

# Russia: Environmental Issues\*

## Introduction

At nearly twice the size of the United States, and encompassing 11 time zones, Russia is by far the world's largest country. Russia also contains some of the world's most abundant natural resources. In addition to huge deposits of fossil fuels, Russia's *other* natural resources include boreal forests that comprise over 20% of the world's forest cover; a vast Arctic tundra; seemingly endless steppe lands (the 'taiga'); and Lake Baikal, the world's largest inland lake, which alone accounts for 20% of the world's freshwater. The Arctic, the Siberian forests, and Russia's Far East regions – home to geothermal resources, indigenous peoples and endangered wildlife – make up ecosystems that are important parts of the world's biological balance.

Russia inherited a legacy of environmental problems from the demise of the Soviet Union in 1991. The Soviet Union's emphasis on industrial production and blatant disregard for the environment has left Russia grappling with numerous environmental problems, from severe air pollution to radioactive contamination. In addition, the Soviets bequeathed to Russia an economy dependent on a military-industrial complex that is highly energy-intensive. Although numerous factories and heavy industry were shut down in the economic contraction that followed Russia's independence, the country still has an economy that is heavily reliant on extractive industries. Furthermore, Russia's ongoing transition to a market-based economy has meant that the government has been strongly disposed to promoting economic growth rather than environmental protection.

Yet, the environment is certainly a more pertinent issue in today's Russia than it was even 10 years ago. The country's Environmental Protection Law and the Law on Ecological Expert Review – both passed since Russia became independent – prohibit the financing or implementation of any project that could have a potentially harmful effect on the environment without an environmental impact assessment prepared by the project sponsor (the Environmental Protection Law does, how-

ever, permit a company to discharge "hazardous substances" after obtaining a permit and subject to the periodic payment of a fee based on the type and amount of the pollutant). On the other hand, Russia's economic problems make it more difficult to clean up or repair environmental damage, and Russian authorities, while professing to protect the environment, have not always been steadfast at enforcing compliance with environmental laws and regulations.

## Air Pollution

Air pollution is a significant problem in several major Russian cities, including Moscow and St. Petersburg, but also in some smaller cities, where industrial facilities are under less scrutiny for environmental compliance. Russia's air quality standards remain below US and European norms, although Russia's are becoming stricter as environmental awareness grows.

Single-source pollution is a major contributor to Russia's air pollution problems. Most power plants in Russia are aging and lack modern pollution control equipment, resulting in large amounts of toxic emissions and waste. Several major cities are threatened by these problems, as are delicate ecosystems such as Lake Baikal, the world's largest freshwater lake. Lake Baikal, a UNESCO World Heritage site, is home to approximately 1,500 indigenous species of flora and fauna, but the lake is threatened by runoff and air pollution from both a cellulose production plant on one of Baikal's major tributaries, and a coal-fired power plant on another.

Although Russia's massive industrial sector is responsible for much of the country's air pollution problems, non-point pollution – mainly in the form of motor vehicles – is playing an increasing role. Motor vehicles are subject to only minimal environmental regulations, and automobile emissions (i.e. lead, carbon monoxide and nitrogen oxides) in major cities are major sources of air pollution. Furthermore, private vehicle ownership is on the increase, mea-  
 ning that the trans-

\* Source: Energy Information Administration.

portation sector is not only seeing more automobile traffic, but also a rise in emissions and a corresponding increase in its share of the air pollution problem. Continued economic growth will add more vehicles to the road in Russia, but the ongoing replacement of older vehicles without catalytic converters with newer, more environmentally-sensitive models should help mitigate the air pollution problem, if only somewhat.

## Oil and Natural Gas Issues

The oil and gas extraction industries not only contribute to the air pollution problem in Russia, but are also significant sources of pollution in their own right. Environmental standards are weak, enforcement is poor, and small-scale accidents, pipeline leakage, and tanker spills have contaminated many areas of Russia. Oil pipelines in areas like the Tyumen region and Khanty-Mansiysk autonomous district leak significant volumes of oil. Serious health problems from oil pollution have been reported in the more contaminated areas. Oil spills in Siberian rivers near the city of Nizhnevartovsk, for example, have polluted drinking water and have been linked to increased cancer rates in several affected areas.

The most severe problems however, are in Chechnya, where an estimated 30 million barrels of oil have leaked into the ground from the region's black market ("pirate") oil industry. Since the collapse of the Soviet Union, thieves have tapped into the pipelines and have stolen large quantities of oil from reserves at refineries in Grozny. Also, according to Russian military ecologists, an estimated 15,000 "mini-refineries" have been built. These mini-refineries, which produce less petroleum products from the crude oil that they process than do normal refineries, typically dump their residual refining wastes with little regard for the environmental consequences, contaminating the ground and water supplies, rivers and fish.

There are now concerns that oil pollution from Chechnya could spread into the Caspian Sea, which itself is polluted from oil and gas waste, petrochemical industry discharges, and agricultural runoff. The World Bank already has designed and implemented regional programs for the other major seas that Russia borders, the Baltic and Black Seas, while providing environmental project loans amounting to several hundred million dollars for

cleaning up major oil spills and other environmental reclamation and improvement projects.

Heightened concerns about the environmental impacts of oil and gas development in Russia could hinder growth in these sectors. However, the importance of the hydrocarbon sector to Russia's economy could mean that new projects in eastern Siberia will go ahead regardless of the environmental consequences. Planned oil and natural gas pipelines from eastern Siberia to Asian markets are being challenged by environmental groups who claim that Russian officials are ignoring the protected status of the Siberian Plateau (Ukok Plateau), which covers parts of Mongolia, China, Russia and Kazakhstan. Road and pipeline projects will not only incur enormous costs in both construction and maintenance, but they will also have a severe impact on the environment, since they would be routed through highland marshes, tundra, permafrost areas, mountain passes and elevations of up to 1.6 miles. Due to Russia's poor record of protecting the environment, as well as the country's lenient standards and lax enforcement of existing regulations, environmental groups feel that the road and pipeline projects could endanger the Siberian Plateau.

However, a proposed oil pipeline from Angarsk in eastern Siberia to Daqing, China, was put on hold in 2003 after the Natural Resources Ministry ruled that the proposed route would violate Russia's environmental regulations (although a different oil pipeline from Angarsk to the Russian Pacific coast at Nakhodka has been proposed and may be built instead of the pipeline to China). In addition, the Natural Resources Ministry, which was created in 2000 through the combination of the functions of the former State Committee for Environmental Protection and the State Committee on Forestry, has been taking a more stringent approach in punishing oil companies for violating environmental terms of their field license agreements.

## Radioactivity and Nuclear Waste

Currently, there are 10 operating nuclear power plants with 30 reactors in Russia, some of which are first generation RBMK reactors similar to the ones that operated in Chernobyl in Ukraine. Although maintenance has improved in recent years and security against terrorist attacks has increased with the cooperation and financial assis-

tance of the United States, the Russian nuclear industry nevertheless continues to register numerous accidents and incidents. The European Union considers the RBMK reactor design to be fundamentally-flawed since it does not have a containment dome. Nevertheless, despite safety concerns, Russia is seeking to extend the operating life of several reactors that are nearing the end of their proscribed operating lifespan, as well as increase the country's nuclear capacity by building 40 new reactors by 2030.

Radioactive contamination has damaged several regions in Russia. Lake Karachay, adjacent to the Mayak complex in Chelyabinsk, is one example of the nuclear industry's careless past, and is now considered to be one of the most polluted spots on Earth. Lake Karachay has been reported to contain 120 million curies of radioactive waste, including seven times the amount of strontium-90 and cesium-137 that was released in the April 1986 explosion of the Unit 4 reactor at the Chernobyl nuclear power plant in Ukraine. The area surrounding the Mayak complex suffers from radioactive pollutants from over 50 years of plutonium production, processing and storage.

Nuclear waste from both civilian and military nuclear power installations has become a severe threat to Russia's environmental health. Adding to the problem, in 2001 the Russian parliament approved legislation to allow the storage of foreign nuclear waste on Russian soil. Atomic energy authorities claim that between 10,000 and 20,000 tons of high-level nuclear waste could be imported for storage and reprocessing over the next decade, with the storage plan projected to earn the country \$20 billion in foreign revenues over the ten-year period. The Russian government has said that it plans to use the revenues to clean up the environment. Neighboring states have expressed safety concerns regarding nuclear waste traveling close to their borders, while environmental groups have voiced their overall opposition to Russia's long-term storage plans.

## Energy Consumption

Between 1992 and 2001, Russia's energy consumption declined 19%, falling from 34.9 quadrillion Btu (quads) to 28.2 quads. The country's economic contraction in the early and mid-1990s, along with the transition from a centrally-planned system to a market-based one, resulted in lower

levels of energy consumption. Still, Russia's energy consumption in 2001 accounted for 7% of the world total, making the country the world's third largest energy consumer behind the United States (97.1 quads) and China (39.7 quads).

Russia's large industrial sector accounts for over 60% of the country's energy consumption, with the transportation and residential sectors each making up around one-fifth of the total, and the nascent commercial sector accounting for only a small percentage of overall consumption. Russia has the world's largest natural gas reserves, so it is not surprising that natural gas made up more than half (51.5%) of total energy consumption in 2001, followed by oil (19.1%) and coal (18.2%). Natural gas is the principal source of fuel for Russian power plants and domestic Russian natural gas prices are capped by the government below market rates, providing a disincentive to reduce consumption. Russia's long, cold winters require significant natural gas supplies for heating purposes as well, boosting natural gas and overall energy consumption.

Per capita energy consumption in Russia was 195.3 million Btu per person in 2001, the highest in Eastern Europe and the Commonwealth of Independent States (CIS). Among large energy-consuming countries, Russia's per capita energy consumption in 2001 was higher than Japan's (172.2) and Germany's (174.3), but lower than in the United States (341.8 million Btu/person).

## Carbon Dioxide Emissions

The collapse of the Soviet Union and Russia's ensuing economic contraction led to a dramatic decrease in Russian carbon dioxide (CO<sub>2</sub>) emissions in the early- and mid-1990s. The severe decline of industrial production in the country, highlighted by the closure of hundreds of factories, resulted in a huge drop in CO<sub>2</sub> emissions. In 1992, the first full year after the demise of the USSR, Russian carbon dioxide emissions stood at 573.5 million metric tons, but by 1997, the country's emissions had fallen to 394.7 million metric tons of carbon dioxide – a 31% decline in just five years' time.

Nevertheless, Russia still ranks among the highest CO<sub>2</sub>-emitting countries in the world. Furthermore, since bottoming out in the post-Soviet era in 1997, Russia's carbon dioxide emissions have been on the increase, buoyed by the rebound of

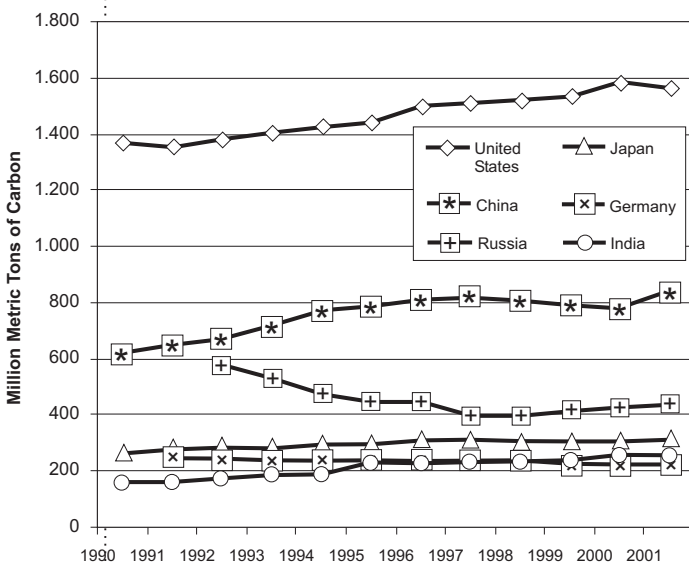
oil extraction and industrial production. In 2001, Russia's energy-related CO<sub>2</sub> emissions totaled 440.3 million metric tons, an 11.6% increase from 1997. In comparison, the United States emitted 1,565 million metric tons of carbon dioxide in 2001, while China emitted 832 million metric tons of CO<sub>2</sub>. The world's next highest carbon dioxide emitters – Japan (316 million metric tons), India (251 million metric tons), and Germany (223 million metric tons) – trailed far behind. Russia's per capita CO<sub>2</sub> emissions in 2001, at 3.05

metric tons per person, were higher than Germany (2.71 metric tons per person), Japan (2.48), China (0.65), and India (0.25), but still far lower than that of the United States (5.51).

Russia signed the United Nations Framework Convention on Climate Change on June 13, 1992, then ratified it on December 28, 1994. Russia signed the Kyoto Protocol, which mandates specific commitments by countries to reduce their emissions of greenhouse gases (GHG) by an average of 5.2% below 1990 levels by 2008 to 2012 period, on March 11, 1999. Under the terms of the climate change agreement, Russia is not required to cut its emissions; since it was classified as a country in transition, Russia merely must maintain its CO<sub>2</sub> and GHG emissions in the 2008-2012 timetable at the same level as 1990. Owing to the significant reduction in carbon dioxide emissions in the immediate post-Soviet era, Russia should have little problem in fulfilling its commitments under the Kyoto Protocol. Moreover, the country would stand to benefit from an emissions trading scheme under the Protocol, as Russia appears to have excess emissions credits – so-called 'hot air' – to sell to other countries.

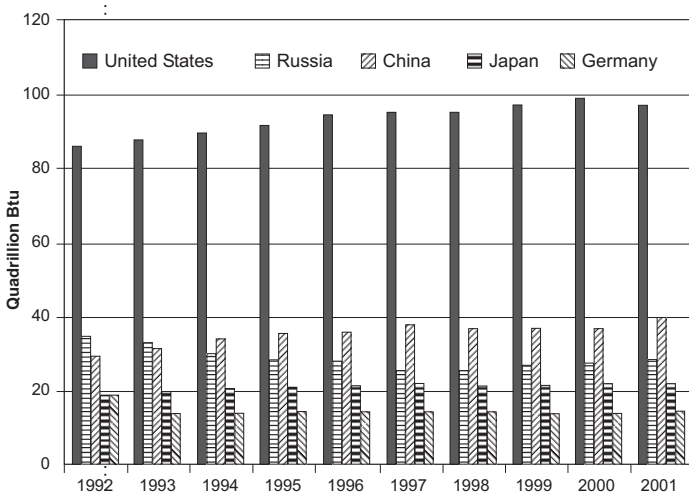
As of May 2004, Russia had not yet ratified the Kyoto Protocol, which has in large part kept the Protocol from coming into force. Although Kyoto has secured enough ratifying parties to bring it into effect, the treaty also requires countries accounting for 55% of emissions to sign on. The Russian government has been discussing possible ratification of the Kyoto Protocol, which

Fig.1. Carbon Dioxide Emissions, 1991-2001



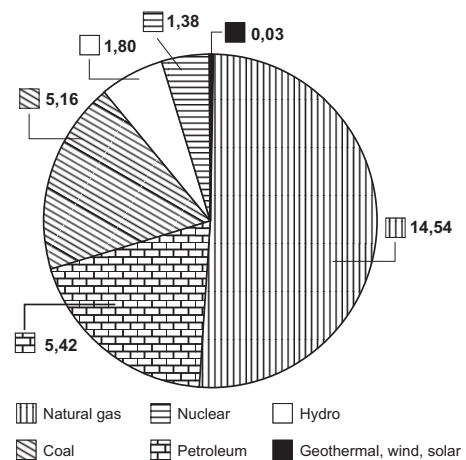
Note: Germany figures begin from 1991; Russia figures begin from 1992  
Source: EIA.

Fig.2. World's Top Five Energy Consumers, 1992-2001



Source: EIA.

Fig.3. Russia's Fuel Share of Energy Consumption, 2001 (Quadrillion Btu)



Source: EIA.

would allow the country to benefit from technology transfers and bring the international agreement into effect.

### Energy and Carbon Intensity

Russia's energy intensity (energy consumption per dollar of GDP) in Russia has decreased only slightly since the collapse of the Soviet Union. The strongest export sectors in the Russian economy tend to be energy-intensive, resource-intensive, and pollution-intensive industries, such as oil, natural gas, timber and metals. Russia also continues to use its abundance of energy resources inefficiently.

A somewhat more rational use of energy (leading to lower levels of consumption), as well as strong economic growth since 1999, means that Russia's energy intensity in 2001 stood at 76,852 Btu per \$1995 (purchasing power parity, PPP), down from a post-Soviet high of 85,681 Btu per \$1995 (PPP) in 1996 and lower than the 1992 level of 78,959 Btu per \$1995 (PPP). Although continued economic growth likely will bolster energy consumption, improved environmental awareness, energy efficiency improvements, and market-based price reforms consequently should lead to a lower energy intensity in Russia in the long-term.

Russia's carbon intensity (carbon emissions per dollar of GDP) stood at 1.2 metric tons of carbon per thousand \$1995 (PPP) in 2001. Although nuclear energy (which emits no carbon) plays a major role in the Russian energy balance, the country's carbon intensity remains high (relative to other industrialized nations) due to a continued reliance on coal and other fossil fuels. Nevertheless, Russia has become less carbon intensive since 1992, when its carbon intensity was 1.3 metric tons of carbon per thousand \$1995 (PPP). Russia's rapidly rising in GDP has more than offset the country's growth in carbon dioxide emissions since 1999, resulting in the decreased level of carbon intensity. However, the country's continued dependence on oil, natural gas, and coal production likely will mean that the country's carbon intensity level will remain relatively high.

### Renewable Energy

With the exception of hydropower, Russia's utilization of renewable energy sources remains low relative to its consumption of fossil fuels. Of the

country's 205.6 gigawatts (GW) in installed power-generating capacity, hydropower accounts for 21.7% of the total, with 44.7 GW of installed capacity. Russian hydropower plants generated 173.5 billion kilowatt-hours (Bkwh) of electricity in 2001, accounting for 20.5% of Russia's total power output (846.5 Bkwh) for the year.

Almost 75% of Russia's hydroelectric capacity is located at 11 power stations with more than 1,000 megawatts (MW) of capacity each, including the 6,400-MW Sayano-Shushenskaya facility in the Krasnoyarsk province, the country's largest power plant. Russia's Unified Energy Systems (UES) is building a number of mega-hydropower projects in the Far East as well, including the 3,000-MW Boguchansk in Krasnoyarsk and the 2,000-MW Bureya hydropower plant.

Russia's use of other renewable energy resources is quite small. The Kamchatka Peninsula in the Far East has rich geothermal resources, and an estimated 380 MW to 550 MW of potential geothermal capacity potentially could be exploited there. The first phase of the 200-MW Mutnovskaya geothermal power plant on the Kamchatka Peninsula was put into service in 2002, with the European Bank for Reconstruction and Development (EBRD) providing approximately \$100 million in financing for the project.

### Environmental Outlook

As Russia continues its transition to a full-fledged market economy, it faces great environmental challenges. Over the past 10 years, the disastrous effects of Soviet development and industrialization policies have come to light, raising awareness in Russia of the need to protect the environment and prevent future damage. While government policies that take the environment into account are an important first step, environmental improvements to date have been more a result of economic problems (i.e., the shutdown of many energy-intensive, highly-polluting heavy industrial plants) rather than policy successes per se.

Russia increasingly has come under international pressure, particularly from the European Union, to improve its environmental conditions. Neighboring countries are concerned with cross-border pollutants, nuclear waste, and water pollution. Buoyed by strong oil output, Russia's economy has grown steadily over the past five years, giving the government additional revenues and an in-



creased capacity to tackle some of its endemic environmental problems. Rather than funding environmental cleanup efforts, however, the Russian government has tended to direct the bulk of revenues from the oil windfall into other spending projects. As such, energy-related environmental problems could still put Russia's long-term economic growth at risk, especially with a decline in world oil prices.

Nevertheless, there is increasing hope that Russia will take a longer-term view of the negative environmental effects of energy projects, if not taking short-term action to clean up existing problems. Recent actions by the Natural Resources Ministry to enforce compliance with environmental terms of oil field license agreements is encouraging, and Russia's possible ratification of the Kyoto Protocol could bring the country significant benefits in the form of technology transfers and money (from the sale of Russia's excess CO<sub>2</sub> and GHG emission credits under the Protocol) to finance environmental improvements. In addition, economic restructuring and consolida-

tion should continue to reduce the industrial sector's energy consumption.

Still, there is much room for improvement in cleaning up Russia's environment and in ensuring that the country's unspoiled natural areas will remain so. Despite new environmental laws and regulations on the books, compliance is uneven, and enforcement by Russian authorities remains lax. As such, despite a growing environmental awareness, Russia's commitment to protecting its environment from future damage appears weak. Russian President Vladimir Putin has made his top goal to double Russia's GDP over the next 10 years, meaning that environmental protection likely will remain secondary to economic growth. The challenge for Russian policymakers will be to conduct environmental remediation activities, implement a sensible policy of natural resource management, and develop a sense of environmental stewardship in the face of pressures to generate enhanced economic growth for the country. □