources of ambient air pollution increased 2.7 times from 2010 (1,099 units) to 2017 (2,964 units). During the same period, air pollution increased by 16.1 thousand tonnes (about 1.5 times) (see Table 15.1). A relatively small increase in air pollution was achieved through air purification technologies. Despite the large amount of particulate matters generated in stationary sources, most of them were captured, so the increase in pollution mainly due to the emissions of liquids and gaseous substances. However, it is important to note that in 2010, as well as in 2017, the share of captured harmful substances is high, accounting for 95.4 and 94.4%, respectively.

Table 15.1: Emission of harmful substances generated in stationary sources of ambient air pollution (2010 and 2017, thousand tonnes,%)

	2010			2017			2010-2017
	Generated (thousand tonnes)	Captured (%)	*Emissions (thousand tonnes)*	Generated (thousand tonnes)	Captured (%)	*Emissions (thousand tonnes)*	*Emission Difference (%)*
Harmful substances, total	**661**	**95.4**	***30.1***	**831.2**	**94.4**	***46.5***	***53***
Solid	631.6	99.4	*3,8*	787.6	99	*7.9*	*108*
Gaseous and liquid	29.3	9.6	*26.5*	43.7	11.7	*38.6*	*46*
Sulphur dioxide	1.8	-	*1.8*	6.3	3.2	*6.1*	*239*
Carbon monoxide	15.1	10	*13.6*	19.3	14.8	*16.4*	*21*
Nitrogen dioxide	4	25	*3.0*	6.4	15	*5.4*	*80*
Hydrocarbon	7.5	-	*7.5*	1.9	0.3	*1.9*	*-75*
Other	1	40	*0.6*	9.7	11	*8.6*	*1,333*

Source: Geostat

The economic activities of stationary sources of ambient air pollution are mainly related to power generation, ferroalloys, nonferrous metal, cement and metallurgy. Their geographical location has

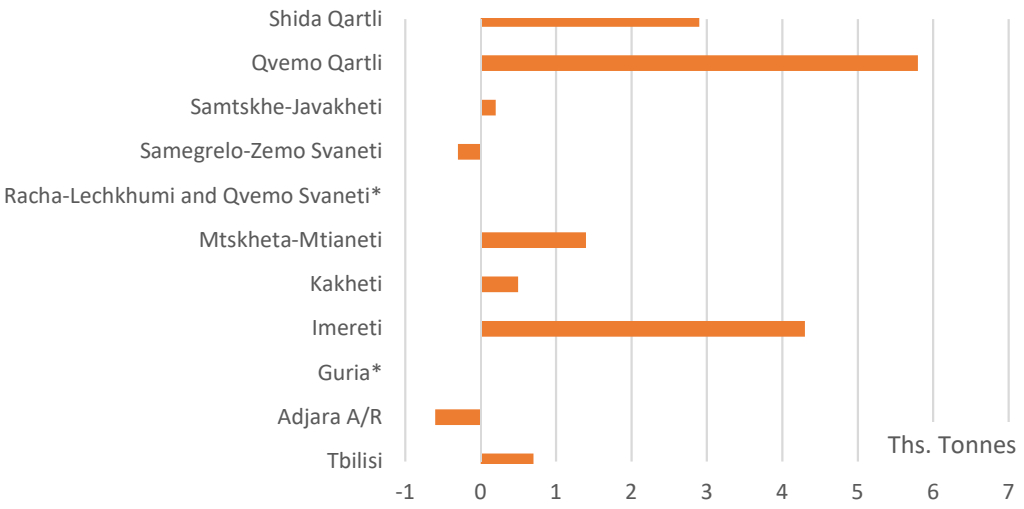
remained largely unchanged since Georgia's independence. It is noteworthy that in 2017, compared to 2010, in most regions of Georgia, the amount of harmful substances emitted into ambient air increased (see Table 15.2). The exceptions are Adjara A/R and Samegrelo-Zemo Svaneti, where emissions are reduced.

Table 15.2: Emission of harmful substances generated in stationary sources of ambient air pollution by regions (2010 and 2017, thousand tonnes)

	2010			2017		
	Generated (thousand tonnes)	Captured (%)	*Emissions (thousand tonnes)*	Generated (thousand tonnes)	Captured (%)	*Emissions (thousand tonnes)*
Harmful substances, total	**661**	**95.4**	***30.1***	**831.2**	**94.4**	**46.5**
Tbilisi	26	95.4	*1.2*	28.1	93.2	1.9
Adjara A/R	4.2	50.0	*2.1*	6.2	75.8	1.5
Guria	0	-	-	6.3	84.1	1.0
Imereti	20.5	27.8	*14.8*	88.1	78.2	19.1
Kakheti	3.8	86.8	*0.5*	2.6	61.5	1.0
Mtskheta-Mtianeti	8.7	95.4	*0.4*	8.9	79.8	1.8
Racha-Lechkhumi-Qvemo Svaneti	0	-	-	0.3	66.7	0.1
Samegrelo-Zemo Svaneti	5.4	79.6	*1.1*	52.6	98.7	0.8
Samtskhe-Javakheti	0.5	80.0	*0.1*	1.9	84.2	0.3
Kvemo Kartli	355	98.3	*6.0*	347.6	96.6	11.8
Shida Kartli	237	98.2	*4.2*	288.5	97.5	7.1

Source: Geostat

Figure 15.2.3: Changes in emissions of harmful substances from stationary sources of ambient air pollution in 2017 compared to 2010 by regions (thousand tonnes)



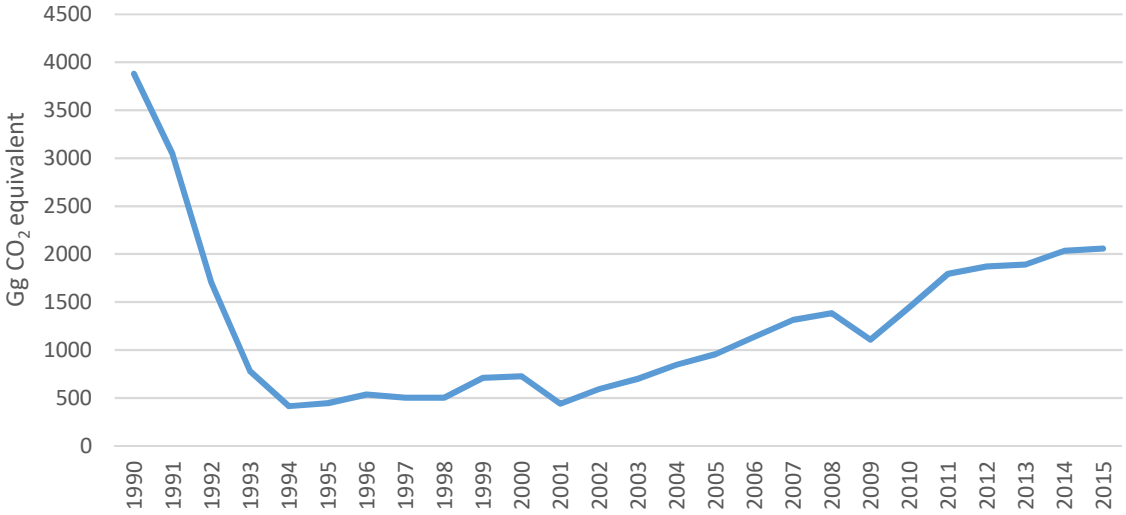
* 2010 data on Guria and Racha-Lechkhumi and Kvemo Svaneti are not given

Source: Geostat

The maximum level of GHG emitted by the industry sector was found in 1990 (equivalent to 3,879 Gg CO_2). After the collapse of the Soviet Union, production was almost stopped, and GHG emissions reached a minimum in 1994 (equivalent to 414 Gg CO_2). In 1995-2000, emissions increased at a low

rate, decreased in 2001 and approached 1994 levels. Emissions from 2002 continue to grow at a rapid pace until 2008 (the period of economic crisis and armed conflict with Russia). After overcoming the crisis, the volume of GHG emissions from 2010 continued to rise, at a relatively low rate and by 2015 reached 2,058 Gg CO_2 equivalent[126] (see Figure 15.2.4).

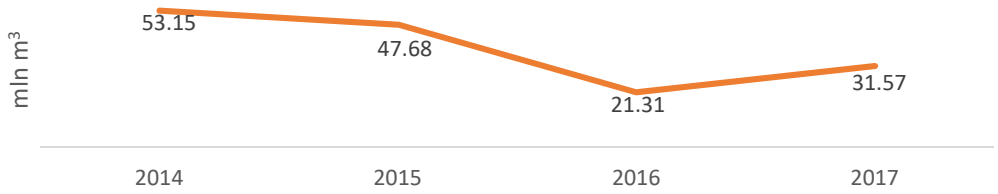
Figure 15.2.4: GHG emissions from the industry sector (1990-2015, Gg CO_2 equivalent)



Source: Fifth National Greenhouse Gas (GHGs) Inventory Report of Georgia, 2014-2015

Extraction of water and the contamination of water bodies with discharged wastewater plays important role in terms of environmental impact of industrial sector. The environment is polluted by both newly generated and previously accumulated industrial waste, and directly by technological processes. It is important to note that according to the Ministry of Environmental Protection and Agriculture of Georgia (MEPA), in 2015-2016, compared to 2014, the rate of water intake in industry decreased to 21 mln m^3, while in 2017, it increased to 32 mln m^3 (Figure 15.2.5).

Figure 15.2.5: Water abstraction for industrial use (2014-2017 mln m^3)

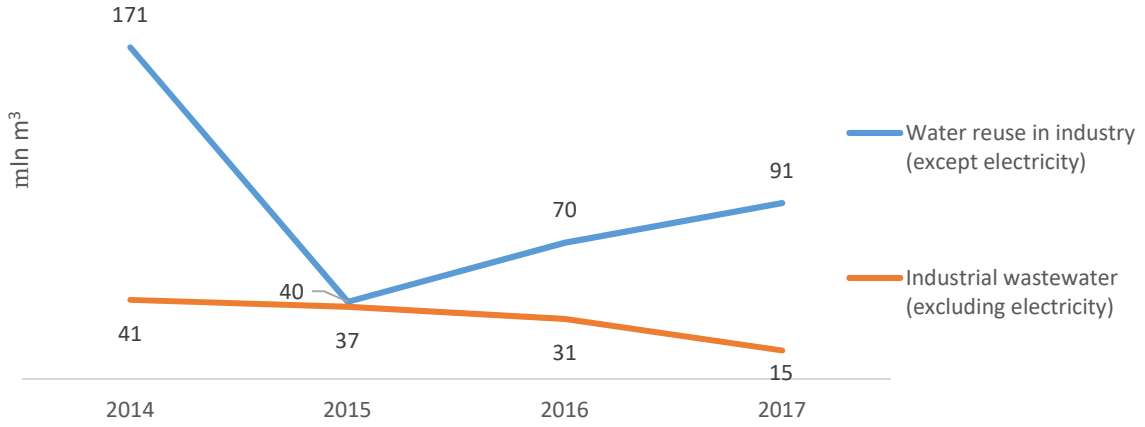


Source: MEPA

The wastewater discharge into surface water bodies has been significantly reduced, in particular, in 2017, to 15 mln m^3, which is 64% lower than in 2014. The discharge of polluted wastewater into the surface water bodies in industry, in 2017 compared to 2014 (19 mln m^3), decreased significantly and reached 8 mln m^3. Regarding the water reuse rates in the industry, it decreased significantly in 2015-2016 and increased in 2017 (Figure 15.2.6).

[126] In 2001 and 2010, emissions of hazardous substances decreased, which is related to the slowdown of the country's economic development process.

Figure 15.2.6: Discharge of wastewater from industry sector into surface water bodies and water reuse (2014-2017, mln m³)



Source: MEPA

Pollution of surface water and land from the industry sector continues to be significant in municipalities associated with the mining industry.

In accordance with the Law of Georgia on Waste Management Code adopted in 2014, since 2017, the issue of registration and management of solid industrial waste has been regulated at the legislative level. Industrial facilities have been required to prepare waste management plans, get acceptance with the Ministry, and act accordingly. The capacity of enforcement mechanisms and executive institutions is currently improving.

Large quantities of solid waste are still being accumulated as a result of the production process in the mining industry. In addition, there are bulk of uncontrolled waste in the area of abolished plants, some of which are toxic.

Along with the environmental impact of existing industrial sites, pollution of water and land by old industrial waste still requires attention. The main sources of contamination are old tailings, buried hazardous waste, areas of old chemical production or mining activities. In this regard, a large amount of contaminated water is located in the tailings of Bolnisi municipality emerged due to the extraction of precious or non-ferrous metals. Separately, the pollution of river Kvirila in Chiatura, as a result of the wash-out of the agglomerate form land piles and tailings in the river, is also noteworthy. Additionally, an example of pollution caused by old industrial activities is arsenic waste in Kvemo Svaneti (Lentekhi, vil. Tsana) and Racha (Ambrolauri, vil. Uravi).

15.3 ENERGY SECTOR AND ITS IMPACT ON ENVIRONMENT

The energy sector plays a major role in the country's sustainable development and has a significant impact on the environment. Consequently, the analysis of the state of the energy sector allows us to observe the dynamics of the country's development and at the same time identify trends in the environmental impact.

In 2013-2017 annual energy supply and consumption in Georgia increased respectively from 4,145.7 to 4,736.9 (by 14.3%) and from 3,726.3 to 4,363.4 (by 17.1%) thousand tonnes of oil equivalent[127]. As of 2017, 80.7% of the country's domestic energy supply was provided by imported resources. The relevant value was 68.3% in 2013 (see Table 15.3).

[127] 2013 and 2017 Energy Balance, Geostat

Table 15.3: Georgia's Energy Balance (2013-2017, thousand tonnes of oil equivalent)

		Coal	Crude oil	Oil products	Natural gas	Hydro	Geothermal, solar etc.	Biofuel and waste	Electricity	**Total**
2013	Production	168.0	48.6	-	4.4	711.2	15.4	481.1	-	**1,428.7**
	Import	156.1	-	1,096.2	1,537.5	-	-	-	41.6	**2,831.5**
	Export	1.8	57.9	12.4	-	-	-	0.1	38.7	**110.8**
2014	Production	121.5	43.3	-	8.6	716.7	16.8	465.0	-	**1,372.0**
	Import	168.3	10.3	1,152.2	1,825.3	-	-	-	73.3	**3,229.4**
	Export	1.0	52.0	16.0	-	-	-	-	52.0	**121.1**
2015	Production	124.2	40.8	11.6	9.5	726.9	18.5	399.0	-	**1,330.4**
	Import	152.1	135.3	1,382.5	2,090.6	-	-	0.1	60.1	**3,820.7**
	Export	0.7	155.0	111.3	83.6	-	-	0.7	56.7	**408.1**
2016	Production	120.4	39.1	-	5.5	802.2	21.2	387.9	-	**1,376.3**
	Import	165.4	43.3	1,526.6	1,885.3	-	-	0.2	114.2	**3,735.1**
	Export	0.6	18.4	108.2	-	-	-	1.3	121.1	**249.6**
2017	Production	108.9	32.5	-	7.1	792.0	28.3	365.0	-	**1,333.6**
	Import	192.8	60.5	1,466.8	1,952.3	-	-	-	150.6	**3,822.9**
	Export	9.9	7.5	238.1	-	-	-	1.6	80.8	**337.8**

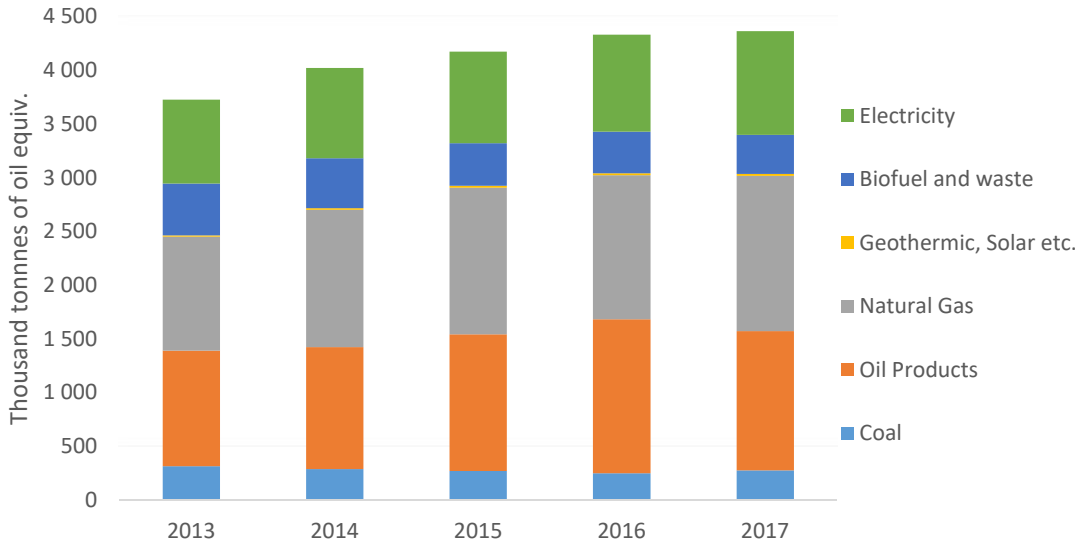
Source: Geostat

Georgia has a large amount of renewable energy potential: hydro, solar, wind, geothermal and biofuels (mainly firewood). At the same time, it is noteworthy that the use of alternative sources of energy has been increasing recently.

The identified stock of oil and gas in Georgia is small. The volume of oil and gas extracted on the territory of the country meets a small portion of demand. Georgia has coal reserves used in the electricity generation, industrial, domestic and commercial sectors. It should be noted, however, that due to the high sulphur content of coal extracted in Georgia, it is one of the sources of environmental pollution and should be used as energy resources with special purification technology.

Hydro-resources, which, according to 2017, generated about 70.7% of electricity consumed in the country, play the most important role in ensuring Georgia's energy independence. Out of the remaining 29.3%, 11.5% was accounted from imports, 17.1% for thermal generation and 0.7% for wind energy (see Figure 15.3.1).

Figure 15.3.1: Energy consumption by species (2013-2017, thousand tonnes of oil equivalent)



Source: Geostat

In terms of total defined capacity, the use of hydropower resources is of the utmost importance during the construction of new generation facilities. At this point, there is relatively little effort, but more and more attention is being paid to the use of energy potential of wind, solar and other sustainable renewable sources. For the first time, the wind power plant (Kartli) was constructed in the reporting period. In terms of the production volume, hydro resources are followed by thermal power generation, however, its dependence on nonrenewable source – imported gas – should be taken into consideration. Statistics on getting into operation of generation facilities also indicate this circumstance. In 2014-2017, 15 hydro (471.5 MW total), 2 thermal (244.4 MW total) and 1 wind (20.7 MW) power plants were put into operation.

According to 2017, the largest amount of energy resource consumed in the country is natural gas. Natural gas accounts for about 33% of total energy consumed. It should be noted that more than 20% of these are used for thermal power generation. The second position is occupied by oil products, which make up 30% of total energy consumption.

In 2017, compared to 2013, energy consumption increased significantly. Specifically, natural gas consumption increased by 36%, oil products by 20%, geothermal and solar energy consumption by 39% and electricity consumption by 24%. It should be noted that the consumption of coal and biofuels (mostly firewood) decreased by 12% and 24%, respectively.

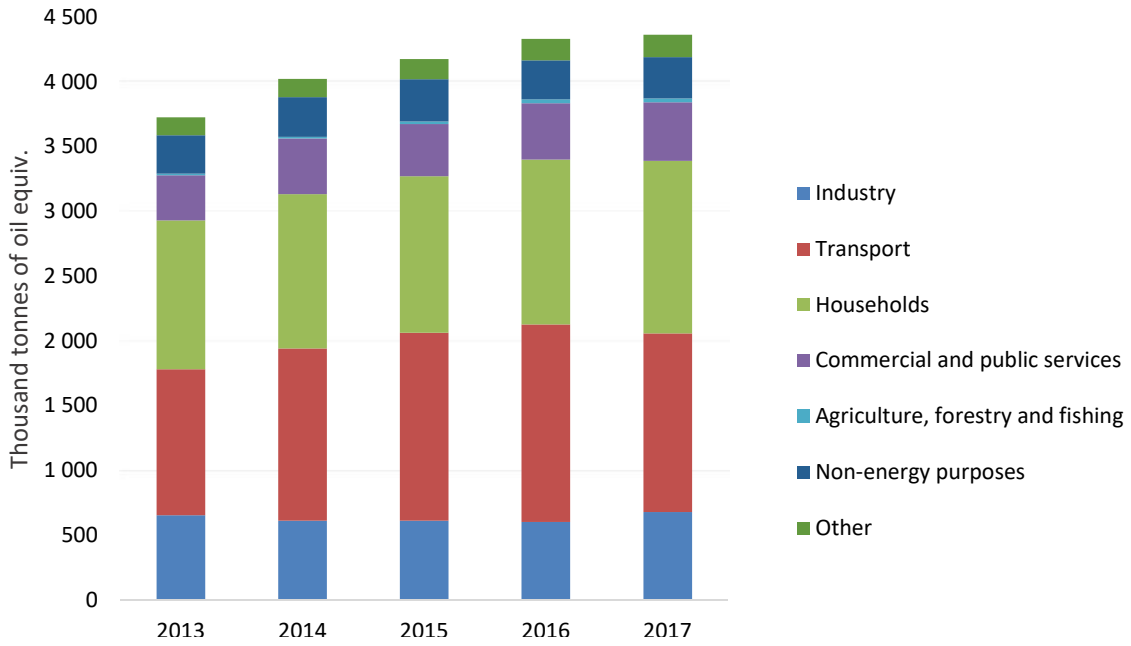
The analysis of Georgia's energy balance for 2013-2017 reveals important issues, some of which are positive and some are negative for the environment. Specifically, in 2017 compared to 2013, we can consider the decline in production of coal by 35.2% and biofuels by 24.1% (mostly firewood)[128]. Geothermal, solar and wind energy production increased by 83.8%. However, negative changes were also found, in 2017, compared to 2013, import growth of oil products by 33.8% and natural gas by 27% was accounted.

The decline in production and consumption of firewood and coal is partly related to the increase in the gasification of villages in the country. However, it should be noted that a significant portion of the population as well as public buildings are not energy efficient. Consequently, some of the energy

[128] In 2016, compared to 2013, coal and biofuel consumption declined by 20.6% and 19.6%, respectively.

allocated is lost and excessively increases the amount of GHG emissions in the atmosphere. Therefore, it is important to note that firewood remains the main means of heating (in some cases food preparation) even in areas where the population is supplied with natural gas. This is most likely due to the fact that natural gas heating is cheaper than firewood if the building is equipped with modern heating systems. However, most of the population do not have access to such systems, so in some cases, heating the same amount of space for disadvantaged population is more expensive by purchasing firewood than a materially capable citizen using natural gas. Therefore, it is noteworthy that particulate matters (PM) emitted from firewood consumption constitute an average of 40% of total PM emissions and is also an important source of indoor air pollution[129].

Figure 15.3.2: Final energy consumption by sectors (2013-2017, thousand tonnes of oil equivalent)



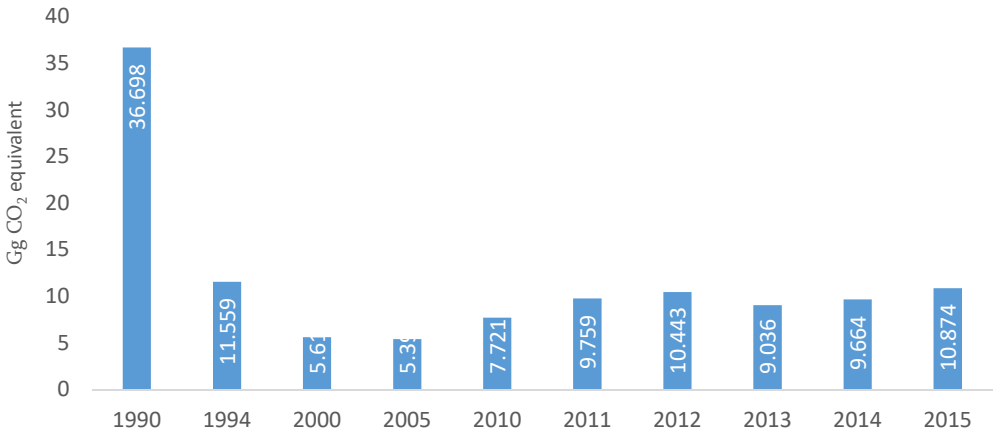
Source: Geostat

In 2013-2017, the increase in imports of oil products and natural gas in Georgia was mainly due to increased demand in the transport (22.5%), households (15.8%), industry (3.8%) and commercial and public services sectors (29.6%).

As of 2015, GHG emissions of the energy sector amount to 10,874 Gg CO_2 equivalent, a 62% of total greenhouse gas emissions (excluding the land use sector). In 2015, emissions were 3.4 times lower than in 1990 and twice as high as in 2005 (see Figure 15.3.3). The lowest number was in 2005, followed by the rapid growth of the country's economy, scale of gasification, and number of vehicles in the following years, significantly affecting the volume of energy sector emissions. In 2008-2010, the economic recession and the 2008 armed conflict with Russia considerably reduced GHG emissions, while in 2010-2012 and then in 2014-2015, energy sector increases its emissions together with the economic development trend.

[129] http://air.gov.ge/pages/10/10

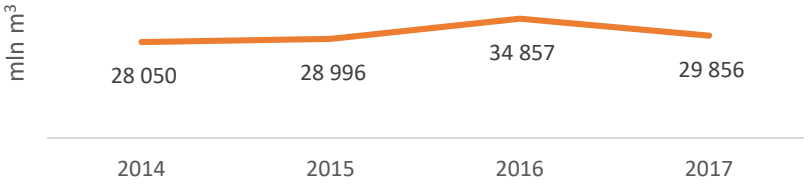
Figure 15.3.3: GHG emissions from the energy sector (1990-2015, Gg of CO_2 equivalent)



Source: Fifth National Greenhouse Gas (GHGs) Inventory Report of Georgia, 2014-2015

The water use rate for electricity generation increased significantly and reached its highest level in 2016 (35 bln m^3), while in 2017, it decreased to 30 bln m^3, which on its hand exceeded 2014-2015 values (Figure 15.3.4).

Figure 15.3.4: Water use values for electricity generation (2014-2017, mln m^3)

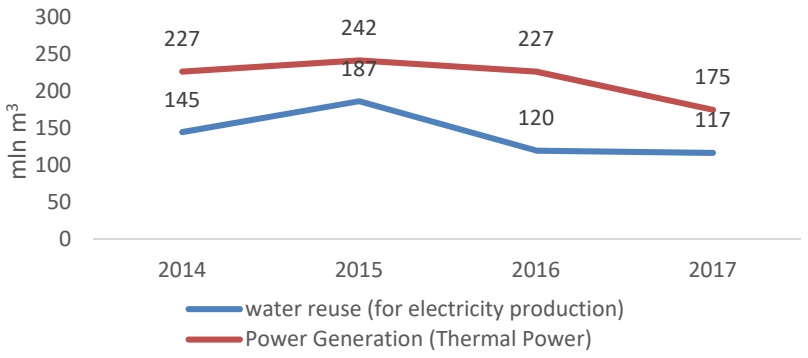


Source: MEPA

Compared to 2014, the volume of polluted wastewater discharge from power generation by thermal power plants was significantly reduced. If 227 mln m^3 of polluted wastewater were discharged to surface water bodies in 2014, it was reduced to 46.88 and 33.69 mln m^3 in 2016 and 2017, respectively.

It is, also, noteworthy the reduction of the amount of water used by thermal power plants and the significant volume of water reuse values for electricity production (Figure 15.3.5).

Figure 15.3.5: Volumes of water used by thermal power plants and water reuse rates for electricity generation (2014-2017, mln m^3)



Source: MEPA

15.4 MAIN CHALLENGES

Along with the growth of industry and energy sectors in the Georgian economy, environmental impact is also increasing.

The challenge is a sustainable management of a large quantity of solid waste accumulated in the mining process, polluted water, and disposal of hazardous waste on the respective sites.

From the point of view of sustainable use of the natural resources and the protection of the environment, the introduction of advanced resource-efficient and clean technologies remains one of the major challenges. Although modern production lines mainly use efficient technologies, there are still companies that require technological upgrade.

Constantly increasing energy consumption at the expense of imported oil products and natural gas is one of the major challenges. Newly introduced power generation capacities cannot meet the increased demand. Coal production and energy generation have decreased in recent years, but the use of coal as a source of energy still remains a significant factor in adverse environmental impacts. The use of sustainable, renewable local resources (hydro, wind, solar and biomass) instead of use of depletable and often environmentally unsustainable natural resources is important.

The largest and most inefficient consumers of energy in Georgia are the transport and household (residential) sectors. Inefficient use of energy means the inefficiency of vehicles, buildings or technologies.

During the reporting period, the requirements of construction norms related to the energy efficiency of buildings in Georgia did not apply to developers and construction companies. Consequently, the thermal insulation for most of new buildings cannot meet modern standards. A significant part of the old building, especially in the regions, is inefficient or depreciated. As a result, expensive imported (gas and oil products) or local (mainly firewood) energy resources are inefficiently spent on heating of buildings. This also includes the inefficiency of residential lighting and other residential technologies.

Significant political initiatives have been introduced during the reporting period to address the above challenges, to approximate with the waste management, energy and, in general, sustainable development policies of Europe. These initiatives include: introduction of the principles of waste management accounting and extended producer responsibility; improvement of environmental impact assessment, safety and standards; enhancement of energy saving or energy efficiency; other important issues. The Waste Management Code, the Environmental Assessment Code were adopted, a draft National Energy Efficiency Action Plan was developed, Georgia joined the Energy Community. In addition, advancement of environmental and energy legislative frameworks, within the process of harmonization with the EU acquis, is actively taking place.

CHAPTER V.

ENVIRONMENTAL GOVERNANCE

V/16 ENVIRONMENTAL POLICY AND PLANNING

The main objective of environmental policy is the sustainable and balanced development of the country, where environmental and socio-economic issues are treated equally and mutually. Planning, implementing and evaluating effective environmental policies for the prevention of adverse environmental impacts, mitigation of existing impacts and improvement of environmental status are of paramount importance. Georgia's environmental policy is based on national strategic and legal documents, the EU-Georgia Association Agreement, the UN Sustainable Development Goals, and international environmental agreements to adapt to national needs and implement modern environmental standards.

16.1 MAIN QUESTIONS AND MESSAGES

1. ***What is the system of environmental planning and evaluation in Georgia?***

Z The National Environmental Action Program is the main document for strategic environmental policy planning. The Program builds on the commitments of the EU-Georgia Association Agreement, the Sustainable Development Goals and the international environmental agreements and responds to other challenges in the country. The approval of the Third National Environmental Action Program for 2017-2021 led to the continuation of strategic environmental planning for a five-year period. Environmental priorities are also reflected in sectoral national environmental and other sectoral strategic documents;

Z The environmental policy assessment system consists of national and international level assessment tools available to the general public. The National Report on the State of the Environment at the national level is the main assessment document of the country's environmental status and environmental policy. An important international assessment instrument is the program of the United Nations Economic Commission for Europe (UNECE) - Environmental Performance Review (EPR).

2. ***How does Georgia fulfill its commitments in the context of the EU association process in the field of environmental protection?***

Z Georgia has made significant progress in fulfilling its environmental obligations under the Association Agreement between Georgia and the EU. In particular, the commitments set out in Annexes XVI and XVII to the AA for 2014-2017 are largely fulfilled, although 4 commitments of the 4 directives are still being implemented. In addition, Georgia has fulfilled many other obligations earlier, than planned.

3. ***What is the state of financing environmental protection?***

Z The new Government, which came to power in 2012, declared environmental protection one of the country's top priorities, highlighted by the strengthening of institutional, human and financial capacity in the environmental field. Budgetary funding of the Ministry of Environment and Natural Resources Protection of Georgia has almost doubled from 2012 to 2017[130] ;

Z In December 2017, during the Government Structural Reorganization process, the Government of Georgia undertook to continue to increase environmental funding by at least 5% in future budgetary allocations, consistent with 2018-2019 under the Ministry of Environment and Agriculture of Georgia;

Z Georgia has expanded its cooperation with international donor organizations and with their financial support 75 new environmental projects have been implemented in 2014-2017 and 89 new projects have been launched.

4. ***How intensively was international cooperation in the field of environmental protection?***

Z In 2014-2017, Georgia joined 3 Multilateral Environmental Agreements and 8 bilateral agreements with countries and international organizations on cooperation in various fields of environmental protection were concluded. It is noteworthy that Georgia hosted one of the highest-level meetings

[130] In 2012, meant the Ministry of Environment of Georgia.

of the UNECE region on environmental protection - the 8th "Environment for Europe" Ministerial for Environment "Batumi 2016". At the conference, which promoted environmental cooperation across the region, documents of regional importance were adopted, including: "Batumi Initiative on Green Economy" (BIG-E), "Batumi Actions for Clean Air" (BACA), Conference Summary Document – „Batumi Ministers Declaration“ and "Batumi Ministerial Statement on Education for Sustainable Development ".

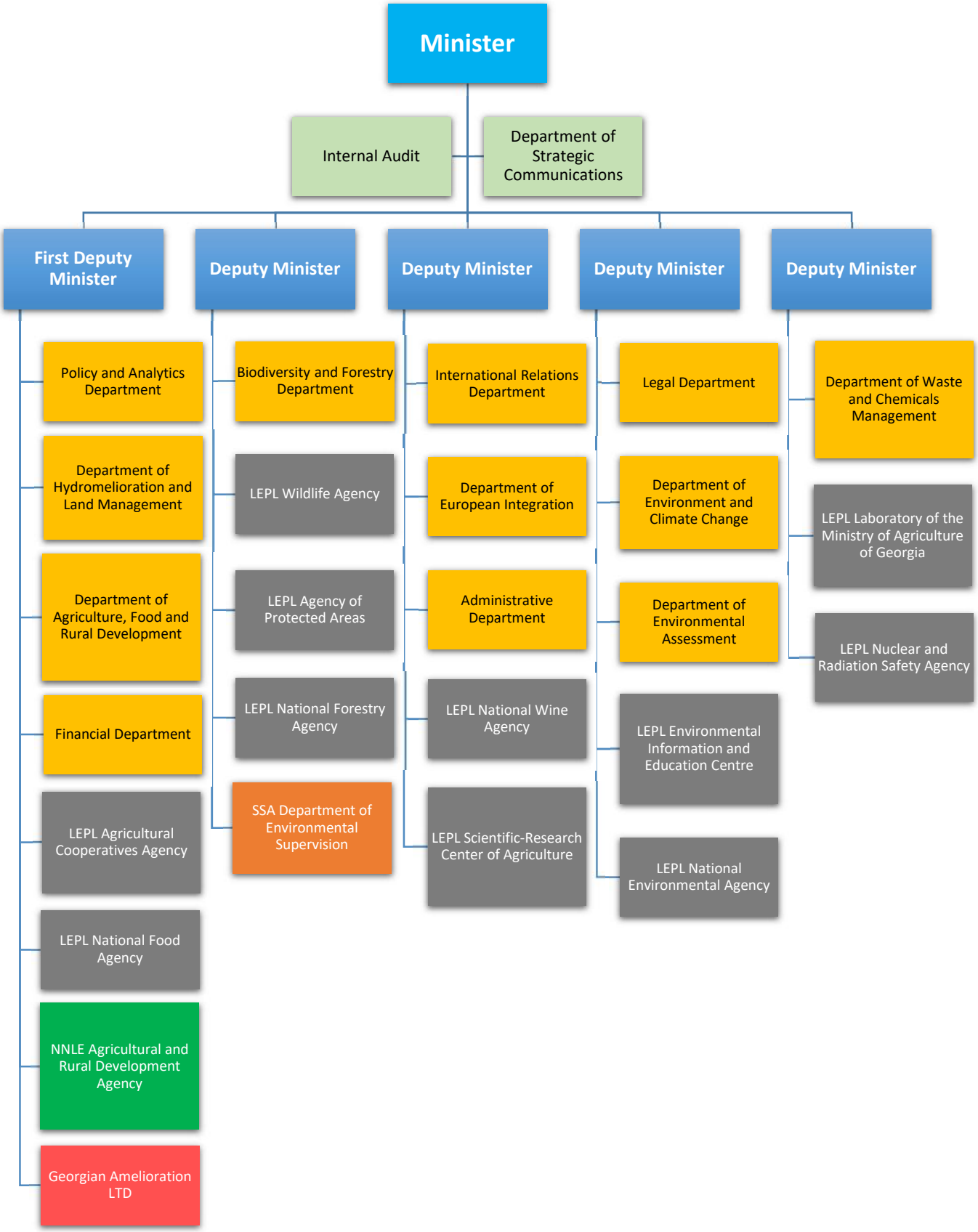
16.2. INTITUTIONAL FRAMEWORK FOR ENVIRONMENTAL POLICY

The main part of environmental policy and legislation has been developed by the Ministry of Environmental Protection and Agriculture of Georgia (MEPA), which was established in accordance with the Changes No 1620 of December 7, 2017 to the “Law of Georgia on Structure, Authorities and Rules of Operation of the Government of Georgia” (2004) merging the Ministry of Environment and Natural Resources Protection and the Ministry of Agriculture of Georgia[131]. The Ministry also plays a major role in environmental administration, issuing permits and law enforcement, implementation of state control over the environmental protection and exploitation of natural resources (except for minerals, oil and gas) , data analysis and management through its Subordinated Structural Units, State Sub-Agency and the Legal Entities of Public Law. The Ministry coordinates the cooperation within regional and global environmental agreements. The Ministry has established close collaboration with Government Authorities to address complex environmental issues such as waste management, reduction of air pollution in urban areas, determination of water quality and use issues, protection of biodiversity, and etc.

According to the above law, functions and authority in the field of state management of mineral resources were transferred to the Ministry of Economy and Sustainable Development of Georgia.

[131] The Law of Georgia N1620 of 7 December 2017 on the Amendment to the Law of Georgia on Structure, Authorities and Rules of Activity of the Government of Georgia, Article 2, Paragraph 3 (see https://matsne.gov.ge/en/document/view/3888824);

Table 16.1: Structure of the Ministry of Environmental Protection and Agriculture of Georgia as of July 1, 2019



Source: Ministry of Environmental Protection and Agriculture of Georgia

According to the Law of Georgia on Environmental Protection (1996), the Ministry of Environment and Agriculture of Georgia is responsible for:[132]:

A) Implementation of state policy in the field of environment protection;

B) State management of environmental protection and use of natural resources (other than oil, gas and minerals);

C) State control over the environment and the use of natural resources (other than oil, gas and minerals);

C[1]) Participation in the implementation of state management and control in the field of the use of Living Modified Organizms (LMO);

D) Monitoring of environmental pollution;

E) Preparation of information on the existing and expected hydro-meteorological and geodynamic processes, assessment geo-ecological situation and state of the environment on the whole territory of Georgia, river basins and waterways/ reservoirs, territorial waters of the Black Sea, continental shelf and special economic zone;

F) Regulation of nuclear and radiation activities;

G) Monitoring the radiation background in the environment;

H) Elaboration, coordination and control of the state policy on the establishment, functioning and management of the system of protected areas;

I) Monitoring of biological diversity;

J) Regulation of removal of animals from the environment for scientific-research purposes;

K) Ensuring access to environmental information;

L) Promoting environmental education and environmental awareness;

M) Preparation of a national report on the state of the environment;

N) preparation of the National Environmental Action Program;

N[1]) Issuing licenses on contained use of LMOs ;

O) Implementation of state policy in the field of environmental assessment;

Q) Issuing permits for the export, import, re-export and importation of species, their parts and derivatives included in Annexes to the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES);

Q[1]) Issuance of permit for import, export, re-export and transit of ozone depleting substances;

Q[2]) Issuance of permits on import, export and transit of waste;

Q[3]) Issuing pre-substantiated consent to the import of certain hazardous chemicals;

R) Monitoring of ozone depleting substances on the territory of Georgia;

S) Implementing climate change adaptation and mitigation measures;

T) Organizing waste management;

U) Performing other functions defined by the Georgian legislation.

In addition to the aforementioned competencies, it is noteworthy to mention other priority areas of the activities of the Ministry, such as promoting the implementation of the Sustainable Development Goals (SDGs) and green economy pronciples in the country.

Adjara A/R and self-governing units are also involved in environmental governance. Environmental Protection and Natural Resources Division represents an institutional environmental body in the territory of Adjara Autonomous Republic. Self-governing units - Municipalities are responsible for the management of natural resources and municipal waste within their competence.

[132] The Law of Georgia on Environmental Protection, Article 13

The main law that creates a legal framework in the field of environmental protection is the Law of Georgia on Environmental Protection (1996). However, the various environmental areas are governed by specific sectoral laws and bylaws discussed in the relevant chapters of this report. It should be noted that in 2014-2017 the work on environmental lawmaking was intensified, prompted by signature of the Association Agreement and the deliberate policy of the Government of Georgia to introduce European environmental standards in the country.

16.3 ENVIRONMENTAL POLICY PLANNING

The National Environmental Action Program is the key strategic document of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) and other state agencies that implement or otherwise participate in implementation of policies related to environmental protection and natural resource management. The Third National Environmental Action Program of Georgia 2017-2021 (NEAP-3) was drafted by the Ministry and adopted by the Order N124 of May 22, 2018 of the Government of Georgia. The document has been elaborated with the financial support of the European Union, with the support of local and European experts and the involvement of state agencies. NEAP-3 sets out long-term strategic priorities, goals, objectives and specific action plans for a five-year period in the sector that are in line with the challenges the country, the Association Agreement between Georgia and the European Union, the Sustainable Development Goals and the international environmental agreements.

NEAP-3 topics:

- Environmental governance
- Water management
- Ambient air protection
- Waste management
- Chemicals management
- Biodiversity protection
- Forest management
- Soil protection
- Climate change
- Natural hazards risk management
- Radiation safety
- Green economy and environmental dimention of sustainable development

NEAP-3 strategic goals:

- Improving the state of the environment, ensuring the protection / sustainable use of natural resources and avoiding / minimizing the risks that endanger human health and the well-being of the population;
- Improving Georgia's compliance with its obligations under regional and global environmental agreements and bringing them closer to EU environmental policy, framework legislation and the requirements of specific directives;
- Strengthening administrative structures to ensure effective environmental governance and environmental law enforcement;
- Promote sustainable development by integrating environmental aspects into social and economic policy.

The main strategic document for 2012-2016 was the Second National Environmental Action Program (NEAP-2). In cooperation with UNDP and with support of international experts the mid-term evaluation of implementation of NEAP-2 was conducted in 2015 and recommendations were

developed[133] which were considered in NEAP-3 elaboration process. With the approval of the Third National Environmental Action Program continuous strategic environmental planning for five-year periods has started.

NEAP-3 complies with the requirements of the Policy Planning Manual[134]. Unlike NEAP-2, Chapter 14 of NEAP-3 provides a framework for monitoring and evaluation according to which the Ministry should prepare a mid-term evaluation of program implementation along with the annual monitoring reports. The results of monitoring and mid-term evaluation will be taken into account in the process of preparation of the fourth National Environmental Action Program of Georgia. Accordingly, the NEAP-3 Implementation Report for 2017-2018 was prepared.[135].

In addition to the National Environmental Action Program, there are various national strategic documents that establish an environmental policy framework. Ensuring environmental safety and sustainability through disaster prevention and rational use of natural resources is one of the three main principles outlined in Georgia's Socio-economic Development Strategy - Georgia 2020. The Agricultural Development Strategy of Georgia 2015-2020, approved by the decree N167 of the Government of Georgia of 11 February 2015, considers environmental issues as one of the priority areas. One of the three priority areas of the Rural Development Strategy 2017-2020 is environmental protection and sustainable management of natural resources. The strategy sets out objectives for the management of natural resources, waste management and climate change, with relevant measures outlined in the 2017 and 2018-2020 Action Plans. Regional Development Program of Georgia 2015-2017 outlines a range of environmental priorities such as ambient air protection, development of water and wastewater infrastructure, sustainable use of forest resources, waste management and reduction of natural and anthropogenic hazards. Georgia's Culture Strategy "Culture 2025" and the Action Plan for 2017-2018 cover environmental education issues.

There are also specific sectoral environmental policy and strategy documents developed to meet the obligations of Multilateral Environmental Agreements (eg CBD, UNCCD) or Association Agreement that are adopted by the Government or the Parliament of Georgia. Among the key sectoral strategic documents are:

- Biodiversity Strategy and Action Plan of Georgia (2014-2020) approved by Decree N343 of May 8, 2014 of the Government of Georgia;
- National Forest Concept of Georgia approved by Decree N1742-I of December 11, 2013 of the Government of Georgia;
- Second National Action Program to Combat Desertification (2014-2022) approved by the Decree N742 of December 19, 2014 of the Government of Georgia;
- National Waste Management Strategy (2016-2030) and Action Plan (2016-2020) approved by the Decree N160 of April 1, 2016 of the Government of Georgia;
- National Strategy on Radioactive Waste Management (2017-2031) and Action Plan (2017-2018) approved by the Decree N640 of December 30, 2016 Government of Georgia ;
- Inteded Nationally Determined Contribution (INDC, 2015).

Another important document defining the long-term framework of national environmental policy is the Sustainable Development Goals (SDGs). The process of nationalization and implementation

[133] A. Aldababseh, T. Gugushvili, "Independent Review and Detailed Assessment and Implementation Status of NEAP-2 in Georgia", 2015

[134] Resolution N629 of the Government of Georgia of December 30, 2016 "On the Approval of the Policy Planning Document Policy Planning Manual"
(see https://matsne.gov.ge/ka/document/view/3526319?publication=0)

[135] 2017-2018 Implementation Report of the NEAP3

of the Sustainable Development Goals at the national level is coordinated by the Government of Georgia. This process also involves integration of SDGs Targets and Indicators into the national strategic documents. In the first phase, MEPA took the responsibility for the implementation of 8 Targets of 4 environmental Goals in the following areas: climate change, waste management, air quality, fishing, biodiversity and forest management. At the same time, the Ministry continues to work towards nationalization and implementation of other Goals.

Tab 16.1: Sustainable Development Goals (SDGs)[136]

The Sustainable Development Goals (SDGs) reflect the challenges facing the world and identify 15 year development directions based on three interrelated elements of sustainable development: economic growth, social inclusion and environmental protection. Sustainable Development Goals represent an integral part of the 2030 Agenda for Sustainable Development that was adopted by the resolution "Transforming Our World: The 2030 Agenda for Sustainable Development" on September 25, 2015 by 193 UN member states. The development of the document in the frame of UN continued for 3 years with the involvement of the international community. The Sustainable Development Goals were preceded by the Millennium Development Goals (MDGs), which represented the world development agenda for 2000-2015.

The Sustainable Development Goals include 17 interrelated goals and 169 targets. These goals and targets are global in their nature and take into account different national prerequisites, capabilities and levels of development. To measure the progress made by countries towards SDGs implementation, each goal has 1 to 5 indicators, reaching a total of 244 indicators. More than half of the Sustainable Development Goals have an environmental aspect, with 86 targets in the field of environmental protection, requiring the international community to pay more attention to environmental issues when setting their national priorities.[137].

Sustainable Development Goals:
Goal 1: End poverty in all its forms everywhere
Goal 2*:* End hunger, achieve food security and improved nutrition and promote sustainable agriculture
Goal 3: Ensure healthy lives and promote well-being for all at all ages
Goal 4: Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all
Goal 5: Achieve gender equality and empower all women and girls
Goal 6: Ensure availability and sustainable management of water and sanitation for all
Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
Goal 8: Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
Goal 10: Reduce inequality within and among countries
Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable
Goal 12: Ensure sustainable consumption and production patterns
Goal 13: Take urgent action to combat climate change and its impacts
Goal 14: Conserve and sustainably use the oceans, seas and marine resources for sustainable development
Goal 15: Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss
Goal 16: Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels

[136] UN Permanent Mission to Georgia, "Sustainable Development Goals" (see http://www.ungeorgia.ge/geo/sutainable_development_goals#.XPe5eBYzaUk)
[137] United Nations Environment Program (UNEnvironment), "Frequently Asked Questions About SDG" (see https://www.unenvironment.org/explore-topics/sustainable-development-goals/why-do-sustainable-development-goals-matter/frequently)

Goal 17: Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development

16.4 EUROPEAN INTEGRATION PROCESS

Tab 16.2: Environmental obligations under the AA and bilateral and multilateral cooperation with the EU

On June 27, 2014, EU-Georgia Association Agreement (AA) was signed, including the Deep and Comprehensive Free Trade Area (DCFTA). The official title of the agreement is - "The Association Agreement between the European Union and the European Atomic Energy Union and their Member States and Georgia"[138]. The Agreement partially entered into force on 1 September 2014 and fully after its ratification by the European Union's governing institutions and Member States on 1 July 2016.[139].

The AA aims at approximation with the EU legal norms and gradual economic integration. The agreement sets out the areas in which Georgia, with EU support, will have to undertake specific reforms. Environmental obligations are set forth in Part 4 of the Agreement:

- The Environmental Chapter covers seven sectoral areas: Environmental Governance; air quality; water quality and resource management, including the marine environment; waste management; nature protection including including forestry and conservation of biological diversity; industrial pollution and industrial hazards; chemicals managenment;
- Climate-related actions are provided in a separate chapter;
- Articles 335-338 deal with fisheries and maritime governance;
- DCFTA Chapter on Trade and Sustainable Development (DCFTA) - covers 4 additional areas, such as: Multilateral Environmental Agreements; biodiversity; sustainable forest management and trade in timber products; trade in fish products.

Annexes XXVI and XXVII to the AA include 23 environmental directives and 4 regulations. The deadlines for fulfilling environmental obligations range from 2 to 15 years. The Ministry of Environmental Protection and Agriculture of Georgia (MEPA) is responsible for implementing most of these obligations.

The Association Agenda for Georgia is a plan for implementation of priority directions of the commitments under the AA in 2014-2016. The document sets out the specific directions and outcomes that Georgia should achieve in accordance with the AA timeframe. In response to the new challenges of the association process, the Association Agenda has been updated for 2017-2020. The new Agenda includes 4 environmental chapters that cover short and medium term commitments to sustainable development, maritime governance, environment and climate change.[140].

On 14 October 2016, the Protocol on Georgia's Accession to the Treaty establishing the Energy Community was signed, which together with other commitments stipulates the implementation of 5 EU environmental directives by Georgia.[141]

The Ministry informs the EU on the implementation of the environmental obligations of the AA and the Association Agenda in bilateral formats through the Association Council, Association Committee and thematic Sub-committees.

Within the Eastern Partnership multilateral cooperation format, environmental issues are mainly concentrated in the third platform - communications, energy efficiency, environment and climate change. The first Eastern Partnership Ministerial on Environment and Climate Change was held in 2016 and the

[138] Information Center on NATO and the EU, Association Agreement, (see http://infocenter.gov.ge/euinfo-the-association-agreement/#1)

[139] Ministry of Foreign Affairs of Georgia, "Georgia-EU Association Agreement in force" http://mfa.gov.ge/News/საქართველო-ევროკავშირის-ასოცირების-შეთანხმება-ძალა.aspx?CatID=5)

[140] EU Delegation to Georgia, "EU and Georgia approve renewed Association Agenda" (see https://eeas.europa.eu/delegations/georgia/35935/node/35935_ka)

[141] Protocol on Georgia's Accession to the Treaty Establishing the Energy Community

participating countries adopted a declaration[142]. The Ministerial Declaration outlines the overall vision of the countries of the region for future action in these areas. The Action Plan for 2017-2018 has been developed to implement the Declaration, which incorporates activities organized by the international organizations in the region.

The Document of the European Union "20 Delieverables of 2020" for Eastern Partnership countries, adopted in November 2017, sets out commitments on climate change, water resources management, marine research, environmental assessment, green economy and environmental information sharing.[143].

As a result of the process of association with the European Union, since 2014 the process of improvement of environmental legislation has been started and new regulatory acts have been prepared. Due to the complexity of the above-mentioned commitments, the Ministry of Environment and Natural Resources Protection of Georgia has first of all set up flexible and effective coordination mechanisms. In 2015, with the support of the European Union, Association Roadmap in the field of environmental protection was prepared, including a plan for reforms and legal harmonization. The roadmap is a guideline document for the EU environmental harmonization process with sequentially defined actions and deadlines for specific commitments. The Roadmap was updated in 2016 and a report on its implementation was prepared.

With the technical and financial support of the EU and other international donor organizations Georgia has made significant progress in fulfilling its environmental obligations under the AA since 2014. The Annexes to the Agreement for 2014-2017 provided for harmonization with 25 provisions of 12 Directives. These commitments are largely fulfilled, although 4 commitments of the 4 directives are still being implemented. Among the measures taken are the adoption of the Environmental Assessment Code and the Waste Management Code, the approval of the National Waste Management Strategy and Action Plan, the reduction of sulphur content in some liquid fuels, etc. The draft Law on Biological Diversity, the draft Law on Environmental Liability, and the draft Legal Act on Mining Waste Management are also being developed.

In addition, Georgia has prematurely complied with many other environmental obligations set out in the Annexes of the AA. The development and approval of NEAP-3 was also a commitment to the AA and the Association Agenda. It is noteworthy to mention the development of a new draft Law - the Forest Code of Georgia - in order to meet DCFTA commitments.

16.5 ASSESSMENT OF ENVIRONMENTAL POLICY

The assessment of the state of the environment provides a solid basis for effective and targeted environmental policy planning and implementation. According to the Law on Environmental Protection, a National Report on the State of the Environment is required to be developed and approved once every four year in order to inform the public, which is a summary document of the information on the state of environment of Georgia.[144]

The report was produced annually from 2001-2006, available on the Aarhus Center website. In January 2010, a working group of experts was set up to ensure transparency in the preparation of the National Report on the State of the Environment. Several public discussions of the draft report were held during 2010, with comments and opinions expressed on the project. The preparation process preparing of the report was fully covered through a blog specifically designed for this purpose. All the working versions of the draft report, including the received comments and notes,

[142] Declaration on Cooperation on Environment and Climate Change in the Eastern Partnership

[143] Eastern Partnership - 20 Deliverables for 2020: Focusing on key priorities and tangible results

[144] Law of Georgia on Environmental Protection, Article 14, paragraph 1

were posted on the official website of the Ministry of Environment Protection of Georgia and the above-mentioned blog. The 2007-2009 National Report was approved on 9 December 2011 and is available in Georgian and English languages.

The 2010-2013 National State of the Environment Report was developed with the assistance of the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) and the United States Agency for International Development (USAID). The document was elaborated with involvement of the representatives of the Ministry of Environment and Natural Resources Protection of Georgia and invited independent experts. Other relevant government authorities of the country were also involved in the development process. In order to improve the development process and formalizing the structure, Decree No. 337 of 6 May 2014 of the Government of Georgia on the "Approval of the Rules for Development of the State of the Environemnt Reports" was adopted. The drafting procedure defines the content of the report, the agencies involved in the development, their functions and recognizes the public's right to engage in the review of the report. The National Report for 2010-2013 was approved on September 15, 2016 by Order N462 of the Minister of Environment and Natural Resources Protection of Georgia. The document is available on the website of the LEPL Environmental Information and Education Centre - eiec.gov.ge[145]. There was no printed version of the document.

Another tool for assessing Georgia's environmental performance is the Environmental Performance Review (EPR) document. The Third Environmental Performance Review (EPR-3)[146] was developed with support of the United Nations Economic Commission for Europe (UNECE) and it assesses the state of environmental governance, analyses the efficiency of the activities implemented in accordance with the reccomendations set by the Second EPR (2010), rewies the progress made between 2010 and 2015 and sets the recommendations for the improvement of environmental governance in the country. The recommendations are not legally binding, but EPR recommendations are one of the foundations of national environmental policy planning and implementation. According to the third review, Georgia has complied with, or continues to comply with, 80% of the EPR-1 and EPR-2 recommendations, and 15% of these recommendations have been partially implemented. The EPR-3 was reviewed and approved by the UNECE Environmental Committee in 2015 and submitted to the public in June 2016.

In 2015, in cooperation with the Ministry of Environment and Natural Resources Protection of Georgia, the World Bank prepared a Country Environmental Analysis of Georgia (CEA)[147] aimed at analyzing the environmental challenges in the country and thus promoting the implementation of sustainable development measures. The document focuses particularly on the social and economic costs of environmental degradation and unsustainable use of natural resources. It is noteworthy that it was the first time when such kind of document has been prepared for Georgia.

16.6 FINANCING OF ENVIRONMENTAL PROTECTION

Annual and mid-term budgetary planning is carried out through the Basic Data and Directions document (BDD) and the Medium Term Expenditure Framework (MTEF). The BDD is an annually updated document according to which the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) sets out the priorities for the budget year and the next three years and is submitted by the Government to the Parliament. In line with the Parliament's comments and suggestions, the Ministry approves the MTEF, which is a document on the measures to be taken to

[145] The National Reports on State of the Environment of Georgia

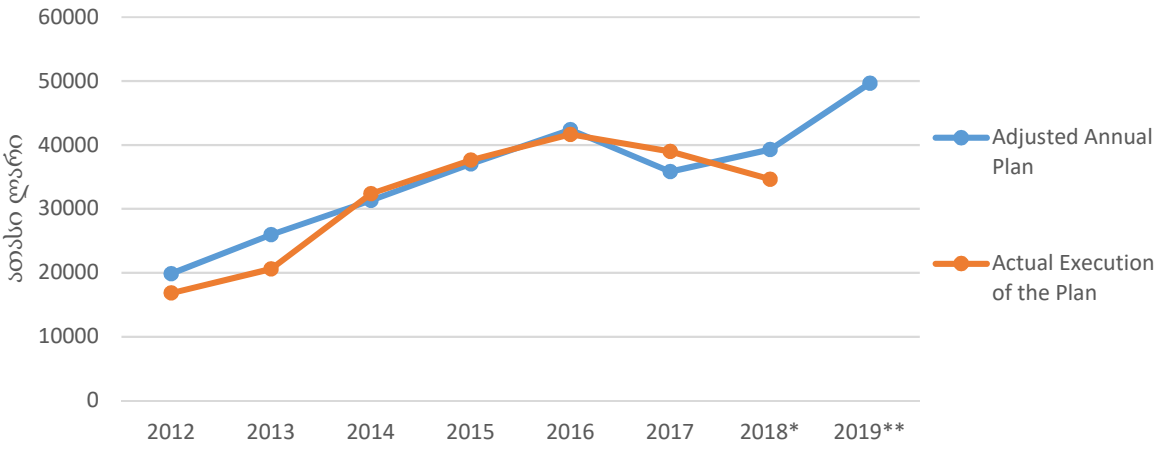
[146] Third Environmental Performance Review (EPR-3)

[147] Country Environmental Analysis of Georgia (CEA)

achieve the results set out in the four-year programs. In order to effectively allocate the limited financial resources, BDD sets out medium-term budget spending programs.

In 2017, the Ministry of Environment and Natural Resources Protection of Georgia implemented the following budget-targeted programs:
1. Development, regulation and management of environmental policy;
2. Environmental supervision;
3. Establishment and management of protected areas system;
4. Establishment and management of forestry system;
5. Establishment and management of the national nursery system;
6. Access to environmental information and promotion of environmental education;
7. Environmental monitoring, forecasting, prevention and management of natural resource.

Figure 16.6.1: Planned and Actual Execution of Environmental Budgeting Programs for the Ministry of Environment and Natural Resources Protection of Georgia and Ministry of Environmental Protection and Agriculture of Georgia for 2012-2019[148]



** Sub-program "Development and Management of Environment and Rural Development Policy (31 01 01)" and without co-financing*

*** Approved plan without co-financing of Sub-program Development and Management of Environment and Rural Development Policy (31 01 01)*

Source: Ministry of Environment Protection and Agriculture of Georgia, Ministry of Finance of Georgia

The new government, which came to power in 2012, declared environmental protection one of the country's top priorities, highlighted by the strengthening of institutional, human and financial capacity in the environmental field. As Figure 16.6.1 shows, the budget of the Ministry of Environment and Natural Resources Protection of Georgia has almost doubled from 2012 to 2017.[149] By 2017, the actual budget execution amounted to GEL 39 mln.

In 2017, during the Government Structural Reorganization and merging of the Ministries, the Government of Georgia took responsibility to continue growth of funding in environmental areas. According to the amendment to the Law on Environmental Protection of December 7, 2017, it is not allowed to reduce the total amount of budgetary assignations envisaged by the annual

[148] The financial data for 2014-2017 refer to budget programs of the Ministry of Environment and Natural Resources Protection of Georgia, and data for 2018-2019 to the environmental programs of the Ministry of Environment Protection and Agriculture of Georgia.
[149] Ministry of Environment of Georgia is meant in 2012.

environmental budget in accordance with the relevant environmental program codes, in comparison with the total amount of budgetary assignations defined by the previous year state budget.[150]. Also, prior to fully fulfilling the obligations under AA, during the preparation of the Draft Law on State Budget the budgetary assignations provided by the program code related to environmental measures shall be increased by at least 5% in comperason to the previous year .[151] Consequently, the Budget of Ministry of Environment and Natural Resources Protection of Georgia in 2017 was GEL 35 825.3 thousand, while MEPA has allocated GEL 39 260.2 thousand in 2018.[152] That is 9.6% more than in 2017, and 2019 funding was 49 661.0 thousand GEL, which is 26.5% higher than in 2018.[153]

Georgia has expanded its cooperation with international donor organizations and foundations, and with their financial support, numerous environmental projects have been implemented. Specifically, in 2014-2017 donor organizations funded 75 projects in the field of environmental protection and launched 89 new projects. The main donors and partner organizations in Georgia in this direction are: Adaptation Fund (AF), Austrian Development Agency (ADA), International Atomic Energy Agency (IAEA), US Agency for International Development (USAID), World Wildlife Fund (WWF), UN Development Program (UNDP), United Nations Environment Program (UNEP), Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), Global Environment Facility (GEF), Organization for Security and Cooperation in Europe (OSCE), United Nations Economic Commission for Europe (UNECE), European Union (EU), Organization for Economic Cooperation and Development (OECD), Caucasus Wildlife Fund (CNF), UN Food And Agriculture Organization (FAO), Czech Development Agency (CzDA), Governments of Austria, USA, Germany, Japan, Norway, Poland, Slovakia, Sweden, Switzerland, the Czech Republic, the Netherlands.

16.7 INTERNATIONAL COOPERATION

International environmental treaties to which Georgia is a party to play an important role in the formulation of national policy. The Ministry of Environment and Agriculture of Georgia is responsible for the implementation of 34 environmental agreements, including 19 conventions, 9 protocols and 5 agreements. On February 4, 2016, Georgia joined the amendment to the Aarhus Convention on Genetically Modified Organisms (GMOs), June 7, 2017 - the Paris Agreement to the UN Framework Convention on Climate Change, and on November 2, 2017, Georgia became a Party to the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

Multilateral Environmental Agreements are listed in Table16.2.

[150] Law of Georgia of 7 December 2017 on Amendment to the Law of Georgia on Environmental Protection, Article 1, Paragraph 2

[151] Ibid, Article 1, paragraph 7

[152] Without sub-program 31 01 01 and cofinancing

[153] Without sub-program 31 01 01 and cofinancing

Table 16.2: Multilateral Environmental Agreements (Conventions/Protocols/Agreements) to which Georgia is a party

Name	Date of ratification / accession
Convention on the Protection of the Black Sea Against Pollution	1993
Protocol on the Conservation of Black Sea Biodiversity and Landscapes	2009
Protocol on Protection of the Black Sea Marine Environment Against Pollution from Land Based Sources	2009
Protocol on The Protection of the Black Sea Marine Environment Against Pollution by Dumping	1993
Protocol on Cooperation in Combating Pollution of the Black Sea Marine Environment by Oil and Other Harmful Substances in Emergency Situations	1993
Convention on Biological Diversity	1994
Cartagena Protocol on Biosafety to the Convention on Biological Diversity	2008
United Nations Framework Convention on Climate Change	1994
Kyoto Protocol to the UN Framework Convention on Climate Change	1999
Paris Agreement of the UN Framework Convention on Climate Change	2017
Convention for the Protection of the Ozone Layer	1995
Montreal Protocol on Substances that Deplete the Ozone Layer	1995
London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer	2000
Copenhagen Amendment to the Protocol on Substances that Deplete the Ozone Layer	2000
Montreal Amendment to the Protocol on Substances that Deplete the Ozone Layer	2000
Beijing Amendment to the Protocol on Substances that Deplete the Ozone Layer	2010
Convention on International Trade in Endangered Species of Wild Fauna and Flora	1996
Convention on Wetlands of International Importance especially as Waterfowl Habitat	1996
Convention on Long-Range Transboundary Air Pollution	1999
Protocol on Long-term Financing of the Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in	2012

Europe (EMEP) to the Convention on Long-range Transboundary Air Pollution	
Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Baasel Convention)	1999
United Nations Convention to Combat Desertification	1999
Convention on the Conservation of Migratory Species of Wild Animals	2000
Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)	2001
Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA)	2001
Agreement on the Conservation od the Population of European Bats	2001
Convention on Access to Environmental Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention)	2000
GMO Amendment	2016
Stockholm Convention on Persistent Organic Pollutants (POPs)	2006
Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade	2006
Convention on the Conservation of European Wildlife and Natural Habitats	2008
European Landscape Convention	2010
Agreement Between the Republic of Georgia and the International Atomic Energy Agency for the Application of Safeguards in Connection with Treaty on the Non-Proliferation of Nuclear Weapons (INFCIRC/617)	2003
Protocol Additional to the Agreement between the Republic of Georgia and the International Atomic Energy Agency for the Application of Safeguards in Connection with the Treaty on the Non-Proliferation of Nuclear Weapons	2003
Convention on the Physical Protection of Nuclear Material	2006
Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management	2009
Convention on Early Notification of a nuclear accident	2010
Convention on Assistance in the Case of a Nuclear Accident or a Radiation Emergency	2017

Source: MEPA

On June 8-10, 2016 the 8th “Environment for Europe” Ministerial Conference of the UNECE Region was held in Batumi. The Ministerial is a high-level platform for stakeholders to discuss the most recent environmental issues, identify priority areas and set the joint actions for sustainable development. The following important documents were adopted at the Ministerial Conference: "Batumi Initiative on Green Economy" (BIG-E), "Batumi Actions for Clean Air" (BACA), "Batumi Ministerial Declaration on Education for Sustainable Development".

In order to strengthen international cooperation the Ministry of Environment and Natural Resources of Georgia concluded 8 bilateral agreements in the field of environmental protection between 2014 and 2017 with the Republic of Korea, the Czech Geological Service, the Republic of Bulgaria, the Republic of Austria, the US Nuclear Regulatory Commission, Italy, Ukraine and the Green Climate Fund.

V/17 ENVIRONMENTAL REGULATION AND CONTROL

The primary goal of environmental regulation is to prevent the damage to the environment. At present, Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) are key tools for preventing adverse environmental impacts in Georgia as a result of the planned activities and the implementation of the strategic document. Environmental regulation in Georgia is implemented through licenses, permits, environmental decisions, norms and regulations. The State Sub-agency Department of Environmental Supervision (DES) of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) carries out the state control over the whole territory of Georgia, including its territorial waters, continental shelf and special economic areas. In case of administrative offences, the Department is entitled to establish protocol for administrative offences, review the cases of administrative offences and issue a resolution on imposing an administrative penalty, determine (calculate) the environmental damage, require the payment of the damages along with the offense protocol or submit the relevant suit to the court, as well as send the case files to the respective agencies in case if signs of criminal offense are found.

17.1 MAIN QUESTIONS AND MESSAGES

1. ***What are the key trends in improving environmental regulation?***

- A total of 51 environmental technical regulations were approved by the Government of Georgia in 2014-2017, half of which focused on biodiversity conservation issues. Moreover, about 20 other environmental by-laws (rules, conditions, requirements, lists, regulations, etc.) and 5 environmental strategic documents have also approved by the Decrees of the Government of Georgia. During the reporting period, 5 new environmental laws were adopted.
- The fundamental reform of the environmental assessment system is noteworthy, in particular the Environmental Assessment Code, which is in line with the EU Directives on Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA), as well as the Espoo Convention, its "Strategic Environmental Assessment" Protocol, and Aarhus The principles set out in the Convention.

2. ***What are the key trends in improving environmental control?***

- The mandate of the DES was increased and structural optimization of the department was carried out to implement new functions. Environmental Patrol and Rapid Response Services provide 24-hour patrols through the Rapid Response Crew. Inspectors' equipment and working conditions have been improved;
- In spite of the changing dynamics, almost 1,000 more regulatory sites were inspected in 2017 by DES in comparison with 2014;
- Environmental Information Management Portal was created - emoe.gov.ge, through which entrepreneurs conduct electronic reporting and accounting through the single window system principle. An electronic messaging system help@emoe.gov.ge has been set up to allow entrepreneurs to register notifications of inconsistencies in their emails to help@emoe.gov.ge;
- Since 2014 Hot Line 153 - a 24-hour telephone notification system has been operating with 30,177 calls registered during the reporting period. 25% of these calls reported environmental violations, which have been responded in accordance with the law. There is a increasing dynamic: in 2014 there were 2,200 calls, compared to 11,000 in 2017;

3. ***What is the dynamics of violations revealed by DES in 2014-2017 and the trend of environmental damage?***

- The dynamics and structure of offenses identified by DES during 2014-2017 in the field of environmental protection and use of natural resources reveals significant offenses in the fields of timber, hunting and fishing, illegal waste disposal. The dynamics of violations revealed during the reporting period were characterized by changing trends, though in 2017 there were 19% more violations than in 2014. However, there is a significant increase in violations under the Criminal Code of Georgia (1999), which increased by 43% in 2014-2017.

- During 2014-2017, the amount of environmental damage was characterized by a decreasing trend. However, there was a high rate of damage to the environment in 2014-2015 due to the limited control over licenses and permits in the field of environmental protection over the years. Consecutive scheduled / unplanned inspections since 2014 have revealed accumulated violations over the years and consequently significant environmental damage, which has been diminishing in subsequent years.

17.2 LICENSES

Two types of licenses are issued in Georgia in the field of environment protection and use of natural resources: license for use and license for activity. According to the Georgian Law on Licenses and Permits (2005), a use license is a type of license that entitles a person to use certain state resources. The license holder may assign the license and transfer it to other persons as well. Currently, the following licenses are issued for the use of natural resources in Georgia: Mining License (for the purpose of extraction and / or exploration-extraction); General forest use license, which includes a special license for timber production and a special hunting license (these licenses can also be issued separately); License for fishing and licence for export of fir cone as well as snowdrop bulbs and eastern sowbread tubers that are included in the Annexes to the "Convention on the International Trade in Endangered Species of Wild Fauna and Flora". The purpose of issuing a license is to ensure sustainable and rational use of national resources. The Ministry of Economy and Sustainable Development of Georgia issues licenses for the use of minerals, while the National Environmental Agency (NEA) of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) issues licenses for all other types of natural resources.

A business license is a type of license that entitles a person to perform activities specified by law. This license is related to the licensee owner and can not be transferred to another legal entity. The following licenses are issued in the field of environmental protection: a license for nuclear and radiation activities and a license for contained use of LMOs.

Issues related to the types of licenses mentioned above are discussed in the relevant sections of this report.

17.3 PERMITS AND ENVIRONMENTAL DECISION

According to the Law of Georgia on Licenses and Permits, a permit is the right to perform an activity for definite or indefinite period of time, which is related to the object of the activity and confirms compliance of the activity with the law. The following environmental permits are issued:

- Permit for export, import, re-export, transit and introduction from the sea of species, their parts and derivatives listed in Annexes of the " Convention on International Trade in Endangered Species of Wild Fauna and Flora," (CITES) ;
- Permit for waste import, export and transit;
- Permit for import, export, re-export and transit of ozone depleting substances;
- Permit for purchase and transmission of radioactive materials;
- Permit for import and export of radioactive materials, raw materials for producing nuclear material, equipments containing radioactive substances, nuclear technology or know-how, as well as permit for export, import and transit of radioactive sources;
- Permit to export radioactive waste.

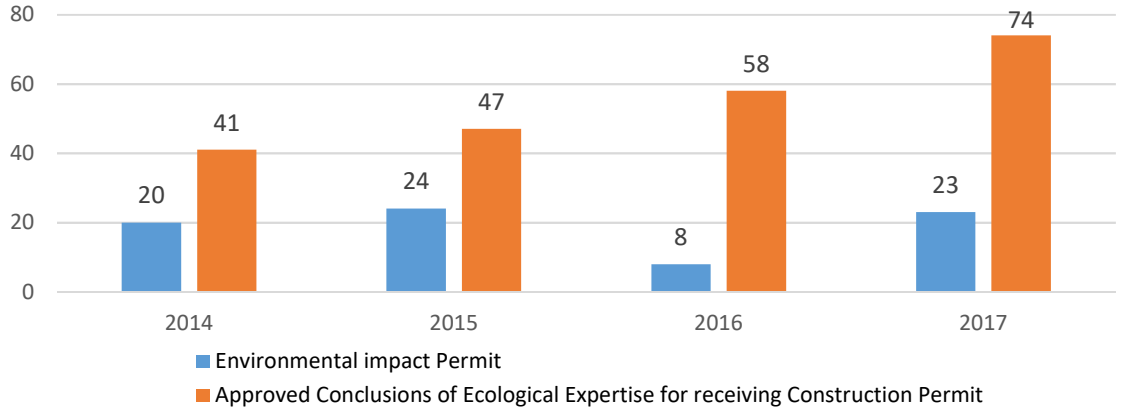
Issues related to these types of permits are discussed in the relevant sections of this report.

Until January 1, 2018 in accordance with the Lawon "Environmental Impact Permits" of 2007 (not in force since 2018) environmental impact permits were issued in order to regulate a potential negative impact of the activities on the environment, which has been replaced by the

environmental decisions envisaged by the "Environmental Assessment Code". The necessary condition for the issuance of this permit was the positive conclusion of the environmental expertise. Conclusions of environmental expertise were also issued for receiving a construction permits.

In 2014-2017, 75 environmental impact permits and 220 environmental expertise conclusions were issued for construction permits (see Figure 17.3.1).

Figure 17.3.1: Number of Environmental Impact Permits / Conclusions of Ecological Expertise issued in 2014-2017

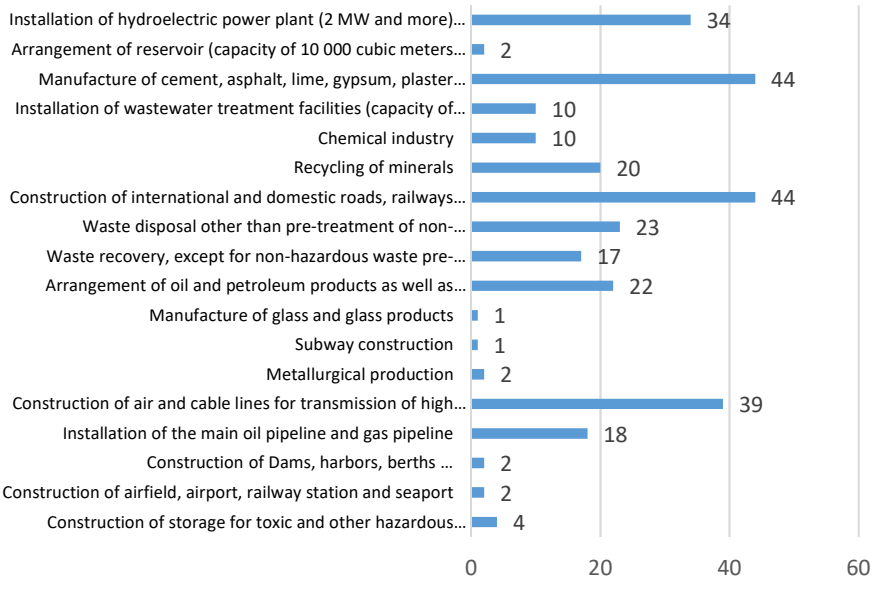


Source: MEPA

55% of the issued environmental expertise conclusions were issued for the following activities (see Figure 17.3.2):

- Construction of international and domestic roads, railways and bridges, tunnels, as well as engineering structures for protection of motorways, railways and their territories;
- Production of cement, asphalt, lime, gypsum, plaster and brick;
- Installation of high voltage (35 kW and above) air and cable transmission lines and substation (110 kW and more);
- Installation of hydroelectric power plant (2 MW and more) and thermal power plant (10 MW and more).

Figure 17.3.2: 2014-2017 Conclusions of Ecological Expertise issued by years by activity

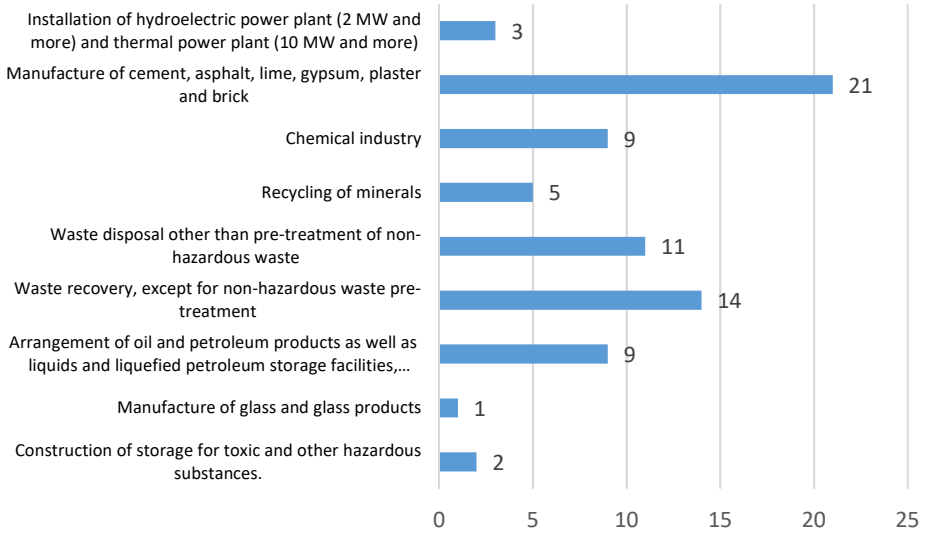


Source: MEPA

About 61% of environmental permits issued were issued for the following activities (see Figure17.3.3)

- Production of cement, asphalt, lime, gypsum, plaster and brick;
- Recovery of waste other than pre-treatment of non-hazardous waste;
- Waste disposal, except for non-hazardous waste pre-treatment.

Figure 17.3.3: Environmental Impact Permits Issued in 2014-2017 by Activity



Source: MEPA

During the reporting period, 1 negative environmental expertise conclusion was issued on the Environmental Impact Assessment Report (2014) for the construction and operation of the Dam. 17 decisions (2015-2017) on the extension of current activities have been issued.

Reform of the Environmental Assessment System

In order to improve the national legislation and bring it into line with EU directives, on 1 June 2017 the Parliament of Georgia adopted the Law of Georgia "Environmental Assessment Code", which regulates the environmental impact assessment system in a completely different manner and provides for its fundamental change and improvement. The Code considers the principles of the EU Directives on Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA), as well as the Convention on Environmental Impact Assessment in the Transboundary Context (Espoo Convention), its Protocol on Strategic Environmental Assessment and the Convention on Access to Environmental Information, Public Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention).

The Environmental Assessment Code regulates matters related to strategic documents and public or private activities that may have a significant impact on the environment, human health and / or life. The Code defines a list of new activities subject to the EIA. Given the environmental risks and the degree of impact, the activities are grouped into two Annexes. The activities listed in Annex I are explicitly subject to the EIA. As for the activities listed in Annex II, they are initially provided with a screening procedure to determine whether the activities are subject to EIA.

As already mentioned, starting from January 1, 2018, the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) issues an environmental decision based on the Environmental Impact Assessment instead of the Environmental Impact Permit. An important novelty is that the new EIA procedure is conducted independently of other licensing / permitting procedures

established by the Georgian legislation and precedes the issuance of all other permits and / or licenses, enabling the business operator to better plan the stages of implementation. At the same time, conditions other than those specified in the environmental decision may not be determined by another license or permit.

The Code provides high standards of public participation, both in screening, scoping and in environmental decision-making. It also obliges the Ministry to conduct a public hearing during scoping and environmental decision procedures, which was the responsibility of the developer under the Law of Georgia on Environmental Impact Permits.

The legislation did not provide for the evaluation of strategic documents in the environmental field and thus, this institution is completely new to Georgian legislation. The Code determines for SEA procedure for strategic documents that may affect the environment and human health. In addition, the Ministry of the Internally Displaced Persons from Occupied Territories, Labor, Health and Social Affairs of Georgia, together with the Ministry of Environment Protection and Agriculture of Georgia, participates in the SEA process. According to the Environmental Assessment Code, the SEA procedure encompasses studying, analyzing, and making recommendations on the potential environmental and human health impacts of the implementation of the strategic document. Subject to SEA is a strategic document which represents an administrative normative act issued on the basis of Georgian legislation, and which sets the framework for the future development for the individual sectors in accordance with Chapter III of the Code and identifies specific features and / or volumes of activities prescribed in Annexes I and II of the Code.

The Code also provides for a transboundary environmental impact assessment procedure which means that if the implementation of an activity or strategic document that may have an impact on the environment of the other country the involvement of this country in environmental decision-making is ensured.

The provisions of the Code came into force in stages. Specifically, part of the EIA is operational - from January 1, 2018, and part of the SEA is operational - from July 1, 2018. The provisions on transboundary environmental impact assessment will enter into force upon the entry into force of the Espoo Convention and its Protocol on Strategic Environmental Assessment to Georgia.

Similar to the Law of Georgia on Environmental Impact Permits, the Code provides for "the procedure for deciding on the continuation of ongoing activities and establishes a deadline for activities that commenced prior to June 1, 2015 and which do not have an environmental impact permit / ecological expertise conclusion. According to the Environmental Assessment Code, the developer was obliged to apply to the Ministry by June 1, 2019 for eligibility to continue the ongoing activities and to submit an environmental audit report along with action plans for mitigating environmental impacts. The purpose of this mechanism is to bring existing activities into a legal framework so that they are subject to environmental regulations.

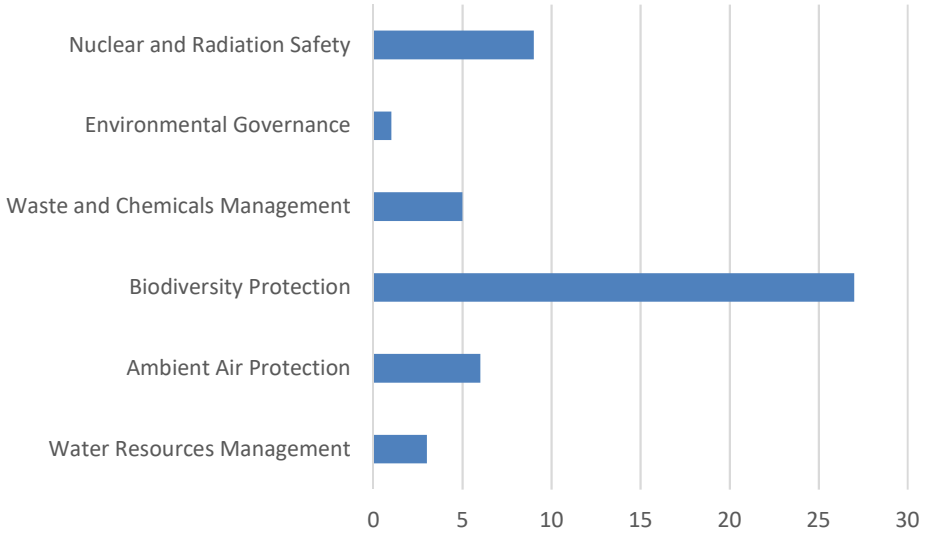
An environmental decision is issued for an indefinite period of time. If the developer does not start the activities envisaged by this decision within 5 years, the Ministry shall declare the environmental decision invalid. Compliance with the conditions stipulated by the environmental decision is supervised by DES.

17.4 ENVIRONMENTAL REGULATIONS AND RULES

Small-scale, relatively environmentally-friendly activities are regulated by environmental technical regulations and rules. Compliance with environmental technical regulations is mandatory for all activities that do not require an environmental decision. A total of 51 environmental

technical regulations were approved by the Government of Georgia in 2014-2017, half of which focused on improving the protection of biodiversity, in particular the management of protected areas.

Figure 17.4.1: 2014-2017 Yearly approved environmental technical regulations by industry



Source: MEPA

During the reporting period, five new environmental laws were adopted:

1. Law of Georgia on Establishment and Management of Pshav-Khevsureti Protected Areas N2237-II of April 16, 2014;
2. Law of Georgia on Living Genetically Modified Organisms No.2656-I of September 18, 2014;
4. Waste Management Code of Georgia N2994 of December 26, 2014;
5. Law of Georgia on Radioactive Waste N4487 of November 11, 2015;
6. Environmental Assessment Code of Georgia N890-II of June 1, 2017.

Up to 20 environmental by-laws (rules, conditions, requirements, list, regulations, etc.) and 5 environmental strategic documents have been approved by the Decrees of the Government of Georgia.

17.5 ENVIRONMENTAL CONTROL

According to the government program, one of the priorities of improving the environmental governance in the country was to improve the state environmental control system - to put in place an effective control system that would prevent, detect and eliminate illegal pollution and use of natural resources, and protect the environment. Fulfill conditions set forth in permits, environmental decisions and licenses to use natural resources.

During the reporting period, the activities were carried out in three priority areas:

1. The activities in following areas have been planned in order to promote voluntary implementation of environmental requirements:

- Launching modern technology-based information systems to raise awareness of regulatory requirements and raise awareness;
- Improvement of environmental reporting systems of regulatory bodies based on best international practice;

- Ensure timely and proportionate response to violations;
- Preventing potential violations by publicity of information;

The following measures were implemented during the reporting period:

Electronic reporting systems were introduced - **Environmental Information Management Portal - emoe.gov.ge** was created, through which entrepreneurs perform one-stop-shop online reporting and accounting, in particular:

- Holders of special licence on timber production register woodcuts, upload origin documents on produced timper trough electronic system of timber management (within 48 hours of document registration);
- The owners of Roundwood Primary Processing facility record on the information on obtained and processed wood online since December 1, 2015, and since 2017 they also reflect online the results of received product (up to 24 hours of the same day), as well as registration of export of the product (immediately);
- Holders of special licenses on fishing in the Black Sea and persons engaged in industrial fishing conduct electronic management of industrial fishing processes. Since November 1, 2017 fishing vessels register daily catches online in the "electronic recording book". Licensee ships have been equipped with electronic monitoring systems.
- Regulatory facilities in the same system, the Electronic Emissions Module, have been filing and submitting forms of harmful emissions in the ambient air since 2017 (until the end of the reporting year, until February 15).

The electronic notification system help@emoe.gov.ge is available for all entrepreneurs, including small and medium-sized businesses:

> Special timber license holders and owners of round timber plants register notices of discrepancies in their e-mails to help@emoe.gov.ge or the department's hotline - 153 and on cases stipulated by the legislation, the legal responsibility will not be imposed.

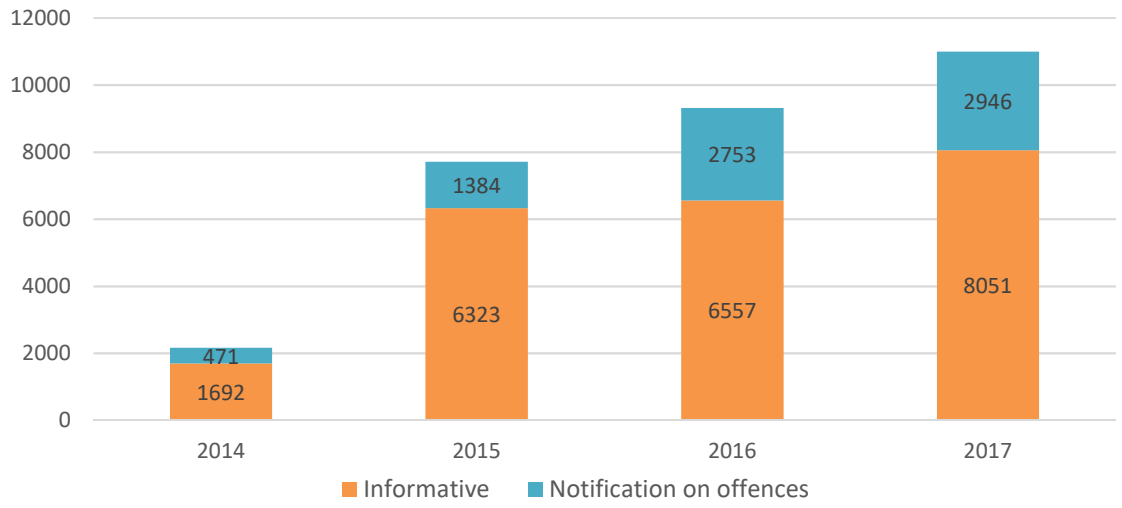
The **Hot Line 153** - a 24-hour telephone alert system has been operational since 2014, allowing individuals and legal entities, including regulators, receive necessary information and consultation on environmental issues; There are also reports of environmental offences, which are subject to operational response.

In total, during 2014-2017, 30 177 calls were made to the hotline - 153.

- 22 623 calls - informative / consulting, with relevant information provided;
- 7 554 calls - notification of environmental offenses responded to by law.

There is a tendency of growing dynamic - if there were 2,200 calls to the hotline - 153 in 2014, the figure in 2017 reached 11,000. In addition, the number of information calls increased 4.8 times, and the number of reported violations - 6.3 times.

Figure 17.5.1: Hotline - 153 calls statistics for 2014-2017



Source: DES

Table 17.1: Hotline - 153 statistics on hotline topics

Call topic	2014 Year	2015 Year	2016 Year	2017 Year
Concerning the introduction of the electronic journal of the round timber processing plant	-	329	723	699
Violation of forest legislation, illegal logging	102	238	386	598
Pollution of the environment with waste	40	199	207	340
Ambient air pollution	117	198	170	210
Violation of the technical regulations of the sawmill	-	20	571	208
Odor polution	41	56	78	172
Illegal fishing	53	86	117	145
Violation of animal protection legislation, animal capture	16	33	104	142
Arrangement of seals on underground wells	3	-	114	138
Illegal hunting	41	55	65	83
Violation of fossil legislation	29	44	63	76
Violation of land laws, land degradation	3	43	49	50
Violation of water laws	8	50	71	49
Noise	8	17	26	31
Accidents / incidents	-	2	9	4
Unauthorized activities	7	7	-	1
Regarding the activities of the department	3	7	-	-
Total	**471**	**1384**	**2753**	**2946**

Source: DES

2. Following activities have been planned in order to promote the establishment of modern standards of the State Environmental Control Inspectorate and effective management of activities:

- Improvement of state environmental control procedures in line with EU directives and international requirements;
- Update the material-technical base of DES, increase the human resources and provide them with relevant technical equipment and facilities.

The following measures were taken to this end:

The mandate of the department has increased. Established in 2013, the State Sub-Agency Department of Environmental Supervision (DES) functionally is the legal successor of the Environmental Inspection operating in 2005-2010. However, the Departmennt has been given much more authority over the following areas:

- Protection of ambient air, water, land, minerals and biodiversity, including compliance with the requirements of Georgian forest legislation;
- State control over the use of natural resources;
- State control of chemical safety, waste management;
- State control over the use of Living Modified Organisms;
- Controlling compliance with environmental permits and licenses.

In 2015-2016, the Department's authority increased – after enactment of the Law of Georgia on Waste Management and the Law on LMOs, the following functions have been added to DES in order to fulfill other obligations under the EU Association Agreement:

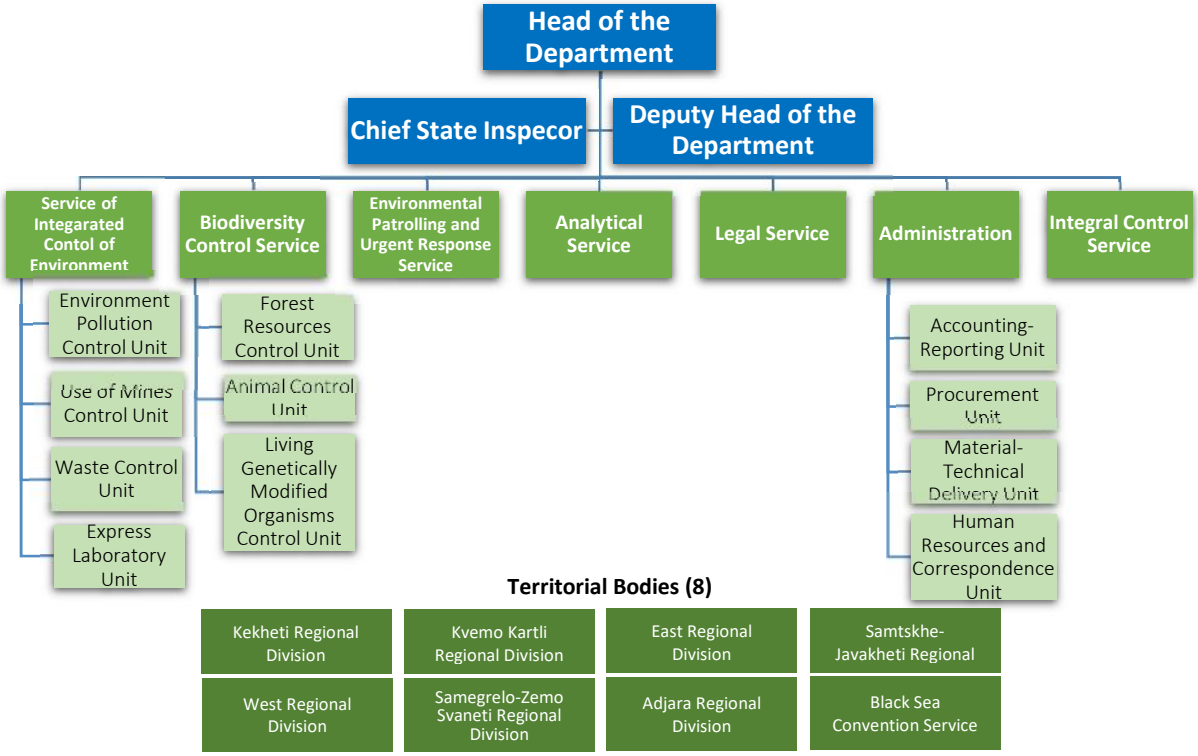
- Monitoring the fulfillment of obligations under the Waste Management Code and responding on violations in accordance with the relevant articles of this Code;
- Control of compliance of the quality of motor gasoline and / or diesel fuel on the territory of Georgia with the quality norms defined by the decree of the Government of Georgia;
- Control of the requirements set in the field of import, export, re-export and transit of ozone depleting substances;
- In accordance with the Law of Georgia on Living Modified Organisms, to take samples of sown and / or warehoused agricultural land owned by physical and legal persons and to conduct research to identify species of LMOs therein.

Structural optimization of the department was carried out, new structural units were formed:

- Waste Control Unit;
- Division of control of Living Modified Organisms;
- Express-Laboratory Unit.

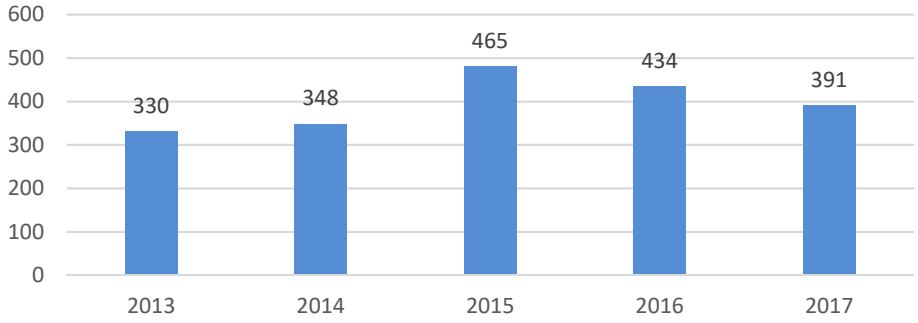
As of 2017, the department has a staff of 391, including 91 in the central office and 300 in the eight territorial authorities.

Figure 17.5.2: Structure of DES, 2017



Source: DES

Figure 17.5.3: Number of staff of DES in 2013-2017



Source: DES

DES, in accordance with the powers granted by the Law, operates in two main areas - **environmental patrolling and inspection,** which perform different functions and have different competencies.

Environmental Patrolling and Urgent Response Division, through urgent response crews, are **patrolling 24 hours,** mainly for the purpose of prevention, detection and elimination of illegal extraction, transportation and processing/modifying of natural resources, as well as environmental pollution.

Main competences:

- Visiting natural resource extraction or primary recycling sites at any time of the day;
- Determining the conformity of natural resources with documents certifying the legality of use / transportation of natural resources; Exploring extracted natural resources and tools used;
- Drawing up a protocol on administrative offenses;

- Confiscation / sealing of offenses;
- Administrative detention, use of coercive measures, etc.

Environmental inspections are carried out by inspectors, and mainly focuses on the licensee using the natural resources, permits / decisions issued in the field of environmental impact assessment, planned and unplanned inspection of facilities subject to environmental technical regulations, general inspection of facilities.

Main competences:

- Inspection of facilities (examination, planned and unplanned inspection);
- Laboratory sampling / measurements;
- Draft / review an administrative offense protocol, issue an administrative penalty, or forward it to the appropriate judicial authorities;
- Determination of damage to the environment, requesting compensation to the violator;
- Submitting case materials to the Investigative Authority in case if criminal offenses are detected;
- Filing an administrative order to eliminate violations or refrain from any actions, etc.

To ensure legal control over inspection activities, legislative gaps have been eliminated, inspection procedures and decision-making procedures have been updated - the "Rule on Execution of State Control", "Technical Regulation - Methodology for Determining (Calculating) Environmental Damage "; legislative initiatives on amendments to the Administrative Offenses Code of Georgia, Laws of Georgia on “Environmental Protection”, “Animal World”, and “Ambient Air Protection” were prepared.

Improved equipment and working conditions of Inspectors:

- Offices of territorial Services of the Department were constructed / renovated and upgraded - Mtskheta and Rustavi in 2014; Ozurgeti, Gori, Ambrolauri, Akhaltsikhe and Batumi in 2016-2017.
- In order to enhance the capacity of the Department, inspectors and urgent responce mobile team (crews) were properly equipped, including:
    - Sailing vessels (boats and inflatable boats) for fighting poaching on inland waterways; Boats for inspection in Black Sea area;
    - Badge camcorders, video recorders, tablet PCs for quick response crews;
    - Special tools for inspection of high-risk facilities (with the assistance of the Czech Development Agency);
    - Complete laboratory equipment for the Black Sea Convention Service;
    - Car fleet, staff uniform have been renewed.

90% of the staff of DES were involved in the qualification raising system.

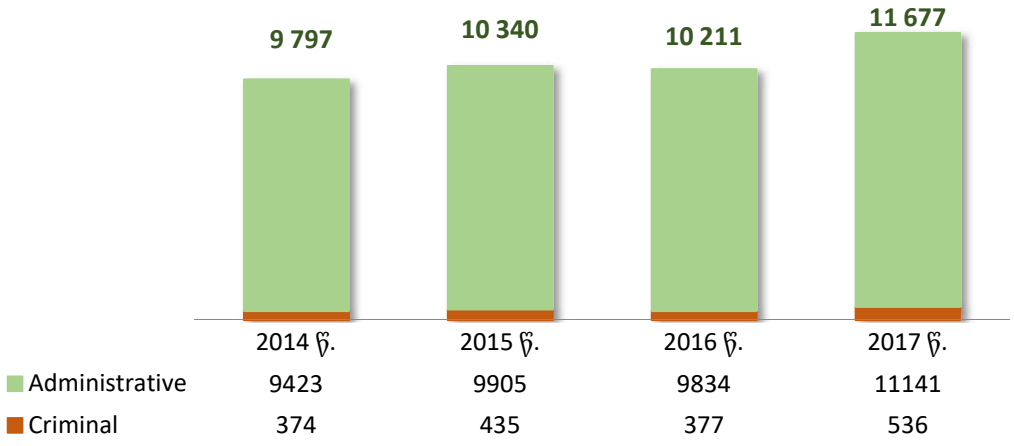
3. **Conduct fair, result-oriented, cost-effective environmental inspections, that will ensure implementation of provisions of licences issued for the use of natural resources and permits / decisions issued in the field of environmental impact assessments; Prevention, detection, elimination of environmental pollution, illegal extraction of natural resources.**

To accomplish these tasks the following activities were planned:

- Carry out scheduled inspections in accordance with the annual inspection plans of the regulated facilities;
- Perform unplanned audits based on alerts, complaints, reporting analysis and more;
- Ensure timely detection and elimination of violations of environmental legislation through 24-hour patrolling.

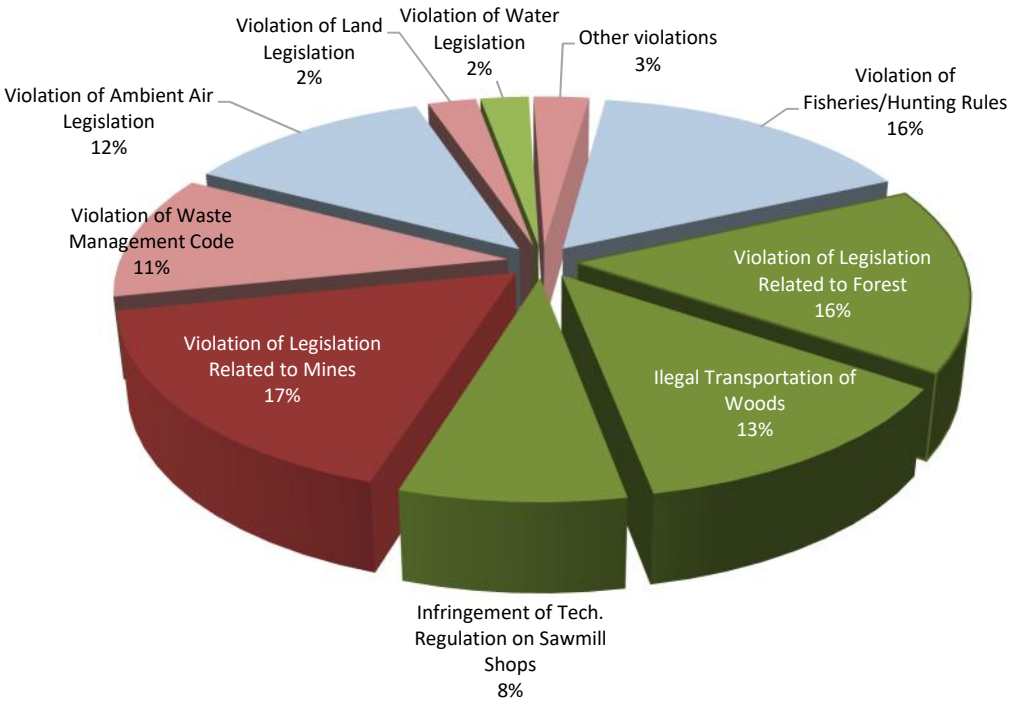
The dynamics and structure of the violations revealed by DES during 2014-2017 in the field of environment protection and use of natural resources reveals more violations in the forest field (violations of forest legislation, rules of transportation of timber, illegal logging) as well as hunting and fishing and illegal dumping. The dynamics of violations revealed during the reporting period were characterized by changing trends, though in 2017 there were 19% more violations than in 2014. However, there is a marked increase in violations under the Criminal Code of Georgia (1999), which increased by 43% in 2014-2017.

Figure 17.5.4: Dynamics of offenses identified by DES in 2014-2017



Source: DES

Figure 17.5.5: Structure of offenses identified by DES in 2014-2017



Source: DES

The amount of damage to the environment during 2014-2017 is characterized by a decreasing trend. However, the high rate of environmental damage in 2014-2015 is due to the limited control over licenses and permits in the field of environmental protection over the years. Consecutive scheduled / unplanned inspections since 2014 have revealed accumulated violations over the years and consequently significant environmental damage, which is diminishing in subsequent years.

Table 17.2: Fine and Environmental Damage (GEL), 2014-2017

YEAR	PENALTY (GEL)	ENVIRONMENTAL DAMAGE (GEL)
2014 YEAR	4 593 150	52 530 342
2015 YEAR	4 032 108	110 277 067
2016 YEAR	4 415 070	10 396 814
2017 YEAR	5 108 160	9 242 791

Source: DES

In 2014-2017, inspections of regulatory facilities - licenses for natural resources, entities subject to environmental permits, and enterprises subject to environmental technical regulations were planned on a regular basis. Inspections (planned / unplanned, inspection / study) were carried out by years:

- 2014 - 1 902 regulation objects;
- 2015 - 3 012 regulation objects;
- 2016 - 2 074 regulation objects;
- In 2017 - 2 840 regulation objects;

Table 17.3: Number of planned / unplanned inspections of regulation facilities in 2014-2017

Regulation facilities activity	Number of scheduled / unplanned checks			
	2014	2015	2016	2017
• Mining license	130	117	145	104
• Special License for Timber / State Forest Fund Areas (optional)	68	13	22	9
• Special license for fishing / hunting	8	17	3	6
• Fir cone concession license	-	24	14	-
• Environmental Impact Permit / Environmental Expertise Conclusion, Enterprises Subject to Environmental Technical Regulations	29	61	65	79
• To take samples and identify GMO species in crops and warehouses	-	51	62	25
Total	**235**	**283**	**311**	**223**

Source: DES

17.6 MAIN CHALLENGES

Significant progress has been made in recent years in environmental legislation, enforcement and supervision. However, the extensive development of legislation poses new challenges to the structural units responsible for environmental supervision. New approaches (SEAs, EIAs, emission limits, integrated permits, hazard management, new environmental liability systems, etc.) envisaged in the EU-Georgia Association Agreement require the conversion of inspection processes and procedures, qualification of inspectors, development of sectoral guidelines, provision of equipment for monitoring and introduction of new electronic system, which is necessary tool for reporting. It is important to reform the inspection system with respect to the determination

(calculation) of environmental damage. However, it is important to involve all stakeholders and strengthen their capacity not only in the development of environmental legislation but also in its implementation. For example, the implementation of SEA is a major challenge as it requires development of the experience, practices and capabilities of all government agencies and rapid coordination.

Therefore, the following tasks are planned to improve environmental supervision in medium-term perspective:

- improvement of forest control, preventing / reducing illegal forest use;
- Development of electronic timber control mechanisms and improved traceability;
- Introduction of effective, best practice-based methodology for environmental recovery instead of monetary compensation for environmental damage and ensuring compliance with environmental damage prevention / mitigation measures;
- Inspecton regulatory facilities based on control priorities and risk assessments that will provide an objective basis for decision-making on regulatory audits.

Further improvement / enhancement of the environmental enforcement and supervision system is also important to overcome the set challenges and achieve positive environmental outcomes.

V/18 ENVIRONMENTAL RESEARCH, EDUCATION AND AWARENESS RAISING

Education for Sustainable Development is in the world development agenda today. For the creation of a sustainable future, it is important to develop the knowledge, skills, values and competences required for each member of society. Sustainable development policy and governance must also address attitudes and behavior change at all levels of society. It is very important to raise awareness among different target groups and the general public on environmental issues, including their role in shaping an environmentally responsible society, on environmental human rights, and participation in decision-making. Public participation in environmental protection can only be enhanced by the introduction of a proper environmental education system at both formal and informal levels.

18.1 MAIN QUESTIONS AND MESSAGES

1. What measures have been taken in 2014-2017 to raise environmental education and awareness in Georgia?

Measures for different target groups are being implemented to promote environmental education and awareness.

- The LEPL Environmental Information and Education Center (EIEC) has developed an auxiliary guide for educators to teach environmental issues effectively in preschool. In 2016-2017, all kindergartens in Tbilisi and Kakheti municipalities were retrained and trained (412 in total);
- In 2017, changes were made to the school textbooks (grades 1-6) and sustainable development principles were added, which have been reflected in all elementary school textbooks since 2018;
- The following programs are being implemented in the institutions implementing vocational education programs: environmental technician, labour safety and environmental technologies, forestry. The module "Environmental Basics" has been developed, which has been integrated into the framework document of various professions;
- since 2016, in cooperation with the Georgian Institute of Public Affairs (GIPA), a master's program: "Environmental Management and Policy" has been indroduced and implemented;
- In 2014-2017, 165 trainings were held for the qualification of the Ministry staff, attended by 1 803 participants. In addition, 83 trainings were organized by EIEC for interested persons attended by 1,342 stakeholders;
- In 2014-2017, EIEC organized lectures and seminars on environmental issues, attended by about 3500 school students, 1000 high-school students and 500 teachers;
- Since 2015, the LEPL National Environment Agency has created a space for students - "NEA Field", where up to 500 participants attended lectures in 2015-2017;
- To raise awareness on protected areas, LEPL Agency for Protected Areas conducted eco-education activities attended by approximately 390,000 pupils, students, teachers, local population, etc.
- In 2015, a bilingual (Georgian and English) website (www.eiec.gov.ge) was created that combines environmental information by subject categories. In 2017, Environmental Information and Knowledge Management System (eims.eiec.gov.ge) was established to provide consolidation, analysis and sharing of environmental data / information.

2. What are the challenges of environmental education in Georgia?

Despite numerous measures aimed at raising the level of environmental education and awareness in the country, some challenges remain, such as:

- Weak coordination of environmental education and awareness raising activities;
- Lack of measures to develop appropriate skills, attitudes and behavior change;
- Lack of sustainable development issues in school textbooks;
- Lack of environmental directions and subjects in vocational and higher education institutions;
- Insufficient number and availability of environmental education programs for adult education;
- Lack of educational resources considering age and sector specifics.

18.2 ENVIRONMENTAL EDUCATION AND AWARENESS RAISING

Promoting environmental education and awareness raising is one of the priority areas for the Ministry of Environmental Protection and Agriculture of Georgia (MEPA). The Ministry carries out activities targeting different target groups. For broader segments of society, including school children, students and the local population, MEPA regularly conducts meetings, conferences, contests, briefings, awareness-raising campaigns, educational seminars and trainings, planting and cleaning campaigns, eco tours, Eco-camps and media tours, documentaries and commercials, informational and educational brochures. Public information is served at: www.eiec.gov.ge.

In order to promote public awareness raising, preparation of relevant specilists, trainings, certification, education on environmental issues, on the bases of the Atcilce 8 of the Law on Environmental Protection the LEPL Environmental Information and Education Center was created in 2013, which also aims to promote access to environmental information and ensure public participation in decision-making process. Since 2013, EIEC is active in introducing and implementing the principles of education for sustainable development, and in its actions is relies on the vision and directions "Education for Sustainable Development Strategy" of the United Nations Economic Commission for Europe (UNECE).

An Environmental Education Coordination Working Group has been set up with the participation of government and non-governmental organizations, including the Ministry of Education, Science, Culture and Sport, LEPL National Center for Teacher Professional Training, LEPL National Center for Children and Youth, LEPL Environmental Information and Education Center, LEPL Agency of Protected Areas (APA), Agricultural University of Georgia and representatives of organizations - Ecovision, UNDP, World Wildlife Fund (WWF), Caucasus Environmental NGOs Network (CENN), the Greens Movement of Georgia / Earth Friends.

The purpose of the working group is interagency coordination and implementation of actions that will raise public awareness and engage them in environmental activities.

18.2.1 ENVIRONMENTAL EDUCATION

In 2014, EIEC conducted a study - "**Environmental Education Assessment in Georgia**", which aimed to assess the level of environmental education in Georgia in the formal (at all stages of education: preschool, secondary education, vocational and higher education) and non-formal education, as well as identifying existing achievements and challenges, assessing the extent to which the current approaches have contributed to the development of the right attitude towards the environment in children / pupils / students and the acquisition of relevant knowledge and skills. The study focused on the following topics: biodiversity, waste management, energy efficiency, forestry, air, soil, climate change, natural disasters, environmental legislation, as well as the cross-cutting issues: poverty, transport, sustainable urban planning, the green economy, GMOs.

The study revealed a low level of environmental awareness among the population. It also showed that various regulatory documents, standards and educational programs included some environmental issues, but needed to be refined and developed in this regard. Non-formal education activities in both preschools and schools, as well as in vocational and higher education institutions, appeared to be diverse, but less systematic. The local experts recommended to implement a systematic approach to environmental education and integrate environmental issues at all levels of education, taking into account its specificities. An important issue was also the revision of the Early Learning and Education Standards, National Curriculum, subject standards, textbooks, vocational standards, vocational and higher education programs. In line with the recommendations, a number of activities have been planned and implemented.

In order to raise public awareness of environmental issues, it is important to provide continuous **formal environmental education** in preschool, secondary, vocational and higher education institutions, for which important steps have been taken in 2014-2017.

In 2015, an environmental component was added to the state Educational Standard for School Readiness to promote **preschool environmental education.** In 2016, within the framework of the School Readiness Program, EIEC developed a guide for preschoolers - "Preschool Environmental Education", which covers the following environmental topics: Biodiversity around us; Water and energy saving; Waste management. In 2016-2017, Methodists and Educators of Preschools of different municipalities of Tbilisi and Kakheti region were retrained (412 persons) in order to facilitate the introduction of effective environmental education and textbooks at preschool level. Preschool environmental education will be implemented throughout Georgia. In order to encourage the introduction of the textbook, a cognitive project called "Meet the Little Environmentalists" was implemented.

In order to promote **school environmental education**, a document - "Environmental Education for Sustainable Development (EESD) was developed in 2015 and incorporated into the National Curriculum. The educational resource was published within the framework of teacher's book in 2015. One of the three directions of the resource is dedicated to ecological literacy.

In 2017, changes were made to the school textbooks (grades 1-6) and the Sustainable Development Principles were added, which have been reflected in all elementary school textbooks since 2018. In order to reflect the principles successfully, potential textbook authors and textbook reviewers were trained by EIEC (196 persons were retrained).

The subjects of the National Curriculum for Public and Natural Sciences include the principles of environmental education, which are specified in the step-by-step results of the standard. For example, the basic step in all subjects in the science group includes the result: "The student must be able to evaluate the achievements of the natural sciences and technologies in terms of the principles of sustainable development", which requires students to research and raise awareness in environmental education.

Environmental projects have been implemented in around 200 schools to support teachers' professional education in environmental education: within the framework of "Discover Georgia", "Waste Management" and "Green Response" 175 teachers were trained. In addition, in December 2017, the National Center for Teacher Professional Development held a National Teacher Conference on the topic "National Sustainable Development Goals". Since 2015, an event "The World's Largest Lesson" has been organized by the United Nations Children's Fund (UNICEF) to provide a lesson on the topic of Sustainable Development Goals for schoolchildren. In 2014-2017, 20 articles on environmental issues were published in informational/educational sources - magazine "Teacher" and online newspaper Mastsavlebeli.ge.

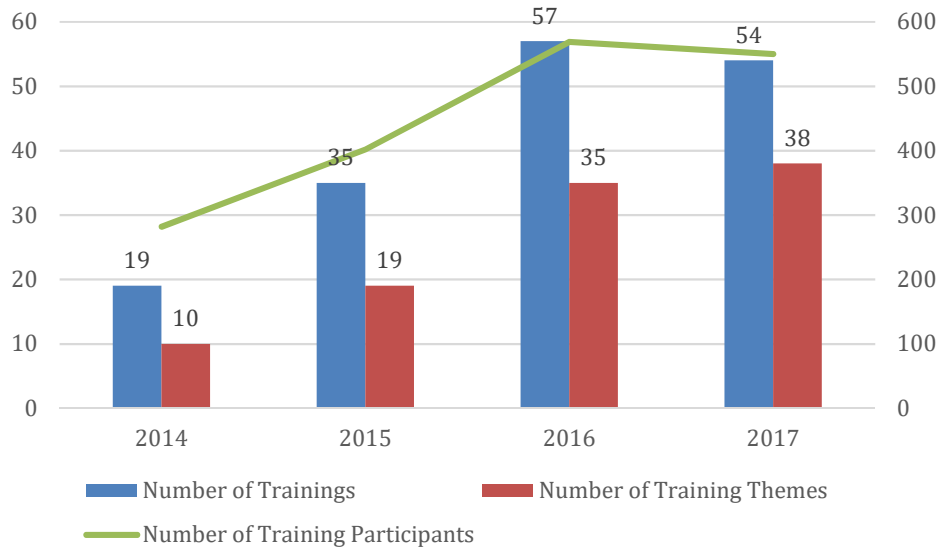
Institutions implementing **vocational education programs** (Georgian Technical University, LEPL Public College "Spectrum", etc.) are implementing the professional program of environmental technicians. A educational program module "Labour Safety and Environmental Technologies" has also been developed and introduced. In order to integrate the framework of different professions into the document, the module "Environmental Basics" has been developed. In addition, the program for professional training of forestry specialist has been updated in Akhaltsikhe, Kachreti and Tsinamdzgvriantkari vocational schools. The training is fully funded by the state.
With the initiative of the Ministry of Environment and Natural Resources Protection of Georgia, a Master's program "Environmental Management and Policy" was launched in 2016 in cooperation

with GIPA for the purpose of promoting higher environmental education and training of highly qualified specialists in environmental management and policy. The training for 2016-2018 was co-funded by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) which is still continued. Currently the Master Students are funded by the state on the basis of the results of the general master's exams.

In addition, the curriculum of higher education institutions outlines issues related to environmental protection, natural resources use and forestry.

Measures for **non-formal environmental education** are also noteworthy. Specifically, in 2014-2017, 165 trainings were held for 1 803 participants to enhance the qualifications and skills needed to effectively perform the duties assigned to them by the Ministry of Environment and Natural Resources Protection of Georgia.

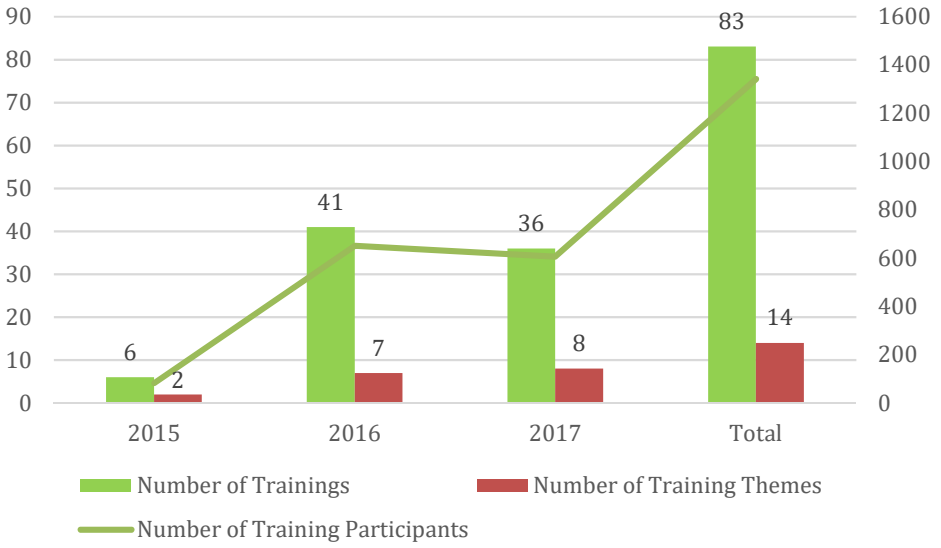
Figure 18.2.1: Information on trainings for the staff of the Ministry of Environment and Natural Resources Protection of Georgia in 2014-2017



Source: EIEC

In addition, with the purpose of training and certification of the stakeholder community, EIEC has organized 83 trainings on 14 different environmental topics, attended by 1,342 stakeholders.

Figure 18.2.2: Information on trainings for the public interested in organizing EIEC in 2014-2017



Source: EIEC

More than 20 study modules and guides have been developed to support formal and informal environmental education.

18.2.2 ENVIRONMENTAL AWARENESS RAISING

Raising the level of environmental awareness of the public is of great importance for solving environmental problems and managing natural resources effectively.

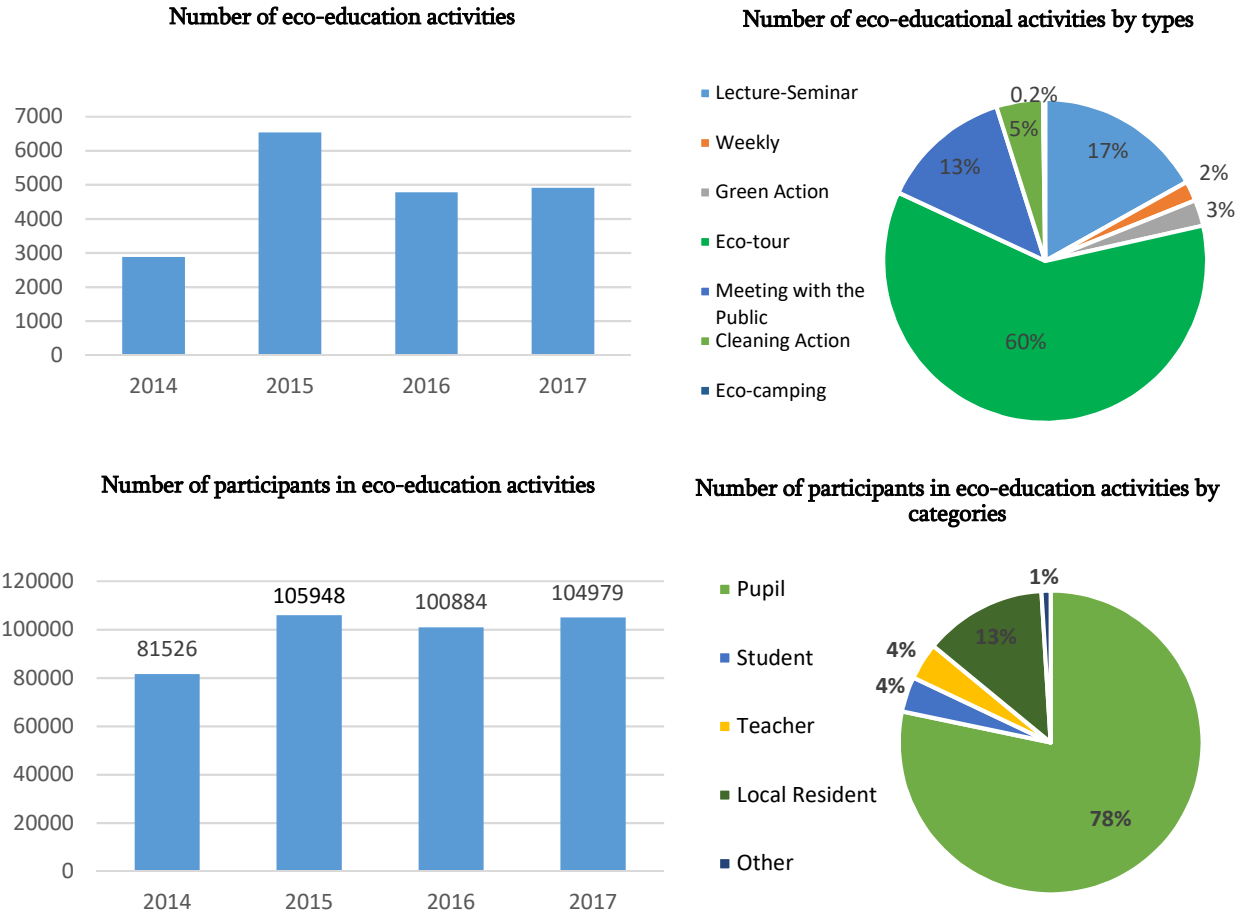
The Ministry of Education, Science, Culture and Sport of Georgia has been conducting a summer eco-school since 2017 in the field of environmental education for pupils of general education institutions of Georgia.

EIEC actively conducts environmental thematic lectures for different target groups. In 2015, a "Volunteer Lecturer" project was introduced and the staff of the Ministry of Environmental Protection and Agriculture of Georgia (MEPA) deliver lectures on up to 50 themes. Lectures and seminars organized by EIEC in 2014-2017 were attended by about 3,500 pupils, up to 1,000 students and up to 500 teachers.

Since 2015, the LEPL National Environment Agency has created a space for students - the NEA Field, where up to 500 participants listened to awareness-raising lectures in 2015-2017.

The LEPL Agency of Protected Areas (APA) is actively implementing eco-education activities in order to raise awareness about protected areas. During the reporting period, about 390,000 pupils, students, teachers, local residents and others participated in eco-education activities. Within the framework of student volunteer program a volunteer camp for first-year Students of the Free University and Agricultural University of Gerogia is organized in five protected areas of Georgia (Lagodekhi, Borjomi, Mtirala, Tusheti, Martvili).

Figure 18.2.3: Information on eco-educational activities organized by APA in 2014-2017



Source: APA

The following environmental days were celebrated with various events in 2014-2017: Earth Hour, International Forest Day, World Meteorology Day, Earth Day, World Environment Day, International Tree Planting Day, International Youth Day, Car Free Day, International Ozone Day, Water International Day for the Protection of Resources, "Green" Consumption Day, the International Day to Combat Desertification.

In 2015, EIEC created a green space - EcoHab - for public access to environmental information, with up to 20 events (public lectures, discussions and film shows) on environmental topics.

In 2016, the Project “Green Tee with Minister” was launched by EIEC, which allowed environmental stakeholders to discuss various important environmental issues with the Minister of Environment and Natural Resources Protection of Georgia in an informal meeting.

Table 18.1: Environmental campaigns implemented in 2014-2017

Name of Campaign	Year
Do Not Leave Waste - Take Care of the Environment	2014
Earth Hour	2014-2017
Garden Bird Watch	2014
"My Environment"	2014
"It's Easy, Take Care of the Environment!"	2015
On International Trade in Endangered Species of Wild Fauna and Flora (CITES)	2015
Ozone Layer Protection Campaign	2015
Mercury campaign	2016
"Don't Cut, Decorate!"	2016
"Clean up Georgia"	2017
"Don't cut buxus!"	2017
"Don't Cut the spruce!"	2017
Green Consumption campaign	2017

Source: MEPA

In order to raise the level of environmental awareness, numerous programs, articles and other information materials were also produced.

18.2.3 PROVIDING ACCESS TO ENVIRONMENTAL INFORMATION

According to the Law of Georgia on Environmental Protection, a citizen has the right to receive complete, objective and timely information on the state of his / her working and living environment and to participate in important environmental decision-making.

Providing access to environmental information is an effective way to engage the public in important environmental decision-making.

In 2016, in order to ensure access to environmental information and access to justice, Article 4 of the Law on Environmental Protection was amended and the term "Environmental Information" was added.

Order N12 of the Minister of Environment and Natural Resources Protection of Georgia was issued on March 27, 2017, "On the Procedure for the Proactive Disclosure of Public Information by the Ministry of Environment and Natural Resources Protection of Georgia, Approval of the Standard for Requesting Public Information in Electronic Form and the rule on Access to Environmental Information".

In 2015, a bilingual (Georgian and English) website (www.eiec.gov.ge) was created that combines environmental information into eighteen thematic categories. Each category contains sector data, projects, environmental legislation, and other important documents.

The website also includes: Environmental Encyclopedia, Environmental Library, Environmental Dictionary, Documents, Database of Environmental Organizations, Map / Register of Environmental Impact Permits (www.maps.eiec.gov.ge).

An Environmental Information and Knowledge Management System (eims.eiec.gov.ge) was set up in 2017 to assist the Government of Georgia in decision-making and policy planning / formulation, providing reliable environmental data / information, saves time and human resources, and promotes implementation of national and international obligations (e.g. Assossiation Agreement, the three Rio Convention (CBD, UNFCCC, UNCCD), the Aarhus Convention).

Environmental Information and Knowledge Management System provides consolidation, analysis and sharing of environmental data / information. The following functionality can be configured and implemented through the knowledge management system:

- Modeling, forecasting and reporting;
- Risk management and decision support;
- Publication of public information;
- Structured maintenance and referrece of the legislative base;
- Structured storage and referrence of projects / programs, activities, news, events, etc.;
- Geographic Information System (GIS) for analyzing and interpreting spatial information.

18.3 ENVIRONMENTAL RESEARCH

In 2014-2017, 62 environmental research studies were carried out by LEPL National Environmental Agency (22 surveys), Ilia State University (12 surveys), Tbilisi Ivane Javakhishvili State University (10 surveys) and Georgian Technical University (18 surveys).

Table 18.2: 2014-2017 Environmental studies carried out over the years

Name of study	Implementator	Year	
		Start	Finish
Geological monitoring (spring-autumn) and evaluation of natural geological processes in force-majeure situations	LEPL National Environmental Agency	Annual	
Compilation and monitoring of geological hazard map (landslide, mudflow, etc.) in Tbilisi (scale 1:25 000)	LEPL National Environmental Agency	2016	Ongoing
Monitoring of ground freshwater	LEPL National Environmental Agency	2016	Ongoing
State Geological Mapping (Geological Surveying)	LEPL National Environmental Agency	2014	Ongoing
Estimation of Landslide Probability of endangered settlements in Mountainous Regions of Dusheti Municipality of of Georgia, Example of International Roads and Pipelines	LEPL National Environmental Agency	2014	2017
River Basin Environment Protection (EPIRB) - Installation of a Groundwater Monitoring Network in the Chorokhi-Adjaristskali River Basins	LEPL National Environmental Agency	2016	
Geological Assessment of Gldanula Watershed - Tbilisi Urban Risk Management Strengthening Project	LEPL National Environmental Agency	2015	2016
Developing climate-friendly flood management practices to protect vulnerable populations in Georgia	LEPL National Environmental Agency	2012	2017
Development of a hazard mapping methodology and hazard mapping for Mestia Municipality ("Strengthening Prevention and Preparedness Systems" within Phase 2 of the project)	LEPL National Environmental Agency	2014	2015
Establishment of Groundwater Monitoring Network and Implementation of Information System on Data Transfer in Kvareli and Lagodekhi Municipalities	LEPL National Environmental Agency	2014	
Development of information system for monitoring and transmission of groundwater in the Alazani-Agricha region	LEPL National Environmental Agency	2015	

Study of pollution of artificial reservoirs of Kakheti region and their adjacent territories	LEPL National Environmental Agency	2016	2018
Harmonization of analytical methods used by the National Environment Agency of Georgia with the requirements of the Water Framework Directive (2013/39 / EU)	LEPL National Environmental Agency	2017	2018
Introduction of an electronic system for the assessment of Georgia's water resources and energy potential	LEPL National Environmental Agency	2013	2016
Establishment of new construction-climate norms in view of climate change in Georgia	LEPL National Environmental Agency	2015	2017
Monitoring and assessing the impact of drought on water resources and their effective use in Georgia	LEPL National Environmental Agency	2017	2018
Adaptation of Remote Sensing Methods for Water Resources Management and Extreme Hydrometeorological Situation Assessment	LEPL National Environmental Agency	2017	2019
Improving Black Sea Environmental Monitoring (EMBLAS)	LEPL National Environmental Agency	2015	2017
Improving Black Sea Environmental Monitoring (EMBLAS) – Second Phase	LEPL National Environmental Agency	2015	2018
Study of seismic coding and local magnitude in Georgia	Ilia state university	2016	2019
Diversity of invertebrate animals in the Upper Imereti Plateau gastric caves	Ilia state university	2016	2019
Rock lizard species production: secondary contact between isolated populations	Ilia state university	2016	2019
Biodiversity of freshwater molluscs in Georgia	Ilia state university	2016	2019
Working together to save endangered birch (Betula megrelica) in Georgia	Ilia state university	2017	2018
Ex situ and in situ conservation of Georgian Red List species of Salix kikodseae	Ilia state university	2017	2018

Partnership with Millennium Seed Bank: Caucasus Flora Survival Program, Georgia	Ilia state university	2017	2018
Objectives of the Institute of Botany of Ilia State University in 2017 with respect to Georgia's "Biodiversity Strategy and Action Plan for 2014-2020"	Ilia state university	2017	
The Uplift and Seismic Structure of the Greater Caucasus	Ilia state university	2017	2020
Supporting Sustainable Mountain Development in the Caucasus (Sustainble Caucasus)	Ilia state university	2017	2018
Community Development Study on the Example of Artificial Javakheti Forests	Ilia state university	2017	2019
Implementation of rapid identification and notification system of regional earthquake control mechanisms for Georgia	Ilia state university	2017	2020
Research of natural and anthropogenic atmospheric characteristics and phenomena in Georgia in order to create safe ecosystems and promote sustainable economic development	Ivane Javakhishvili Tbilisi State University	2014	2023
Complex geo-ecological study-evaluation of Madneuli field and surrounding area	Ivane Javakhishvili Tbilisi State University	2011	2014
Complex geoecological study-assessment of the territory of Eastern Georgia	Ivane Javakhishvili Tbilisi State University	2015	2019
Environmental risk assessment of possible oil products contamination along the Georgian Transport Corridor	Ivane Javakhishvili Tbilisi State University	2013	2014
Development of effective technology for the formation of briquette fuel from carbon-containing wastes of different origin	Ivane Javakhishvili Tbilisi State University	2014	2018
Study of ecological status in different regions of Georgia, based on determination of toxic elements in biological material.	Ivane Javakhishvili Tbilisi State University	2015	2017
Electrolytic purification of industrial and quarry water from carbon ions using carbon materials.	Ivane Javakhishvili Tbilisi State	2015	2017

	University		
Wastewater treatment by electrochemical processes and oxidation systems	Ivane Javakhishvili Tbilisi State University	2015	2017
Geoecological, Geochemical and Hydrochemical Study of Black Sea Aquatic Zone of Georgia	Ivane Javakhishvili Tbilisi State University	2015	2024
Study of the use of hydrocarbon in the Black Sea for energy purposes	Ivane Javakhishvili Tbilisi State University	2013	2014
Enguri Hydropower Safety from Geohazards in Georgia	Ivane Javakhishvili Tbilisi State University	2015	2016
Research of Black Sea Ecological Parameters on the Basis of Multimedia	Georgian Technical University	2014	
Hydroengineering Problems of Rivers and Settlements in the Black Sea Regions of Georgia	Georgian Technical University	2014	
Investigation of geological, environmental and energy-economic aspects of natural gas potential exploitation of Kazbegi-Omalo zone	Georgian Technical University	2014	
Theoretical study of erosion-mudflow processes	Georgian Technical University	2014	
Development of a new type of floating-swimming wave-mitigation hydraulic structures complex to protect storm waves and open ports from storm surges	Georgian Technical University	2014	
Assessment of ecological status of Black Sea water and development of complex measures for protection against abrasive processes on the coast of Georgia	Georgian Technical University	2014	
Environmental issues in engineering studies of higher education in the era of global warming	Georgian Technical University	2014	
Assessment of the vulnerability of degraded slopes adjacent to the Traseka Transport Corridor (Gldani section) and development of modern anti-degradation technology	Georgian Technical University	2014	

Differentiation of plants from heavy metals and radionuclides from phytogenetic resource stocks to subsequently obtain environmentally friendly raw materials	Georgian Technical University	2014
Academic collaboration to enhance environmental learning opportunities	Georgian Technical University	2015
Predicting the catastrophic impact of mudflats on mountainous areas	Georgian Technical University	2015
Development of methodology for determination of the amount of solid waste collection and morphological composition in Georgia and creation of a database	Georgian Technical University	2015
Critical conditions of static slope stability, mathematical modeling, forecasting and protection of dynamic processes in avalanche flows	Georgian Technical University	2015
Impact of uncontrolled landfills on the ecological status of adjacent territories in Georgia	Georgian Technical University	2016
ACCES Academic Collaboration for Capacity Building in Environmental Education	Georgian Technical University	2016
Regional Interdisciplinary Training in Energy and Environmental Law	Georgian Technical University	2016
Investigation of erosive and landslide genesis of mudflows and development of modern combative events on the example of Gldaniskhevi River	Georgian Technical University	2016
Investigation of manganese dioxide pollution in environmental facilities of Zestaponi industrial district by numerical modeling	Georgian Technical University	2016

Source: NEA, Ilia State University, Tbilisi Ivane Javakhishvili State University, Georgian Technical University

18.4 MAIN CHALLENGES

Despite numerous measures aimed at raising the level of environmental education and awareness in the country, some gaps and challenges remain.

The adoption and implementation of the "Education for Sustainable Development - National Strategy and Action Plan of Georgia" is essential for the promotion of environmental education.

Coordination of environmental education and awareness-raising activities across the country should be strengthened.

The implemented measures have been focused solely on raising of knowledge and awareness, instead of developing appropriate skills, attitudes and behavior.

After basic level, it is important to reflect the principles of sustainable development in all the textbooks of the VII-XII classes at school. In order to deliever the changes made in the curriculum it is necessary to develop and implement systematic trainings for teachers, provide them with high quality educational materials as well as encouraging teachers and students for increased motivation

Environmental education issues should also be integrated into relevant vocational education specialties. Therefore, it is important to develop vocational education materials and train vocational education teachers to integrate environmental education issues into the curriculum.

The implementation of environmental policy and management programs in higher education institutions should be facilitated, and in secondary/non-profile programs the topic of environmental education should be strengthened. It is important to motivate university academic staff to make more use of environmental education in teaching and research.

Training civil servants to support the implementation of sustainable development principles still remains a challenge. Environmental education programs for adult education are not sufficiently developed and easily accessible.

It is important to develop educational resources with consideration of age and sector specifics.