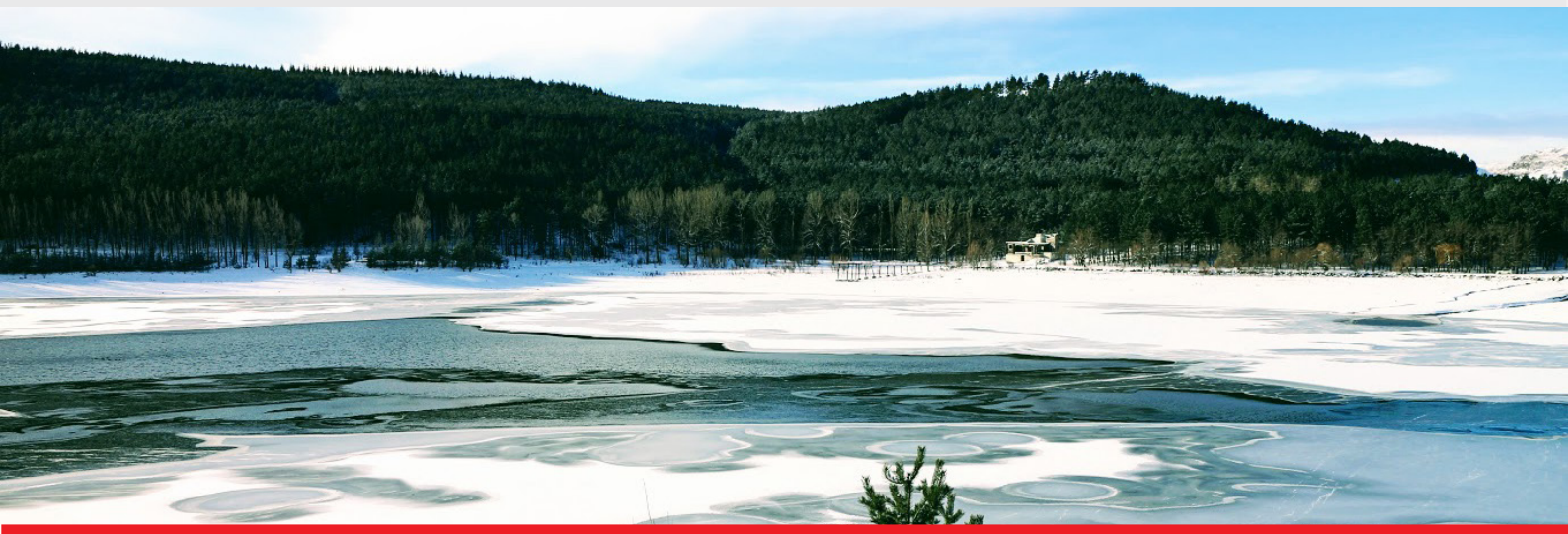




NATIONAL STATISTICS OFFICE OF GEORGIA

NATURAL RESOURCES OF GEORGIA AND ENVIRONMENTAL PROTECTION 2017



STATISTICAL
PUBLICATION

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**Natural Resources of Georgia and Environmental Protection
2017**

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Notation keys:

... No data
- Event does not exist
0.0 Negligible magnitude

The discrepancy between the totals and the sum in some cases can be explained by using rounded data.

The data in this publication do not cover occupied territories of Georgia (Autonomous Republic of Abkhazia and Tskhinvali region).

Foreword

The information on the use of land, forest and water resources, ambient air protection, protected areas, natural disasters and environmental violations is presented in this statistical publication, "Natural Resources and Environmental Protection of Georgia". The publication also includes methodological explanations and information from different reference and scientific sources.

The preparation of this publication is based on the growing interest of a wide range users, however, the information collected in it, presents the best way of policy planning at local or global levels. In addition, the need to produce environmental indicators is related to the most important issues of global policy, such as climate change and environmental security.

The data in the publication reflects the natural resources of Georgia and developed trends of environmental activities in 1995-2017 years.

Substantive comments and suggestions on the format and content of the publication will be highly appreciated by the group of authors.

This edition is designed for different groups of users.

National Statistics Office of Georgia

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Geographic location and natural resources of Georgia

(Brief overview)

Georgia is located in the central and western part of the South Caucasus. Total length of the border of Georgia is 2 148 kilometres, out of these 1 839 kilometres on land. To the west Georgia is bounded by the Black Sea – between the estuary of the river Psou and village Sarpi, to the north – by the Russian Federation, to the east – by Azerbaijan, to the south – by Armenia, and to the southwest - by Turkey. The extreme west and east borders go through eastern latitude 40°05' and 46°44', and north and south borders – through north longitude 41°07' and 43°35'.

Relief

The territory of Georgia is spread up vertically to 5 201 m from sea level (peak Shkhara). Georgia is distinguished with complexity of relief – about 2/3 of its territory is mountainous. Along the north border, more than 1/3 of the country area is occupied by the Caucasus Mountain System. The relief of Georgia is represented by high, medium and low mountains, uplands and plains. There are following principal orographic units in Georgia: the Caucasus Mountains, the intermountain plains divided by Likhi Ridge into Kolkheti and Iveria Valleys and Trialeti Ridges (part of the Small Caucasus Mountain System). Some of the peaks of the main watershed ridge of the Caucasus Mountains in Georgia are higher than 5 000 m.

Climate

Georgia is characterized by almost every climate zone existing on the earth, from humid sub tropical climate to eternal snow and glaciers zone. Diversity of the climate in Georgia is determined by its location on the northern border of the subtropical zone between the Black and the Caspian Seas on the one hand and by complexity of its relief on the other hand. Average temperature in January is +3°C (on Kolkheti Valley), and in August – +23°C-26°C. The ridges of various direction and height play an important role in climate formation.

A local climate is determined by the Caucasus Mountains which protects Georgia from cold air masses incursion and by the Black Sea which makes the temperature moderate and facilitates to greater precipitation. In Georgia, range of annual amount of precipitation is 400-4 500mm.

Due to its location on a relatively lower longitude and temperate cloudiness, Georgia receives a significant warmth from the sun. Average annual sunshine is 1 350–2 520 hours.

Mineral Resources

There are plenty of mineral resources available in Georgia; out of them the following have industrial importance: oil, coal, non ferrous and rare metals, mining and chemical raw materials, inert materials and other mines.

Ground Waters

Ground waters have a great importance in the mineral treasure of Georgia. They are very important for development of national economy of the country. Georgia is also rich in thermal waters that can have a wide range of use in agriculture and energy sector. There is a big amount of fresh ground water resources in Georgia and its total natural debit is 21.7 cubic kilometres (23% of the precipitation on the country territory). Its distribution is very non-homogeneous – it increases from the east to the west.

Mineral Waters

Mineral waters of Georgia are characterized by a great variety. There is a small amount of mineral waters with natural flow to the surface by following chemical structure: Carbon dioxide calcium hydrocarbonate, sodium-calcium hydrocarbonate, calcium hydrocarbonate-chloride-sulfate. A large part of the mineral waters flow through the boreholes. Their chemical composition is: sodium chloride, sodium calcite sulfate-chloride, sodium hydrocarbonate-chloride etc. Georgia is on one of the first places among the former Soviet Union countries with internal waters (rivers, lakes, reservoirs, glaciers, underground waters, wetlands).

Rivers

River network in Georgia is unequally distributed: out of 26 060 rivers with total length of about 60 000 km, 18 109 rivers are in western Georgia, and 7 951 rivers – in eastern Georgia. Length of 25 923 rivers is less than 25 km, of 121 rivers – about 25-100 km, and of 16 rivers – 100-500 km. The rivers of Georgia belong to the Black and the Caspian Sea basins. Almost all rivers of eastern Georgia form the entire system of the Kura River and flow into the Caspian Sea, while the rivers of western Georgia independently join the Black Sea.

The rivers of Georgia are fed by glaciers, snow, rain and ground waters. Water resources of Georgia are not equally distributed. Run-off of the rivers of western Georgia (together with transit) compiles 49.8 cubic kilometres, and run-off of eastern Georgia – 16.5 cubic kilometres. The most voluminous river is Rioni; Mtkvari is much less voluminous, its run-off near Georgian-Azerbaijan border is 8.3 cubic kilometres. The following rivers - Enguri, Kodori, Bzipi, Tskhenistskali, Kvirila, Liakhvi, Aragvi, Ktsia-Khrami, and Alazani - are worth mentioning as well.

Lakes

There are about 860 lakes in Georgia. Most of them are very small; therefore a total area of the lakes does not exceed 170 square kilometres (0.24% of the country territory). The lakes of Georgia are remarkable with their diverse origins. The majority of lakes in Georgia are fresh water, and part of them contains very little salt. The largest lake in area in Georgia is Lake Paravani, in volume – Lake Tabatskuri, in depth – Lake Ritsa, that is the deepest lake in the South Caucasus.

Reservoirs

There are 44 reservoirs on the territory of Georgia, their total area is 163 square kilometres, and the total volume of water is 3 315 million cubic metres.

There are 725 glaciers in Georgia and they all are located in the Caucasus Mountains. Their cumulative area is 370 square kilometres that is 0.5 % of the country territory.

Wetlands in Georgia are located on the Kolkheti Valley and their total area is 627 square kilometres. Georgia is bounded to the west by the Black Sea. The length of the coastline is 330 km. Within the territory of Georgia the following rivers flow into the Black Sea: Rioni, Bzipi, Kodori, Enguri and Chorokhi.

Winter is mild and warm on the coast of the Black Sea. An average temperature in January is + 4-7°C. The amount of precipitation is large during all seasons; South part of Kolkheti is especially rainy, where the annual precipitation is more than 2 500 mm.

An average value of surface layer salinity of water in an open sea fluctuates from 17.8‰ (in spring) to 18.3‰ (in winter). From the surface to the depth of 200 metres the salinity increases up to 21.3‰. Rivers of Georgia make the sea significantly fresher near the coast, especially in spring and in the first half of summer. However, water stays salty beyond 2-4 miles from the coast.

Soil

Due to the diversity of natural conditions, we can find almost all types of soil in Georgia. There are three soil provinces: West, East and South. By the conditions and processes of soil formation, in each of them different zones and subzones are distinguished and within the latter – regions and subregions. There are 48 soil regions and 169 subregions in Georgia. Soil vegetation in Georgia is very diverse: Polydominant Colchis forest on red and yellow soils; alder forest in Kolkheti peat swamp; broadleaf and coniferous forest; etc.

Flora

Due to diversity of physical-geographic and climatic conditions, the flora of Georgia is very rich and misclanous. Diversification of relief and complex configuration of mountain rings caused geographic and ecological isolation of ecosystems in Georgia and high level of local endemism. In Georgia, there are up to 5 000 species of wild and vulnerable, hidden and naked seed plants, up to 8 300 spore plants (about 75 species of firms, 600 species of moss, 600 species of lichen, 5 000 species of mushrooms, 2 000 species of algae etc.). Some species that became extinct in the rest of western Eurasia million years ago are still preserved in Georgia. In particular, in Kolkheti we can still find Caucasian birch, Pontine oak, Kolkheti ivy, Cranberry, Cherry laurel, etc. The substantial difference in the climate of the East and West Georgia provided the distinction of their vegetation that is reflected in the structure of vertical belt. In the western Georgia there is no semi-arid and arid belt without forest. The flat areas, slopes and foothills are covered with forests from the sea shore. Compared with eastern Georgia, the landscapes of subnival vegetation are less expressed here, accordingly in western Georgia there are only 5 main belts: forest (1 900 m above sea level); subalpine (1 900-2 500 m); alpine (2 500-3 000 m); subnival (3 000-3 600 m) and nival (3 100 m and above). In eastern Georgia there are 6 main belts: semi deserts, dry fields and low density forests (arid light woodlands) (150-600 m); forest (600-1 900 m); subalpine (1 900-2 500 m); alpine (2 500-3 000 m); subnival (3 000-3500 m) and nival (3 500 m and above). Vegetation of mountain fields prevails in the mountainous forest and subalpine belts of southern Georgia.

Fauna

There is a rich and diverse fauna in Georgia, mainly represented by the elements of sub district of Mediterranean Sea of Pale arctic district, but in north part of the country the representatives of European and Siberian sub districts are also frequently met, while in south east district – species of Central Asian sub district fauna or others similar to them.

There are around 100 mammal species, more than 330 bird species, about 48 reptile species, 11 amphibian species, and 160 fish species known in Georgia. Thousands of invertebrate species are met, but an exact number is not determined yet. Animals are distributed by zones, but the species with a great ecologic valence inhabit in several zones.

Landscapes

There are various types of natural-territorial complexes (landscapes) in Georgia, including semi-deserts (eastern Georgia), Kolkheti humid subtropics (western Georgia) and nival-glacial landscapes as well. Here, as in a mostly mountainous country, variation of natural components by altitude and accordingly, altitudinal zonation with the full spectrum of landscape zones are well represented. Herewith, various types of natural-territorial complexes, typical for flat lowlands and small mountain areas of humid, moderately humid and dry subtropics, are developed in the valleys and lowlands between the mountains. More than 100 types (type, sub-type, form) of landscape are spread on the territory of Georgia.

The idea about necessity of nature protection in Georgia was formed in ancient past followed by a gradual development of legal norms. Old Georgian sources provide interesting information concerning a legal protection of single objects of nature. “The forest guards” are mentioned in the Book of King Tamar, dated 1189, and “the senior guardians” are mentioned even earlier in 1078. Norms regulating the use of water and pastures are provided in the document of the XVIII century (“Dasturmali”). One of the articles of this document protects hawks’ and peregrines’ nests. King Vakhtang’s Book of Laws also takes into account protecting water, forest and pastures. In Ioane Bagrationi’s Book of Laws (the project of public reforms in Kartli-Kakheti Kingdom) the following is mentioned: “there should be a person responsible for hunting forests and fields; nobody can hunt in the royal hunting lands without their permission”. Hunting was prohibited in a reproduction period of birds and animals.

Definition of terms

<i>Atmosphere</i>	The gaseous mass or envelope surrounding the earth or any other celestial body.
<i>Climate</i>	The meteorological conditions, including temperature, precipitation, and wind that characteristically prevail in a particular region.
<i>Debit</i>	Amount of liquid or gas, which is generated by the source in a given amount of time.
<i>Ecology</i>	Social science, studies interrelations of human and nature and technical economic aspects of mentioned process.
<i>Endemic</i>	A plant or animal peculiar to a particular geographic area.
<i>Fauna</i>	Animal life. Animals, characteristic of a region, period, or special environment.
<i>Flora</i>	All the plants that live in a particular area, time, period, or environment.
<i>Hydrosphere</i>	The aqueous envelope of the earth (oceans, seas, lakes, rivers).
<i>Meteorite</i>	A stony or metallic mass of matter that has fallen to the earth surface from cosmic space.
<i>Mile</i>	A unit of length, employed mainly for marine navigation. The International Nautical Mile equals to 1.85 km.
<i>Phitocenosis</i>	Unity of such plants that grow together and have close relations with one another and environment. A plant community.
<i>Photosynthesis</i>	The process by which a green plant turns water and carbon dioxide into food when the plant is exposed to light.
<i>Promile, ‰</i>	A tenth of a percent or one part per thousands.
<i>Radiation</i>	Emission of electromagnetic energy by a particular body.

1. LAND RESOURCES

Land resources play an important role in human life and activities. While using the land, man uses its chemical, physical and biological features. Thus, final result of the land cultivation – harvest - depends on thickness of the fertile layer, its mechanical composition, availability of chemical substances, i.e. soil fertility. Land represents the territorial-spatial basis in industrial activities (except the mining industry), in construction and infrastructure sectors.

Land is one of the main national wealth that needs special care and protection; almost half of natural wealth of Georgia counts on soil.

Georgia is a highland country. Lowland zone covers only 46% of the country territory. The land resources are characterized by a high level of agricultural utilization and high natural fertility of arable lands. Territorial distribution of lands in Georgia, similarly to other components, is subject to the rule on vertical zoning:

I zone (up to 250 m above sea level) – mainly characterized by sub tropical cultures of western Georgia.

II zone (250-500 m) – area of horticulture, viticulture, market-gardening and intensive field activities.

III zone (500-1 000 m) – dominates cereals, arable lands, and animal husbandry.

IV zone (1 000-1 500 m) - grasslands; field activities are weakly developed;

V zone (1 500-2 000 m) – mainly grasslands.

VI zone (above 2 000 m) – agriculture does not exist.

The territory of Georgia can be divided into three parts according to utilization types:

1. Agricultural land – 15.8%;
2. Natural – farming area (forest, shrubbery, hay pastures) – 70.6%;
3. Land not used in agriculture – 13.6%.

Agricultural land is subject to permanent changes in structure and quality, determined by cultivating new areas, intensive melioration activities, and others. Moreover, erosion processes, land salinity or bogging or flooding and other unfavourable conditions cause decreasing the size of agricultural land and worsening its quality. Thus, land resources are under permanent quantitative and qualitative changes.

Table 1.1. Land cover by tenure and agricultural land categories

(on April 1, 2004, thousand hectares)

	Total area	Non-agricultural land	Agricultural land	Arable land	Permanent crops	Meadows	Pastures	Residential or farming facilities and yards
Total area*	7 628.4	4 602.6	3 025.8	801.8	263.8	143.8	1 796.6	19.8
Private land	948.9	181.6	767.3	438.5	180.5	44.0	84.5	19.8
State land	6 679.5	4 421.0	2 258.5	363.3	83.3	99.8	1 712.1	-
Agricultural organizations	2 822.3	650.2	2 172.1	358.8	76.1	92.7	1 644.5	-
Non-agricultural	3 857.2	3 770.8	86.4	4.5	7.2	7.1	67.6	-
Settlements	88.4	86.8	1.6	0.4	0.7	-	0.5	-
Protected areas	300.7	285.1	15.6	0.1	0.1	1.1	14.3	-
Forest	2 456.2	2 400.3	55.9	2.8	6.1	5.1	41.9	-
Industry, transport, communications, radio broadcasting, TV, energy, defence and other	171.9	159.1	12.8	1.2	0.3	0.9	10.4	-
Religious organizations	4.9	4.9	-	-	-	-	-	-
Water (including inland waters)	835.1	834.6	0.5	-	-	-	0.5	-

Source: State Department for Land Management of Georgia.

* Including territorial water of Autonomous Republic of Abkhazia and Tskhinvali region.

Table 1.2. Sown area of agricultural crops
(thousand hectares)

	2014	2015	2016	2017
Sown area, total	274.9	263.7	240.0	220.3
Grain and leguminous crops	213.0	198.9	180.0	161.9
Potato, vegetables and melons	41.2	43.8	38.9	37.0
Other crops	20.8	21.0	21.1	21.3

Source: National Statistics Office of Georgia.

Table 1.3. Agricultural land operated by agricultural holdings according to land use type
(on October 1, 2014, hectare)

	Agricultural land	Arable land	Land under permanent crops	Greenhouses	Natural meadows and pastures
Georgia	787 714	377 445	109 567	699	300 004
Tbilisi	2 817	2 159	258	15	385
Adjara AR	19 731	6 054	9 011	12	4 653
Guria	26 909	13 474	12 366	7	1 060
Imereti	65 737	51 033	8 831	462	5 410
Kakheti	315 499	133 099	33 117	53	149 230
Mtskheta-Mtianeti	20 829	12 253	1 238	25	7 313
Racha-Lechkhumi and Kvemo Svaneti	5 757	2 700	901	0	2 156
Samegrelo-Zemo Svaneti	66 662	36 608	27 003	24	3 027
Samtskhe-Javakheti	76 057	28 626	687	2	46 742
Kvemo Kartli	122 316	50 087	2 098	88	70 043
Shida Kartli	65 400	41 351	14 056	11	9 983

Source: National Statistics Office of Georgia.

Agricultural Census of Georgia 2014.

Table 1.4. Non-agricultural land operated by agricultural holdings and its structure
(on October 1, 2014, Hectare)

	Non-agricultural land	Buildings and yards	Woodland	Reservoirs for aquaculture	Other non-agricultural land
Georgia	54 575	42 945	9 023	1 492	1 115
Tbilisi	1 341	1 326	1	0	13
Adjara AR	2 212	1 497	468	7	240
Guria	3 844	2 893	637	166	149
Imereti	11 454	9 861	1 306	102	186
Kakheti	13 296	6 755	5 352	1 035	154
Mtskheta-Mtianeti	1 412	1 302	8	1	100
Racha-Lechkhumi and Kvemo Svaneti	964	901	27	19	17
Samegrelo-Zemo Svaneti	10 130	8 694	1 213	48	175
Samtskhe-Javakheti	2 076	2 042	2	25	7
Kvemo Kartli	4 249	4 161	6	41	42
Shida Kartli	3 597	3 512	3	49	33

Source: National Statistics Office of Georgia.
Agricultural Census of Georgia 2014.

2. FOREST RESOURCES AND ITS PROTECTION

Forest is one of the important components of the biosphere. Forest area is about 4.0 billion hectares in the world, i.e. almost 1/3 of the total land cover. World reserve of wood is around 360 billion cubic metres, and annual growth – 3 200 million cubic metres. There are about 30 000 species of timber and shrubs, and thousands of bird and animal species. According to modern understanding, forest is a part of geographic landscape, unity of trees, bushes, grass, animals, birds and micro organisms which are biologically interconnected in the process of their development and affect one another and environment.

A quantitative accumulation of wood species creates new qualitative features in a forest. This ecological complex has significant and versatile impact on the environment. A forest differs from parks and gardens since the trees in a forest create a specific functional interconnections.

There are several tiers in a forest that are developed according to the species composition, the biological features of the basic plants, their age and the particular physical geographic conditions. In complex forests of moderate zone the following tiers are identified: the first one consists of trees that develop first value forest (pine, spruce, fir, beech, oak, etc.); the second one is developed by second value trees (lime, maple, hornbeam, elm, etc.); the third or under wood one is composed by bushes (nut, cornel, hawthorn and so on, etc.); the fourth and fifth ones consist of grass and moss cover. One can meet climbing plants and mosses, mushrooms and algae on the branches in the different tiers of forest.

Forests become non-homogenous on a relatively big territory. Forests differ in species composition (pure – of one species or mixed – composed with several species), form (simple – one tier and complex – multi tier), age (one aged and various aged), origin (seeds and vegetation), frequency, productivity, etc.

The species composition and ecological features of forest vegetation change sharply according to the geographic longitudes, i.e. horizontal zones.

Georgia is a highland country, thus almost all forest (97.7%) are located on the mountain slopes. In western Georgia forests begin from sea level and cover lowlands and foothill slopes up to 500 m above sea level. In lowland swampy areas we meet willow, poplar in some places Imeretian oak, ash and beech; Elevated places and foothills are covered by Colchis forests. In under wood rhododendron, bilberry, etc. are growing. There are lots of climbing plants as well.

On lowlands and foothill slopes of dry regions of eastern Georgia (Shiraki, Eldari, Mtskheta, etc.), up to 400 – 600 m above sea level light forests are spread, mostly composed of Georgian maple, pomegranate, pistacia, juniperus, etc. In lower zone of mountains (from 500 m to 900–1 000 m) there are oak and chestnut forests. Chestnuts are met in both eastern (Kakheti) and western Georgia. On lime soils of western Georgia and dry districts of eastern Georgia (Kartli, Gare Kakheti) oaks and hornbeams are spread instead of chestnuts. Medlar, hawthorn, cornel, nuts, etc. grow in lower zone of mountains. In middle zone of mountains (from 900 m–1 000 m to 1 500 m–1 600 m) beech is growing in some cases purely and in some cases mixed with hornbeam, field maple, lime, spruce, etc.

In Georgia one cannot find the beech zone only in Samtskhe-Javakheti, here it is replaced by spruce, fir and pine. High zone of mountain is represented by dark coniferous forests. In Western Georgia it begins from 1 400 m and often reaches high margin of forest distribution, in Eastern Georgia it extends from 1 500 metres to 2 100 metres. These forests are composed with the Eastern spruce and Caucasian fir, that form multiaged, highly productive, diverse pure and mixed zones. Beeches, elms, limes as well as pines are also growing here. Great number of pines is also distributed in the mountainous part of Tusheti, Meskheta and Trialeti ridge. In the districts where there are no spruces and firs (Gare and Shida Kakheti) beeches are

spread. Upper zone of mountain (from 1 900 m – 2 100 m to 2 400 m) is covered by subalpine forests. Crooked forests that are spread in all districts are mainly presented by birches and beeches. Subalpine light is more typical for western Georgia and is composed with highland maple, highland oak.

Forest is a global and vital factor for the entire ecological system of the earth. It is one of the live substance accumulators on our planet, as it retains a large amount of chemicals and water in the biosphere. A forest actively interrelates with the troposphere and determines the level of oxygen and carbon balance. Land vegetation and its main component – forest, provide more than 60% of the oxygen in the biosphere. One hectare mixed forest absorbs 13-17 tons of carbon dioxide and generates 10-15 tons of oxygen. Forest is the most productive formation of our planet and is characterised by the highest intensity of the biological circle. A biomass accumulated in the forest considerably exceeds the biomass of grass and other vegetations. Annual growth of one hectare forest phytomass is 10-30 tons on average, of vegetation – 9 tons and of tundra – 2 tons.

Forest has various functions: forest is a strong accumulator of the solar energy. It has a significant influence on climate formation, on water turnover in nature, and air circulation in the atmosphere; thus, forest ensures the conditions necessary for human life. The starting point of this circle is the process of photosynthesis that generates oxygen. While in 30-50s forest was generating just 30% of planet's oxygen, now forest provides 60% of biologically active oxygen, the rest is supplied by marine and oceanic plankton, and field and garden plants. Oxygen generated by a forest is qualitatively different from marine and ocean oxygen, since it is full of negative ions. This significantly increases biological features of forest, since a positive influence of negative ions on the human organism is proved by scientists. Ionization of forest oxygen is 2-3 times more than marine one and 5-10 times more than ionization of urban atmosphere.

Forest cleans the air from dust. One hectare forest filters 50-70 tons of dust annually, and consequently forests of Georgia filter about 135-190 million tons of dust.

Forest regulates intensity of snow melting, significantly reduces speed of air circulation and protects useful fauna and microorganisms. A lot of forest plants restrain disease-causing organisms and make the environment healthier. Forest is a powerful sanitary factor that ensures human life and health.

Water protecting function of forest is very important. It facilitates normal and equal supply of water to the rivers and other water resources (lakes, springs, etc.), prevents floods, improves water quality and protects it from pollution. The role of forest is also important for increasing the soil fertility and protecting it from water and wind erosion. A majority of the arable lands are located in unstable and insufficient humidity zones. A protective forest planting belongs to the activities directed against draught and erosion. Forest is distributed on all continents, except Antarctica. In the past times forest was spread over a larger area, part of which was later occupied by agricultural lands, cities and industrial complexes.

Forest is a source of many resources: timber, bark, branches, leaves, fruit, seeds, mushrooms, etc. It is widely used in industry and other sectors. Forest is one of the biological resources that have regeneration ability. It has biochemical function, participates in formation of diverse landscapes, has a great water preserving, soil protecting, climate regulating and sanitary hygienic importance; thus, protection of forest and its rational use has a great economic and vital importance.

The forest increment is a cambium layer of a tree that annually produces the bark cell. In any period of the growth of tree or stand of trees, a tree grows both in height and in diameter. This change is called increment. There are two types of forest increment: mean and current increment. Mean increment is defined by the annual variation of different taxation indicators (height, diameter, volume, stock etc.). I.e. absolute volume of taxation indicator divided by the age. Current increment is defined as a difference between the volume of taxation indicator today and several years (1 or 10 years) ago.

The main purpose of the forestry is meeting the demand for forest products of national economy and population, without exhausting the forest resources. This problem should be solved without reducing the forest area, preserving forest productivity, and protecting its environmental, sanitary-hygienic and other useful characteristics. Forestry, as a production sector, has a peculiarity – a significantly long period of forest growth. One turnover of forestry takes as much time as necessary for 80 – 150 turnovers of agriculture. Changes in the forestry are basically unnoticeable for one generation.

Forest is a renewable natural resource – in case of a rational use, it retains and improves its natural features and ensures a proper change of generations. A miscellaneous importance, the length of growth, and the need for a rational use of forest determine specificity of relations between human and forest. Timber logging should be done carefully in order to encourage development of highly productive forests.

Lack of adequate road infrastructure hinders proper logging in Georgia. Road construction in mountainous regions is very expensive, thus agencies interested in a complex utilization of highland areas should cooperate.

Protecting forests from fire has a great ecological importance – fire destroys young trees and burns vegetation; this of course worsens physical – chemical, water preserving, and soil protecting features of soil. Danger of wind and water erosion also increases. In the past wildfire was quite frequent in Georgia and was spread on large areas. For example, there was a strong forest fire in 1884, named “Gujareti”. It covered 30 thousand hectares of forest from Tsaghvery-Bakuriani to ravine of the River Tana. The wildfire was active for several months, population of Kartli and the military forces were mobilized for its localization. Implementation of forestry activities is very important for fighting against forest fires. Fire brigades should be organized and properly equipped, public awareness should be improved concerning these issues.

Definition of terms used in tables

Forest	Part of geographic landscape which consists of trees, land, bushes, grass, animals and others that belong to forest according to legislation and that are biologically connected and have an impact on one another and on the environment.
Area covered by forest	Area of 0.3 hectare and more, covered with trees higher than 2 meter or with bushes higher than 1.5 meter. Their canopy should cover 30 percent or more of the total area.
Forest restoration	Forestry related activity that aims at forest restoration on the areas of forest not covered by trees . Forest restoration activities include forest planting and seeding, as well as facilitating its natural recovery.
Facilitating natural recovery of forest	Set of activities that facilitate natural recovery of forest: fencing the forest areas with a purpose of protecting the trees from livestock grazing, treating natural growing, etc.
Forest area	Set of state forest, its land, forest under other types of ownership and their resources. Forest area consists of areas covered by forest and areas not covered by forest. The last includes fields, meadows, pastures, swamps, cliffs, glaciers, etc.
Timber felling	Removing trees and shrubs from natural environment of forest.
Illegal logging	Felling the trees without permission.
Operational expenses of the National Forestry Agency	Expenditures on operation of the National Forestry Agency, such as: forest arrangements, forest restoration, development of forest protection lines, protecting forest from fire, pests, diseases, etc. as well as expenses on the office of the agency.

Table 2.1. Forest area, 2017
(thousand hectares)

	Forest area
Forest area of Georgia	3 124.2
Forest area under the National Forestry Agency*	2 008.9
Forest area under the Forestry Agency of Adjara	150.1
Forest area under the Agency of Protected Areas**	596.2
Forest area under the Abkhazia AR***	369.0

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

Agency of Protected Areas.

National Forestry Agency.

*Including Tskhinvali region.

**Including Autonomous Republic of Abkhazia and Tskhinvali region.

*** On January 1, 2003

Table 2.2. Forest area of Georgia by regions, 2017
(thousand hectares)

	Forest area	Of which covered by forest
Georgia	3 124.2	2 690.0
Forest area under the Agency of Protected Areas*	596.2	317.2
Forest area under the Forestry Agency of Adjara	150.1	141.8
Forest Area of Abkhazia AR**	369.0	346.0
Forest area under the National Forestry Agency***	2 008.9	1 885.0
Guria	85.9	82.5
Imereti	312.4	299.9
Kakheti	288.4	268.2
Mtskheta-Mtianeti	250.5	235.4
Racha-Lechkhumi and Kvemo Svaneti	281.9	267.8
Samegrelo-Zemo Svaneti	272.3	256.0
Samtskhe-Javakheti	133.4	128.1
Kvemo Kartli	146.7	133.5
Shida Kartli	237.3	213.6

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

Agency of Protected Areas.

National Forestry Agency.

* Including Autonomous Republic of Abkhazia and Tskhinvali region.

** On January 1, 2003.

*** Including Tskhinvali region.

Table 2.3. Area of Georgia covered by forest

Year	Area covered by forest*	
	Area, million hectares	Percentage share in the country land area
2000	2.77	39.9
2005	2.77	39.9
2010	2.77	39.9
2015	2.70	38.8
2016	2.69	38.7
2017	2.69	38.7

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

National Forestry Agency.

Agency of Protected Areas.

* Including area covered by forest of Abkhazia AR and Tskhinvali regions.

Table 2.4. Number of employees and operating costs of the National Forestry Agency

	1995	2000	2005	2010	2015	2016	2017
Number of Employees (thousand persons)	3.5	7.4	2.0	0.7	1.0	1.0	0.9
Operating costs (thousand GEL)	2 081	940	3 237	6 574	15 529	17 345	21 612

Source: Ministry of Environment Protection and Agriculture of Georgia.

National Forestry Agency.

Table 2.5. Forest and field fires

	2013	2014	2015	2016	2017
Number of fire cases (unit)	48	69	83	51	87
Area covered by fire (hectare)	2 682	1 723	216	398	1 582

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

Agency of Protected Areas.

National Forestry Agency.

Table 2.6. Forest and field fires by regions, 2017

	Number of fire cases, unit	Area covered by fire, hectare
Georgia	87	1 582
Tbilisi	...	...
Adjara AR	5	32
Guria	1	1
Imereti	5	13
Kakheti	7	217
Mtskheta-Mtianeti	1	14
Svaneti	3	1
Samegrelo-Zemo Svaneti	2	1
Samtskhe-Javakheti	13	1 010
Kvemo Kartli	7	17
Shida Kartli	16	25
Protected areas	27	250

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

National Forestry Agency.

Agency of Protected Areas.

Table 2.7. Forest restoration
(hectare)

Year	Forest restoration	Forest seeding and planting	Facilitating natural recovery of forest
1995	13 912	1 002	12 910
2000	1 158	258	900
2005	74	10	64
2010	165	111	54
2015	142	21	121
2016	178	50	128
2017	156	44	112

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

National Forestry Agency.

Table 2.8. Forest seeding and planting
(hectare)

	1995	2000	2005	2010	2015	2016	2017
Georgia	1 002	258	10	111	21	50	44
Tbilisi	35	18	1	-	-	-	-
Adjara AR	70	11	1	-	7	2	3
Guria	25	5	-	-	-	19	-
Imereti	130	59	-	-	-	0	-
Kakheti	220	27	0	109	7	25	0
Mtskheta-Mtianeti	90	18	4	0	-	2	2
Racha-Lechkhumi and Kvemo Svaneti	33	17	-	-	-	-	-
Samegrelo-Zemo Svaneti	211	43	-	-	-	-	1
Samtskhe-Javakheti	34	12	-	2	7	0	38
Kvemo Kartli	110	25	-	-	0	1	-
Shida Kartli	44	23	4	-	0	1	-

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

National Forestry Agency.

Table 2.9. Facilitating natural recovery of forest
(hectare)

	1995	2000	2005	2010	2015	2016	2017
Georgia	12 910	900	64	54	121	128	112
Tbilisi	90	-	-	-	-	-	-
Adjara AR	3 000	-	-	-	118	100	100
Guria	1 100	158	-	-	-	-	-
Imereti	1 050	22	-	-	-	-	12
Kakheti	870	20	-	54	-	-	-
Mtskheta-Mtianeti	610	50	-	-	-	-	-
Racha-Lechkhumi and Kvemo Svaneti	2 500	230	-	-	-	-	-
Samegrelo-Zemo Svaneti	1 910	130	4	-	-	-	-
Samtskhe-Javakheti	680	130	-	-	3	28	-
Kvemo Kartli	290	50	-	-	-	-	-
Shida Kartli	810	110	60	-	-	-	-

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

National Forestry Agency.

Table 2.10. Volume of felled timber
(cubic metre)

	1995	2000	2005	2010	2015	2016	2017
Georgia	289 712	442 140	810 615	876 749	712 336	628 035	630 462
Tbilisi	19 192	4 741	6 278	...	...	...	...
Adjara AR	24 464	44 648	73 007	77 868	75 510	65 422	69 034
Guria	4 952	24 463	56 384	16 193	12 269	8 526	13 185
Imereti	19 098	45 270	103 718	97 440	80 775	57 443	53 277
Kakheti	44 890	61 893	119 479	181 706	140 086	121 773	132 067
Mtskheta-Mtianeti	20 341	36 029	68 938	86 944	74 956	63 545	66 790
Racha-Lechkhumi and Kvemo Svaneti	16 509	52 706	52 713	37 148	60 919	59 145	49 523
Samegrelo-Zemo Svaneti	22 175	55 923	110 376	91 524	29 019	39 538	49 564
Samtskhe-Javakheti	71 916	72 483	123 253	94 374	89 170	79 784	81 956
Kvemo Kartli	32 552	20 757	44 100	89 704	52 496	44 222	42 799
Shida Kartli	13 623	23 227	52 369	103 848	76 661	71 284	58 267
Protected areas	...	...	...	...	20 475	17 353	14 001

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

Agency of Protected Areas.

National Forestry Agency.

Table 2.11. Illegal logging
(cubic metre)

	2013	2014	2015	2016	2017
Georgia	6 039	45 915	44 612	28 586	35 022
Tbilisi	...	...	...	...	...
Adjara AR	1 671	1 895	1 880	1 044	1 514
Guria	225	474	729	647	331
Imereti	1 182	9 105	3 087	3 958	4 539
Kakheti	432	565	18 686	9 568	9 685
Mtskheta-Mtianeti	102	20 498	1 576	993	447
Racha-Lechkhumi and Kvemo Svaneti	268	802	1 993	320	2 032
Samegrelo-Zemo Svaneti	236	2 291	1 766	2 119	3 928
Samtskhe-Javakheti	752	1 583	10 648	7 170	9 022
Kvemo Kartli	229	6 636	1 783	1 738	1 227
Shida Kartli	188	1 596	1 581	845	1 975
Protected areas	756	472	883	185	324

Source: Ministry of Environment Protection and Agriculture of Georgia.

Forestry Agency of Adjara.

Agency of Protected Areas.

National Forestry Agency.

Table 2.12. Export of non-processed timber

	2000	2005	2010	2015	2016	2017
	Thousand USD					
Total export	3 065.3	49.5	-	6.1	11.9	15.9
Armenia	-	43.7	-	5.9	-	-
China	94.6	-	-	-	-	15.9
Germany	26.8	-	-	0.2	-	-
Greece	60.3	-	-	-	-	-
Iran	-	5.6	-	-	-	-
Israel	8.9	-	-	-	-	-
Italy	87.5	-	-	-	-	-
Latvia	1.6	-	-	-	-	-
Russia	9.6	-	-	-	-	-
Spain	77.8	-	-	-	-	-
Switzerland	1.0	-	-	-	-	-
Turkey	2 694.3	-	-	-	11.9	-
Ukraine	1.7	-	-	-	-	-
United Kingdom	1.2	-	-	-	-	-
Usa	-	0.2	-	-	-	-
	Cubic metre					
Total export	39 033	559	-	33	15	200
Armenia	-	487	-	33	-	-
China	787	-	-	-	-	200
Germany	251	-	-	0	-	-
Greece	721	-	-	-	-	-
Iran	-	71	-	-	-	-
Israel	64	-	-	-	-	-
Italy	755	-	-	-	-	-
Latvia	24	-	-	-	-	-
Russia	78	-	-	-	-	-
Spain	588	-	-	-	-	-
Switzerland	13	-	-	-	-	-
Turkey	35 693	-	-	-	15	-
Ukraine	42	-	-	-	-	-
United Kingdom	17	-	-	-	-	-
USA	-	1	-	-	-	-

Source: National Statistics Office of Georgia.

Table 2.13. Import of non-processed timber

	2000	2005	2010	2015	2016	2017
	Thousand USD					
Total import	7.7	632.3	2 222.8	4 058.4	3 043.7	4 019.4
Belarus	-	-	-	-	-	198.2
Bulgaria	-	-	-	-	-	199.0
Canada	-	-	-	-	-	18.9
Czech Republic	-	-	567.0	-	-	-
Germany	-	-	-	1.8	-	-
Latvia	-	-	-	-	-	764.9
Lithuania	-	-	-	-	-	1 094.8
Russia	7.7	43.9	-	12.8	-	21.0
Slovakia	-	-	-	-	15.8	-
Turkey	-	-	-	-	221.9	815.9
Ukraine	-	588.4	1 655.8	4 043.8	2 785.8	906.7
United Kingdom	-	-	-	-	20.2	-
	Cubic metre					
Total import	212	8 430	18 803	27 052	23 114	25 377
Belarus	-	-	-	-	-	1 160
Bulgaria	-	-	-	-	-	1 159
Canada	-	-	-	-	-	111
Czech Republic	-	-	888	-	-	-
Germany	-	-	-	3	-	-
Latvia	-	-	-	-	-	4 214
Lithuania	-	-	-	-	-	6 214
Russia	212	429	-	32	-	83
Slovakia	-	-	-	-	32	-
Turkey	-	-	-	-	1 130	4 697
Ukraine	-	8 001	17 915	27 017	21 783	7 739
United Kingdom	-	-	-	-	169	-

Source: National Statistics Office of Georgia.

3. PROTECTED AREAS

Georgia, as a part of Caucasus, is recognized as one of the special regions regarding biodiversity. It is considered to be a “hotspot” of biodiversity as its nature is special with diversity of species, high level of endemism and ecosystems with global importance. Protected areas are key instrument for biodiversity conservation. The larger the territory under the protected areas, there are better conditions for preserving and protecting species and habitats under the threat of extinction.

The first protected area in Georgia was established in 1896 as Ajameti reserve. The reserve was for special purpose, the aim of its establishment was the protection of oak trees in Kolkheti and Imereti lowlands from the local population. Only a certain number of trees could be cut down in these forests for developing wine-making. However, the establishment of Ajameti reserve had a progressive meaning, as in those years of hardship, against the background of spontaneous development of capitalism, the forests of Imereti lowland survived from the mass felling of timber.

Establishment of protected areas in Georgia aims at preserving natural and cultural environment and its components, protecting conditions for mental and physical health of humans and creating one of the important fundamentals for civilized development of the society. Protected areas in Georgia are created for protecting and restoration of important national heritage – unique and rare ecosystems, plant and animal species, cultural areas and for using them for scientific, educational and recreational purposes. There are following categories of protected areas in Georgia: strict nature reserves, national parks, managed nature reserves, natural monuments, protected landscapes and multiple use areas.

The main purpose of establishing protected areas is restoration and protection of natural ecosystems, landscapes and living organisms, gene pool of threatened Red List species of wild animals and plants, unique and rare organic and nonorganic natural components and territories under threat of flooding, landslides and avalanches, and areas of surface and ground water formation.

Definition of terms used in tables

<i>Biocenosis</i>	Unity of plants and animals which exist in more or less similar conditions (animals and plants of particular field or coast).
<i>Managed reserve</i>	Protected area established for the purpose of protecting natural conditions for preservation of wild species, biocenosis and non organic formations of national importance, which from humans' side requires special restoration and care activities. In reserve it is allowed to use particular renewable recourses in conditions of strict control and supervision.
<i>National park</i>	Protected area established for preservation of relatively big and wonderful ecosystems, of national and international importance, as well as for recreational activities, where not or less damaged ecosystems, biocenosis and species included in the red list of Georgia are presented.
<i>Natural monument</i>	A relatively small area of national importance, represented by ecosystems of rare, unique and highly aesthetic features, specific geographical and hydrological formations, and individual samples of plants or fossils of living organisms. Natural Monument can be a cave, a valley, river deltas, wood groves, etc.
<i>Protected area</i>	Land territory or area of water having a special importance for preservation of cultural phenomena involved in biological diversity, natural resources and natural environment, which is protected and managed under long-term and solid legal grounds. Categories of protected areas are the following: restricted area, natural monument, national park, public reserve, and protected landscape.
<i>Protected landscape</i>	Protected area established for protecting natural cultural landscape developed as a result of harmonic interaction of human and nature, preservation of vital environment, recreational, tourism and traditional activities.
<i>Strict nature reserve</i>	Strict nature reserves are established in order to maintain nature, natural processes and genetic resources in a dynamic and pristine condition, and to conduct scientific research and studies, with a minor impact, for educational and environmental monitoring purposes.
<i>Travertine</i>	Dense, banded rock composed of calcium carbonate, formed by the evaporation of river and spring waters.

Table 3.1. Structure of protected areas of Georgia, 2017

Name
1 Administration of Borjomi-Kharagauli National Park Protected areas under supervision: Borjomi Strict Nature Reserve Borjomi-Kharagauli National Park Ktsia-Tabatskuri Managed Reserve Nedzvi Managed Reserve Tetrobi Managed Reserve
2 Administration of Tusheti Protected Areas Protected areas under supervision: Tusheti Strict Nature Reserve Tusheti National Park Under the supervision of Local Municipality: Tusheti Protected Landscape
3 Administration of Vashlovani Protected Areas Protected areas under supervision: Alazani Floodplains National Monument Eagle Gorge Natural Monument Takhti-Tepa Natural Monument Vashlovani National Park Vashlovani Strict Nature Reserve
4 Administration of Kintrishi Protected Areas Protected areas under supervision: Kintrishi Protected Landscape Kintrishi Strict Nature Reserve
5 Administration of Lagodekhi Protected Areas Protected areas under supervision: Lagodekhi Managed Reserve Lagodekhi Strict Nature Reserve
6 Administration of Mariamjvari Strict Nature Reserve Protected areas under supervision: Iori Managed Reserve Korughi Managed Reserve Mariamjvari Strict Nature Reserve
7 Administration of Kazbegi National Park Protected areas under supervision: Abano Mineral Water Lake Natural Monument Jvari Overpass Travertine Natural Monument Kazbegi National Park Keterisi Mineral Vaucluse Natural Monument Sakhizari Natural Monument Truso Travertine National Monument

continued

8 Administration of Kobuleti Protected Areas

Protected areas under supervision:

Kobuleti Managed Reserve

Kobuleti Strict Nature Reserve

9 Administration of Imereti Caves Protected Areas

Protected areas under supervision:

Bgheri Cave Natural Monument

Didghele Cave Natural Monument

Gabzaruli Lake Natural Monument

Ghliana Cave Natural Monument

Jason's Cave Natural Monument

Khomuli Cave Natural Monument

Melouri Cave Natural Monument

Nagarevi Cave Natural Monument

Navenakhevi Cave Natural Monument

Prometheus Natural Monument

Sakazhia Cave Natural Monument

Sataplia Managed Reserve

Sataplia Strict Nature Reserve

Satsurblia Cave Natural Monument

Solkota Cave Natural Monument

Tskaltsitela Gorge Natural Monument

Tsutskhvati Cave Natural Monument

White Cave Natural Monument

10 Administration of Martvili and Okatse Natural Monument

Protected areas under supervision:

Abasha Waterfall Natural Monument

Baldi Canion Natural Monument

Gochkadila Canion Natural Monument

Jortsku Cave Natural Monument

Martvili Canyon Natural Monument

Motena Cave Natural Monument

Nazodelao Cave Natural Monument

Ochxamuri Waterfall Natural Monument

Okatse Canyon Natural Monument

Okatse Waterfall Natural Monument

Oniore Waterfall and the Tobas's First Cave Natural Monument

Toba Waterfall and Arsen Okrojanashvili Natural Monument

11 Administration of Mtirala National Park

12 Administration of Algeti National Park

Protected areas under supervision:

Birtvisi Natural Monument

Dashbashi Canyon Natural Monument

Samshilde Canyon Natural Monument

continued

13 Administration of Batsara-Babaneuri Protected Areas

Protected areas under supervision:

Babaneuri Strict Nature Reserve

Batsara Strict Nature Reserve

Ilto Managed Reserve

14 Administration of Tbilisi National Park

Protected areas under supervision:

Gardabani Managed Reserve

Tbilisi National Park

15 Administration of Kolkheti National Park

Protected areas under supervision:

Katsoburi Managed Reserve

Kolkheti National Park

16 Administration of Ajameti Managed Reserve

17 Administration of Chachuna Managed Reserve

18 Administration of Javakheti Protected Areas

Protected areas under supervision:

Bughdasheni Lake Managed Reserves

Javakheti National Park

Kartsakhi Lake Managed Reserves

Khanchali Lake Managed Reserves

Madatapa Managed Reserves

Sulda Managed Reserves

19 Administrations of Machakhela National Park

20 Administration of Pshav-Khevsureti National Park

Protected areas under supervision:

Asa Managed Reserve

Pshav-Khevsureti National Park

Roshka Natural Monument

21 Administration of Liakhvi Strict Nature Reserve

22 Administration of Pskhu-Gumista Strict Nature Reserve

Protected areas under supervision:

Gumista Strict Nature Reserve

Pskhu Strict Nature Reserve

Skurchi Strict Nature Reserve

23 Administration of Ritsa Strict Nature Reserve

24 Administration of Bichvinta-Miusera Strict Nature Reserve

Protected areas under supervision:

Bichvinta Strict Nature Reserve

Lidzava Strict Nature Reserve

Miusera Strict Nature Reserve

 Source: Ministry of Environment Protection and Agriculture of Georgia.

Agency of Protected Areas.

Table 3.2. Protected areas of Georgia by categories, 2017

Name	Total area, hectare
Protected areas, total*	596 156
Area of strict nature reserves	139 049
1 Babaneuri	862
2 Batsara	2 986
3 Bichvinta-Miusera	3 645
4 Borjomi	13 169
5 Kintrishi	10 703
6 Kobuleti	316
7 Lagodekhi	19 749
8 Liakvi	6 388
9 Mariamjvari	1 023
10 Pskhu-Gumista	40 819
11 Ritsa	16 289
12 Sataplia	330
13 Tusheti	12 627
14 Vashlovani	10 143
Area of national parks	347 927
1 Algeti	6 822
2 Borjomi-Kharagauli	60 576
3 Javakheti	13 498
4 Kazbegi	8 687
5 Kolkheti	44 309
6 Machakhela	7 333
7 Mtirala	15 699
8 Pshav-Khevsureti	75 843
9 Tbilisi	21 036
10 Tusheti	69 515
11 Vashlovani	24 610
Area of managed reserves	71 530
1 Ajameti	4 991
2 Asa	3 943
3 Bughdasheni	119
4 Chachuna	5 200
5 Gardabani	3 734
6 Ilto	6 971
7 Iori	2 127
8 Kacoburi	271
9 Kartsakhi	158
10 Khanchali	727

		continued
11	Kobuleti	466
12	Korughi	2 068
13	Ktsia-Tabatskuri	22 000
14	Lagodekhi	4 702
15	Madatapa	1 398
16	Nedzvi	9 213
17	Satapia	34
18	Sulda	309
19	Tetrobi	3 100
Area of natural monuments**		2 941
1	Abano Mineral Lake	0
2	Alazani Floodplain Forests	204
3	Artsivi Gorge	100
4	Balda Canyon	6
5	Bgheri Cave	...
6	Birtvisi	561
7	Bodorna Rock Columns	18
8	Dashbashi Canyon	669
9	Didghele Cave	...
10	Gabzaruli Lake	...
11	Ghliana Cave	...
12	Goderdzi Pertified Forest	36
13	Iazoni Cave	...
14	Jortsku Cave	2
15	Jvari Overpass Travertine	3
16	Keterisi Mineral Vaucluse	1
17	Khomuli Cave	2
18	Martvili (Gochkadila) Canyon	13
19	Melouri Cave	...
20	Motena Cave	...
21	Mukhura Waterfall	14
22	Nagarevi Cave	...
23	Navenakhevi Cave	...
24	Nazodealo Cave	12
25	Ochkhomuri Waterfall	9
26	Okatse Canion	71
27	Okatse Waterfall	...
28	Oniore Waterfall and the First Toba Cave	33
29	Prometheus Cave	47
30	Roshka	122
31	Sakazhia Cave	...

		continued
32	Sakhizari Cliff	336
33	Samshilde Canyon	475
34	Satsurblia Cave	0
35	Solkota Cave	0
36	Takhti-Tepa	10
37	Tetri Cave	0
38	The River Abasha Waterfall	99
39	Toba Waterfall and Arsen Okrojanashvili Cave	73
40	Truso Travertines	4
41	Tskaltsitela Gorge	22
42	Tsutskhvati Cave	...
Area of protected landscapes		34 708
1	Kintrishi	3 190
2	Tusheti	31 518

Source: Ministry of Environment Protection and Agriculture of Georgia.

Agency of Protected Areas.

* Including Autonomous Republic of Abkhazia and Tskhinvali region.

** Covers only areas of natural monuments with marked and registered borders and areas.

Table 3.3. Area and categories of protected areas of Georgia, 2017

	Number, unit	Area, hectare
Strict nature reserves	14	139 049
National parks	11	347 927
Managed nature reserves	19	71 530
Natural monuments	42	2 941
Protected landscapes	2	34 708

Source: Ministry of Environment Protection and Agriculture of Georgia.

Agency of Protected Areas.

Including Autonomous Republic of Abkhazia and Tskhinvali region.

Table 3.4. Number of main animal species preserved in the protected areas
(unit)

Name	1995	2000	2005	2010	2015	2016	2017
Chamois	672	807	594	552	672	617	375
Badger	290	298	7 018	828	274	411	452
Brown bear	213	265	325	543	863	501	344
Fox	340	694	275	667	513	933	1 065
Grey wolf	210	310	224	626	702	559	502
Hare	1 046	948	551	3 599	559	589	309
Hyena	...	2	...	1	6	...	8
Jackal	282	187	4 173	9 151	7 309	5 745	4 870
Lynx	39	37	63	85	111	95	88
Marten	475	476	1 816	1 598	827	875	1 000
Nutria	30	40	...	1 293	885	410	165
Otter	10	20	168	411	307	286	237
Red deer	776	194	299	554	877	955	1 047
Roe	759	735	1 372	2 613	2 263	3 507	2 609
Squirrel	780	130	50	1 667	333	843	598
and daghestan tur	750	641	695	1 455	1 689	1 068	708
Wild boar	126	230	320	892	966	1 127	794
Wild goat	130	150	170	150	419	418	457
Wildcat	98	83	2 507	511	88	143	216

Source: Ministry of Environment Protection and Agriculture of Georgia.

Agency of Protected Areas.

Table 3.5. Number of main bird species preserved in the protected areas
(unit)

Name	1995	2000	2005	2010	2015	2016	2017
Black kite	...	...	50	17	39	33	1 577
Black stork	...	...	10	20	1 084	215	415
Blackbird	2 970	1 930	1 842	3 652	5 000	11 151	4 033
Caucasian grouse	412	780	982	845	966	966	1 017
Caucasian snowcock	641	702	766	645	886	505	568
Cinereous vulture	...	12	42	184	159	116	182
Common wood pigeon	670	...	375	362	...	1 190	1 332
Crow	90	310	150	35	2 000	2 674	1 360
Eastern imperial eagle	...	2	10	46	54	51	56
Eurasian jay	1 440	1 100	779	2 158	1 900	669	1 483
Eurasian woodcock	252	692	528	950	3 300	7 727	307
Falcon	12	...	16	18	62	83	67
Golden eagle	79	55	38	51	36	44	51
Goshawk	60	75	35	608	380	301	220
Grey partridge	...	...	100	...	...	...	...
Gyps	15	28	80	116	114	167	231
Mistle thrush	2 340	1 380	1 100	210	1 000	68	690
Nightingale	60	90	40	...	...	...	50
Owl	176	419	531	30	198	212	523
Pheasant	20	45	166	647	700	...	1 725
Rock partridge	890	365	2 120	4 670	2 235	...	3 106
Sparrowhawk	46	97	75	403	96	2 741	327
Tawny eagle	...	10	10	...	...	158	25
Woodpecker	2 894	449	504	2 311	871	15 788	...

Source: Ministry of Environment Protection and Agriculture of Georgia.

Agency of Protected Areas.

Table 3.6. Expenses on the maintenance of protected areas and number of employees, 2017

	Person					Thousand GEL		
	Total number of employees	Head	Specialist of natural resources	Security staff	Other staff	Total expenses on maintenance of protected areas	From state budget	From other sources
Total in Georgia	470	21	22	334	93	11 543.1	6 786.8	4 756.4
Agency of Protected Areas	38	1	0	0	37	3 063.3	575.4	2 487.9
Ajemeti Managed Nature Reserve	16	1	1	14	0	144.1	85.3	58.8
Algeti National Park	17	1	1	13	2	208.0	133.9	74.1
Batsara- Babaneuri Protected Areas	14	1	1	12	0	136.6	84.2	52.4
Borjomi-Kharagauli National Park	71	1	2	63	5	1 037.1	752.2	285.0
Chachuna Managed Nature Reserve	6	1	1	4	0	74.3	45.9	28.4
Imereti Caves Protected Areas	22	1	1	11	9	2 229.9	1 786.8	443.1
Javakheti Protected areas	12	1	1	8	2	226.6	174.7	51.9
Kazbegi National Park	13	1	1	9	2	146.0	102.7	43.4
Kintrishi Protected Areas	11	1	1	7	2	121.6	90.6	31.0
Kobuleti Protected Areas	7	1	1	3	2	78.1	38.4	39.7
Kolkheti National Park	32	1	2	26	3	340.1	201.2	138.9
Lagodekhi Protected Areas	24	1	1	19	3	478.5	353.5	125.0
Machakhela National Park	18	1	1	13	3	155.8	102.3	53.4
Mariamjvari Strict Nature Reserve	9	1	1	7	0	80.9	44.2	36.6
Martvili and Okatse Natural Monument	23	1	1	13	8	1 336.7	1 067.9	268.8
Mtiral National Park	18	1	1	13	3	270.2	199.1	71.1
Pshav-Khevsureti National Park	19	1	1	15	2	146.2	89.5	56.8
Tbilisi National Park	39	1	1	34	3	353.1	207.4	145.7
Tusheti Protected Areas	31	1	1	24	5	417.5	301.9	115.6
Vashlovani Protected Areas	30	1	1	26	2	498.5	349.5	149.1

Source: Ministry of Environment Protection and Agriculture of Georgia.

Agency of Protected Areas.

4. WATER RESOURCES

Area of the earth surface is 510.0 million square kilometres, its 71%, that is 362.1 million square kilometres, is occupied by the ocean that creates illusion of abundance of water resources. In fact 97.5% of the total hydrosphere reserve (1 353.3 million cubic kilometres) is almost useless for economic activities, due to its salinity (the World Ocean, the salty lakes and the wetlands). Share of the fresh water that exists in form of rivers, glaciers, ground waters, lakes, reservoirs and wetlands, is just 2.5% or 34.7 million cubic metres. Today only 12% of total fresh water stock, or 4.16 million cubic metres is being used, that clearly demonstrates problem of fresh water deficit.

According to internal waters (rivers, lakes, ground waters, glaciers, and wetlands) Georgia was one of the leading countries in the Soviet Union. However, rivers are unequally distributed between eastern and western Georgia. In western Georgia run-off of rivers (together with transit run-off) is 49.8 km³, and in eastern Georgia – 16.5 km³.

The problem of water consumption has a great importance among the factors having an impact on the river ecosystem, since using of water for economic activities, especially for irrigation causes lowering the water level, i.e. reduction of water resources.

Increasing level of hydrosphere pollution is even more important and problematic. The main reasons for worsening water quality are the following: irrigation, melioration of salty soils, wastewater, and improperly arranged reservoir caves. Importance of this problem can be justified by the following general examples: even those wastewaters which, after treatment return to the primary sources, require 15 fold dilutions with clean water in order to restore natural quality of water.

Annual volume of wastewater of any types pollutes 12-15 times more natural water in general, that is a significant part of river run-off. Sharp decrease in industrial production in recent years implied only one positive result: amount of hazardous substances emitted into the atmosphere and pollution level in wastewaters decreased.

Inland water resources located on the country territory are the state property and can be used only on the basis of the licenses issued by authorized agencies. Ownership of the land does not imply permission for water use. Throwing or burring industrial, household, toxic, radioactive and other hazardous waste into the water bodies or nearby areas is prohibited as well as discharge of wastewater without having an appropriate license.

Despite of great importance of administrative-legislative policies, economically grounded scientific-technical activities play decisive role in environmental protection. For example, rational allocation of industrial objects according to availability of water resources and its quality and implementing the technologies, that ensures getting the production with minimal consumption of natural resources and minimizing hazardous waste.

Definition of terms used in tables

<i>Losses of water during transport</i>	Volume of water lost from the point of abstraction to the point of its use or transmission due to filtration, evaporation, leakage, burst mains or other reasons.
<i>Mechanical treatment of wastewater</i>	Process of wastewater treatment which is used for filtering wastewater from solid particles, stones, sand, waste, etc.
<i>Water abstraction from natural water bodies</i>	Volume of water taken from surface water bodies (rivers, lakes and seas) and groundwater bodies for further use. This indicator does not include volume of transit water supplied to big channels and volume of water taken by population from wells, natural reservoirs, etc.
<i>Polluted wastewater</i>	Industrial and household wastewater (including mine, fossil and draining waters) which contains much more polluting substances than admissible amount.
<i>Water use</i>	Use of water resources abstracted from different sources (surface, main, ground, sea, etc.) for various needs; volume of used water does not include cycling water supply, wastewater of secondary use as well as wastewater controlling draining waters.
<i>Water use for drinking and household needs</i>	Volume of water used by population and employees of enterprises and organizations (excluding agricultural ones) for economic, household and communal needs.
<i>Water use for industrial needs</i>	Total volume of water used for industrial needs (excluding agriculture) and for filling the cycling water supply systems.
<i>Water supply system</i>	System of receiving, transportation and distribution of water (pipelines, reservoirs, open and closed channels, etc) that is used for supplying water to customers.

Table 4.1. Big and medium rivers of Georgia

Name of the river	Length of the river on the territory of Georgia (km)	Area of river basin (km ²)	Corresponding sea basin
Alazani	362	11 800	The Caspian Sea
Rioni	327	13 400	The Black Sea
Mtkvari	326	188 000	The Caspian Sea
Iori	320	4 650	The Caspian Sea
Enguri	213	4 060	The Black Sea
Ktsia-Khrami	201	8 340	The Caspian Sea
Tskhenistskali	176	2 120	The Black Sea
Khobi	150	1 340	The Black Sea
Kvirila	140	3 630	The Black Sea
Algeti	118	763	The Caspian Sea
Kodori	110	2 030	The Black Sea
Bzipi	110	1 510	The Black Sea
Supsa	108	1 130	The Black Sea
Tekhuri	101	1 040	The Black Sea
Didi Liakvi	98	2 440	The Caspian Sea
Acharistskali	90	1 540	The Black Sea
Psou	89	885	The Black Sea
Ksani	84	885	The Caspian Sea
Dzirula	83	1 270	The Black Sea
Paravani	74	2 350	The Caspian Sea
Aragvi	66	2 740	The Caspian Sea
Mashavera	66	1 390	The Caspian Sea
Abasha	66	350	The Black Sea
Patara Liakvi	63	513	The Caspian Sea
Natanebi	60	657	The Black Sea
Khanistskali	57	914	The Black Sea
Okumi	56	559	The Black Sea
Ghalidzga	53	483	The Black Sea
Tedzami	51	404	The Caspian Sea
Mokvi	50	356	The Black Sea
Chorokhi	26	22 100	The Black Sea

Source: Ministry of Environment Protection and Agriculture of Georgia.
National Environmental Agency.

Table 4.2. Main lakes and reservoirs of Georgia

Name	Surface area (km ²)	Volume (mln. m ³)	Average depth (m)	Maximum depth (m)
Lake Paravani	37.5	90.8	2.4	3.3
Tsalka Reservoir	33.7	312.0	9.3	25.0
Lake Khozapini	26.3	19.3	0.7	1.0
Lake Paliastomi	18.2	52.0	2.1	3.2
Lake Tabatskuri	14.2	221.0	15.6	40.0
Jvari Reservoir	13.5	1 092.0	115.0	230.0
Shaori Reservoir	13.2	90.0	6.8	11.5
Lake Jandara	12.5	52.0	4.6	7.2
Sioni Reservoir	12.0	325.0	25.4	67.5
Samgori Reservoir	11.8	308.0	26.2	45.0
Jinvali Reservoir	11.5	52.0	50.0	98.0
Tkibuli Reservoir	11.5	84.0	16.0	32.0
Gali Reservoir	8.0	145.0	17.0	52.0
Lake Saghamo	4.8	7.7	1.6	2.3
Lake Ritsa	1.5	94.0	63.1	101.0
Lake Bazaleti	1.2	5.6	4.5	7.0
Lake Lisi	0.5	1.2	2.6	4.0

Source: Ministry of Environment Protection and Agriculture of Georgia.
National Environmental Agency.

Table 4.3. Main indicators for water supply industry and wastewater collection

	2015	2016	2017
	Percentage		
Population connected to water supply industry	57.8	61.4	66.4
Population connected to a wastewater collecting system	44.2	46.4	48.6
Population connected to wastewater treatment facilities	32.1	33.9	36.9
of which:			
Primary/mechanical treatment	28.6	29.4	31.1
Secondary/biological treatment	3.3	4.3	5.5
Tertiary/advanced treatment	0.2	0.2	0.2
	Million cubic metres		
Gross volume of water supplied by water supply industry	683.2	676.2	705.4
Losses of water during transport	403.9	428.9	443.4
Net volume of water supplied by water supply industry	279.3	247.3	262.0
Water supplied to households by water supply industry	243.3	208.1	223.4

Source: National Statistics Office of Georgia.

Table 4.4. Main indicators for protection and use of water resources

(million cubic metres)

	2015	2016	2017
Water abstraction from natural water bodies, total*	1 887.5	2 110.0	2 038.1
Water abstraction from groundwater bodies	498.5	479.9	489.2
Water use, total*	996.9	1 117.9	1 050.4
Household needs	381.5	340.8	311.9
Industrial needs	354.8	262.4	247.2
Other needs	260.6	514.7	491.3
Wastewater discharge into surface water bodies, total	544.1	389.0	344.0
Polluted wastewater	305.4	158.5	131.7
Losses of water during transport	890.6	992.1	987.7
Cycling and secondary water supply	226.8	190.3	207.9

Source: Ministry of Environment Protection and Agriculture of Georgia.

* Water for hydroelectricity generation purposes is excluded.

5. AMBIENT AIR PROTECTION

Atmospheric air that surrounds the earth is one of the main components of environment and represents source of life on our planet. Atmosphere protects the earth from destructive impact of meteorites: most of them burn while flying through the dense layers of atmosphere; it also detains a large share of ultraviolet radiation and ensures life existence on the earth. Atmosphere basically consists of nitrogen (78.084%) and oxygen (20.976%). Carbon dioxide has a very small share in the atmosphere (0.0314%), but plays a special role since it absorbs and releases long wave radiation. Moreover, carbon dioxide is essential for plants.

Atmosphere always contains water steam in different quantities and its role is significant in atmospheric events: water steam condensation causes creation of clouds and precipitation, and its transformation is followed by absorption or emission of big amount of warmth. It is well known that a person daily consumes about 1 kg food, 1.5 litre water and 12 kg air in relaxed condition. It is possible to check the quality of water or food and treat them when needed, but the air is consumed as it is in the environment. This is a good example for realizing importance of protecting of atmospheric air form hazardous substances.

Air pollution is spread in several kilometres vertically. During the last decades the amount of polluting substances into atmospheric air increased twenty times. Atmosphere is highly polluted by the enterprises of black and coloured metallurgy, and chemical industry that emit sulphur gases, carbon dioxide, dust and other substances.

Transport emissions have a significant share in total air pollution. One of the alternatives for reducing transport emission can be improvement of internal combustion engine and petrol quality, use of electro mobiles, etc. In the near future the substance substituting mentioned types of fuel will be hydrogen, which is cheaper and more flexible than electricity. In combustion process it mixes with oxygen and without smoke develops steam in insignificant amount.

Greening industrial sites and development of forestry economy has a great importance for implementation of measures aiming protection of atmospheric air. One hectare forest filters about 50 – 70 tons of dust per year. The forest is directly connected to improvement of the health of atmospheric air and protection of water resources, since oxygen is basically filled by photosynthesis. 1 hectare forest emits 10-15 times more oxygen than any phitocenosis.

Definition of terms used in tables

Captured hazardous substances

Amount of hazardous substances captured with gas cleaning and dust collection equipment from hazardous substance generated in stationary sources. It does not include hazardous substances used in technological processes of production in form of raw materials or intermediate products.

Hazardous substances emitted into the atmosphere from stationary sources

Total amount of all hazardous substances emitted into the atmosphere as a result of incomplete filtration and cleaning by abatement equipment. This does not include hazardous materials generated as a result of erosion, forest fire, etc.

Stationary sources emitting hazardous substances into the atmosphere

These sources can be organized and non-organized; organized sources are immobile sources out of which hazardous substances are emitted from gas and air discharging systems (chimneys, ventilation devices, etc.). The system gives possibility to use gas cleaning and dust collection equipment, for decontamination of hazardous substances. The source is considered non-organized when hazardous substances directly go into the atmosphere due to non-hermetic protection of technological aggregates, loading systems (for example: places for loading cement, etc.).

Table 5.1. Number of stationary sources emitting hazardous substances
(unit)

	1995	2000	2005	2010	2015	2016	2 017
Number of stationary sources	132	117	153	1 099	2 695	2 891	2 964

Source: Ministry of Environment Protection and Agriculture of Georgia.

Table 5.2. Main indicators of generation of hazardous substances in stationary sources and protection of atmospheric air (thousand tons)

	1995	2000	2005	2010	2015	2016	2017
Hazardous substances generated in stationary sources, total	30.4	28.7	57.3	661.0	802.2	772.5	831.2
Captured hazardous substances	15.0	10.0	33.2	630.7	757.3	728.0	784.7
Share of captured hazardous substances in total generated hazardous substances (%)	49.3	35.0	57.9	95.4	94.4	94.2	94.4

Source: Ministry of Environment Protection and Agriculture of Georgia.

Table 5.3. Captured and emitted hazardous substances generated in stationary sources
(thousand tons)

	Generated	Captured	Emitted	Share of captured hazardous substances, %
2000				
Hazardous substances, total	28.7	10.0	18.7	35.0
Solid	9.2	5.9	3.3	64.6
Gaseous and liquid	19.5	4.1	15.4	21.1
Sulphur dioxide	0.4	-	0.4	-
Carbon monoxide	3.7	1.9	1.8	51.0
Nitrogen oxides	4.1	1.0	3.1	23.5
Hydrocarbons	8.1	-	8.1	-
Other	3.2	1.2	2.0	37.4
2005				
Hazardous substances, total	57.3	33.2	24.1	57.9
Solid	34.5	29.6	4.9	85.8
Gaseous and liquid	22.8	3.6	19.2	15.8
Sulphur dioxide	0.9	-	0.9	-
Carbon monoxide	12.1	2.6	9.5	21.5
Nitrogen oxides	2.8	0.7	2.1	25.0
Hydrocarbons	6.6	-	6.6	-
Other	0.4	0.3	0.1	75.1
2010				
Hazardous substances, total	661.0	630.7	30.1	95.4
Solid	631.6	628.0	3.7	99.4
Gaseous and liquid	29.3	2.8	26.5	9.6
Sulphur dioxide	1.8	-	1.8	-
Carbon monoxide	15.1	1.5	13.7	10.0
Nitrogen oxides	4.0	1.0	3.0	25.0
Hydrocarbons	7.5	-	7.5	-
Other	1.0	0.4	0.5	40.0
2015				
Hazardous substances, total	802.2	757.3	44.9	94.4
Solid	758.2	752.6	5.6	99.3
Gaseous and liquid	44.0	4.7	39.3	10.7
Sulphur dioxide	6.3	0.1	6.2	2.1
Carbon monoxide	17.5	2.4	15.0	14.0
Nitrogen oxides	7.3	1.2	6.1	15.8
Hydrocarbons	9.7	0.1	9.6	1.3
Other	3.2	0.8	2.4	25.8

	Generated	Captured	Emitted	Share of captured hazardous substances, %
2016				
Hazardous substances, total	772.5	728.0	44.5	94.2
Solid	728.8	724.0	4.8	99.3
Gaseous and liquid	43.6	3.9	39.7	9.0
Sulphur dioxide	5.8	0.0	5.8	0.0
Carbon monoxide	18.8	2.5	16.3	13.3
Nitrogen oxides	6.0	0.6	5.4	9.4
Hydrocarbons	10.7	0.0	10.7	0.0
Other	2.4	0.9	1.5	37.2
2017				
Hazardous substances, total	831.2	784.7	46.5	94.4
Solid	787.6	779.6	7.9	99.0
Gaseous and liquid	43.7	5.1	38.6	11.7
Sulphur dioxide	6.3	0.2	6.1	3.2
Carbon monoxide	19.3	2.9	16.5	14.8
Nitrogen oxides	6.4	1.0	5.5	15.0
Hydrocarbons	1.9	0.0	1.9	0.3
Other	9.7	1.1	8.6	11.0

Source: Ministry of Environment Protection and Agriculture of Georgia.

Table 5.4. Capture and emission of hazardous substances generated in stationary sources by regions (thousand tons)

	Generated	Captured	Emitted
2000			
Georgia	28.7	10.0	18.7
Tbilisi	0.8	0.2	0.6
Adjara AR	9.8	0.0	9.8
Guria	0.0	0.0	0.0
Imereti	3.6	3.1	0.5
Kakheti	0.0	0.0	0.0
Mtskheta-Mtianeti	0.2	-	0.2
Racha-Lechkhumi and Kvemo Svaneti	-	-	-
Samegrelo-Zemo Svaneti	0.5	0.0	0.4
Samtskhe-Javakheti	0.0	-	0.0
Kvemo Kartli	13.5	6.7	6.8
Shida Kartli	0.2	0.1	0.1
2005			
Georgia	57.3	33.2	24.1
Tbilisi	3.0	0.1	2.9
Adjara AR	4.1	0.0	4.0
Guria	-	-	-
Imereti	27.8	19.2	8.6
Kakheti	0.0	0.0	0.0
Mtskheta-Mtianeti	0.8	0.4	0.4
Racha-Lechkhumi and Kvemo Svaneti	-	-	-
Samegrelo-Zemo Svaneti	0.3	-	0.3
Samtskhe-Javakheti	0.0	0.0	0.0
Kvemo Kartli	10.2	5.4	4.8
Shida Kartli	11.0	8.2	2.8
2010			
Georgia	661.0	630.7	30.1
Tbilisi	26.0	24.8	1.2
Adjara AR	4.2	2.1	2.1
Guria	0.0	-	0.0
Imereti	20.5	5.7	14.8
Kakheti	3.8	3.3	0.5
Mtskheta-Mtianeti	8.7	8.3	0.4
Racha-Lechkhumi and Kvemo Svaneti	0.0	-	0.0
Samegrelo-Zemo Svaneti	5.4	4.3	1.1
Samtskhe-Javakheti	0.5	0.4	0.1
Kvemo Kartli	355.0	349.0	6.0
Shida Kartli	237.0	232.8	4.2

	Generated	Captured	Emitted
	continued		
	2015		
Georgia	802.2	757.3	44.9
Tbilisi	85.5	83.6	1.9
Adjara AR	1.3	0.3	1.0
Guria	5.9	5.3	0.6
Imereti	50.7	37.2	13.5
Kakheti	7.0	2.5	4.5
Mtskheta-Mtianeti	9.8	8.6	1.2
Racha-Lechkhumi and Kvemo Svaneti	0.5	0.4	0.1
Samegrelo-Zemo Svaneti	13.1	8.7	4.4
Samtskhe-Javakheti	1.2	1.0	0.2
Kvemo Kartli	338.3	328.3	10.0
Shida Kartli	289.0	281.4	7.6
	2016		
Georgia	772.5	728.0	44.5
Tbilisi	59.5	57.7	1.8
Adjara AR	6.4	5.2	1.2
Guria	3.3	2.3	1.0
Imereti	71.6	56.3	15.3
Kakheti	5.5	2.7	2.8
Mtskheta-Mtianeti	8.1	6.1	2.0
Racha-Lechkhumi and Kvemo Svaneti	0.3	0.2	0.1
Samegrelo-Zemo Svaneti	2.2	1.0	1.2
Samtskhe-Javakheti	1.4	1.2	0.2
Kvemo Kartli	337.6	326.4	11.3
Shida Kartli	276.6	268.9	7.7
	2017		
Georgia	831.2	784.7	46.5
Tbilisi	28.1	26.2	1.9
Adjara AR	6.2	4.7	1.5
Guria	6.3	5.3	1.0
Imereti	88.1	68.9	19.1
Kakheti	2.6	1.6	1.0
Mtskheta-Mtianeti	8.9	7.1	1.8
Racha-Lechkhumi and Kvemo Svaneti	0.3	0.2	0.1
Samegrelo-Zemo Svaneti	52.6	51.9	0.8
Samtskhe-Javakheti	1.9	1.6	0.3
Kvemo Kartli	347.6	335.8	11.8
Shida Kartli	288.5	281.4	7.1

Source: Ministry of Environment Protection and Agriculture of Georgia.

Table 5.5. Captured and emitted hazardous substances generated in stationary sources by cities
(thousand tons)

City	Hazardopus substances			Share of city, %	
	Generated	Captured	Emitted	In pollution of atmospheric air of region	In pollution of atmospheric air of region
2015					
Tbilisi	85.5	83.6	1.9	100.0	4.2
Batumi	1.1	0.3	0.8	84.7	1.8
Gardabani	1.8	0.0	1.8	18.0	4.0
Zestaponi	37.3	29.0	8.3	62.0	18.6
Kaspi	273.5	267.1	6.4	84.1	14.2
Rustavi	325.5	318.8	6.8	67.8	15.1
Poti	8.0	7.5	0.5	10.9	1.1
Kutaisi	0.3	0.0	0.3	2.0	0.6
2016					
Tbilisi	59.5	57.7	1.8	100.0	4.0
Batumi	5.5	4.5	0.9	78.4	2.1
Gardabani	0.9	0.0	0.9	8.0	2.0
Zestaponi	50.3	41.2	9.1	59.6	20.5
Kaspi	257.3	251.6	5.7	74.9	12.9
Rustavi	325.3	319.5	5.8	51.6	13.1
Poti	0.7	0.4	0.3	22.4	0.6
Kutaisi	1.3	1.0	0.2	1.6	0.5
2017					
Tbilisi	28.1	26.2	1.9	100.0	4.1
Batumi	5.7	4.5	1.2	76.4	2.5
Gardabani	0.9	0.0	0.9	7.2	1.8
Zestaponi	58.8	48.8	10.0	52.0	21.4
Kaspi	272.9	266.9	6.0	85.2	13.0
Rustavi	333.8	327.7	6.1	51.3	13.0
Poti	51.2	50.9	0.3	37.7	0.6
Kutaisi	0.3	0.1	0.2	1.0	0.4

Source: Ministry of Environment Protection and Agriculture of Georgia.

Table 5.6. Emission of hazardous substances from road transport by type of substances
(thousand tons)

Hazardous substances	2010	2011	2012	2013	2014	2015	2016
Carbon oxides (CO)	118.0	108.0	100.3	95.1	91.1	93.8	132.0
Nitrogen oxides (NO ₂)	20.1	21.2	22.2	22.9	23.5	25.8	28.5
Hydrocarbons (NmVOC)	15.5	14.8	14.3	13.9	13.6	14.2	18.0
Patriculate matters (PM ₁₀)	1.1	1.1	1.2	1.2	1.2	1.4	1.5
Patriculate matters (PM _{2.5})	0.9	1.0	1.0	1.1	1.1	1.2	1.3
Soot (EC)	0.4	0.4	0.4	0.5	0.5	0.5	0.6
Ammonia (NH ₃)	0.2	0.2	0.3	0.3	0.3	0.4	0.6
Sulphur dioxide (SO ₂)	0.4	0.5	0.4	0.4	0.2	0.3	0.2
Other hazardous substances	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Source: Ministry of Environment Protection and Agriculture of Georgia.

6. NATURAL HAZARDS AND VIOLATIONS OF LAW

Definition of terms used in tables

<i>Avalanche</i>	A rapid flow of snow or land down a sloping surface.
<i>Flash Flood</i>	A sudden raise f water level caused by heavy rains and intensive snow melting.
<i>Flood</i>	An overflow of river water that submerges land (during heavy rains or melting of snow).
<i>Hail</i>	A form of solid precipitation that consists of ball or irregular lumps of ice.
<i>Hurricane</i>	Very strong wind, velocity of which exceeds 20 mpc and which causes strong storm on the sea and damage of buildings on the ground.
<i>Landslide</i>	A geological phenomenon which includes a wide range of ground movements, such as rockfalls and deep failure of slopes. Its primary driving force is the action of gravity.
<i>Mudflow</i>	A downhill movement of soft wet and debris, made fluid by rain or melted snow and often building up a great speed.
<i>Squall</i>	Short hurricane.

Table 6.1. Number of occurred geological phenomena (landslide, mudflow), human fatalities and vulnerable objects (unit)

Year	Landslide		Mudflow		Vulnerable objects		
	Number of landslides (activated or newly occurred)	Number of human fatalities	Number of mudflows (activated or newly occurred)	Number of human fatalities	Affected agricultural land (hectare)	Number of human settlements	Number of buildings
1995	670	6	250	12	179	274	195
1996	610	3	165	5	232	403	626
1997	871	2	335	7	337	458	227
1998	543	5	173	6	230	370	159
1999	56	1	27	-	138	157	314
2000	65	1	23	-	162	240	207
2001	75	-	26	-	128	191	127
2002	69	1	23	2	148	203	193
2003	71	3	28	-	107	90	207
2004	949	4	258	2	16 289	755	6 042
2005	603	-	155	4	7 590	473	3 682
2006	356	1	63	-	3 173	531	2 066
2007	136	-	104	-	1 389	269	707
2008	311	10	126	8	1 388	392	1 198
2009	323	1	193	3	8 232	521	2 696
2010	250	3	81	2	1 155	366	822
2011	94	3	37	8	652	181	463
2012	325	1	88	5	1 255	239	845
2013	336	-	93	-	1 413	739	1 269
2014	727	-	141	10	...	1 041	962
2015	936	4	167	19	...	931	1 014
2016	780	-	208	-	...	1 421	1 084
2017	845	-	165	-	...	1 587	1 353

Source: Ministry of Environment Protection and Agriculture of Georgia.

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Table 6.2. Number of occurred hydrometeorological hazards
(unit)

Hydrometeorological hazard	January	February	March	April	May	June	July	August	September	October	November	December	Total
2012													
Flood and flash flood	-	-	-	-	5	3	3	4	-	-	-	-	15
Hurricane and squall	-	-	-	-	-	1	1	1	-	2	-	-	5
Hail	-	-	-	-	7	2	2	3	-	-	-	-	14
Heavy snow	1	-	-	-	-	-	-	-	-	-	-	-	1
Avalanche	5	4	5	-	-	-	-	-	-	-	-	1	15
2013													
Flood and flash flood	-	-	-	-	1	2	1	2	1	-	-	1	8
Hurricane and squall	-	-	3	1	1	3	2	1	2	1	3	3	20
Hail	-	-	2	3	6	5	3	4	-	-	-	-	23
Heavy snow	-	-	-	-	-	-	-	-	-	-	-	-	-
Avalanche	1	2	2	1	-	-	-	-	-	-	-	2	8
2014													
Flood and flash flood	-	-	-	2	1	2	3	4	7	1	1	-	21
Hurricane and squall	-	3	2	1	3	8	2	2	6	5	2	-	34
Hail	-	-	-	3	8	10	1	3	3	-	-	-	28
Heavy snow	-	-	-	-	-	-	-	-	-	-	-	-	-
Avalanche	3	-	1	-	-	-	-	-	-	-	-	-	4
2015													
Flood and flash flood	-	-	-	1	2	4	1	-	-	1	1	-	10
Hurricane and squall	2	1	-	-	-	-	-	-	-	-	4	2	9
Hail	-	-	-	2	6	9	3	1	-	1	-	-	22
Heavy snow	2	-	-	-	-	-	-	-	-	-	-	-	2
Avalanche	3	-	-	-	-	-	-	-	-	-	-	-	3
2016													
Flood and flash flood	1	-	-	1	-	5	15	1	2	-	-	1	26
Hurricane and squall	-	4	1	5	-	2	1	4	4	-	1	1	23
Hail	-	-	-	-	16	11	3	4	-	2	-	-	36
Heavy snow	8	-	1	-	-	-	-	-	-	1	2	4	16
Avalanche	-	-	-	-	1	-	-	-	-	-	1	3	5
2017													
Flood and flash flood	-	-	-	-	5	5	9	1	3	4	-	-	27
Hurricane and squall	-	-	6	8	2	3	1	3	6	3	-	2	34
Hail	-	-	-	1	18	10	5	-	2	-	-	-	36
Heavy snow	3	2	-	-	-	-	-	-	-	-	-	-	5
Avalanche	5	4	4	1	2	-	-	-	-	-	-	5	21

Source: Ministry of Environment Protection and Agriculture of Georgia.

National Environmental Agency.

Table 6.3. Revealed violations of law related to environmental protection by regions and violation types, 2017 (unit)

	Illegal logging	Violation of timber transportation rules	Violation of fishing rules	Violation of hunting rules	Violation of technical reglament of sawmills	Illegal mining	Violation of mining licence terms	Violation of atmospheric air legislation	Violation of water legislation	Violation of land legislation	Pollution of environment by waste disposal	Violation of permission terms/activity without permission	Other violations	Total number of revealed violations of law
Georgia	1 674	1 409	579	511	832	1 571	963	1 821	233	306	1 491	119	287	11 796
Tbilisi	-	4	116	37	-	3	22	85	10	15	408	10	21	731
Adjara AR	227	52	16	54	56	603	54	358	37	9	230	12	21	1 729
Guria	14	21	18	49	39	174	87	104	5	9	16	2	9	547
Imereti	95	124	30	136	111	442	244	518	74	82	96	25	31	2 008
Kakheti	687	468	78	56	54	77	107	62	13	7	44	3	32	1 688
Mtskheta-Mtianeti	22	41	67	20	7	31	60	70	15	15	116	4	37	505
Racha-Lechkhumi and Kvemo Svaneti	13	26	-	1	77	12	36	70	-	-	37	3	29	304
Samegrelo-Zemo Svaneti	107	181	80	113	161	126	146	193	32	16	194	24	24	1 397
Samtskhe-Javakheti	454	273	14	8	264	32	53	185	12	127	40	-	36	1 498
Kvemo Kartli	36	116	88	21	4	37	72	94	15	15	238	29	27	792
Shida Kartli	19	103	72	16	59	34	82	82	20	11	72	7	20	597

Source: Ministry of Environment Protection and Agriculture of Georgia.

Environmental Supervision Department.