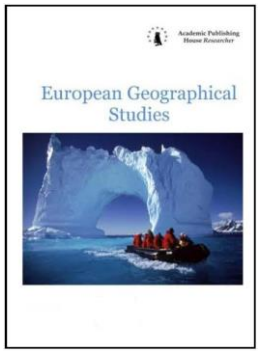

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Forest Cover for the Safety of Biosphere and Environment

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Abstract

The extreme events resulting from climate change are discussed: floods, decline of fresh water and land resources, draughts, crop failure, desertification, etc. The reasons causing climate change are examined, main of them being the anthropogenic increase of carbon dioxide concentration in the atmosphere. Its absorption is possible only by green vegetation through the process of photosynthesis, as a result of which large amount of oxygen is produced being a principal source of existence for all living organisms. Forest is rich in many kinds of food and medical products. It is a protector of water and land resources as well as a filter for purifying air and the water.

The importance of forest cover in mountain regions is described, where it protects settlements, roads and fields from floods and mudflows, erosion processes, landslides and avalanches. Forest is regulating the water regime of mountain rivers curtailing floods and preventing them from drying up.

The data are presented on the state of forest cover in Georgia and the world over. Resulting from unsystematic felling forests are becoming sparse, are losing their protective functions, thousands of plant and animal species are wiped out. In all settlements the population and local authorities must care for reforestation and afforestation that will facilitate the reproduction of animals and birds, increase in crop capacity and the development of resort-recreational, and ecotourism activities. While planting the forests useful kinds should be chosen and cutting dawn must be permitted for only elderly and sick trees and considering the amount of annual accretion.

Very important is the raising of public awareness. Only the knowledge, correct education and love to the nature may save the biosphere and environment from the destruction and produce economic and social prosperity.

Keywords: anthropogenic processes, carbon dioxide, photosynthesis, water and land resources, oxygen.

1. Introduction

Nowadays one of the main concerns of the world society is the anomaly cataclysmic processes caused by global warming on our planet, which resulted in increasing catastrophic disastrous events that led to large destruction and casualties. In addition, with the increase of the population of the planet, which predicts that in 2050 it will be 11 billion, demand for food, water, housing, energy, family and mobile equipment and others will increase. The capture of forest areas and the irrational cutting of trees causes the reduction of photosynthesis process and the resulting

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increased heat beams of the sun is the reason that causes global warming, oxygen reducing, new viral, bacterial and chronic diseases.

In the XXI century it is expected to increase the temperature on the Earth, which will lead to the melting of Antarctic and Greenland ice, the sharp rise of the world ocean level and flooding the coastline, leading to large economic and social shocks, loss of crops, deficit of drinking water, floods, storms, and coastal erosion will increase as well. Since climate change is global, it is necessary to find ways to solve problems through joint efforts on an international level.

Today, for the purpose of Biosphere and environmental protection, in order to ease the climate change process for all countries in the world the most important task is to carry out various activities. First of all, the rational use of natural resources and ensuring the sustainability of environmental ecological balance is necessary. In this regard, it is worth mentioning that for the climate regulation, stabilization of oxygen balance and the maintenance of biodiversity particular importance has the forest cover.

2. Study area

Biosphere. The word "bios" means life in Greek. The biosphere is a combination of live and immobile substances in dynamic equilibrium, where the living organism transforms this environment in accordance with its demand. The history of the development of the biosphere is 2,5-3 billion years old. During this time, living organisms have been developing in different conditions of the environment. For example, some single-celled seaweed and bacteria are grown in hot springs up to 75-100 °C, others, on the contrary, minus 6-7 °C and mushroom spores can endure 120-180 °C (Miqadze, 2006). Thus, the biosphere is the layer of the earth where life exists and develops. It covers the whole hydrosphere, lithosphere and atmospheric parts. The hydrosphere is a watery layer of the earth. The World Ocean covers 7/10 of the Earth's surface. It is used by live organisms 100 to 200 m. where the sunbeams can reach. Only bacteria can live deeper (Basilashvili, 2016b).

The lithosphere is a thick layer of the mainland, where life is up to a few tens of centimeters. Some organisms live in 2-3 km depth on land conditions and 1-2 km from the bottom of the ocean. The simplest anaerobic bacteria live in an underground watershed and oil-containing horizons at a depth of 3-5 km.

The biosphere ecosystem is a combination of plants, animals, microorganisms and non-living components of the environment. The main biomes of the biosphere are the land, sea and freshwater biomes (Dre, 1976).

The upper boundary of the biosphere reaches 6 km in the atmosphere, where there are only plants that contain chlorophyll. Only some arthropods live above that are nourished with plant dust, spores, and microorganisms brought by the wind (Eliava et al., 1992).

About 600 million years ago, the lowest autotrophic plants emerged, 500 million years ago – plants and insects, 350 million years ago – angiosperms and mammals. The development of plants containing chlorophyll on the ground along with the increase of oxygen contributed to the formation of soils. Later, thanks to the increased amount of oxygen, a variety of flora and fauna, including humans have developed on earth. The existence of biosphere before human origin is called biogenesis, while the development stage of society is called Noogenesis.

At present, there are about 2 million species of plants and animals, including animals up to 1.5 million. According to the number of plants in the first place is angiosperms – about 300 thousand, in the second place, is mushrooms - about 100 thousand. According to the number of species among the animals, the insects are in the first place up to 1 million, mollusks are in the second place up to100 thousand, and then there are vertebrates up to 50 thousand (Qajaia, 2008).

The atmosphere is the layer of the Earth's surrounding gases and consists of various gases, water vapor, and dust. According to the height, individual layers are included: Troposphere (thickness 8-18 km), stratosphere 55 to 60 km, Mesosphere 80-85 km, thermosphere 80 to 1000 km, and above – Exosphere.

The atmosphere holds part of the space beams and the majority of meteorites. Only 48 % of solar radiation reaches the Earth. If there was no atmosphere, the average temperature of the air on the surface of the earth would be 23° C, not 15° C (Miqadze, 2006). Almost half of the radiating energy on our planet is spent on evaporation of water and this water returns to Earth as precipitation.

Forest and life on earth. In the past, the atmosphere did not contain much oxygen. Then it was rich with carbon dioxide, methane and nitrogen compounds. Nearly 3 billion years ago, the first living organisms on the earth were created at the bottom of the non-deep parts of the hydrosphere, where the sunbeams and warmth were reaching. Such conditions are near the tropical belt where with the carbon dioxide absorbed by the plant's chlorophyll and from the weather with help of solar energy, carbohydrates are synthesized and free oxygen is released. This process is called photosynthesis, or to produce organic substances from the inorganic components of the environment by the green plants. Schematically it looks like this (Qajaia, 2008):

Sun's radiation energy

$$6\,CO_2 + 6\,H_2O \longrightarrow C_6H_2O_6 + 6O_2 \qquad (1)$$

Green plants

Here the carbon dioxide and water molecules are diluted and the combination of glucose molecules is formed during the joining, and then the free oxygen is released.

The first species of the earliest times were the blue-green seaweeds, which made solar energy transform into chemical energy that contributed to the growth and development of the plant and its fruit. Scientists estimate that over a year there are more than 10 billion kcal of solar radiation per 1 Ha on Earth, which is used by the plant for photosynthesis (Budiko, 1965). Every year, with the solar effect, about 83 billion tons of organic substance is formed on Earth. Because of these, 53 billion tons are created on land and the rest in the seas and oceans. It is noteworthy that plants accumulate only 0.3 % of solar energy. Because of photosynthesis, the quantity of carbon dioxide in the atmosphere was reduced to 0,03 %, and the number of free oxygen increased to 21 % or 1000 times (Qajaia, 2008).

According to F. Ramad (Ramad, 1981), 2 billion years ago, emerged the first organisms that were able to make photosynthesis (prokaryotes: blue-green plants, bacteria, viruses), after 0,5 billion years the highest organisms (eukaryotes) emerged. As a result, 1 billion years ago, the oxygen content in the atmosphere constituted 1 % of the modern number. Phytoplankton increased and as a result of photosynthesis intensity atmospheric ozone was created, which stopped the adverse effect of ultraviolet beams of the sun. This contributed to the development of the organic world first in the upper layers of water, then on land. Millions of years later, various species of plants were developed that were the primary products for animal and human nutrition (Dre, 1976). The vegetation of the earth annually assimilates around 5×10^{10} tone carbon, or absorbs $1{,}8\times10^{11}$ tone carbon dioxide, decomposes 1.3×10^{11} tone water, separates $1{,}2\times10^{11}$ tone molecular oxygen and gathers 4×10^{17} Kcal solar energy (Eliava et al., 1992).

It is estimated that all 50-60% of oxygen is released by land vegetation and the rest by the phytoplankton. 1 ha forest in 1 hour absorbs so much carbon dioxide as 200 people breath out in 1 hour. During one year, 1 ha of mixed forest absorbs 15 t carbon dioxide and releases 13 t oxygen. The use of oxygen by humans depends on the physiological condition of his body, age, weight, and sex. In medicine, it is known that the person in a waiting period in one minute spends 0,35-0,40 liters oxygen and 5 l/min during work. A person needs 500-600 liters oxygen in a day, therefore a forest area per person should consist of at least 0.3 ha (Dre, 1976).

Although trees are less than 1 % of all plant species, they form almost 90 % of land phytosum and 64 % of its productivity (Miqadze, 2006). So the vegetation cover is the source of oxygen, food, and energy, and therefore the existence of humans and animals depends on the condition of the forest cover.

In the Bible, it is known that God during the seven-day cycle of creation of the universe, among many wonders, on the third day created forests and brought the axe to all the barren trees. By doing so, he defined the right to use the timber. But the forest is ruined unmercifully by people.

3. Discussion

Climate warming factors

Global warming is the process of fastest growth of average annual temperatures of the Earth's atmosphere. Scientists claim two different versions for this situation. According to the first version, it is a periodically repetitive natural cataclysm of solar activity. It determines the 11-year, 22-year, and 80-90-year-old changes in solar activity. The current global warming is likely to be associated with a higher rate of sunlight, which can be changed by its reduction. In the second version, the warming in

the Earth is because of human's anthropogenic activity, due to the heat radiation containment, reflected from the earth by the gases expanded in the atmosphere. From such gases, it is noteworthy: carbon dioxide, methane, nitrogen monoxide, ozone and freons (hydrocarbon halogen), that freely passes solar beams on earth, but holds the heat reflected by it (Tkemaladze, 2015).

From 1880 to 1930 the average annual air temperature increased by 0,5 °C. Since 1940 the increase in temperature has changed with the decrease, and since the 1960s the intensive growth of the temperature began on Earth (Elizbarashvili et al., 2013). With the development of the technique over the last 1.5 years, in the atmosphere the amount of carbon dioxide (CO_2) increased by 1/3, methane (CH_4) increased by 2.5 times, which excites the Earth 20-25 times more, rather than carbon dioxide. The increase of methane is associated with pipelines and bogs leakage and livestock. Methane is formed by means of special bacteria in the stomach of the livestock. From their dung methane is released that is used for fuel. 1,5 billion cows living on the planet will allocate 18 % of the greenhouse gases, which exceeds all types of transport indicator. That is why the ecoactivists of the world propagate the vegetarian diet and claim that if there is no livestock, there will be no problems. A third of the methane in the atmosphere is created by the livestock (Buchkovska et al., 2015).

The increase in carbon dioxide is associated with the development of industry, as well as wood and coal burning. Every year humanity burns 4,5 billion tons of coal, 3,2 billion tons of oil, gas, peat, and other fuel. The number of carbon dioxide increases especially by cars and aircraft fumes. The main source of harmful substances is outdated transport and the suspicious quality of their fuel.

By the industrial activity, in the Earth's atmosphere 27 billion tons of carbon dioxide is estimated annually and its concentration in the atmosphere has grown up to 38 %. Its 30 % absorbs the world ocean, 13 % biosphere, and soil, 57 % remain in the atmosphere that contributes to increase the warming. From the beginning of the industrial era, the atmosphere has accumulated 770 billion anthropogenic carbon dioxide (Barkalaia at al., 2015).

As a result of photosynthesis, 1 ha of forests absorb 5-10 tons of carbon dioxide and releases 10-20 t oxygen. The thermal energy of solar radiation falls on Earth every year on 1 ha area of 10 billion kcal, 93.8 % of which is absorbed by the green cover (Aress, 1982).

The excessive amount of harmful gases caused by anthropogenic activity expands the ozone field in the atmosphere, which is a very dangerous phenomenon for living organisms and is directly related to global warming. These processes were further enhanced when people began to take up various technologies in space. It is estimated that launching space missiles cause damage and disruption of the ozone layer, which will lead to increased solar radiation and temperature.

Ozone layer and its change

Ozone is a blue air which molecule consists of three atoms of oxygen (O_3). It occurs when the ultraviolet radiation of the sun causes the oxygen molecule to collapse into the atoms and the oxygen atoms are linked to the oxygen molecule (Zhorzholiani, Gordadze, 2006):

$$O + O_2 = O_3 \qquad (2)$$

There is "bad ozone" and "good ozone". Scientists call the "bad ozone" photochemical smoke, which is located in the lowest layer of the atmosphere in the troposphere. Under certain concentrations, it is dangerous for human health: irritates of the upper respiratory tract, causes vegetative disturbances, pulmonary edema, dizziness, eye cataracts, and etc. Such "bad ozone" is only 10% of the Earth's ozone and the remaining is 90 %.

"Good Ozone" is located in the stratosphere and protects the Earth from the devastating impact of ultraviolet radiation. Ozone content is variable at different altitudes. 60 % of its total size comes from the layer that is situated 16 km to 32 km, and the maximum concentration is approximately 25 km. This is a 3.5mm thick of Earth's protective ozone layer that makes the planet more suitable for human existence. Ozone that absorbs a large portion of the ultraviolet radiation of the sun's radiation, which destroys living organisms. So the ozone layer is considered to be the protective shield of the biosphere in the earth (Budiko, 1965). The amount of ozone in Stratosphere depends on the geographic range, the height of the distance from the Earth's surface and the time of year. The effects of solar radiation and oxygen, nitrogen, hydrogen, chlorine, and bromine cause the dissolution of the ozone molecule and the ozone layer. The main reason for this is the fact that many chemical compounds are used in household and agriculture, especially Freons ($CFCL_3$ and $CFCL_2$), which were previously used successfully in refrigerators and air-conditioners.

As a result, the ozone layer has been reduced in many parts of the world twice, and in the Arctic, in summers, and above the Antarctic, in winters even some hole is formed. The subsequent degradation of the ozone layer will facilitate the penetration of ultraviolet radiation into the atmosphere that dramatically affects living organisms, causes climatic anomalies and natural disasters. In 1996, factories of ozone disbanding substances (Freones) were closed, resulting in a reduction in the ozone hole by 34 % in 2014. According to scientists, this hole will be reduced by 10 % by 2020.

According to the new information, by 2030 the ozone layer will be filled in the Northern Hemisphere, by 2040 in the Southern Hemisphere, and by 2050 at the Earth's poles. It is noteworthy that since the 50s of the 20th-century space has accumulated a lot of cosmic trash, which comprises 25,000 items of various sizes ranging from the smallest particles to the total spacecraft. They are moving about 25,000 km/h speed and their collision with any moving spacecraft will cause a huge catastrophe.

Forest, its impact and importance

The forest is a vital component of the biosphere and represents a complex combination of ecosystems of trees, bushes, and herbs, animals, birds, and microorganisms that are interconnected in their development process and affect both the environment and each other. The forest has a substantial impact on the processes that are occurring in the atmosphere, on the surface of the earth and below its depths. The forest cover participates in the emergence of natural resources such as soil, water, animals, minerals, energy, recreations, and resorts. The forest also plays an important role in economic activity. It is a source of raw material, which is widely used in different industries. The timber is used as building materials and still as a fuel. The forest also provides food and medicinal products. Paper, cardboard, furniture, parquet is made of it. 15 thousand types of a piece of work are made from trees, in addition, with the increase of the population of the planet, which predicts that in 2050 it will be 11 billion, demand for food, water, housing, energy, family and mobile equipment and others will increase. So the increase in population in the world and technical progress is the reason for an incredible increase in demand for forest resources. The capture of forest areas and the irrational cutting of trees causes the reduction of photosynthesis process and the resulting increased heat beams of the sun is the reason that causes global warming, oxygen reducing, new viral, bacterial and chronic diseases.

Forest-Factor of Climate Formation. The importance of the forest is first revealed in the regulation of the air elements (air temperature, humidity, motion speed, etc.) that affects human health. For example, in summer, temperatures in the treeless areas are relatively 3-5 times higher, which results in the acceleration of human pulse, overheating of the body and decrease of labor ability. Dry air is also harmful in areas where is the lack of forest that causes the mouth, throat, nose dryness and deterioration of antiinfective capacities. The high speed of wind in treeless areas has a negative impact on breathing, blood circulation, and the nervous system.

Thus, the most comfortable conditions for people to relax and rejuvenate are created in the forest. Besides, the beauty and attractiveness of the natural landscapes of forests have a positive impact on the mental condition of humans, improvement of his mood, restoration of labor skills and spiritual conditions.

The sanitary-hygienic role of the forest. In the cities, industrial centers and other settlements the atmospheric air is systematically polluted by harmful chemical contaminants, so in this environment, for the protection and improvement of the sanitary and hygienic standards the greatest importance is granted to the forest, where almost all the tree-plant emissions of gliding aromatic essential substances fitoncides, which can disappear many microbes and viruses, that cleans and makes the air healthier. As a result, the bacteria and microbes are reduced in the woods. 1 m^3 air contains up to 500 pathogenic bacteria, while in the 1 m^3 air of the city there are 36,000 bacteria. It is estimated that land vegetation annually releases 175 million tons of aromatic oils (Kandelaki, 2013).

Forest as a filter. The lower layers of the atmosphere in our era, except carbon dioxide, are systematically dirty with harmful chemical and mechanical admixtures. The dust reduces the sun's ultraviolet radiation, air transparency, changes the level of ionization and etc. The person breathes 20 m^3 air overnight and if the air is dusty, it causes a lot of illness: poisoning, asthma, nasal mucosal atrophy, erosion, and etc. The forest is the strong filter of the air from dust. It is estimated that 1 ha forest during the year filters 50-70 tones of dust. In this regard, beech copse,

1 ha area of which filters about 68 tonnes of dust, oak copse – 56 t, pine copse – 36 t, spruce copse – 32 t are distinguished (Kandelaki, 2013).

Forest and technogenic pollution. Today, a large scale of technologization has caused the accumulation of harmful chemical substances in nature. The contamination of air, water, and soil with different substances reached the level that the living world, including the forests, is threatened in many regions of the world and the desiccation of the massive forests. Experiments have revealed plants that have the ability to remove pollution from air – to detoxification. Oleaster, Ash-tree, Acacia, Oak, Plane-tree, Maple, and Willow are distinguished with the durability towards harmful gases, but the Pine cannot stand them so that is why it is damaged.

Forest and noise. The great importance has the ability of a forest to absorb various kinds of noise, which depends on the composition, structure, frequency, mixed composition of the forest. Multi-story high-frequency copse is characterized by high noise absorption. For example, a high (0,8) radius of 80-100 m away from the source of noise (highway) is reduced to 30 decibels in the forest copse (Zhorzholiani, Gordadze, 2006).

Forest and yield. The influence of forests is huge for the cultivation of agricultural crops. In the case of a forest cover, the yield increases by 20-25 % (Armand, 1964). In this regard, the importance of forests is clearly indicated (Iashvili, 1976) in the data of the thesis: each hectare of forest strip protects the average 30-40 hectares of the field, from which the grain yield increases with 2-3 centner per hectares. From such protected areas can additionally be received 60-80 centner of crops and 8-10 years after the expenses incurred on the construction of forest stripes will be fully compensated. The impact of the forest stripes is particularly pronounced in the months leading up to drought. It is said: "The forest produces water, the water produces a harvest, and the harvest produces the life".

Water management and soil protection skills of the forest. Part of the atmospheric precipitation on the land surface is slept down in the soil that feeds the river all year round. The higher is the seepage in the river the less is the flood and erosion of the soil. Therefore, forests also perform watershed and protective functions. In this regard, the importance of forest is huge in mountainous areas where there are many other defensive features added to the multilateral purposes of the forest, described above. The forest in the mountains regulates the flow of rivers. According to statistical observations, the high frequency (> 0,8) mountain forest is the main factor that facilitates the transfer of atmospheric precipitations to the depths of the soil, thus regulating the liquid surface runoff, improving the water balance and protecting the river from the drying (Kharaishvili, 2001). The main thing is that forests protect the inhabited areas and populations, roads, fields and soils from dangerous disasters such as floods, mudflows, landslides, avalanches, erosion, etc.

World forest cover

Forest cover in the past. The oldest vegetable cover is found in Australia, which is 395 million years old. About 370 million years ago, vegetation was a form of a bush. Primary forests were low. The tallest was then 7.5 m trees of the primitive ferns. 345 million years ago, the Stone Age began, when dense, wide forests have been spread with 30 meters high trees and primitive plants with seeds. During the dry climate 280 million years ago, primitive coniferous were spread.

Sequoia trees and floral seed plants were spread over 225 million years ago. 135-65 million years ago, the ancestors of modern Rubber-trees, Magnolias, Oaks, Willows, and Maples were dominated. During the Paleogene period, the northern hemisphere forests were similar to modern tropical and moderate belts of forests. In the north, there was arctic type flora. In the Tertiary, the tropical flora spread near the equator.

Under the dry climate of the Neogene period, forests decreased and the herbaceous vegetation was spread. The dominant has become coniferous plants. The Quaternary period began 1.8 million years ago and is still going on. The peculiarity of this period is the alternation of the ice age and the warm glacial intervals. Because of this, the forest areas were reduced everywhere.

Forest cover in the epoch of civilization. Over the last 800 thousand years, humans have been able to get rid of around 50 % of the forest area. These areas are occupied by crops, pastures, settlements, and others. Several hundred years ago the forest areas were 7.2 billion hectares, covering 48 % of the land. At present, the area covered by vegetation is 12.2 billion

hectares 4,1 billion of which are covered with forests. Out of this, only 3,8 billion hectares are covered with wooden plants, while the rest holds bushes, marshes, and cliffs (Gulisashvili, Urushadze, 1973). 75 % of the lack of forest comes to the XX century during the global demographic explosion. 80 % of forests have been changed by cultural trees.

According to FAO estimates (Table 1) in 2015 forests were covering 4000 million ha of land or 31 % of its total area. 1488 million ha represents sparse forests, bushes and roadside trees that are not included in the forest category. In the world's forests, up to 30,000 species of trees and shrubs grow and thousands of animals and birds live. In the early twentieth century, the forest area was about 2 ha per capita. In 2015, per capita comes only 0.6 ha of forests. The total amount of live forest is 1509 billion tons, of which 25 % (377 billion tons) comes to roots, leaves, and fruits, and the remaining 1132 billion tons represents timber. The world's timber reserves in cubic meters are 360 billion m^3, that annual increment (productivity) is 3200 million m^3 (Kandelaki, 2013).

With regular inventory manufactured by FAO, forestry is decreasing with high rates: from 1990 to 2000 annual decrease was 16 million hectares, and in 2000-2010, 13 million hectares, in 2010-2015 the forest area decreased with16.5 mln, ha, or yearly forests were decreased by 3,3 mln ha. In 2016, the destroyed forest area was 29.7 million hectares.

Destroying the forest increases with geometric progress every year. The reason for this, besides the tree cutting, is that the forest area goes into land use categories (arable, towns, roads, etc.). Forests are also destroyed because of natural disasters (landslides, avalanches, etc.) after which the trees will not be restored. According to National Geographic, 80,000 m^2 green cover is damaged annually, causing not only material loss but also victims. For instance, fires resulted in 100,000 deaths in Indonesia. In 2017, about 100 people were killed in California, Portugal, and Spain because of fire. The fires were hugely destructive in California in November 2018 when more than 70 people were killed, 1400 people were lost, and up to 100 ha forest were burnt and about 80 thousand houses were destroyed. It is important to note that during the fires besides people, a lot of live beings, living in the woods die. In addition, fires cause excretion of excessive carbon in the atmosphere, which negatively affects water quality, forest structure, and biodiversity.

Table 1. Areas of the world forest and their dynamics

Region	Common area, mln ha	Forests of local species, mln ha	Forest, % from the total area	Dynamics of forest areas, mln ha		
				Change of forest area 2010 – 2015		Forest Plant Area
				Total	Annual	2015
World	3999	1277	31	- 17	- 3,0	290
Africa	624	135	23	- 14,2	- 2,4	16
Asia	593	117	19	- 3,4	0,8	129
Europe	1015	277	34	1,9	0,3	82
North and Central America	751	320	33	0,4	0	43
South America	842	400	49	- 10,1	- 2	15
Oceania	174	27	23	1,5	0,3	4

With the destruction of forest from the beginning of XXI century, forest cover will be increased by artificial forest (3,3 million hectares) or naturally restored forest (27 million ha a year). From 2000 to 2010, forest area in Asia grew by 2,2 million ha, mainly due to the intensive cultivation of forest in China. Forest areas in Europe have grown annually by 700 thousand ha.

Forest cover of Georgia

Forest layout and composition. Georgia is located southwest of the Caucasus, where climate and landscapes are diverse: wet sea subtropics to the west, steppe-continental to the south and constant snow and glaciers in the highlands of the north. Mountain slopes in Georgia were covered with frequent forests, where many varieties of fruits were produced, and many species of animals and birds lived there. That's why the Georgian peasants were kept, defended and fed by the forest. Therefore, in the past, the forest industry has been created here.

The forest cover starts from the seashore and extends to 2100-2200 m, and in some cases up to 2500 m. The total forest fund of Georgia amounted to 3007.6 thousand hectares in 2010, which is 43.2 % of the country's territory, but it is spread unequally: 58 % in west and 42 % in the east. 73 % of the forests are located at the height of 1000 m above 80 % of which are spread over the slopes of over 20°. Forests cover 2770 thousand ha of the state forest fund of Georgia, with 86 protected areas covering 600 thousand ha (Atlas, 2018).

In the forests of Georgia are presented coniferous and deciduous, evergreen and leafless trees, shrubs and giant sizes (up to 60 m and 2 m in diameter) trees, lianas, parasitic plants, mushrooms, fruits, berries, medicinal and technical raw material plants. There are many relic and endemic species of plants. Out of 400 types of woods, 61 are Georgian, and 43 Caucasus endemic species. In the forests, the coniferous palms are 16 %, the hardwood deciduous – 68 %, softwood leaflets – 7 % and other species 10 %. In the forests, the giant (70 m high and 2,5 m diameter) Caucasian Sochi, 50 m high and 2 m diameter east beech are growing which is considered as a phenomenon for the moderate climate zone. Chestnut, oak, maple, zelkova, walnut, box-tree and other types of tree timber are important (Gigauri, 2004).

In the valleys of high mountains and hard to reach gorges the untouched forests (566 thousand ha) are still remaining. According to World Bank experts, in Europe, we can hardly find a country where the natural landscapes of unique beauty are so exquisitely replaced by old cultural landscapes. It is noteworthy that the forests of Georgia, is the shelter of pre-ice age flora and fauna, or Relics, that connect us with ancient geologic epochs and their area will be a huge loss not only for Georgia but for all mankind.

Forest resource potential of Georgia. Forest resources are very important in terms of the average forest characteristics: age 98 years, height 22 m, diameter 36 cm, Bonita III, frequency 0.54. Timber supplies 1 176 m^3 per hectare, ripe and overripe copse 244 m^3, coniferous 288 m^3. Forest's total timber reserves are more than 535 million m^3. But, 66 % of reserves are in the unattainable zone, where the slope incline is greater than 25 °C (Atlas, 2012).

Along with timber, more than 150 species of plants in the forests give fruits, berries, walnuts, and other resources, using of which can make significant contributions to economic development. More than 110 species of plants are used in medicine. 2/3 out of 48 medicinal and 200 recreational resorts of Georgia are located or surrounded by forest. Their existence in the forest is justified by an aesthetic viewpoint. Therefore, ecotourism and resort-recreational farming are developed in Georgia. The potential of hunting tourism is also great in Georgian forests.

Results of Anthropogenic Impact on Forest

No one argues about the great importance of the green forest cover, but as for the proper attention to it, it is not yet visible. The reason for this is the enormous increase in demand for forest resources as a result of population growth and technical progress. That is why the extraction and use of forest resources in the world are increasing annually. Such attitude towards forest causes the destruction of it, especially in the tropical and coniferous (Taiga) areas. It is noteworthy that the use of forest areas has helped not only the plant but also the reduction of unique representatives of animals and birds.

Particularly negative consequences are to eliminate forests in mountainous areas where the river water regime changes, catastrophic floods and torrents increases, erosive and landslide phenomena develop, soil erosion, stone erosion, snow-glacier evolution, etc. occurs (Basilashvili, 2016b).

In addition, tree-plants are usually cut into forest copse as well as in the towns and planting strips, which, in addition to the lack of oxygen, resulting in the reduction of water keeping and catchment function, which causes drying of some springs, rivers, and lakes. The areas that aren't

covered by the forest began to become a desert that was accompanied by the reduction of food production (Basilashvili, 2015).

Thus, the reduced green cover in the world is no longer capable of the use and regulation of solar heating energy. This increases the amount of carbon dioxide in the atmosphere and the climate intensive warming. Consequently, ecological disasters are activated, leading to not only destruction but also a casualty of human and other living beings.

The accumulated excess quantities of harmful gases allotted by the anthropogenic impact will be returned to Earth in the atmosphere as acidic rains and radiation compounds. The sources of acidic rainfall (rain, snow, fog) are fuel and biomass burning, metallurgy, motor transport and etc. During the past 100 years, the acidity of precipitation has significantly increased.

Acid precipitations have a negative effect on ecosystems since such water sprays the spawns and phytoplankton, which therefore reduces the types of hydrophones in the reservoirs. Additionally, acidic precipitations cause corrosion of machine tools, buildings, and art samples, and plants are damaged that is expressed by their fall of leaves and the rotting of the roots. In the 90s of the XX Century, the area of damaged forests in Germany and the Netherlands was 50 %, Switzerland 35 %, Austria 30 %, Russia 600,000 ha (Qajaia, 2008).

Thus, the cosmic ecological function of forests is weakened. It is estimated that the cosmic environmental effect performed by the forest green cover 3-5 times exceeds the natural revenue received by the use of forest resources (Chagelishvili, Gvazava, 2015).

4. Conclusion

Forest is a complex ecosystem of trees, plants and living organisms, which is the guarantee of preservation of the cosmic-ecological – economic-sustainable environment of the biosphere on earth, along with water, air, and soil. The forest absorbs carbon dioxide and releases large amounts of oxygen, regulates microclimate (humidity, temperature, and wind). The forest is a powerful filter for cleaning air and water from harmful impurities, characterized by antimicrobial, ionization and sterilization properties. By doing so, it makes the environment healthy and friendly affects human and other living organisms. The forest also provides many types of food and medicinal products. Thus, the forest is a powerful factor in improving environmental sanitation-hygienic conditions with a broad spectrum of biodiversity, hence it is called vital "green lungs".

In addition, forests protect agriculture and populated areas from strong wind. Forest is also the main factor for regulating water resources. It improves groundwater quality, increases their debate. In the mountains, forests protect communities, roads, and fields from floods and mudflows, erosive processes, landslides, and avalanches. The forest promotes an increase in yield.

The forest has great importance in agricultural activities, as a source of raw timber, which is used in various industries. With the increase of population and farming, demand on the timber is increasing as well. Because of this, forests are cut and the forest area is reduced to 0.3 % annually in the world. Over the last decade, 25 thousand plants and more than a thousand species of animals have been completely lost. This caused not only the development of the technique but the wrong approach towards the forest. In the opinion of a certain part of society, nature is a gift that we must use to profit, even at the expense of its pollution. With such approaches, forests are dying.

In addition to plant cutting and disease, the forest is also damaged by fires, which have become more frequent in areas of different countries due to the negligence of adolescents in terms of climate warming. It is noteworthy that fire prevention is much cheaper than the elimination of their results, which is not fulfilled. Because of all this, the world's lowered green cover is no longer able to regulate the heat energy of the solar radiation. Because of this the number of oxygen decreases and the amount of carbon dioxide increases in the atmosphere and climate heats intensively.

According to expert conclusions, the global warming in the XXI century will continue and the temperature of the Earth may increase by 2-4 °C, which will seriously damage the ecosystems and most of the world's countries' economies. So technical progress, on the one hand, improves the conditions of human well-being, but on the other hand, threatens their future. The process of weakening of self-purification, self-regulation, and self-restoration is underway not only in a specific environment but also on a planetary scale.

Today, the protection of nature and the rational use of its resources is the primary problem of human significance. It is a necessary precondition for biosphere existence. Therefore, in all countries of the world, special attention should be paid to the protection and expansion of forest

cover. The population and administration in every settlement should take care of their forest cover and renovation. Useful plant varieties should be selected for renovation and, if necessary, their selective cuts should be carried out in the number of annual increments with the score to ensure that their natural recovery is restored. In agricultural fields, the protective lines of the forests should be planted, which will help to increase yield. In order to ensure rational use of forest resources, its manufacturing and processing processes must be undertaken with complex non-waste technologies.

In order to protect the biodiversity of forests in the perspective, the system of biomonitoring should be created and timely restoration of forests and their management should be carried out. It is necessary to develop long-term programs for the rational use of forest resources in order to improve forest productivity and its qualitative composition; Complex production of timber raw materials – introduction of techniques of progressive methods of processing and non-waste technologies and finally creating protected areas for the purpose of maintaining biological and landscape diversity.

It is also necessary to raise the knowledge of the broad parts of society on nature and its rational use. Proper bring up of the youth and their love of nature can save the biosphere and our natural environment from destroying and bring us economic prosperity.

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