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GLOBAL WARMING: FEATURES AND IMPACT ON LIFE IN MEGACITIES

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Abstract

The article considers one of the key factors affecting the climate - human activity. First of all, it is associated with emissions of carbon dioxide into the atmosphere, which creates a kind of greenhouse above the surface of the planet. The second factor is related to excess solar energy, which has accumulated over millions of years in oil, gas, coal, peat and other fossil hydrocarbons. Particular attention in the study is paid to those problems and methods of solution that can help or weaken global warming.

Keywords: greenhouse effect, ecology, climate, history, society.

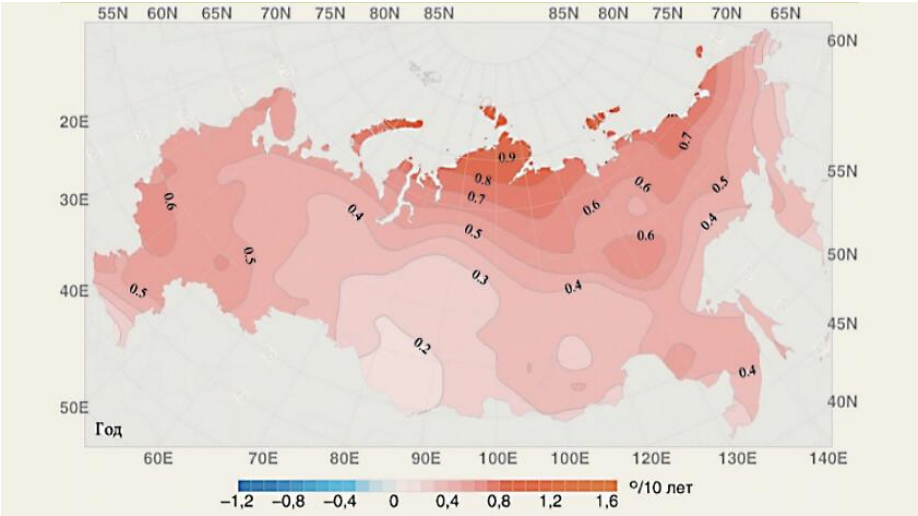
I. INTRODUCTION

The issue of global warming has been discussed since the last century. In theory, it will lead to the flooding of many coastal cities, to severe storms, heavy rainfall and long droughts, which will result in problems with agriculture. Also, mammals will migrate, and some species may become extinct in the process.

Scientists are still arguing whether warming has begun. Meanwhile, Russia is warming up. According to the Roshydrometcenter data from 2014, the average temperature in the European territory is rising faster than others. And this happens in all seasons except winter.

II. METHODOLOGY AND RESULTS

The article uses methods of statistical and geographical analysis. Correlation analysis was used to assess the spatial and temporal consistency of hydrometeorological parameters. Trends in the time series were identified using the least squares method. Identification of cyclic components in long-term series of air temperature, precipitation, river runoff was carried out using spectral and wavelet analysis.



The temperature rises most rapidly (0.052 °C/year) in the northern and European territories of Russia. This is followed by Eastern Siberia (0.050 °C/year), Central Siberia (0.043), Amur and Primorye (0.039), Baikal and Transbaikalia (0.032), Western Siberia (0.029 °C/year). Of the federal districts, the highest rates of temperature increase are in the Central, the lowest - in the Siberian (respectively 0.059 and 0.030 °C / year).

Despite the fact that the temperature indicators of water and air are growing, experts are in no hurry to call this global warming. “The fact of global warming has not yet been reliably established,” says Evgeny Zubko, associate professor at the School of Natural Sciences at Far Eastern Federal University. - Temperature change is the result of the simultaneous action of several processes. Some lead to warming, others to cold.

One of these processes is the decline in solar activity, which leads to a significant cooling. Sunspots will be thousands of times less than usual, this happens once every 300-400 years. This phenomenon is called minimum solar activity. According to scientists from Moscow State University. M.V. Lomonosov, the decline will continue from 2030 to 2040. Humanity has emitted too much carbon over the past couple of centuries by burning fossil fuels and has changed the earth's surface too much. The natural climate fluctuations observed earlier cannot be compared with what is happening now - neither in terms of the rate of temperature increase, nor in terms of the global effect. This is evidenced by the analysis of the isotopic composition of the emitted carbon, and numerous studies on climate modeling, which are unable to explain the observed effects without taking into account anthropogenic influence.

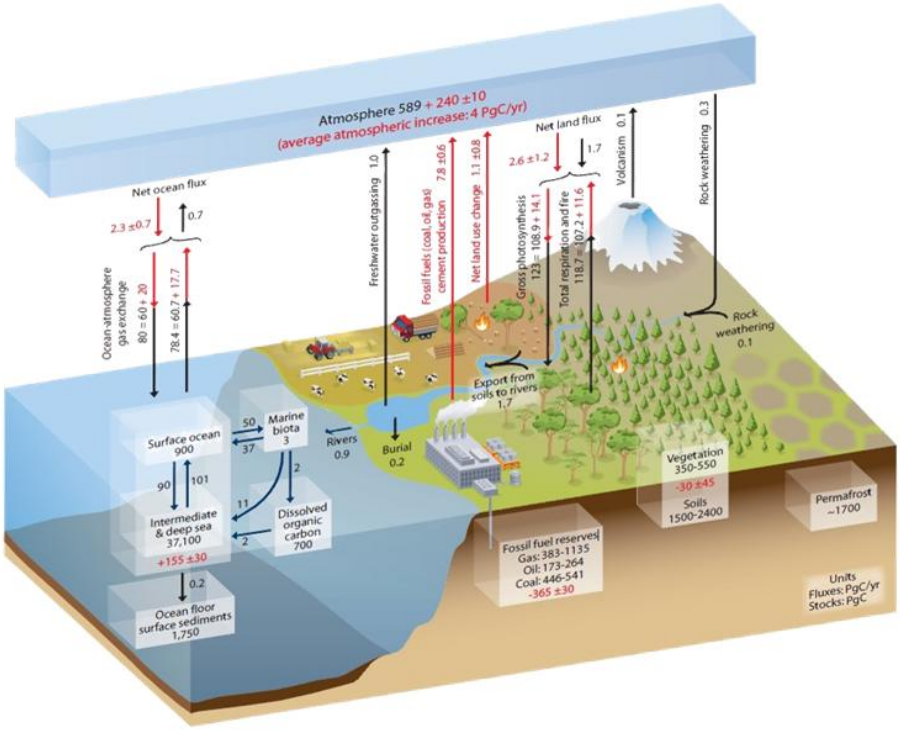
Over the past couple of centuries, humanity has released about 600 Gt (billion tons) of carbon (more than 2400 Gt CO2) into the atmosphere. Carbon is very slowly removed from the atmosphere, so it accumulates there. Therefore, CO2 plays a much more important role in warming than another greenhouse gas - water vapor, which condenses easily. Of the 600 Gt emitted, about 40% remained in the atmosphere, increasing the concentration of CO2 in it by 40% compared to pre-industrial levels to the highest levels in the last 800 thousand years. The remaining 30% of carbon is absorbed by the ocean, which leads to an increase in its acidity, and another 30% is absorbed by biomass, due to which its increase is observed. So the planet, of course, tries to digest our influence, but does not keep up with it.

Humans are still emitting 11 Gt of carbon per year, so rising temperatures are inevitable, with all the risks involved. But at the moment, the balance has changed and developing countries are “catching up” due to the rapid growth of the economy and the need to meet growing demand for energy, which economically viable measures to reduce emissions cannot keep up. In terms of current annual emissions, China (28%), the USA (15%), India (7.0%) are in the lead. Russia is again in fourth place with 4.6% of annual global emissions.

Within the framework of already several international agreements - the Kyoto Protocol, the Paris Agreement, etc., most countries are going to reduce emissions, and many are already doing it. For example, Europe under the Kyoto Protocol reduced emissions by more than 23% compared to 1990, while GDP grew by 60%. The United States did not join the Kyoto Protocol, but they passed the peak of emissions in 2000 and have since reduced them by 20%, returning to 1990 levels. The motivation to reduce emissions, by the way, is not limited to issues of global climate change. Sometimes a much more important argument is the banal concern for clean air in large cities and metropolitan areas, which is directly related to the health of hundreds of millions of people.

However, the total emissions on the planet due to developing countries continue to grow. Global CO2 emissions have risen 1.6 times since 1990. In China and India for the same time - more than 4 times.

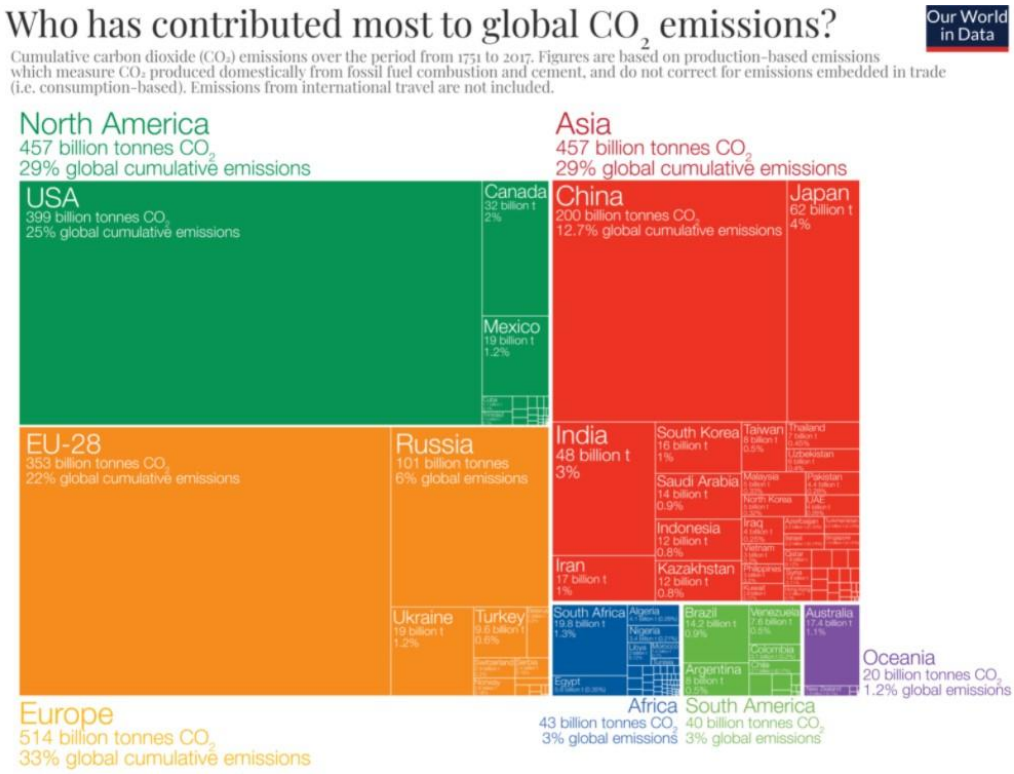
In addition to the commitments made under the Paris Agreement to reduce emissions, many countries have outlined plans for their complete reduction, to zero, i.e. to achieve carbon neutrality. The European Union, the US, Japan, South Korea and dozens of other countries are set to achieve carbon neutrality by 2050. China promises to peak emissions by 2030 and achieve carbon neutrality by 2060 at the latest. According to the UN, at the beginning of 2021, countries outlined plans for carbon neutrality, accounting for 70% of global GDP and responsible for 65% of all emissions.



Carbon balance (more precisely, imbalance) on the planet. IPCC AR5, 2014.

It is clear that the growth of population and industry on the planet was uneven. The Western world was industrialized earlier than today's developing countries, and therefore the bulk of carbon emissions came from them.

The picture below shows that by 2019, the historical cumulative volume of all emissions was formed by 25% of the United States, 22% by Europe, China accounts for 12.7%, Russia 6%.



Moreover, climate change is hitting the economy hard. One hurricane can reduce a country's annual GDP by 800 percent, as seen in the Caribbean. In Africa, the decline in annual GDP due to droughts and floods over the past 50 years has been as high as 20 percent. The World Bank estimates that it would take at least $50 trillion to achieve global carbon neutrality by mid-century.

The experts of the World Meteorological Organization (WMO) stated that the last eight years have become the warmest on record, this was facilitated by the ever-increasing concentration of greenhouse gases and accumulated heat. Climate changes are taking place all over the planet, but they concern Russia even more than other countries, and have their own characteristics. In fairness, it should be pointed out that the consequences of climate change are already being observed, just not with the same force as it will become noticeable by the middle, and even more so by the end of the century. The main difference from other countries is that the territory of Russia is heating up almost twice as fast as the land of the planet as a whole, Roshydromet stated. The Federal Service in its Third Assessment Report described the consequences for the country from climate change. The report has been prepared in accordance with the Russian National Adaptation Plan. It will form the basis for the implementation of the second phase of the implementation of the Plan, which will begin in 2023. First, the methodological base was prepared, and then the time for practical actions will come: we must figure out how to adapt to new conditions by 2030. The study considers two scenarios for combating climate catastrophe. The first implies that in 30-50 years the countries of the world will achieve the promised carbon neutrality, and global warming will stabilize at around 2.5 degrees Celsius relative to pre-industrial levels. Another version of the development of events allows for an increase in average world temperatures up to 4-5 degrees from the second half of the 19th century. Both options imply their consequences, they differ only in their intensity. The immediate danger lies elsewhere. “The point is not in these average degrees, but in the growth of dangerous meteorological phenomena: droughts, forest fires, storm winds, abnormal precipitation and floods. In the worst case, there could be 4-5 times more heat waves in Russia than now, and droughts in the south of the European part of the country will occur 2-3 times more often,” commented Alexei Kokorin, director of the climate program at the World Wildlife Fund.

The Center for Monitoring and Forecasting Emergency Situations of the Ministry of Emergency Situations "Antistikhia" is concerned that the degradation of permafrost zones caused by warming affects the flood situation in a significant part of Russia's territories. The risk group in the next decade, according to scientists, includes the territories of the Arkhangelsk and Murmansk regions, the Komi Republic, the Yamalo-Nenets district, the Krasnoyarsk Territory and Yakutia.

Permafrost occupies about 63% of the territory of Russia and its destruction threatens with great troubles for the country. French scientists predict that in the next 35 years, thawing permafrost in Siberia could lead to the frequent collapse of residential and industrial buildings, according to Le Figaro. According to the Ministry of Emergency Situations, the degradation of frozen soil primarily affects the stability of various structures - residential buildings, industrial facilities, pipelines, power lines, runways.

According to the Ministry of Emergency Situations, the southern border of permafrost has already shifted to the north by an average of 60 kilometers over the past decades, and in the next 25-30 years, the permafrost area in Russia may decrease by 10-18%. Domestic experts seriously fear that the ongoing thawing of permafrost is able to destabilize the transport, construction and energy infrastructure in the cold regions of Russia.

In addition, the thawing of permafrost zones releases huge amounts of methane, which, accumulating in the atmosphere, only enhances the greenhouse effect and accelerates the process of global warming.

III. CONCLUSION

Climate unites the world. It is common to all of us, and we still have a more humane way to stop its excessive warming. Nature itself tells us. It is necessary to cool the permafrost and soils of the north. Technically, this requires thinning out all low-grade boreal forests and regular mowing of ground vegetation so that bushes and weeds do not stick out above the snow in winter. That is, it is necessary to turn most of the dark forests into light savannahs. Due to this, the average annual temperature in this region will decrease by 3-5 C. By cooling the boreal zone, we will slow down the melting of glaciers. (The melting of the ice in Greenland today is the main cause of rising sea levels.) In addition, throughout the boreal zone, it is necessary to dig up all the snow several times every winter. Because of this, its thickness will decrease three times, it will become more dense and lose its thermal insulation properties. Due to this, the soils will cool down greatly in winter, and the average annual temperature of soils and permafrost will drop by another 3-4 C. Such hard work every year, for free, is done by reindeer, musk oxen, Yakut, Bashkir horses and Przhevalsky horses, bison, bison, elk, Kalmyk and Kazakh cows, several subspecies of red deer, roe deer, yaks, bighorn sheep and goats, antelopes, camels (they have already appeared in our Arctic).

Today, these animals are few and their impact on the climate is small. But their ancestors lived in the ecosystem of mammoth savannahs, in their zone there were hundreds of millions of animals. This ecosystem and its soils regulated the content of greenhouse gases in the atmosphere and the climate of the planet. Mathematical modeling has shown that even without the albedo effect, only by trampling snow, pasture ecosystems are able to stop permafrost melting in most of its range. Having cooled the soil a few degrees, we use the grass roots to pump hundreds of gigatonnes of carbon into them from the atmosphere. Forests burn regularly, and the carbon in the soil is safely hidden from fire. When there are many herbivores, they themselves maintain and expand their grass pastures, namely: they trample down mosses, thin out trees, and fertilize the soil with manure. This ecosystem itself creates the necessary conditions for itself and depends little on the climate. To cool the climate, we must revive the mammoth steppes and savannahs. These ecosystems are our genetic homeland. Our ancestors became modern people in them.

To implement this project, it is necessary in all countries where there is unused territory to create a network of parks in which animals of the mammoth steppe will be collected. Harvard scientists are already actively working on the creation of mammoth-elephant hybrids for this project. When animals form stable communities, these ecosystems can be spread throughout the territory.

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ГЛОБАЛЬНОЕ ПОТЕПЛЕНИЕ: ОСОБЕННОСТИ И ВЛИЯНИЕ НА ЖИЗНЬ В МЕГАПОЛИСАХ

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Аннотация

В статье рассматривается один из ключевых факторов, влияющих на климат, - деятельность человека. Прежде всего, это связано с выбросами углекислого газа в атмосферу, который создает своеобразный парник над поверхностью планеты. Второй фактор связан с избытком солнечной энергии, которая за миллионы лет накопилась в нефти, газе, угле, торфе и других ископаемых углеводородах. Особое внимание в исследовании уделяется тем проблемам и методам решения, которые могут помочь или ослабить глобальное потепление.

Ключевые слова: парниковый эффект, экология, климат, история, общество.

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