Table 6.1
Protected areas in the Republic of Sakha

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<tr>
<th>Region and type and name</th>
<th>Size (ha)</th>
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<tbody>
<tr>
<td><strong>Lena River basin</strong></td>
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<tr>
<td><em>Zapovedniki</em></td>
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<tr>
<td>Delta Leny (Lena Delta)</td>
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<td>1996</td>
</tr>
<tr>
<td>Olyokminsky</td>
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<tr>
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<td>Sinyaya</td>
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<tr>
<td>Undyulyung</td>
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<tr>
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<tr>
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<td>Piika</td>
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<td><em>Zakazniki</em></td>
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<td>Eselyakh</td>
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<td>Sutoryokha</td>
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<td>Okhogino Lake</td>
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<td><strong>Anabar River basin</strong></td>
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<td><em>Resource reserve</em></td>
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<tr>
<td>Ternei-Tumus</td>
<td>1,112,000</td>
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*Note: Not all resource reserves are listed.*

*Source: Sakha Ministry of Environmental Protection, 2000.*
include Siberian crane, hooded crane, osprey (Pandion haliaetus), golden eagle (Aquila chrysaetos), and peregrine falcon (Falco peregrinus).

**Delta Leny.** This **zapovednik** protects the Lena Delta and has two major sections: Deltovy (1,300,000 ha) in the central part of the delta, and Sokol (133,000 ha) in the Kharaulakhsky Mountains. Channels, bays, and lakes cover over half of the area. The vegetation is primarily tundra, with thickets of willow along the riverbanks. There are about four hundred vascular plant species, including twenty rare species such as *Androsace gorodkovi*, *Corydalis gorodkovi*, and *Saxifraga lactea*. The thirty mammal species found here include reindeer, snow sheep, arctic fox (*Alopex lagopus*), and Kamchatka marmot (*Marmota kamchatica*). There are about seventy bird species, including Bewick’s swan and Ross’s gull. Important fish species include various whitefish (*Coregonus, Prosopium, Stenodus*) and sturgeon (*Acipenser sibiricus*). The **zapovednik** is working with World Wildlife Fund (wwf)–Russia to create a biosphere **zapovednik** to strengthen the protection of the entire Lena Delta. Activities of the **zapovednik** include monitoring the water quality of the Lena River and the Laptev Sea, tracking fish populations, studying effects of the diamond industry along the lower Lena, and studying soil composition of the New Siberian Islands.

**National nature parks (Ayan ayilgy).** Administered by the Sakha Ministry of Environmental Protection, nature parks are intended for nature conservation, and educational, scientific, cultural, and recreational use. The development of natural resources within the parks is allowed in some areas, provided it is compatible with the overriding purposes and the resource use is compatible with the principles of traditional nature use. Different types of zoning are allowed within the parks, including:

- Protected zones (Tyytylybat sirder)—all industrial, agricultural, and recreational use is prohibited.
- Sacred areas (Yityk sirder)—places of traditional spirituality and worship.
- Limited and active recreation zones.
- Traditional nature-use zones (Torut sirder).
- Enclosures and captive breeding zones for endangered wildlife.
- Protected historical or archeological zones.

The use of land, mineral, and biological resources is prohibited except in zones of traditional nature use. Each park has its own directorate. Regulations vary for each park and determine particular zoning and protection regimes.

**National resource reserves (Erkeyi sirder).** These reserves are created to protect land, water, mineral, and biological resources, as well as the land of indigenous peoples, and to allow for environmental education and ecotourism. There is a variety of different zoning regimes, including protected zones, sacred lands, licensed resource-use zones, seasonal protection of biological resources, and traditional nature use, determined by the regulations for each reserve. Interaction between landowners and users in each reserve is regulated by negotiated agreements. Tourism and recreation are regulated on a project-by-project basis and licensed.

**Protected landscapes (Uluu tuolbeler).** These areas preserve unique landscapes. Recreation, tourism, and other limited activities are allowed. To establish a protected landscape, it is not necessary to take over the land or to prohibit current users from enjoying the resources. Regulations for each landscape vary, and they determine the protection regime.

**Natural monuments (Ayilba meneler).** Standard regulations adopted by the republic determine the creation and protection of natural monuments.

**Reserved territories.** Reserved territories protect, sustain, and restore natural habitats. Limited traditional natural resource use is allowed, but no industrial mining development.
Biodiversity hotspots

1. Vilyui River basin (forest and wetland)

In western Sakha, the rolling hills and valleys of the Vilyui River basin are covered with larch and sparse forests. The northern part of the basin, where the terrain is more rugged, with elevations of up to 800 m, includes the Markoka, Markha, Tiung, and Tsuchkoyan Rivers. These rivers form the Vilyui basin, which includes tributaries of the Vilyui (Chona, Botuobuya, Ualkhan, Ochchugui-Botuobuya, and others) and the Lena (Nuya, Dzherba, Biryuk, Blue, and others). In January, the temperature drops to −55°C or −60°C; in July, temperatures reach 35°C. Winds from the west bring moisture, and the climate is somewhat milder than that of central Sakha.

Threats. Diamond mining, oil and gas prospecting, gold and coal mining, cattle grazing, and reindeer breeding are degrading this vast river basin, all of which lies on sensitive permafrost soil. Mining has had the most serious impact, as highly mineralized waters, containing harmful levels of strontium, bromine, lithium, and boron salts accumulated during the processing of kimberlite pipes, were stored in cesspools. Subsequent floods washed this waste into rivers, including the Vilyui and Markha. Water quality studies by scientists at the Institute of Applied Ecology of the North revealed that the thallium concentration in waters around diamond mining ventures was two to three times higher than acceptable. Geochemical studies have shown that there are unacceptable levels of thallium concentrations throughout most of the region. Water pollution by the diamond mining venture, Russian-Sakha Diamonds, continues.

Vilyuiskaya Hydroelectric Power Stations No. 1 and No. 2 were built to meet the energy demands of the diamond industry. The world’s first power station on permafrost was constructed without consideration of the ecological impact. Forests in the water reservoir were not logged, but flooded; an estimated 3 to 8 million cu. m remain underwater. This has caused tremendous phenol pollution, twenty-five times above acceptable levels in some years. Vilyuiskaya Hydroelectric Power Station No. 3 is under construction, and the reservoir basin will be cleared by burning the forests, which will pollute the river. In general, power station construction has damaged glacial, thermal, and hydrological regimes.

Since 1974, underground nuclear tests have been conducted in the region. Accidents occurred during two of the tests: Kristall (1.7 kilotons) and Kraton-3 (19 kilotons). Research revealed that their radioactive pollution totaled 239 isotopes and 2,400 isotopes, respectively. Until 1996, rocket fuselages launched from Baikonur in Kazakhstan regularly fell into the northern part of the region. This no longer takes place, but the environmental consequences of this practice remain. In 1997, an area between the Lena and Vilyui Rivers was designated as a location in which dumped fuselages would be acceptable. However, the public is demanding an end to this practice, because conditions of this agreement have been regularly violated.

Large oil and gas fields have been explored in the Lena and Vilyui lowlands. Some of these, such as the Masta-takhskoe, Urelyakhskoe, and Talakanskoo fields, are being commercially developed. Oil spills due to extraction and exploration have polluted large areas, and many wells have been abandoned. One of the most serious ecological problems in the region has been caused by the development of Talakanskoe oil field, for which a temporary oil pipeline from Talakan to Vitim was built along the bank of the Lena River. Built without the required environmental impact review, the pipeline is not capable of withstanding natural disasters. For example, it has no fire prevention system, the fire suppression lane parallel to the pipeline is not wide enough, and the pipeline area is filled with garbage.

Forest fires, logging, unsustainable agriculture, and uncontrolled hunting and fishing have created additional environmental problems. Since 1989, the Yakut Institute of Applied Ecology has monitored public health and environmental conditions in the Vilyui watershed. Results show that public health and the environment are in poor condition.

Existing protection measures. A portion of the Vilyui River basin remains pristine; the northern territories in particular are not well explored. In 1991, the Yakutia Council of Ministers declared the republic a nuclear-free zone. Yakutia banned all nuclear testing, the use and storage of nuclear weapons or radioactive waste, and the construction of nuclear power plants. Thanks to the Vilyui Committee and other nongovernmental organizations, in 1992, the Yakutia Supreme Soviet and government adopted a resolution calling for the ecological restoration of the Vilyui River. In 1997, the government created a committee to eliminate the effects of nuclear tests. This committee is developing projects to reclaim territories affected by the underground nuclear tests, Kraton-3 and Kristall. Although the republic launched a government program and identified sources of financial support, funds have not yet been provided in full.

Federal authorities are developing programs to improve public health and the state of the environment. The government is also developing a research program to study the environmental impact of fuselages from rockets that have crashed in the Nyurbinsky and Gorny Uluses.

Recommendations. The following actions should be taken:

- Reclaim areas disturbed by diamond mining and oil and gas development.
- Conduct an independent environmental impact review of oil and gas exploration and development.
- Conduct multidisciplinary research on the effects of fuselage refuse on the environment and on public health.
2. Tundra woodlands of Northern Sakha (forest and tundra)

**N. Sedelnik**—Forests growing on permafrost total an estimated 860 million ha, 480 million of which are inhabited. In many of these permafrost forests, industrial activity should be forbidden and, in other areas, only limited types of activity should be allowed. Logging on sensitive permafrost forests leads to collapsing thermokarsts, landslides, erosion, and other undesirable results. Once this happens, it is too late to restore the forests. There is a growing movement to conserve the northern forests, and in particular, the tundra woodlands. These woodlands form a 100-km broad belt, encompassing about 19,716,000 ha across the northern part of Sakha. They also dominate the northeastern part of the republic. These forests represent one of the most important virgin forest territories on Earth, and are one of the world’s few remaining regions that have not been disturbed since the Ice Age. Along this broad belt of tundra and taiga, logging should not take place, as these forests fulfill critical ecological functions that far outweigh the economic benefits gained from logging. Unfortunately, in addition to logging, diamond, gold, tin, and polymetal mining degrades these forests.

Rare animals and plants inhabit this fragile taiga and tundra ecosystem. Nesting birds include Siberian crane, gyrfalcon (*Falco rusticolus*), and Ross’s gull. Indigenous people herd reindeer in this region. The poorly studied territory remains largely pristine, and scientists fear that the damage to the ecosystem may have a multitude of unseen consequences, such as causing shifts in the global climate with melting of the permafrost. What is becoming well known about the region is its critical role in regulating the water flow of the northern rivers and circulation processing of the atmosphere.

**Threats.** Several mining companies operate within the region, including large tin and gold mining companies (Deputatsky and its subdivisions, the Kularzoloto gold mines). Diamond mines are being developed (Ebelyakh mine), and deposits of niobium have been discovered and partially prospected (Tomtor mine). In strip mining, large tracts of forest are destroyed, primarily in the river valleys, where the most productive forests grow. Little effort is made to recultivate the land after mining, and the areas often become lunar landscapes.

The forests have no real commercial export value, but local communities are logging them for firewood. In some cases, entire river valleys have been logged for this purpose. Due to rising transport costs, it has become much more difficult to bring in fuel supplies. Fires, although less frequent than in regions further south, also continue to destroy vast tracts of these fragile forests; some areas burned between 100 and 150 years ago still have not recovered. Similarly, many forests have not recovered after logging.

Research has focused primarily on the impact of industrial development in the Yano-Indigirka region, and particularly some of the impact from gold and tin mining companies. The Siberian white crane, which lives in this region, has also been studied to some degree.

**Existing protection measures.** To regulate use and conserve the forests of this subtundra zone, the Sakha government established a protected 100-km strip on January 1, 1960. Within this strip, some protected areas have been, or are in the process of being, created. It is unclear, however, what is actually prohibited in this protected strip.

**Recommendations.** The following actions should be taken:

- Conduct ecological monitoring to support conservation and rational use of these forests; databases compiled by the Sakha Forest Service could be a good starting point.
- Study the impact of industrial activity on this region and the globally important role played by these forests.
- Recultivate all lands destroyed by gold and tin mining.
- Do not develop new mines.
- Use alternative sources of fuel, other than timber, whenever possible.
3. Between the Lena and Amga Rivers  
(land and wetland)  

P. Timofeev, R. Desyatkin — The region, which covers 9.5 million ha, includes the Amgin, Megino-Kangalass, Ust-Aldan, and Churalchin regions. Part of the central Yakutsk Plain, the area has a continental climate and receives little precipitation (between 200 and 800 mm yearly), 80 percent of it in summer and fall. Forests cover 72 percent of the region, or 7.64 million ha. The total wood supply is estimated at 780 million cu. m. Larch covers 87.4 percent of the forested area, with pine forests making up 3.7 percent. Other forest types include primary birch forests (3.2 percent), and dwarf forests and birch shrub (5.6 percent). Within the ecologically diverse birch forests (local and different from secondary forests of birch and aspen) grow a community of steppe plants known as charans; these communities only grow between the Lena and Amga Rivers. Spruce, aspen, willow, and poplar forests are rare and more likely to be found on the left bank of the Aldan River. Twenty-eight percent of the area consists of alas — a unique complex of wetland, meadow, and forest-steppe vegetation.

**Threats.** Intensive agriculture and cattle grazing are degrading the region. Forests are being converted into pasture and plowed fields. In two decades, the soil will become so poor that it will be virtually unusable. Animal waste, mineral fertilizers, pesticides, and herbicides have polluted many lake and river systems. Also, because it is one of the most populated regions of Sakha, tourism has had a negative impact. Like most ecosystems in Sakha, this region is fragile, and even limited disturbances can cause a thermokarst phenomenon, which frequently leads to major changes in the landscape.

The alas are communal, ancestral places for the indigenous Yakut peoples and are considered sacred.

Other major causes of damage are forest fires and logging, either for firewood or for the construction of industrial facilities. Each year, at least 10,000 ha of forest are cut for firewood. Regeneration can take up to three hundred years. Construction for road and water transportation is fragmenting this taiga region, limiting the proper regulation of water levels. Some experts speculate that, as a result, there have been changes in the local climate, causing the region to become more prone to drought.

Due to forest destruction, water birds, squirrels, and weasels are becoming rare. Bears and deer have virtually disappeared. Ecologists fear that further damage will be disastrous for wildlife and will increase desertification in an already hard-hit region. There are already extensive areas of sandy, barren deserts in the central Lena basin.

**Recommendations.** The following actions should be taken:

- Strictly limit logging for firewood and construction to conserve the remaining pristine forests.
- Replant forests on a massive scale where the land is not regenerating itself naturally.

4. Between the Aldan and Uchur Rivers  
(arctic and forest)  

L. Shmatkova — The region between the Aldan and Uchur Rivers occupies a sizable area in the mountainous part of southern Sakha. Administered by the Neryungri and Aldan regional governments, these subalpine forested lands have altitudes ranging between 650 and 2,200 m. The forests are primarily larch and Scots pine, with some Siberian pine, spruce, and fir, interspersed with birch, aspen, and, less commonly, poplar. The area has a high biodiversity, particularly for Sakha, as this is where the Far Eastern and Eastern Siberian geographical regions meet. There are more than 850 species of vascular plants in the region, including a number of endemics and species that are listed in the Red Data Book (lycopodiums, orchids, dryases, saxifrages, thyme, and so on). There are several species of carnivores and ungulates in the area.

**Threats.** The indigenous Evenks, although few in number, inhabit this region. Some have settled in the village of Khatystyr; others remain nomadic. In the Aldan River valley, gold and coal mining, along with the construction of the industrial towns of Neryungri, Timpton, Berkakit, and Kanku and the construction of a railroad, has affected the ecosystems.

There are currently plans to construct the Uchur hydroelectric station and to mine the Elginsky coal deposit, which is located next to the protected Bolshoe Tokko Lake, considered by most ecologists to be one of the natural gems of Sakha. If this area is developed, the high biodiversity will suffer as some species will be exterminated, the unique and scenic lake will be affected, and widespread destruction of these permafrost lands can be expected.

**Existing protection measures.** Part of the region has been protected as a series of republic-level natural resource reserves, among them the Ulakan-Tary, Unga, Tynym, Dzhandag, Gonam, Bolshoe Tokko, Timpton Cascade, and Synnagino-Silinsky reserves.

**Recommendations.** The following actions should be taken:

- Recultivate areas already affected by gold and coal mining.
- Develop a comprehensive program, on a regional level, for sustainable development of the south Yakutsk industrial region, incorporating better technologies for developing the natural resources, guidelines on limiting development, and programs for restoring degraded forests.
- Conduct an environmental impact assessment of the planned Elginsky coal mining and Uchurskaya hydroelectric station projects.
5. Tuimaada Valley (forest and wetland)

I. SHURDUK, V. POPOV—Tuimaada Valley, which extends from north to south for 65 km and is 12-km across at its widest point, is situated on the left bank of the Lena River. North and south of the valley are the Kangalass and Tabagin cliffs, respectively, both of which are composed of Jurassic-era sandstone. To the west are mountains built up from ancient alluvial deposits. Covered entirely by permafrost, this land ranges in altitude from 25 to 50 m in the valleys and to 400 m in the mountains. The rich alluvial soil has allowed pine, larch, and spruce forests to grow here, creating a relatively rich region suitable for cultivation. The first inhabitants of this area herded livestock, and to do so, they cleared forests and set fires. Only about 9 percent of the forest cover remains today. Sakha’s capital, Yakutsk, is located here.

The rich valley has a diverse variety of ecosystems (forests, shrub, meadow, steppe, forest-steppe, and swamp) for such a small region. Some of the areas in need of protection include the Tulagino-Kildyam lake-steppe complex, with spruce groves that are unique to the Tuimaada Valley, the Zhataisk forest-steppe complex with combinations of charans and fragments of steppe and halophytic vegetation, the Vladimir and Shestakovka forest massifs, with bearberry (Arctostaphylos uva-ursi) and diverse pine, birch, whortleberry (Vaccinium myrtilli), and larch forests, and natural monuments, including Sergelyakh, Prigorodny, Kyutyur-Kal, and others.

Threats. The steppes, in particular, are in need of protection, as numerous rare species of flora grow here, many endemic to Sakha. Urban and industrial sprawl is the major cause of the destruction of these steppes. The ecosystems are fragile and unstable, and industrial growth and deforestation have rendered them incapable, in many cases, of protecting the permafrost ground from erosion and collapse. This degradation is becoming visible in the city of Yakutsk. As the valley was settled, the heat flow in the soil increased, and the protective frost-preserving ability of the land decreased.

Existing protection measures. The importance of measures for conserving the ecosystem of the valley has been supported by a resolution of the Sakha administration. This resolution points to the need for emergency measures to be taken to address the problem of permafrost melting in and around the city of Yakutsk.

Recommendations. The following actions should be taken:

- Regenerate the forests of Tuimaada Valley. This program should include the establishment of protective forest belts in the valleys of the Markhinka, Maganka, and Shestakovka Rivers, as well as around all lakes in the Tuimaada Valley. Forest vegetation around lakes regulates and filters outflow and may help desalinate the water.

### Economy

**Alexander Isaev, Josh Newell**

Industry, primarily power generation (25 percent) and mining for diamonds, gold, coal, and tin (70 percent), accounts for almost 65 percent of total economic output. Other main industries include production of building materials, food, light manufacturing, and logging.

- Sakha includes the following industrial centers:
  - Western and northwestern regions. Diamond industry, hydroelectric power generation, natural gas and oil industry.
  - Southwest. Timber.
  - Summer and southeast. Mining for gold, black coal, and other minerals, power generation, and building industry.
  - Central. Building industry, power generation, coal mining, and local industry.
  - Yana-Indigirka industrial region. Mining for gold, tin, and other minerals.

Sakha’s economy is in crisis. Sweeping political and economic changes first affected heavy industries, notably mining. In 1992, mining operations began to shut down because of a lack of domestic demand for the mineral resources. Only diamond and coal mining have remained viable, and they (along with subsidies from the federal government) are the main sources of revenue for the republic. The budget has shrunk steadily since 1996, and its overall debt continues to increase. Failure to pay wages and other problems in many industrial sectors, particularly the farming sector, have led to increased social tension and crime.

However, the fundamental structure of the Soviet-era state-operated economy remains, hampering further industrial development. Dependence on imports for basic raw materials, an increasing need for capital investment and credit, an underdeveloped and costly infrastructure, and the absence of an established internal market all combine to make the economy vulnerable to external influences. The resulting economic instability has led to increased unemployment and a decline in social services. Many mining and energy enterprises are bankrupt or on the brink of bankruptcy.

In converting to a market economy, the objectives of mining enterprises have fundamentally changed. Many were created to ensure that the former USSR was self-sufficient in all necessary mineral resources, in accordance with strategic industrial development plans for the Far North. Economic viability was often of secondary importance, and mining enterprises were supported by government credits and price controls. With the introduction of a market economy, many of these enterprises became unprofitable.

Environmental impact. Assaults on Sakha’s environment come from all sides, industry and development, agriculture, the economy, and government policies. These include:

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Diamond, coal, gold, and tin mining.
Oil and gas development.
Hydroelectric power, including the Vilyui and Kolyma power station chains and some under construction.
Forest fires.
Excessive agricultural use of ecologically fragile areas, especially in the area between the Lena and Amga Rivers and in the Tuimaada Valley.
Uneven growth of the infrastructure.
Intensive logging in the mid-Lena River region and the valleys of northern rivers.
Industrial development without adequate environmental safeguards.
Inadequate education about the ecology.
Continuing radiation from sites of underground atomic explosions, including the disastrous Kraton-3 and Kristall explosions.

Closing industrial enterprises does not always reduce pressure on the environment. Although many mining operations have closed down, huge devastated territories remain, and the possibility that these areas will be reclaimed is slight. Similarly, even though annual timber production has shrunk from 5 million cu. m to less than 2 million cu. m, this has not necessarily reduced the stress on forests. With logging companies facing financial difficulties, and operating and transport costs rising, the distance over which timber is transported has diminished drastically, increasing logging pressure on forests near populated areas and transport arteries. Logging has intensified in accessible areas that, under optimal conditions, might not be considered appropriate because the trees are small or are growing along riverbanks.

Sakha’s mining industry has damaged the structure and function of both marine and terrestrial ecosystems, decreasing their productivity and impoverishing their biological diversity. Of particular concern are (1) the Vilyui River basin, with its extensive diamond and gas extraction industry, (2) the Yana-Indigirka industrial region, where there is intensive gold and tin mining, and (3) southern Sakha, which is a center for coal, gold, and other minerals. Inefficient utilization of agricultural lands has led to a decline in the lichen that naturally grows on northern tundra and destroyed the many ala lake ecosystems in central Sakha. Because Sakha occupies a significant portion of northeastern Russia and has a great variety of ecosystems including arctic deserts, tundra, taiga, mountain systems, steppes, river basins, and numerous lakes, the territory is of vital significance for the ecological balance in Eurasia.

Sources of radioactive pollution in Sakha are numerous and varied. These include underground nuclear explosions, the dumping of radioactive waste generated during exploratory drilling and mining, and airborne radionuclides from nuclear weapons testing in nearby regions during the 1950s. In addition, so-called peaceful underground nuclear explosions were set off in Sakha, two of which (Kraton-3 and Kristall) released radionuclides into the atmosphere and onto the ground. The Sakha Ministry of Environmental Protection classified these incidents as environmental disasters.

Rockets also pass over Sakha and often release toxic fuel. Waste dumping from other regions occurs continually, notably from the Norilsk mining complex.

Although there are hundreds of thousands of rivers and lakes in Sakha, some regions (primarily the area between the Lena and Amga Rivers) lack water. The quality of river water has not deteriorated over the past few years, but many rivers remain polluted. Concentrations of phenols, oil byproducts, copper, and zinc exceeded permissible levels in many instances. Water is being redirected from the Lena River to the overexploited agricultural region between the Lena and Amga Rivers.

The Kolymskaya Hydroelectric Power Station, on the border of Magadan and Sakha, will affect the Kolyma River, which begins in Magadan Oblast and runs through Sakha to the Arctic Sea. It will destroy rivers, wetlands, and rich fisheries. The Chernyshevskaya Hydroelectric Power Station (Viluisky Ulus) was built in the 1960s to provide energy for the huge diamond mining center near Mirny, and it is the first station of its kind to have been built on permafrost. Vast areas of taiga forest were flooded by the reservoir; this is now a major problem, as rotting trees in the reservoir and...
massive waste from nearby diamond mines are poisoning the water. Since 1987, the release of harmful substances into the atmosphere has been declining. However, with the continuing economic crisis, this has changed recently. The figures for chemical releases in 1996 were almost 9,000 tons higher than in 1995. Recycling of waste is insignificant. Among the most critical unsolved problems are the disposal, utilisation, and detoxification of hazardous wastes, of which, by the most conservative estimates, some 90,000 tons have accumulated.

**Timber**
The timber industry logs in the Lensky and Olyokminsky Uluses, primarily near the Lena River and the settlements alongside it. Forest composition, and structure in the permafrost zone in general, is relatively simple, and productivity alongside it. Forest composition, and structure in the permafrost zone in general, is relatively simple, and productivity increases toward the south. The forests of the southwest Prilensky Ulus, the most productive in the republic, form the nucleus of Sakha’s great central taiga region. Due to poor infrastructure, logging is localized near settled regions. Intact forests are shrinking due to logging and frequent, unnatural forest fires. Despite their relatively moderate scale, logging operations have a great impact on the environment owing to destructive clear-cutting and heavy logging near settlements and transportation routes. To obtain 100 cu. m of acceptable quality construction lumber, it is often necessary to clear-cut up to 5 or 6 ha of forest. In some areas, such as the central reaches of the Aldan and Lena Rivers, forests have been badly degraded due to logging. Logging and fires also disrupt fragile transition zones between forest and tundra, which often do not regenerate themselves well.

**Hunting and fishing**
Hunting is another major industry. More than 500,000 muskrat (*Ondatra zibethica*) pelts, 250,000 Eurasian squirrel (*Sciurus vulgaris*) pelts, some 50,000 sable and ermine (*Mustela erminea*) pelts, more than 10,000 arctic fox pelts, and 500,000 variable hare (*Lepus timidus*) pelts are obtained yearly. Sakha is Russia’s largest producer of pelts. Forty thousand wild reindeer are killed annually. Fishing annually yields about 8,000 tons, mainly in the lower reaches of the Lena, Yana, Indigirka, and Kolyma Rivers.

**Agriculture**
Since 1997, with dissolution of the sovkhoz system, 49 state enterprises, 166 collective limited partnerships, 4 horse-breeding farms, 5 agricultural farms, and 16 privately owned stockholding companies have sprung up in its place. There are also 2 poultry companies, 130 family-owned communal enterprises, and 36,769 family-operated farms. The overall structure of agricultural production is changing. However, despite farm production reform and the transfer to a market economy, productivity has declined. Field-grown fodder is in decline, and the area under grain has decreased almost fourfold. Animal husbandry, which represents more than 85 percent of the total agricultural production, includes reindeer breeding and raising fur animals in cages. In central Sakha, cattle and horse breeding is often combined with the production of grain, potatoes, and vegetables. Pig and poultry farming is also under way.

**Mining**
There are more than nine hundred potential mining sites in Sakha. Open-pit mining, the most common method, has degraded ecosystems in southern and eastern Sakha. Some vegetation has grown back on these degraded lands, but most remain barren.
### Key players in the diamond industry

#### Almazy Rossii-Sakha (Alrosa)
Alrosa mines all of Sakha’s diamonds. Founded in 1992, Alrosa is owned by the Sakha and Russian governments (32 percent each), company employees (23 percent), administrations of Sakha ulus in which the company carries out its activities (8 percent), and the Fund for the Social Guarantees of Servicemen under the Russian government (5 percent). The company employs about thirty-seven thousand people, has interests in Angola and Namibia, and has offices in London, New York, Antwerp, and Moscow. In 2000, Alrosa sold about U.S.$725 million worth of diamonds to De Beers, with the other $725 million sold to Russian manufacturers and the Russian government.27

Between 2001 and 2005, Alrosa plans to invest U.S.$2.8 billion in production development, with $2.2 billion coming from its own funds and $600 million from loans, including $90 million from the U.S. Export-Import (Ex-Im) Bank and $80 million from the South African Export Agency.28 Funds from the two banks will go toward construction of the Nyurbinsky Ore Mining and Processing facility.29

#### Roskomdragmet
This powerful committee determines industry policies and oversees all Russian firms that extract and process diamonds. The committee also controls all of Russia’s gold, diamond, and precious metal reserves.

#### De Beers Corporation
De Beers, the largest diamond mining company in the world, has been losing world market share, partly because large quantities of Russian diamonds are flooding the international market. In 2000, the corporation announced that it would focus on marketing jewelry and high-quality diamonds rather than trying to act as the sole supplier of uncut diamonds. But De Beers is by no means relinquishing the latter role, as the corporation’s Diamond Trading Company will continue to be the world’s principal supplier of uncut diamonds.

#### Sakha Government
The government is pushing to increase production in an attempt to secure more revenue for the republic, as well as trying to develop a polishing and cutting industry to generate value-added products. In 1991, the government established the joint-stock company Tuimaada Diamond (Alrosa controls most of its stock) to develop a processing industry. The Sakha cutting industry has thirty-three enterprises, sixteen of which are owned by Tuimaada Diamond. They can produce up to 100,000 carats of cut diamonds, which are worth approximately U.S.$150 million annually.30 However, the processing industry in Sakha, thus far, has languished.

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**Diamonds.** Sakha produces 98 percent of the Russian Federation’s diamonds and is the second-largest diamond producer in the world (26 percent of world production) after Botswana and South Africa combined. Experts estimate that Sakha has the resources to increase its overall share of world production to 30 and 35 percent. Annual production ranges between 18 and 30 million carats. Russian diamonds account for between 20 and 26 percent of De Beers Corporation’s worldwide sales. The industry is based in Mirninsky Ulus, in the western Sakha. Diamonds are extracted from both bedrock veins and placers, and 95 percent of them come from five mines: Udachnaya, Aikhal, Mir, Internatsionalny, and Sytykansk. The remaining 5 percent come from alluvial deposits, usually placer deposits, but there are some alluvial-talus and talus deposits. The Udachnaya mining complex produces four-fifths of Sakha’s diamonds, and the No. 12 Concentration Factory is the world’s largest diamond mine.31 Two diamond pipes, Botuobuya and Nyurbin, were recently discovered in Nyurbinsky Ulus. Sakha has modern diamond mining technology with a well-developed infra-

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cow’s control during the Soviet period, but since perestroika, Sakha has managed to gain control over 20 percent of all mined diamonds. Moscow retains control over the other 80 percent. At the end of 2001, the Russian government and De Beers Corporation signed a five-year trade agreement regarding the sale of Sakha’s diamonds. As stipulated in the agreement, De Beers committed to buy up to U.S.$800 million worth of diamonds per year from Russia. Russia is free to use the other diamonds it produces as it sees fit. Twenty percent of the mined diamonds produced can remain in the republic, provided they are processed. The Alrosa Corporation controls the diamond industry on the Russian side. De Beers has been purchasing diamonds from Russia since the 1950s.

Unlike other sectors of the mining industry in Sakha, the diamond industry is fairly robust. In addition to 20 percent of the mined diamonds, Sakha has started to receive 45 percent of revenue from diamond sales. Alrosa almost completely subsidizes some farming areas. It may start mining promising sites in southern Sakha and will fund geologists to continue exploration of these deposits.

Both Moscow and the Sakha government used to channel almost all diamond exports through the De Beers Corporation. However, De Beers’s new strategy to market jewelry rather than concentrate on purchasing uncut diamonds is having a major impact on the Russian diamond industry; the industry is greatly expanding its own manufacturing capabilities.

History. Locals found diamonds in northwestern Sakha in the 1920s. On August 7, 1949, a team of geologists found diamond deposits on the Vilyui River, and by 1954, dozens of diamond deposits had been found and prospected in this river basin. Other alluvial deposits were found along tributaries of the Lena River and in the Anabar River basin. In late 1954, geologists found the first kimberlite pipe, the Zarnitsa (Distant Lightning) deposit near the Daldyn River, a tributary of the Vilyui River. On June 13, 1955, the Mir pipe was found in the upper reaches of Irkutskh River, a tributary of the Lesser Botuobuya River. Later that year, a huge pipe, the Udachny (The Lucky One) was discovered. During 1955 and 1956, the Vilyui basin yielded numerous other kimberlite pipes, which provide the material basis for the industry today. In 1957, the predecessor to Alrosa, Yakutalmaz trust, was created, and a settlement (present-day Mirny) sprang up near the Mir pipe. In 1959, the Rudnik mine was created and included a pit, two enrichment plants, a laboratory, and a mine with an experimental enrichment facility. Construction of Plant No. 3 began in 1962 and was completed in 1966. In 1960, the Aykhal diamond pipe was discovered, Plant No. 8 was built, and operation of the second diamond site in western Sakha began. The third, and now largest, center of the diamond mining industry was the town of Udachny, near the Udachny pipe.

Environmental and social impacts. The diamond industry alone is not responsible for the large-scale environmental destruction in the Vilyui River basin. Pollution from jettisoned rocket boosters, underground nuclear explosions, hydroelectric development on the Vilyui River, airborne pollution from the Norilsky complex, radioactive fallout from military...
nuclear testing on Novaya Zemlya Island to the north, and small-scale agriculture all contribute. For the past thirty years, the industry has, however, played the leading role in disrupting the basin’s ecological balance. It has polluted the environment, retarded the ability of the ecosystem to regenerate itself naturally, and damaged the health of all living things in the region. Mining inevitably leads to localized pollution and disruption of natural landscapes and ecosystems, particularly when precautions are not taken. Diamond mining, which processes a massive amount of raw material to obtain the final product, accumulates waste at both the mining and the enrichment stages. One-sixth of the nonagricultural area of Sakha is concentrated in the Mirninsky Ulus, and the diamond industry makes up one-sixth of this area.

During mining, rocks with harmful chemical components are brought to the surface and stored in waste dumps, which contain geochemical anomalies and leak hydrocarbon ions, calcium ions, and trace elements into the environment. Highly mineralized drainage water from open pits often leaks into the river systems. In the past, diamond mining factories have used contaminating reagents and toxic substances during the enrichment stage and these tailings were dumped into the environment.

In 1994, concerns about these environmental and social effects were voiced at the Vilyui region’s first environmental seminar. Soon afterward, the Community Ecology Center of Sakha and the Vilyui Committee, which was established shortly after the seminar, organized the first public, non-governmental expeditions to investigate regions affected. Consultation and discussions between land users, citizens, and specialists were organized. The concerns expressed in these meetings resonated strongly with the general public, and attracted the attention of administrative, governmental, and scientific agencies, organizations, and institutes. In an attempt to find solutions to pollution problems, a comprehensive scientific analysis and evaluation of the ecological situation in the Vilyui River basin was conducted. Specialists from the Yakut Science Center of the Russian Academy of Sciences (RAS), the Academy of Sciences of Sakha, the Yakut State University, and others conducted research from 1989 to 1994 to obtain objective and credible data about the significant changes that had occurred in the environment and in the situation of those living in the basin. The findings of this study bear out concerns for the environment.

Effects on the water resources and river ecosystems. Suspicions about river pollution turned out to be well founded. The primary source of pollution was the dumping of industrial and open-pit mining effluents into the rivers. Even though the industry ceased dumping waste into rivers by the early 1990s, high concentrations of harmful chemicals remain in the river bottoms of the Markha, Botuobuya, and Vilyui Rivers, as well as their tributaries. This residue is not only a store of toxins and carcinogens, but may also contaminate the water. A state of environmental emergency was declared in Mirninsky Ulus due to large concentrations of hazardous chemicals, where substances exceeded the maximum permissible level by five to ten times. Waste dumping by enrichment plants drastically reduced concentrations of zooplankton in some rivers. Reserves of commercially valuable fish have also sharply declined. In sum, the ecosystems of the Vilyui River and its tributaries (Irelyakh, Botuobuya, Daldvn, and Markha Rivers) were declared environmental disaster zones. These rivers have always been the only source of potable water for residents. Pollution of this water supply has had a severe impact on the health of the local human population.

Medical and biological studies revealed that incidents of malignant tumors and developmental anomalies were the highest when by-products from submerged, decayed forests and highly mineralized wastewater had entered the Vilyui River watershed. Studies have shown that mortality rates in this region are significantly higher than in Sakha as a whole. Fifty percent of those examined had a weakened immune system. Studies have also shown that those living close to diamond mining plants and the Vilyuisky Reservoir demonstrate higher rates of immunological homeostasis. Evidence of contamination-induced damage to the genetic structure of those living near the Vilyui River basin indicates that future generations will also be harmed.

Ecosystems of the Vilyui River basin are quite varied, with differing capabilities for regeneration and levels of biodiversity. Before industrialization, the basin supported 882 species of flora, including 662 flowering species, in 69 families. Since then, indigenous plant life has been drastically affected. Studies of rodents and fur-bearing species show that mammals have also been strongly affected. About 11,000 ha of land in the region have been declared an environmental disaster zone. Northern taiga and highland forests in the Aikhal–Udachny industrial center have been harmed, and the taiga forests in the Mirninsky industrial zone, which includes the Vilyuisky Reservoir, have been destroyed. Burnt forests that fail to develop new growth after ten years are declared environmental disaster areas. Heavy metal contamination caused by diamond mining is present in Mirninsky Ulus as well as the Vilyui and Markha Rivers and their tributaries.

Over the past decade, Alrosa has devoted between 8 and 10 percent of its total capital investment to environmental protection and cleanup. Many projects now planned by Yakutniproalmaz, the planning arm of Alrosa, abide by federal and republic-level environmental legislation. All projects must include an environmental impact assessment, which is coordinated with the Sakha Ministry of Environmental Protection. Every large industrial plant has environmental controls and industrial sanitation laboratories. Approval by the Ministry of Environmental Protection is required before a plant can begin operating. The financial group, Sakhaalmainvest, which was set up by Alrosa, transfers 2 percent of its profits to the Vilyuisky group of uliues as compensation for past damages to their infrastructure and environment. In
addition, the company provides regular financial assistance to the Nature Protection Committees of those uluses.

Alrosa has developed some technological measures to reduce environmental impact and clean up degraded areas, and water quality in the river watersheds has improved considerably. Alrosa has stopped dumping mineralized wastewater into river systems. All the water used in the Mir and Udachny open-pit mines is now disposed of underground. Construction of an antipercolation tamponage barrier in the Mir mine, which will reduce the inflow of water into the working area of the mine, is complete. Dumping of industrial wastewater has ceased at Plants No. 3, No. 8, and No. 12, and from Dredges No. 201 and No. 202. The Yubileny and Anabar Mine sites are being equipped with watertight reservoirs for tailings and hydraulic systems that maximize the use of recycled industrial water, which has increased to 95 percent of total water used. Almost all the agricultural and household sewage in Lensk, Mirny, Aikhala, Udachny, and Ebelyakh is now being treated. To improve air quality, Alrosa restricts the use of heating oil, no longer burns coal, and is converting boiler rooms to gas. Vehicles are being equipped with catalytic converters, and vehicle exhaust emissions are now being monitored. Soil is now regularly recultivated.

Gold. Long a pillar of the Sakha economy, residents of gold mining regions and the republic’s budget alike depend on the industry. However, production of gold has declined sharply in recent years (see fig. 6.1). Reasons for this decline include:

- Prices for goods, commodities, fuels, and energy have increased dramatically.
- Loans carry high interest rates.
- Currency exchange rates are unstable.
- Taxation between 1992 and 1995 was high.
- Costs for social infrastructure, particularly housing and utilities are rising.
- The raw material base is declining.
- Relations between industries and republics have been disrupted, leading to decentralization and a decline in the quality of service and maintenance.
- There is no significant foreign investment.

Despite this crisis, Sakha remains the second-largest gold producer in the RF and in 1999 produced slightly more than 15 tons. Gold is mined primarily in the southern Yakutsk, Verkhne-Indigirkinskoe, Allakh-Yun, and Kulurskoe gold fields (see fig. 6.2).

The average gold content has decreased, the location of reserves is less favorable, and engineering conditions have become more difficult. Several gold mining enterprises, including a number in the Kulursky, Verkhne-Indigirsky, Aldansky, and Dzhugdzhursky Uluses, have gone bankrupt. Many smaller open-pit sites, and even large enterprises such as Lebedinsky Gold Mining Company, AO (joint-stock company) Nezhdaninskoe Zoloto, and AO Kularzolotohas, have also closed. Numerous sites have been turned over to independent associations of prospectors (artels). Entire gold mining settlements are now in shambles.

The structure of Sakha’s gold mining industry is like that of the rest of the Far East: two-thirds placer mining and one-third vein mining. However, the proportions of the actual deposits are closer to two-thirds ore and one-third alluvial, and herein lies part of the problem for the industry. Exploration for new ore deposits has been drastically curtailed due to a lack of capital and the uncertainty of financial return resulting from high extraction costs. (To extract 1 ton of gold from ore, an initial investment of U.S. $3–5 million is needed.) The prospects for expanding open-pit mining are limited. Funds and effort, therefore, should be redirected toward the mining of gold ore veins. Government subsidies are needed to shift the industry toward exploiting large gold ore deposits using advanced mining and enrichment technologies. To do so, the government is promoting joint ventures with foreign companies and capital. Plans are also under way to establish gold refining and jewelry production.

Sakha has the third largest gold reserves in Russia. Forty-three percent of these gold reserves are confirmed; the remainder are estimated resources. About 70 percent of confirmed reserves are gold ore, primarily in the Yuzhno and Allakh-Yunsky Uluses (see fig. 6.2). These reserves are located in large sites, including Nezhdaninsk, Kuranakh, and Kyuchyus, which together account for about 90 percent...
of all known ore reserves. Most estimated alluvial reserves are in the Yuzhno-Yakutsk and Verkhne-Indigirsksy Uluses. There are also gold resources in gold and silver mixtures, as well as in ancient greenstone bands of the nevadite type. Remaining confirmed reserves are valued at U.S.$10 billion, and estimated reserves at U.S.$30 billion. All the reserves are located in some 700 sites, including between 30 and 50 underground sites and more than 650 alluvial deposit sites, which account for 52.8 percent and 47.2 percent of industrial reserves, respectively. About 62 percent (around 300 sites) of gold deposits are exploited by open-pit mining, 26.9 percent (about 20 sites) by dredging, and 1.4 percent (more than 130 sites) by underground shafts. Seventy additional placer mines with undetermined reserves are also being worked by private ventures.

Yakutzoloto used to control all the gold mining, but its subsidiaries, encouraged by the Sakha government, split off in the early 1990s. Today, Yakutzoloto (now Sakhazoloto) is one of several joint-stock companies producing gold. The government holds 51 percent of the company’s shares. By the end of 1997, Sakhazoloto consisted of five operating enterprises, which produced 37.4 percent of that year’s total. Artels increased their share of total production from 40.8 percent in 1990 and 1994 to 61.6 percent in 1997. In 1996, the state began to monitor and control the artels, and made it easier for Sakhazoloto to form joint ventures (see table 6.2).

History. The first, but somewhat unreliable, accounts of gold discovery date back to 1782. In those days, panners would sell several dozens of kilograms of gold per season to middlemen, who then shipped the gold to Japan or China. In 1843, alluvial deposits were discovered in the upper Olyokma River and its tributary, the Tungir. In the 1860s, gold was discovered on the tributaries of the Vilyui River, and from 1908 to 1916, prospectors from the Lensk Gold Mining Association and the Verkhneamurskaya Corporation explored these areas.

Table 6.2
Major gold mining companies and associations in Sakha

<table>
<thead>
<tr>
<th>Company</th>
<th>Established</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK Aldanzoloto</td>
<td>1992</td>
<td>Joint-stock company</td>
</tr>
<tr>
<td>AK Indigirzoloto</td>
<td>1992</td>
<td>Joint-stock company</td>
</tr>
<tr>
<td>AO Nezhdaniinskoe zoloto</td>
<td>1992</td>
<td>Joint-stock company</td>
</tr>
<tr>
<td>AO Zoloto</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dzhugdzhura</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OAO FPK Sakhazoloto</td>
<td>1995</td>
<td>Holding company; controls Sakha government’s holdings in the four companies listed above</td>
</tr>
<tr>
<td>AK Zoloto Neryungri</td>
<td>1995</td>
<td>51 percent owned by Sakha government</td>
</tr>
<tr>
<td>AK Zoloto Yakutiy</td>
<td></td>
<td>Coordinates prospection teams</td>
</tr>
<tr>
<td>Association Zolotoi Soyuz</td>
<td>1995</td>
<td>Supports prospection and resolves technical and procurement issues</td>
</tr>
<tr>
<td>AO Kuranakh Gold Mining Co</td>
<td></td>
<td>Joint-venture company</td>
</tr>
<tr>
<td>AO Zoloto Kuchusa</td>
<td>1996</td>
<td>Joint-venture company</td>
</tr>
</tbody>
</table>

Foreign investment in gold mining

The Sakha government has ambitious plans to introduce foreign investment and technology to the industry. Currently there are four major projects operating with foreign investment (see map 6.2).

Kuranakh gold ore deposit
- Location: Kuranakh River, 20 km south of Aldan in southern Sakha. The placer deposit stretches for 23 km.
- Estimated development cost: U.S.$450 million.
- Estimated reserves: 450 tons, consisting primarily of nuggets, but also some alluvial gold. These epithermal deposits have a high gold content, but as they have been heavily mined for the past forty years, many of the large deposits now have only lower quality ore left.
- Current production: The twelve confirmed gold deposits yielded 3.7 tons of gold in 1996.
- Estimated production: New leaching equipment for lower quality ore is expected to increase gold output to between 7.7 and 14 tons per year.
- Foreign involvement: Canada’s Echo Bay Mines holds 50 percent of Kuranakh Gold Mining Company. The Russian firms Aldanzoloto (30 percent) and Sakhazoloto (20 percent) control the remainder. Reportedly, the U.S. firm Newmont Gold is in the process of purchasing shares from Echo Bay.

Aldanzoloto is a joint-stock company that owns the Kuranakh mill. This mill can currently handle 2.5 million tons of ore annually, and there are plans to upgrade so that it can process 5 million tons of ore annually. Full projected capacity of the project is 15 million tons of ore annually. The project plans to use standard gravitation technology. The field is currently being developed with two deep dredgers (up to 15 m) and a single rotor excavator with an annual capacity of 400 kg of gold per year. As of 2000, Echo Bay Mines was attempting to obtain U.S.$150 million in credits from foreign banks. As of December 2001, the companies still had not worked out the details of the Production Sharing Agreement (PSA).

The company plans to build a plant capable of processing 500 tons of ore and yielding 3 tons of gold annually. A feasibility study for the project has been completed. The cyanide method will be used. The deposit, first explored in 1974, was yielding 1 ton of gold annually in the 1980s. Russian geologists say that the gold will be difficult to extract because of its high carbon and arsenic content. The Duma Natural Resources Committee estimates that it will cost up to U.S.$300 million to rehabilitate the mine and to achieve an annual output of 5 tons.

Ust-Kuyga gold deposit
- Location: Northern part of Sakha (70° latitude, 135° longitude).
- Foreign involvement: No current information is available. As of 2000, Pinnacle Associates, Ltd. (Moscow) owned 50 percent, and Western Pinnacle Mining, Ltd. (Canada) owned the other 50 percent. Ownership of the mine was achieved through acquisition of Sakha Gold Overseas, Ltd. However, Western Pinnacle is now WPN Resources, Ltd. and their investment in the project, as of June 2002, is unknown.

An epithermal gold deposit, the ore includes carbon, antimony, and mercury. Underground and open-pit mining is planned by the fourth year of the development. There are enough resources to last twenty years. Capital costs of the mine are expected to be U.S.$210 million. A feasibility study was completed in 1997.

Nezhdaninsk gold and silver deposit
- Location: Aldan River in the Tomponsk mining region in northeastern Sakha.
- Total value: U.S.$5.6 billion (according to the Duma Natural Resources Committee).
- Estimated gold reserves: 480 metric tons. Western sources report that 335.9 tons are recoverable. Estimated to be the second-largest gold deposit in Russia.
- Silver reserves: 2,000 metric tons.
- Current production: None.
- Foreign involvement: Celtic Resources Holdings (Ireland) holds 50 percent of the joint-stock company Nezhdaninskoe Zoloto, which was set up with Sakhazoloto in January 1997. In September 2000, Celtic Resources announced it had secured a U.S.$7 million loan from Zenit Bank of Moscow.

The company plans to build a plant capable of processing 500 tons of ore and yielding 3 tons of gold annually. A feasibility study for the project has been completed. The cyanide method will be used. The deposit, first explored in 1974, was yielding 1 ton of gold annually in the 1980s. Russian geologists say that the gold will be difficult to extract because of its high carbon and arsenic content. The Duma Natural Resources Committee estimates that it will cost up to U.S.$300 million to rehabilitate the mine and to achieve an annual output of 5 tons.

Nezhdaninsk gold ore deposit
- Estimated development cost: U.S.$450 million.
- Estimated reserves: 450 tons, consisting primarily of nuggets, but also some alluvial gold. These epithermal deposits have a high gold content, but as they have been heavily mined for the past forty years, many of the large deposits now have only lower quality ore left.
- Current production: The twelve confirmed gold deposits yielded 3.7 tons of gold in 1996.
- Estimated production: New leaching equipment for lower quality ore is expected to increase gold output to between 7.7 and 14 tons per year.
- Foreign involvement: Canada’s Echo Bay Mines holds 50 percent of Kuranakh Gold Mining Company. The Russian firms Aldanzoloto (30 percent) and Sakhazoloto (20 percent) control the remainder. Reportedly, the U.S. firm Newmont Gold is in the process of purchasing shares from Echo Bay.

Aldanzoloto is a joint-stock company that owns the Kuranakh mill. This mill can currently handle 2.5 million tons of ore annually, and there are plans to upgrade so that it can process 5 million tons of ore annually. Full projected capacity of the project is 15 million tons of ore annually. The project plans to use standard gravitation technology. The field is currently being developed with two deep dredgers (up to 15 m) and a single rotor excavator with an annual capacity of 400 kg of gold per year. As of 2000, Echo Bay Mines was attempting to obtain U.S.$150 million in credits from foreign banks. As of December 2001, the companies still had not worked out the details of the Production Sharing Agreement (PSA).

The company plans to build a plant capable of processing 500 tons of ore and yielding 3 tons of gold annually. A feasibility study for the project has been completed. The cyanide method will be used. The deposit, first explored in 1974, was yielding 1 ton of gold annually in the 1980s. Russian geologists say that the gold will be difficult to extract because of its high carbon and arsenic content. The Duma Natural Resources Committee estimates that it will cost up to U.S.$300 million to rehabilitate the mine and to achieve an annual output of 5 tons.

Ust-Kuyga gold deposit
- Location: Northern part of Sakha (70° latitude, 135° longitude).
- Foreign involvement: No current information is available. As of 2000, Pinnacle Associates, Ltd. (Moscow) owned 50 percent, and Western Pinnacle Mining, Ltd. (Canada) owned the other 50 percent. Ownership of the mine was achieved through acquisition of Sakha Gold Overseas, Ltd. However, Western Pinnacle is now WPN Resources, Ltd. and their investment in the project, as of June 2002, is unknown.

An epithermal gold deposit, the ore includes carbon, antimony, and mercury. Underground and open-pit mining is planned by the fourth year of the development. There are enough resources to last twenty years. Capital costs of the mine are expected to be U.S.$210 million. A feasibility study was completed in 1997.

Nezhdaninsk gold and silver deposit
- Location: Aldan River in the Tomponsk mining region in northeastern Sakha.
- Total value: U.S.$5.6 billion (according to the Duma Natural Resources Committee).
- Estimated gold reserves: 480 metric tons. Western sources report that 335.9 tons are recoverable. Estimated to be the second-largest gold deposit in Russia.
- Silver reserves: 2,000 metric tons.
- Current production: None.
- Foreign involvement: Celtic Resources Holdings (Ireland) holds 50 percent of the joint-stock company Nezhdaninskoe Zoloto, which was set up with Sakhazoloto in January 1997. In September 2000, Celtic Resources announced it had secured a U.S.$7 million loan from Zenit Bank of Moscow.

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Nezhdaninsk gold ore deposit
- Estimated development cost: U.S.$450 million.
- Estimated reserves: 450 tons, consisting primarily of nuggets, but also some alluvial gold. These epithermal deposits have a high gold content, but as they have been heavily mined for the past forty years, many of the large deposits now have only lower quality ore left.
- Current production: The twelve confirmed gold deposits yielded 3.7 tons of gold in 1996.
- Estimated production: New leaching equipment for lower quality ore is expected to increase gold output to between 7.7 and 14 tons per year.
- Foreign involvement: Canada’s Echo Bay Mines holds 50 percent of Kuranakh Gold Mining Company. The Russian firms Aldanzoloto (30 percent) and Sakhazoloto (20 percent) control the remainder. Reportedly, the U.S. firm Newmont Gold is in the process of purchasing shares from Echo Bay.

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—JN
In 1889, mining began in earnest with the discovery of rich deposits in the Timpton and Sutam River basins in the south, followed by the subsequent development of these deposits by the Russian Gold Mining Association and the Verkhneemurskaya Corporation. These operations were infamous for destroying the region’s ecology. In 1898, volumes 38–40 of the newspaper *Yakutskaya Zhizn* described the operations as follows: “The mine leaves one feeling depressed. Forests near the mine have been burned or cut down, dampness abounds, and there is mud and water everywhere…. Monotonous, hastily slapped together shacks bring to mind the thought that all these structures are temporary, that there will be no regret in abandoning them, and how many have, indeed, already been abandoned! Such is the Timpton region today. What will come next is hard to say at present.”

By World War I, depletion of the Sutam and Timpton deposits had begun. Prerevolutionary gold prospecting in the Vilyui and Aldan basins failed to spur development, as these mineral reserves were thought to lack commercially viable quantities of gold.

In 1923, commercially valuable gold reserves were discovered in southern Sakha, near Nezametny. By 1924, the Yakutsk State Gold Mining Trust had been established to mine the Nezametny deposit, site of the present-day city of Aldan. A dredge was brought in from the abandoned Olyokma mine, and with this dredge, the first large gold mining center was born. Geologists discovered three more large gold deposits (Ust-Maya in 1936, Indigir in 1945, and Kular in 1964), which were also developed during the Soviet period. An industrial association, Yakutzoloto was established in 1965, with facilities in the Aldansky, Ust-Maisky, Tomponsky, Oymyakonsky, and Ust-Yansky Uluses. During this period, despite extremely harsh conditions in these remote areas, a powerful industrial base and some of the largest mining enterprises in the USSR were established. State enterprises accounted for up to 80 percent of gold production. Nevertheless, the most profitable enterprises then, and to this day, are associations of individual prospectors. Other gold mining regions developed during the Soviet period include Allakh-Yunsky Ulus (1936), Verkhne-Indigirsky Ulus (1944), and Kularsky Ulus (1965).

The present period has seen a decline in production and a concomitant decline in standards of living throughout Sakha. The current state of production is discussed on pp. 247–49 and of the economy in general on pp. 241–43.

Environmental impact. In the 1990s, the Institute of Applied Ecology97 in Sakha studied the Aldan mining region and the area between the Seligdar and Yakotit Rivers, where Aldanzoloto operates. It was determined that gold mining in these regions was damaging the ecosystems and harming their potential for future sustainable development. Mining waste dumps and pits occupy 7.2 sq. km, or 0.5 percent, of this area, and dredge sites occupy about 76.8 sq. km, or 4 percent, of the area. Dredging operations have further affected 42 sq. km, or 20 percent, of the area between the Seligdar and Yakotit Rivers. During mining operations here, associated industrial activities have also affected the ecosystem. Fires and logging between the 1950s and 1980s affected two huge chunks of land, 30 sq. km (14 percent of the total area) and 0.92 sq. km (0.5 percent of the total area), between the Seligdar and Yakotit Rivers. In this part of southern Sakha, ecosystems usually regenerate themselves fairly rapidly when compared with more northern ecosystems. Due to the scale of the destruction, however, they have not regenerated themselves well here. In total, 32.5 percent of the interfluvial plain has been completely transformed by industrial development. The ecological balance has been disrupted and is beyond repair in many areas.

Summary of impacts:
- Dredging and prospecting have disrupted valley landscapes.
- Mining facilities have modified interfluvial ecosystems.
- Modification of ecosystems has reduced biodiversity.
- Forest fires and logging have degraded vegetation cover, particularly in areas of mild, intermittent, and insular permafrost. Regeneration in these areas is retarded, and some rare plant species have disappeared entirely.
- Toxic compounds have polluted the ecosystem.

Coal. The coal industry was the first to develop, starting in the prewar Soviet period. In the late 1920s, the territorial administration of the Main Directorate of the Great North Sea Lanes developed the first coal mining operations in the region, starting with the Kangalasskoe (in 1929) and Sangarskoe (in 1930) coal reserves on the Lena River. These reserves were located about 45 km and 300 km, respectively, downstream from Yakutsk. Sangarskoe coal is of higher quality, producing more heat and less ash than Kangalasskoe’s brown coal, so mining the Sangarskoe reserves took priority. The Kangalasskoe deposit, because of its large size, favorable geologic position, and convenient location, was mined despite its impurities. In those days, mining was not mechanized, but open-cast, and Sakha’s entire production (1,800 tons) came from those two sites. By 1936, production in Sakha had reached 38,000 tons, and soon thereafter, large-scale development of the Sangar reserves began. For decades, Sangar was the largest site, with annual production in the 1960s averaging 250,000 tons.

In 1933, the Kolyma Department of River Shipping, a division of Dalstroii, started exploratory mining of the Zyryansky deposit, as well as an open-pit mine in northeastern Sakha. Commercial mining using open-cast methods began in 1940. Coal mining was the foundation for development of the Zyryan industrial and transportation center, and the site still supplies coal to consumers throughout the RFE. In 1940, Dalstroii began working the Dzhebarki-Khaya deposits, where the coal was even higher in quality than at Sangarsky. In 1952, the mine produced 112,000 tons and supplied the river shipping industry and enterprises in Yakutsk. By 1964, ...
production had almost doubled to 220,000 tons. In the late 1980s and early 1990s, the site was producing 1.1 million tons annually. However, production subsequently declined sharply, and 1999 production was down to 500,000 tons. Coal is mined both by open-cast and shaft methods.

Until the late 1970s, Sakha's coal industry served the energy needs of the republic, sent small shipments to Magadan and Irkutsk Oblasts, and supplied ships traveling along the northern sea route. Coal mining in southern Sakha began in the late 1970s with the development of the Neryungri coking coal site, made possible by Japanese investment. Today, the industry has an annual capacity of 17.25 million tons, mined at one underground mine (Dzhebariki-Khay), three large open-pit mines (Zyryansky, Kangalassky, and Neryungri), and a number of small mines.

Japanese investment. Japan and Russia have a long history of joint coal-development projects in Sakha. In 1974, fifty-one Japanese banks, trading companies, and individual Japanese manufacturing companies formed the South Sakha Coal Development Cooperation Company. Eyeing the proven 7.4 billion tons of coal in the south Yakutian basin, this consortium helped set up the present Neryungri coal mining complex in 1974 to mine its rich coking coal. Sakha began mining the vast reserves in the mid-1980s when the Export-Import Bank of Japan (now the Japan Bank for International Cooperation) provided low-interest loans to fund the project. This allowed Japanese companies to provide credits of 216 billion yen (including 109.5 billion yen for machinery and equipment) in exchange for 5.5 million tons of coal annually over a sixteen-year period. The Soviet-Japanese agreement was one of a series of large-scale resource exploitation projects between the two countries; others include the KS Sangyo forest development agreement, Sakhalin offshore oil development, and numerous fishing agreements. The main Japanese companies benefiting from this arrangement were Komatsu, which provided bulldozers, Kato Works, which sold excavators and truck-mounted cranes, and Banzai Automobile, which provided repair operations. Others who provided practical assistance in establishing the Neryungri facility included Sumitomo Heavy Industries and the Mitsui Mining Company.

Although beneficial for companies in Moscow and Japan, imports of extractive machinery have created a dependence on coal exports in exchange for steel and machinery, which has handicapped Sakha's efforts to develop its own steel-making industry. In addition, open-cast mining has been the main method used to extract the coal, and there has been almost no reclamation of ruined land.

Sakha used to produce about 17 million tons of coal annually, but this total has declined to about 10 million tons. The Neryungri strip mine produces most of the coal, with annual production estimated at 75 million tons of coking and energy coal. The other major coal mines are the Dzhebariki-Khay deep mine (1.1 million tons), Kangalassky strip mine (520,000 tons), Zyryansky strip mine (300,000 tons), and Sangar deep mine (330,000 tons). Yakutugol, Sakha's coal monopoly, established in 1974, operates all of the mines. In an effort to bail out an unprofitable industry, the Sakha government recently offered shares of Yakutugol to Japanese companies. Yakutugol is Russia's largest coal exporter, and according to some reports, it sells about 40 percent of Neryungri mine's output, mainly high-quality coking coal, to Japanese steel makers such as Nippon Steel Corporation, through Sumitomo, Kanematsu, and Marubeni trading companies. Domestic consumers are the Neryungri and Chulmanskaya power stations, and power stations in the Khabarovsk, Primorsky, and Sakhalin regions.

Open-cast methods are used to mine the rich coking coal, which has been shipped to Japan since commercial operations began. Coal from this site also supplies coal-fired electric power to plants in Sakha. The Neryungri site has the capacity to mine 15 million tons of coal per year, while its enrichment plant can process 9 million tons of coking coal annually. The government wants to increase production of the Neryungri mine to between 12 and 13 million tons. Twenty percent of the coal mined in southern Sakha is used locally within the republic, 40 percent is shipped to other regions of the RFE, and the remaining 40 percent is exported to Japan and South Korea, and to a lesser degree, metallurgical plants in Chelyabinsk and Ekaterinburg Oblasts in European Russia.

About 20 km from Neryungri is the Denisovsky deposit, which has about 300 million tons of coking coal. The Sakha government is also promoting investment in development there, but the price tag is about U.S.$2 billion due to infrastructure costs. In the neighboring Neryungri region, there are an estimated 118 tons of gold, with another 40 tons expected. The Chulmikan bituminous coal deposit has about 700 million tons of coal, but costs to develop these reserves are estimated at U.S.$2.7 billion. There are also two industrial deposits of iron ore near Chulmikan: Tayozhny (1,254.6 million tons) and Desovsky (400.7 million tons). Total costs to develop these reserves are estimated at U.S.$660 million and $580 million, respectively.

In a related development, the government would like to open up the rich Elginsky coal reserves, but lacks funds to do so. These reserves are located in the Bolshoe Tokko Lake region, in the extreme southeast of Sakha. Reserves of high-grade coking coal are estimated at 500 million tons. Some analysts consider these reserves the most promising, in terms of both quantity and quality, in the entire RFE. Ecologists are concerned, however, that mining in this region could destroy one of the most important biodiversity hotspots in Sakha (see p. 240). They point out that new ventures should be put on hold until new technologies can be practically employed to extract and process the coal for local use. Two regional zakazniki currently protect some portions of the Bolshoe Tokko Lake region; open-cast coal mining is
planned in areas between these zakazniki. To develop the mines, a railroad is also being planned, which will open up forests for exploitation.

**Energy**

The Soviet and Russian governments have traditionally placed great importance on Sakha’s energy production (see Table 6.3). In the 1980s, 50 percent of all capital investment for industrial development was allocated to the energy industry, rising to almost 55 percent by 1995. The energy industry (oil, gas, hydroelectric, and coal) now employs about 25 percent of those working in Sakha. In addition to providing Sakha’s needs, energy was exported throughout the RF and abroad. To date, the industry has received virtually no foreign investment. Major companies involved include AO Yakutenergo and AO Sakhaneftegaz, along with branch companies of the latter: AO Yakutgazprom, Lenaneftegaz, Lenagaz, Yakutgeofizika, and Taas-Yuryakh-neft.

In 1928, Sakha’s two 300-kW power stations produced only 700,000 kW-h per year, and not until 1937 was construction of a centralized electric power station in Yakutsk completed. By the 1960s, Sakha had more than fifteen hundred small power stations and electrical installations. Primary sources of power included black and brown coal, wood, and imported oil. Ninety percent of these power stations had a capacity of less than 200 kW; a few had capacities of up to 5,000 kW. The largest were the Yakutsk, Chulman, Yakokut, Batagai, and Deputatsky stations. Large mobile power stations were set up in Lensk and the settlements of Pokrovsk and Zhatai. In 1967, the first modules of the Vilyuiskaya Hydroelectric Station, now called the Kaskad Station, were brought on line. To complete the station, a gigantic dam with a huge reservoir was constructed in an area of permafrost. Today, Kaskad, together with the Yakutsk Natural Gas Station in central Sakha and the Neryungri Coal-Fired Station in southern Sakha, provide about 84 percent of the total electrical energy production. In 1997, Sakha’s power stations produced 27 percent of the republic’s electricity from coal (770,000 tons), 24 percent from gas (704,000 tons), 12 percent from diesel oil (357,000 tons), and 36 percent from hydro sources (1,049,000 tons).

Power generation is a primary polluter. In 1990, just twelve of the Yakutenergo’s facilities generated 389,600 tons of harmful substances. More than 5.7 million cu. m of effluent, including 3.2 million cu. m of insufficiently processed waste containing large quantities of suspended particulates, chlorides, sulfates, oil byproducts, and nitrogen, were dumped into the rivers. Producing energy also pollutes the air. The average concentration of dust in Neryungri, the location of a large coal mine and coal-fired power plant, exceeds the maximum permissible level (MPL) by 2.7 times, and occasionally reaches 7 times the MPL. Nitrogen dioxide concentrations exceeding the MPL by four times and instances of benzopyrene pollution have also been recorded. Use of outdated technologies in oil and gas development may have dire effects upon the Lena and Vilyui Rivers. Construction of the reservoir for the Vilyuiskaya station has had an adverse effect upon the health of the local population and ecosystem (see pp. 245–47).

**Oil and natural gas.** Oil first flowed in Sakha in 1937. The Sredne-Botuobuya field has been producing oil for ten years, and production began recently at the Ireyakh and Talakan fields. The Talakan-Vitim oil pipeline was built on schedule, and a refinery in Vitim is producing diesel fuel. Future plans call for the construction of oil-refining facilities in Lensk and in the settlement of Tas-Yuryakh. In 1997, a total of 152,000 tons of oil were extracted. As in previous years, the primary

<table>
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<tr>
<th>Table 6.3</th>
<th>Energy resources in Sakha</th>
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<tbody>
<tr>
<td><strong>Resources</strong></td>
<td><strong>Quantities</strong></td>
</tr>
<tr>
<td>Oil and gas</td>
<td></td>
</tr>
<tr>
<td>Hydrocarbons</td>
<td>20.1 billion tons</td>
</tr>
<tr>
<td>Oil</td>
<td>9.4 billion tons</td>
</tr>
<tr>
<td>Free gas</td>
<td>9.4 trillion cu. m</td>
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<tr>
<td>Gas dissolved in oil</td>
<td>0.7 trillion cu. m</td>
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<tr>
<td>Condensate</td>
<td>0.6 billion tons</td>
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<tr>
<td>Extractable resources</td>
<td></td>
</tr>
<tr>
<td>Oil</td>
<td>2.4 billion tons</td>
</tr>
<tr>
<td>Gas</td>
<td>9.4 trillion cu. m</td>
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<tr>
<td>Coal</td>
<td>4.4–15 billion tons (reserves)</td>
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<tr>
<td>Hydropower</td>
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<tr>
<td>Lena River</td>
<td>144 billion kW-hr</td>
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<tr>
<td>Indigirka River</td>
<td>54 billion kW-hr</td>
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<tr>
<td>Vitim River</td>
<td>51 billion kW-hr</td>
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<tr>
<td>Aldan River</td>
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<tr>
<td>Kolyma River</td>
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<td>Olyokma River</td>
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<td>Yana River</td>
<td>22 billion kW-hr</td>
</tr>
<tr>
<td>Olenyok River</td>
<td>14 billion kW-hr</td>
</tr>
<tr>
<td>Anabar River</td>
<td>3 billion kW-hr</td>
</tr>
</tbody>
</table>

*Note: There are at least 32 oil and gas deposits in Sakha: Vilyuisk region – 9 (gas, condensed gas); Predverkhovansky depression – 2 (gas); Nepsko-Botuobinsky region – 18 (gas, gas-oil, oil-gas, oil-condensate); Predpatomsky depression – 3 (gas, condensed gas).*  

*Source: Isaev, 2000.*
consumer (42.6 percent) was Alrosa. Oil extraction and delivery are carried out by several companies, including Lenaneftegaz (from Talakan and Irelakh), Yakutgazprom (from Sredne-Botuobuya field), and Irelakhneft (from Irelakh). A recent discovery showed that there are over 100 million tons of oil in the Talakan region.46

The Ust-Vilyui natural gas deposits were discovered in 1956, and in 1968, a gas pipeline was constructed from the site to Yakutsk. Production facilities have also been developed at other gas fields. Fifteen hundred km of gas pipeline in western Sakha (Tas-Yuryakh, Mirny, and Svetly) and in central Sakha (Kyzyl-Sur, Yakutsk, and Moxogollokh) supply most of the large population centers. A gas-processing plant has been built in Yakutsk. In 1998, in the Kyzyl-Syr settlement, work began on a gas reprocessing facility with a capacity of thirty thousand tons per year. Liquid gas is being supplied to riverside uluses (Aldansky, Neryungriisky, and Gorny), as well as to the settlement of Sangar. Yakutgazprom extracts 70 percent of its gas from Srednevilyui, 14 percent from Maastakh, 15 percent from Sredne-Botuobuya, and 1 percent from Severo-Nebinsk. Efforts are under way to connect pipelines to wells at the Srednevilyui and Taas-Yuryakh fields.

Exporting Sakha’s natural gas? Oil and natural gas reserves in all prospective areas of western Sakha may exceed 20 billion metric tons of hydrocarbons. The U.S. Geological Survey estimates Sakha’s hydrocarbon potential at between 70 and 278 trillion cu. ft. of natural gas and between two and fifteen billion barrels of oil. Estimates by the South Korean Ministry for Energy and Resources of the area’s natural gas reserves are even higher: 350 trillion cu. ft.47 More than 65 percent of these reserves are located in the Botuobuya and Vilyui regions. A recent inventory revealed there are over 100 million tons of oil in the Talakan region.48

As noted earlier, Sakha’s heavy reliance on diamond, gold, and coal mining makes it eager to diversify its industries and develop a stable source of oil products. It is currently looking for foreign investment to do so. Lack of transport facilities and equipment have left much of Sakha’s oil untapped, although there are thirty-one oil and gas production sites. Even though it is sitting on vast reserves, Sakha imports most of its oil products—3 million metric tons annually—at very high cost. Sakha is now constructing two oil refineries that will be capable of producing about 300,000 tons of oil yearly. The government has offered up six oil fields for development.
primarily in the southwest. The oil and gas industry is controlled by Sakhaneftegaz, which is responsible for the exploration, development, and marketing of new oil and gas resources within Sakha and abroad. Fifteen South Korean companies interested in building a gas pipeline to South Korea spent U.S.$30 million for a general study.

Initially, Sakha’s natural gas reserves, rather than oil, were most interesting to investors. Japan’s Institute of Energy Economics estimates that demand for Russian natural gas in Japan, South Korea, and China will be 45 billion cu. m/year in 2010 (out of a total demand of 180 billion cu. m/year). Since the late 1960s, the Japanese have had an interest in the Taas-Tumus gas fields in the central Lena Valley, which have an estimated annual capacity of 20 billion cu. m. Japanese participation in the project was secured when an agreement was signed to create the joint venture Yakutia National Gas Exploration Project on January 28, 1975, backed by U.S.$100 million from the Export-Import Bank of Japan. Japanese investors, particularly the project leader Tokyo Gas, considered U.S. participation to be essential, so when the main partner, Occidental Petroleum, was unable to get sufficient financing from the U.S. Export-Import Bank, the project faltered. Initial project plans were to pipe the gas to a liquid natural gas plant near Olga in Primorsky Krai and then ship it to Japan. Japanese companies continue to show interest in Sakha’s reserves, but are perhaps more interested in the reserves located off Sakhalin Island.

Given Japan’s immediate interest in Sakhalin, perhaps the most likely scenario for Sakha is to build pipelines to South Korea and possibly across the entire Korean Peninsula, or to China. In the initial feasibility study, four different project scenarios for export to Korea were explored, with project costs ranging from between U.S.$17 and $23.5 billion. The first two options would produce 34 billion cu. m of gas a year; the third and fourth options would produce 44 billion cu. m a year. Development of gas production would consume between 40 and 42 percent of investments, or between U.S.$7.2 billion and $9.6 billion, depending on the project chosen. About 35 percent would be spent on construction of a Sakha-Korea pipeline: 85 percent on the Russian segment and 15 percent in Korea. The project would have a profitability of between 15 and 18 percent, and production could peak in 2010, 2015, or 2018.

Sakhaneftegaz recently signed an agreement with the Chinese national oil company to prepare a feasibility study on constructing a gas pipeline from Sakha to China. Gas deliveries would begin after 2005, and the volume would be a maximum of 20 billion cu. m. During President Putin’s visit to China in July 2000, both countries signed a Memorandum of Understanding to approve construction of two natural gas pipelines from Russia to China. The understanding also includes approval for a number of companies from South Korea to continue with feasibility projects for the pipelines. Given the massive size of the Irkutsk’s Kovykta reserves, a pipeline from this region would likely be built first. But conceivably, the Sakha reserves could then be linked to the Irkutsk-China pipeline.

The environmental impacts of large-scale oil and gas development are well known. However, the location of Sakha’s reserves in a permafrost region, the frigid temperatures, and the widely varying pressure of the deposits add to these concerns. An independent environmental impact assessment should be done to determine the expected effects of this proposed development, particularly before large infusions of capital are poured into the project.

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**Toward sustainable development**

*Lyudmila Shmatkova*

A federal program for the social and economic development of Sakha, adopted in 1994, includes a program for environmental protection that calls for a study to determine where sustainable natural resource management methods historically adapted to the northern environment should be permitted to operate and which territories should be protected from new industrial development. These measures, together with environmental-protection regulations, if enforced, would allow the republic to shift to the most efficient method of operating in a free-market economy.

To preserve the flora and fauna of the unique northern landscapes, the program calls for the expansion of the protected area system from its present 134,000 sq. km to 301,000 sq. km by the year 2005. To stabilize the economic situation, resolve social problems, and restructure the economy, several comprehensive natural resource management programs have been adopted. The most important are:

- Developing lumber processing, furniture making, building material, and food processing industries.
- Improving the environmental situation in the Vilyui River basin.
- Providing for the social and economic development of northern ethnic minorities.
- Supplying natural gas to populated centers in the central, transriver, and the Vilyuiisky Ulus.
- Providing a stable water supply for the transriver uluses.

Besides these specific programs, the government has developed several comprehensive environmental policies:

- Gradually converting the entire Sakha economy to environmentally benign modern technologies.
Establishing a single, unified system of governance and oversight.
Ensuring a proper balance between industrial and traditional methods of nature management.
Creating a system to set aside up to 30 percent of the nonrenewable natural resources, and at least 25 percent of Sakha’s territory in the specially protected areas, for future generations.

Indigenous peoples

Josh Newell

The Republic of Sakha is the traditional homeland of the Yakut people, who today constitute about one-third of the population. When the Russians arrived at the end of the sixteenth century, the Yakuts were settled in the Lena River valley, with smaller settlements along the headwaters of the Yana, Indigirka, and Kolyma Rivers. Their traditional way of life continues to center around reindeer herding, cattle and horse raising (Yakut means “horse people”), hunting, and fishing, but most Yakuts today are urban dwellers and live much like other Russians.

Reindeer herders are nomadic and have no formal hierarchy. Hunters and fishers live either in permanent settlements or wander within a limited territory on a seasonal basis. Other indigenous peoples who live in Sakha include Evens, Evenks, Dolgans, Chukchi, and Yukagirs. Like the Yakuts, they hunt, fish, and herd reindeer. Under Soviet collectivization, nomadic herders were organized into work units so that their reindeer herding followed an official plan. To reach production quotas, communist officials forced herders to have their animals overgraze the land. This led to a rapid decline in the productivity of pastures, which hit the reindeer industry hard. There are still about 400,000 domestic reindeer today, but good grazing land continues to decline.

Horse herding is still a strong tradition. Yakut horses are very hardy and can survive the winters on natural pastures without being fed by humans. One hundred ninety thousand horses still roam the lichen and moss fields. Cattle are also bred, but their numbers are presently at an all-time low. Efforts to regenerate cattle herds are being made on farms in the Even-Bytyntaysky Ulus, as well as in central Sakha. Hunting and fishing are not being done sustainably. Overfishing of rivers and overhunting of snow deer and snow sheep has led to a drastic decline in populations. As with the collectivization of reindeer herds, this decline stems mainly from restructuring and reorientation imposed during the Soviet period.

At least eight major villages in southern Sakha continue to preserve their traditional way of life. These include the Eveni villages of Topolino, Beryozovka, Sebyan-Kyuel, and Oyotung. Between five hundred and seven hundred Evens live in the Algama region, and for years they have been protesting the operations of Yakutugol, the Yakut coal monopoly, which has expanded onto their native territory. Most Evens in this region have retained their own language and culture, continuing to herd reindeer in the traditional manner. Other villages include lengra (Evenks), Nenemnoe (Yukagirs), Andryushkino (Chukchi), and Yuryung-Khaya (Dolgans). A gold mining venture is planning to expand its operations to the village of lengra and surrounding land, despite protests from the Evenks.

The Republic of Sakha is famous for its stolby (pillars), unique rock formations along the Lena and Sinyay Rivers.

Legal issues

Lydmlia Shmatkova

Laws, decrees issued by the president of Sakha, resolutions and directives from the government of Sakha, and instructions and regulatory reports from the federal ministries govern environmental protection in the republic. Since 1992, financial support for environmental protection has come from a system of taxation on the use of nonrenewable natural resources. These fees are also levied on rights to use natural resources.

Legislation on environmental protection includes:
- General environmental protection.
- The establishment of protected territories and agreements with the Magadan and Irkutsk Oblasts to establish joint protected areas that span more than one territory.
- Use of Forest Resources; these laws are based on the constitutional principle that the forests of Sakha are the inalienable property of its people.
- The use of mineral resources.
- Encouragement of foreign investment, by which several development priorities for attracting more foreign investment were identified:
  - Joint ventures in diamond processing, gold mining, and jewelry manufacture.
  - Export-oriented gas and oil industries and medical and biological industries.
  - Modernization of the energy sector and food production.
  - Modernization of the construction industry.
  - Modernization of the transportation and telecommunications industries.
  - The tourism industry.

International cooperation. Sakha has international and economic connections with many countries, as well as with smaller administrative units within individual countries. It maintains official relations with Latvia, Mongolia, Slovenia, Hungary, Belorussia, China, Switzerland, and others. To foster direct links, the Republic of Sakha also has offices in Latvia, Ukraine, Kazakhstan, and Japan. In a context of favorable geographic and geopolitical circumstances, the republic strives to establish mutually advantageous economic interactions with countries in the Asia-Pacific region. The republic actively participates in the activities of international organizations such as UNESCO, the United Nations Industrial Development Organization (UNIDO), the Northern Forum (a regional organization that unites northern countries and territories), the Organization of Unrepresented Nations and Peoples, and the Russian National Committee for Pacific-Ocean Economic Cooperation. In the nature protection arena, the republic works with numerous international organizations and foreign government agencies, including the World Wildlife Fund (WWF), the World Conservation Union (IUCN), Friends of the Earth—Japan (FoE–Japan), the U.S. Fish and Wildlife Service, the U.S. Department of National Parks in Alaska, and the German Union for Nature Conservation.

Perspective

Robert A. Spira

Moscow’s share of diamond wealth falls into corrupt hands

1999: An abortive attempt to liberate the Russian diamond industry from its dependence on De Beers Corporation failed due to corruption of the well-connected, but dishonest, principals. The effort ended up amounting to a mere siphoning off of federal stocks of diamonds and other valuables, and collapsed in a flurry of arrests and fines by American and Russian authorities, though most of the central players remain unscathed.

Evgeny Bychkov, chairman of the Russian Federation’s Committee on Precious Metals and Gems at the time, grew up with Boris Yeltsin, and was trusted beyond his actual merits. Bychkov initiated a plan to set up a company to sell Russian diamonds competitively with De Beers Corporation, using federal stocks of diamonds and other valuables held to back up the national currency. De Beers assumed early on that the Russian diamond resources would be ephemeral, an assumption that has not been borne out in reality.

A company with opulent facilities, Golden ADA, was set up in San Francisco, California, and chief executives made concentrated efforts to curry favor with local and national politicians, business leaders, and the people of San Francisco. Gems of the finest quality began to pour into San Francisco, with other valuables also included in the shipments. Golden ADA signed a contract with Unique Premium Metals, a Los Angeles gold distributor, which called for Unique to melt down and sell 5.5 tons of Golden ADA’s gold. Meanwhile, Golden ADA offered to sell 22,000 carats of diamonds.

The Russian government officials who had approved this transaction were told that these valuables were being put up as collateral with the Bank of America to fund the new business venture. However, flamboyant purchases indicated that the company’s executives were expropriating the fruits of these sales. Expensive U.S. and foreign real estate, cars, yachts, a jet, and museum-quality paintings were purchased by Andrei Kozlenok, one of the chief executives and a protégé of Bychkov, who was also receiving funds that were used inappropriately to set up numbered bank accounts and purchase expensive real estate near Moscow.
It didn’t take long for the U.S. Federal Bureau of Investigation to take interest in the new company, and De Beers also mounted a private investigation. They were soon joined in their suspicions by the U.S. Customs Service, Interpol, and the Financial Crimes Division of the Russian Interior Ministry.

Ultimately, a sting operation was put together between the Moscow special police and the FBI. It was found, among other things, that most of the diamonds landing in San Francisco had been shipped on to Golden Ada’s office in Antwerp, Belgium, where they were cut, polished, and sold for a total of U.S.$77 million. This money eventually wound up in Swiss bank accounts owned by the conspirators. Bogus certificates of origin were unearthed that purported to show that the diamonds came from Zaire. Payoffs to the people in the diamond industry in Antwerp in exchange for their silence were substantial. Nevertheless, the diamonds continued to pour into San Francisco at an ever-increasing pace, even though the number of employees was insufficient to process such a large number of stones.

After a time, the company began to come apart at the seams. Two of the original three chief executives left, allegedly on the threat of violence. Kozlenok remained for a short time, but eventually left behind a looted operation to be cleaned up by a succession of CEOs, one of whom found an undocumented leak of U.S.$130 million. Threats from the last CEO, Moscow entrepreneur Andrei Cehmukhin, induced Bychkov to flee Russia in September 1995.

The U.S. Internal Revenue Service raided the San Francisco office and served a lien of U.S.$63 million for unpaid taxes. The IRS found large quantities of gold, diamonds, and jewelry, together with automatic weapons, thousands of rounds of ammunition, explosives, mortars, and bulletproof vests, but little of the total wealth that had passed through the company remained. In the end, the Russian government got 65 percent of the U.S.$40 million dollars remaining, the IRS kept 25 percent, and creditors got back 10 percent.

Bychkov was found and arrested for “criminal negligence,” as well as other treasonable offenses, facing a minimum sentence of ten years of hard labor in Siberia. Coincidentally, he was up for sentencing on the same day that Russia would be celebrating the fiftieth anniversary of the end of World War II, and President Yeltsin took this very convenient opportunity to pardon him. Today, the resilient Bychkov once again has become a senior officer of one of Russia’s largest banks.

The other partners have not fared as well. One has been indicted on tax evasion charges, another is wanted for questioning, and Kozlenok was arrested in Greece for the possession of a phony passport. Russia requested his extradition, but this is being fought on the grounds that his life would be worth not two minutes’ purchase in Moscow.

Golden Ada turned out to be only one of a series of similar efforts going on simultaneously that also seemed to be emanating from people in central control. Groups were formed to steal timber and oil, and there was even a competing group selling precious metals. While Golden Ada was only a U.S.$200 million piece of the pie, the others were able to quietly steal over a billion dollars of the Kremlin’s choicest property.  

An old cemetery in Pokhodsk, a Cossack village on the Kolyma River. Graves of Russians are marked by crosses; graves of Yukagirs, by geese.