Summary Report of the International Project on Global Environmental Change and its Threat to Food and Water Security in Russia

Draft 13 February 2003

Executive Summary

1. This study takes a fresh view of the question of climate impacts on Russian agriculture and water resources by examining possible changes in the frequency of droughts and by studying climate impacts on the level of oblast/administrative region. The analysis also uses a new integrated model "GLASS" which provides a consistent method for examining changes in agricultural production and water supply.

2. The climate scenarios used in this study (produced by two state-of-the art global models) support the finding of earlier modeling studies that global climate change will lead to a wetter and warmer climate over much of Russia. We have computed that this will mean larger crop yields in many areas that now have marginal crop yields, as well as an expansion of potential crop growing area.

3. Although climate will become more favorable over much of Russia, the potential for food production in most regions is limited by other factors such as poor soils, lack of infrastructure, or remoteness from agricultural markets. Furthermore, better conditions for crops could also mean better conditions for pests, diseases and weeds that could hinder crop growth. Therefore better climate conditions will not necessarily translate into significantly greater food production.

4. It is noteworthy that only 15 important food-export regions out of the 89 administrative regions of Russia provide the rest of the country with much of its basic food requirements, and therefore play a central role in Russian food security (we refer to them here as the "main crop export regions"). About 50 percent of Russian agricultural production today comes from these regions. While the climate scenarios show that it is becoming warmer here as in other parts of Russia, they also show a drying tendency – Some climate scenarios show a decrease in average summer precipitation in these regions of up to 50% between the climate normal (1961-90) period and the 2020s.

5. The warmer and drier climate in the main crop growing regions will threaten the potential productivity of important crops such as wheat, rye, potatoes, maize, and barley. We compute that average potential productivity of grain (wheat and rye) in these regions will drop by 8 to 29 percent in the 2020s, and by about 14 to 41 percent in the 2070s (relative to current averages). A decrease as large as 40 percent in the 2020s and 65 percent in the 2070s is possible for individual administrative regions. In Russia as a whole, the losses in the South are balanced out by gains elsewhere so that the computed total grain production ranges from a 9 percent loss to a 12 percent gain by the 2020s (relative to current averages, with the range due to different estimates of climate change). By the 2070s country-wide production drops by 5 to 12 percent

6. Under current climate conditions, "bad harvests" occur in the main crop growing regions roughly one to three years out of every decade (depending on the region). Under climate change some regions may experience a doubling of the frequency of bad years after the 2020s and even a tripling after the 2070s. This also means that there is a

higher chance that several parts of the main crop growing regions will experience poor harvests in the same year. Of importance, because much of Russia is dependent on the crops produced in these few regions, the effects of drought will be felt throughout the country. We estimate that there are now about 58 million people living in regions that experience one or more bad harvests each decade (either in their own region, or in the region from which they import food). This number may increase up to 77 million in the 2020s and 141 million in the 2070s under the A2 scenario. The possibility of more frequent bad harvests is a threat to Russia's food security that should be taken seriously.

7. Threats due to poor harvests are avoidable. There are many strategies available for adapting to climate change, such as expanding the crop-growing area, changing the types of crops, increasing technological inputs to agriculture (more fertilizer and management), importing more food, changing food consumption habits, and/or building-up a larger strategic food reserve. Each strategy has its own economic, social, and political costs.

8. The expected increase in precipitation over most of Russia (except in the Southwest) will tend to increase river runoff and groundwater recharge, and therefore make more water available to water users. This will in general reduce the pressure on water resources.

9. However, the situation is different in the crop-growing areas in the Southwest. Here, the combination of severe pressure on water resources because of large water withdrawals, together with more frequent low river flows, may cause a significant threat to the water security of the population living in these regions. It will also hinder the development of new irrigation projects.

10. Because of climate change, many river basins outside of the Southwest are likely to experience more frequent extremely *high* runoff events. The possibility of more frequent flooding could pose an additional threat to the security of the Russian population.

11. As with food security, there is a wide palette of strategies available for coping with threats to water security, ranging from increasing the storage of water to reducing the dependence of society on limited water supplies through various water conservation measures.

12. Also, it should not be overlooked that food and water security can be enhanced by not only coping and adapting to climate change, but also by reducing greenhouse gas emissions and thereby avoiding or at least reducing the intensity of expected climate change. For this reason Russia should ratify the Framework Convention on Climate Change and take a leadership role in international climate policy.

13. Taken together, our findings challenge the belief that climate change will mostly benefit Russian agriculture and water resources. Instead our results point out how extreme events such as droughts may become more frequent in key areas of Russia and threaten the food and water security of its people.

Project:
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