

Analysis

The Danger of Climate Change for Russia – Expected Losses and Recommendations

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Abstract

Global warming could significantly change the Russian climate, though it will affect different parts of the country in different ways. The impact will be especially strong on Russia's extensive permafrost and forests. Rising temperatures will also influence the economy and people's lifestyles. Among potential positive changes are reductions in the winter heating season and a longer growing season for Russian agriculture. But it is not clear that Russia will be able to take advantage of these benefits: the country will also face higher temperatures, shifting climate zones, more droughts, forest fires, and extreme weather phenomena. Many types of plants and animals will be threatened. Russia can help to limit the possible adverse consequences, but doing so will require skillful management and the introduction of a wide range of new policies.

Observed and Predicted Climate Changes

Recently published international reports and scientific articles make it possible to identify the consequences of climate change for various Russian regions and to address the three most important issues: the impact of climate change on energy, agriculture, and the permafrost zone, which occupies about 60 percent of the country's territory. On the basis of this information, it is possible to draw several macro-economic conclusions affecting Russia.

The increase in temperature, which is the main indicator of climate change, in the next 30 years for Russian territory in comparison with 2000, could reach 0.4-0.8 °C by 2010-2015 and exceed 1.5 °C by 2030. As in the past, the temperature increase will not be even across Russia's vast territory. Scientists predict different levels of increase in different parts of Russia: by 2015, temperature will likely rise 0.5 – 1.0 °C in Central Russia; 3-4 °C in Western Siberia; 2-3 °C in Yakutia; and 1-2 °C in the Far East. The winter temperature will increase on average 1 °C for most parts of Russia, but only 0.4 °C during the summer.

The amount of precipitation also will increase, especially during the cold period of the year. During the winter, it will rise 4-6 percent. The greatest increase will be in Eastern Siberia, 7-9 percent. As a result, in several regions ground water levels will rise, expanding the extent of the swamps. Because of hotter winter weather in many regions, by March, there will be 10-15 percent less snow accumulation, which could have a negative impact on the harvests. In the eastern parts of the country, from the Ural Mountains to the Far East, in contrast, there could be 2-4 percent more snow.

The change in the temperatures and precipitation amounts will also affect the flow of the rivers. In most

northern regions in the European part of the country, flows will increase 60-90 percent in the winter and 20-50 percent in the summer. The overall annual flow into the Arctic Ocean will increase by 10-20 percent each year, and as much as 150-200 percent during the winter. In all of the southern regions of the country, the river flows will drop by 10-20 percent.

The lack of stability in climatic conditions will grow worse as the frequency and intensity of extreme phenomena increases. Between 1990 and 2005, the occurrence of such phenomena doubled for Russia from 150 to 300, according to the Russian meteorology service, Rosgidromet. Between 2000 and 2015, the number is expected to double again, from 300 to 600. The occurrence of floods will rise, particularly in the spring time. In the southern regions, water flows during catastrophic spring floods could exceed the average annual maximum by 5-7 times. The danger of floods due to heavy downpours will also increase, especially in mountain foothill areas, where they are often accompanied by destructive torrents and landslides.

Impact on the Permafrost and Forests

Climate change will have several negative consequences for the permafrost, particularly along its southern border (see the article by Roland Götze in this issue for more details). Additionally, the warmer air temperatures will increase the number of droughts and heat waves, causing further melting in the permafrost and other harmful consequences.

These changes will have negative consequences for the forests. For example, there could be a replacement of conifers with deciduous trees since the latter are less affected by climate change. If the warming

of the northern taiga continues at the current rate, 0.4-0.5 °C a decade, the result will be an outbreak of epidemics in the forest and the spread of harmful parasites. Simultaneously, the steppe zone will shift to the north, and the forest-steppe will encroach on the forests. In the worst-case scenarios, the borders of these zones could shift north by 600-1,000 km. By less extreme predictions, the polar-tundra, forest tundra, and southern taiga-forest zones will shift north 200-350 km.

One likely consequence of climate change will be an increase in the number of forest fires. For much of the country, the fire watch season, with an increased danger of forest fires, will increase by 5-7 days.

The shifting of climatic zones and the destruction of the current ecological balance will have an impact on a wide variety of plants and animals. By the middle of the century, millions of geese, eider-ducks, stints, and other types of birds will lose up to 50 percent of their nesting areas, which could lead to a significant reduction in their populations. With an increase of 3-4 °C, the lemming population could drop 60 percent, which could disrupt the entire food chain of the tundra ecosystem, with a particular impact on the polar owls and foxes. The polar bear will also lose much of his living space.

Impact on the Economy and Life Styles

In the coming decades, the influence of climate change on the economy, living conditions and health of the Russian population will increase. In the majority of cases, this influence will be negative.

Among the positive impacts of climate change, however, most specialists list the reduction of the amount of time Russians will have to rely on heating. On average, they will need heaters 3-4 days a year less by 2015, and in the southern parts of Kamchatka, Sakhalin, and Primorsky Krai, the reduction will be as much as 5 days a year. By 2025, in most of Russia, the heating season will drop as much as 5 percent. In the southern parts of European Russia and in the north-east of the Far East, the length of the heating season will drop 10 percent. The resulting fuel savings will be 5-10 percent of current usage.

By the middle of the twenty-first century, the heating season in the central parts of Russia will be 5-10 percent shorter. In the southern regions of European Russia and in the northern regions of Siberia and the Far East, it will be 20 percent shorter. Since winter will be warmer, residents will use less fuel to maintain a comfortable temperature in their homes during the winter. Overall, by 2050, Russians could save as much as 10-20 percent of their current energy usage thanks to global warming.

Unfortunately, it is not clear if it will be possible to take advantage fully of this positive effect. The instability and variability of weather conditions during various parts of the year will generate negative short-term phenomena – unseasonable periods of anomalous heat and cold, frosts, strong winds, and snow storms. These occurrences will require additional use of energy.

Thanks to changes in the Earth's soil due to the melting of the permafrost, increasing ground water levels, and overall warming and the rising number of extreme phenomena, the expected life-span for buildings is expected to drop. By 2015, it will be necessary to refurbish them twice as often as today. The threat that housing and other buildings will be destroyed is growing. There will be particular new pressures on pipes and with a change in the flow of rivers and the amount of ice, there will also be more pressure on pipes under ground. This pressure will lead to more frequent accidents, with oil spills and gas leaks, especially in the northern parts of the country, where most pipes are located.

If air temperatures rise 3-4 °C by 2050, the amount of permafrost will drop 12-15 percent and its southern border will move north-east by 150-200 km and the extent of the summer melting season will lengthen by 20-30 percent. Monitoring of the consequences from these changes will have to increase. Current studies show that more than a quarter of houses in the northern cities of Yakutsk, Vorkuta, and Tiksi, built in the 1950s to 1970s, could become uninhabitable in the next 10-20 years, and in Vorkuta, for example, the number of such inhabitable buildings could be 80 percent.

Some believe that climate change will have positive effects on Russian agriculture. The extent of farmable land will increase 150 percent. The frost-free growing season will expand by 10-20 days a year. The quality of the soil in the Black Earth region will improve. The extent of land for growing warm-climate crops will increase. However, the extent of droughts will increase across Russia. Thus, in the south-western European part of Russia, including the Don basin and other key areas for growing wheat, in the first quarter of the twenty-first century, there may be a significant reduction in water supplies. A further increase in droughts combined with increased economic activity could lead to serious water problems and a reduction of the harvest. In some areas, including Siberia and the North Caucasus, the drop in the grain harvest due to droughts could be as much as 20 percent and become critical for the economies of these regions. Accordingly, they will come to rely more heavily on irrigation and have to seek out crops that need less water.

The amount of water supplied to the population and the economy will have to increase. It will grow by 12-14 percent by 2015. However, there will be an increase in the inequality of its distribution across the territory of the country. The most hard-hit areas will be those that are heavily populated, which today are experiencing a shortage of water.

Across the country, there will be more particularly hot summer days and the extent of these heat waves will increase 1.1 to 1.5 times by 2015. Thanks to rising temperatures in urban areas, Russia can expect 4,000 to 28,800 more deaths per year. In the lower Volga and other southern regions, with hotter and drier weather, there could be water shortages and increased threats of cholera, rodent-borne diseases, and a variety of other health issues.

Macroeconomic Conclusions and Recommendations

The above discussion focuses only on the direct dangers facing Russia in the coming decades. In the longer term, the negative consequences could be much worse, especially if there are no reductions in the global production of greenhouse gases, which would make it possible to hold the temperature increase to two degrees. Economic losses could reach 5 percent or more of the economy.

Some believe that “with skillful management of the processes, several countries could avoid losses.” This view holds that if climate change is held to 2 degrees, several northern countries, through skillful management, would actually see the size of their economies grow one percentage point faster.

But it is very important to understand here what “skillful” management means for Russia:

1. Timely adaptation of the economy to the new climatic conditions. State support for technologies of

the future and stimulation of the private sector to introduce these innovations.

2. Achieving maximal benefits from “natural” energy and economic advantages: the presence of extensive natural gas reserves, great expanses for growing exportable bio-fuels, hydro-electricity for energy-intensive production, and reserves of fresh water.
3. Imposing a strict international regime to reduce the emission of greenhouse gases, supporting the price of emissions at a high level (20 euros for one ton of carbon dioxide), and limiting global climate change by 2050 to 2 degrees. Unfortunately, if the temperature rises 3-4 degrees, Russia will face losses that will be much larger than the costs of implementing a timely transfer to new energy technologies.

The emission of greenhouse gases in Russia has grown since 2000. However, the growth between 2000 and 2004 was only one-sixth the increase in GDP. At this level of growth, with the introduction of measures to save energy and increase efficiency, Russia could begin reducing greenhouse gas production to 30 percent less than 1990 emissions by 2020.

Now the members of the United Nations are negotiating over international obligations for reducing greenhouse gas emissions after 2012. In the long-term, energy pricing factors for the development of a market for carbon emissions should be the main area of discussion. The market might not include some of the countries that emit the most emissions, but it could be “stronger” in terms of the obligations and higher prices for the emissions that it imposes on its members. Those conditions would allow Russia to realize its comparative advantages and make a contribution to preserving the planet’s climate.

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