**Nautilus Institute for Security and Sustainable Development**

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# THE ENVIRONMENT OF, AND ENVIRONMENTAL REGULATIONS IN, THE RUSSIAN FAR EAST

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**Khabarovsk**

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## Introduction

This paper has been compiled by Deputy Director of the Economic Research Institute (The Far Eastern Branch of the Russian Academy of Sciences) Prof. Dr. Alexander S. Sheingauz at the request of the Nautilus Institute for Security and Sustainable Development (Nautilus of America, Inc.). The paper has been prepared as a contribution to the Third Grid Workshop, and is devoted to providing a description of the environmental conditions of the Russian Far East (RFE) and their linkage with the possible development of international transmission lines.

The general structure of this paper is as suggested by Nautilus. The paper's content is based on publications, official statistical data, non-published data provided by Russian officials, the Economic Research Institute's (ERI) data base, and the author's personal data and experience.

## 1. Natural Conditions of the RFE

The RFE (Russian Far East) includes the ten eastern-most Russian Federation subjects (provinces). The RFE is thus a vast area of 6,215.9 thousand square kilometers located in the north-eastern corner of the Euro-Asian continent (Figure 1). to the RFE covers 36.4 percent of the Russian Federation's territory and includes 4.2 percent of the world's land area. The RFE stands at the juncture of the world's biggest continent and the world's biggest ocean. The unique geographic position of the region, its enormous territorial size (running 3,900 km from north to south, and 2,500–3,000 km from west to east), and its topography determine the peculiar natural conditions of its climate, soil, and vegetation, with all their diversity and (often) uniqueness.

### *Geology and Topography*

The RFE is primarily a mountainous area, consisting of numerous plateaus, mountain ranges, and peaks with elevations of 1,000 to 2,000 meters (Figure 2).

Only a few mountain formations can be categorized as high mountains (more than 2,000 meters). These formations are represented by two types:

1) Volcanic cones and volcanic ranges of the Kamchatka peninsula and the Kuril islands (3,300–3,600 m);
2) Plicated ranges in the northeastern parts of the Sakha Republic (Yakutiya) and in the Koryakskiy Autonomous Okrug (2,250–3,000 m).

The highest point of elevation in the RFE is the top of the Klyuchevskaya volcano (4,750 m) on Kamchatka peninsula.

Middle-high mountain formations (1,000–2,000 m) are much more common in the RFE. These formations are divided to the following types:

1) Middle-high uplands and massifs with alpine forms (southern Verkhoyanie, Koryakskoe and Okhotsko-Kolymskoe uplands, etc.);
2) Middle-high uplands and ranges with volcanic cones (Kamchatka peninsula, Sakhalin island, etc.);
3) Middle-high plicated ranges without or with faint alpine forms (Western Sakhalin, Sikhote-Alin, etc.).

Low mountains (300–1,000 m) cover significant areas and can be classified as:

1) Low submontain plicated ranges that satellite the basic mountain systems;


**Figure 1. The Russian Far East: Subjects of the Russian Federation (provinces) and Vegetation Zones**

Source: Author's composition, 2002.


**Figure 2. Structure of the RFE Relief**

Source: Geographical Atlas, 1988.

2) Separated low mountains (insular mountains) as edges of mountain formations (northern Sakhalin, southeastern edge of Maliy Khingan range, Chukotka peninsula, etc.);

3) Low mountain massifs consisted of massive crystalline rocks. They are ancient intrusions revealed by the denudation (Khorolskiy and Grodekovskiy massifs in southern Primorie, Shapka Mountain in the Amur valley, etc.).

Effusive plateaus and tablelands are other specific mountainous land types found in the RFE. These types are found in Primorie, north Sikhote-Alin, the Amur valley, the Maliy Khingan range, the Kuril islands, and Kamchatka peninsula, and eastern Yakutiya.

The largest mountain systems in the RFE generally run from north to south, that is, parallel to the shoreline of the Pacific Ocean. As a result, they weaken the ocean's impact on the climate of the region's interior, while simultaneously opening the way for Arctic influences on climate. In general, the complex of mountain systems makes many areas difficult to reach, leaving areas isolated and beset with serious transportation problems.

Plains occupy no more than one-quarter of the RFE territory. Their genesis is not so diverse and has two classes: littoral and intermountain. The littoral plains found in the RFE are of three types:

1) Abrasion – found in the Kuril islands, the Kamchatka peninsula, and in the Auchuvuanskaya lowland on the north RFE;

2) Abrasion-accumulative – found on Severo-Sakhalinskaya (Sakhalin island) and in the Vankaremskaya (Chukchi Sea shore) lowlands;

3) Abrasion-alluvial – found in Chaunskaya (East Siberian Sea shore) and in the Nizhne-Anadyrskaya (Anadyr Bay shore) lowlands.

The intermountain plains are accumulative and are of five types:

1) Alluvial – including the Zeisko-Bureinskaya plain in the Amurskaya oblast, the Tym-Poronaiskaya and Takoi-Susuiskaya plains on Sakhalin island, and the Centralno-Yakutskaya plain (Republic of Sakha);

2) Lake-alluvial – including the Prikhankaiskaia plain (Primorskiy krai), the Middle-Amur plain (Khabarovskiy krai and the Yevreiskaya autonomous oblast), and the Kizi-Kadinskaya plain (Khabarovskiy krai);

3) Glacial-alluvial – including the Verkhne-Zeiskaya plain (Amurskaya oblast), the Parapolsko-Belskaya lowland, and the Centralno-Kamchatskaya plain (both in Kamchatskaya oblast);

4) Erosion-alluvial – including the plain between Amur and Zeya rivers and some other small plains;

5) Volcanic originated from lava stream in a river valley – including the plain in the Anyui basin (Khabarovskiy krai).

The plains and lowlands, especially intermountain plains, are the most favorable areas for life and economic activity in the RFE; it is here that most of its population and economic potential are concentrated. All thermal and hydroelectric power stations and transmission lines are located in these areas as well. However, some parts of the lines run through hills and low mountains.

The RFE has the longest border of any of the regions of Russia, at 17,700 kilometers, of which 29 percent are borders with other Russian regions. The RFE border snakes its way through a vast number of gulfs and bays, among which the most striking are the first-class

Avachinckiy bay in Kamchatka, the gulf of Sovetskaya Gavan in Khabarovskiy krai, the bays of Zolotoi Rog and Wrangel, and the gulfs of Nakhodka and Pos'et in Primorskiy krai. The region also has a huge ocean shelf with vast and diverse biological, fuel, energy, and mineral resources.

The specific geologic history and the contemporary tectonics of the region gave rise to the current high seismic activity in the RFE. A large part of the region belongs to zones with intensive shifts in the earth's crusts and with frequent earthquake shocks of 5.0 and higher (on the 9.0 Richter scale). The eastern edge of Kamchatka with the city of Petropavlovsk-Kamchatskiy, the Kuril islands, and the extreme northwest of the Amurskaya oblast belong to a zone exposed to destructive earthquakes (sometimes measuring over 8.0 in magnitude).

The RFE is abundant in fresh water. There are many large rivers and lakes in the region. Most of the rivers in the RFE belong to two world hydro systems: the Amur River, which flows to the Sea of Okhotsk, and the Lena River, which flows to the Arctic Ocean. These large rivers are wide, often 1 km and more in breadth, and as a result special infrastructure is required to cross them with transmission lines. For example, line passages across the Amur River near Khabarovsk City are more than two kilometers long.

*Climate*

Running from the Arctic Circle in the north to a latitude in the south that is considered subtropical, the RFE has very diverse solar energy conditions. This in turn causes the huge differences in the RFE climate from north to south. The vast conjuncture of the land and the ocean, stretching from the northeast to the southwest, also has an impact on humidity and precipitation. To this must be added the role of mountainous areas, which affect the flow of air masses. As a result, the RFE climate is extraordinarily diverse. As a rule, there is a general tendency for humidity to increase from west to east and for temperatures to rise from northwest to south-southeast.

In the shore areas along the Pacific Ocean, the climate is characterized by high humidity virtually year-round, along with a cool spring-summer-autumn and a relatively mild winter. The eastern part of the Magadanskaya oblast and the Chukotskiy autonomous okrug, the entire territories of Primorskiy and Khabarovskiy krais, the central and eastern parts of Amurskaya oblast, and the western and central part of Kamchatskaya oblast are all dominated by a monsoon climate. Winter here is cold and relatively dry, with the climate shaped by the powerful Central-Siberian anticyclone. Spring is prolonged and cool; summer, which is humid and moderately warm, is dominated by the monsoons of the Pacific Ocean. Autumn is usually warm and dry. Most of the precipitation (up to 70 or 80 percent) comes during the warm seasons of the year. As a result of such this precipitation distribution, spring floods are not common, and there are often high summer floods (up to 8 meters over the mean level on Amur River near Khabarovsk city).

In the Kolyma areas of the Magadanskaya oblast, in the western part of Amurskaya oblast, and throughout the territory of Yakutiya the prevailing climate is continental, with a short but relatively warm summer and a long, severe winter. The climate in these areas has relatively little precipitation, especially in the plains and lower mountainous areas, with the winter bringing little snow. Here, in the northeast of Yakutiya, is Oimyakon, the extraordinarily frigid band of the Northern Hemisphere where the absolute minimum air temperature reaches –71 degrees Celsius.

A distinctive feature of the entire territory of the RFE is its insufficient supply of heat for the air and, especially, the soil. As a result, almost 90 percent of the regional territory is covered

in long-term permafrost. In addition, the soil in the remaining territory suffers from prolonged seasonal freezing.

In the summer and autumn the southern part of the region is in a zone subject to typhoons from the Pacific Ocean, which cause very strong winds and frequent, sometimes catastrophic flooding.

From north to south, the territory of the RFE is divided into arctic, subarctic, and temperate zones. The borders of these zones, however, do not follow longitudinal lines but form amazing curves and twists. The complexities of the topography produce a great diversity in the microclimates of specific areas in the RFE. It is not uncommon for these to produce climatic inversions in various forms, which can be used economically to extend the agriculture to the north. Annual precipitation and temperature ranges in different areas of the RFE are shown in Table 1.

**Table 1. Temperatures and Precipitation in Individual Areas of the RFE**

| Territory | Average Air Temperature (Celsius) | | Average Precipitation (mm) |
|---|---|---|---|
| | January | July | |
| Sakha Republic (Yakutiya): | | | |
| northern part | -38...-50 | 11...15 | 140…290 |
| central part | -38...-43 | 18...19 | 190…235 |
| southern part | -28...-34 | 17...19 | 240…510 |
| Yevreiskaya autonomous oblast | -21...-26 | 18...21 | 500…800 |
| Chukotskiy autonomous okrug | -11...-34 | 5...14 | 200…400 |
| Koryakskiy autonomous okrug | -24...-30 | 10...14 | 300…700 |
| Primorskiy krai: | | | |
| northern part | -13...-30 | 14...21 | 690…1,170 |
| southern part | -10...-21 | 15...21 | 530…1,050 |
| Khabarovskiy krai: | | | |
| northern part | -19...-40 | 10...18 | 380…920 |
| central part | -18...-34 | 12...19 | 475…980 |
| southern part | -14...-28 | 14...21 | 635…1,020 |
| Amurskaya oblast: | | | |
| northern part | -28...-34 | 16...19 | 300…830 |
| southern part | -24...-31 | 18...21 | 450…750 |
| Kamchatskaya oblast | -11...-25 | 12...16 | 600…1,100 |
| Magadanskaya oblast: | | | |
| northern part | -24...-28 | 3…6 | 200...300 |
| central part | -38...-48 | 14...16 | 200... 350 |
| part near the Sea of Okhotsk | -19...-23 | 12...13 | 200…500 |
| Sakhalinskaya oblast: | | | |
| north of Sakhalin island | -17...-25 | 9…15 | 670…1,115 |
| south of Sakhalin island | -8…-17 | 9...16 | 700…1,180 |
| Kuril islands | -6...-7* | 9…17** | 600…1,200 |

*February

** August

Source: The Russian Far East, 1994.

The permafrost and the seasonal soil freezing encountered in the RFE require impose additional demands (on designs and materials) and costs on the construction of buildings and

power lines. The frequency of typhoons demands additional strengthening to enable structures to withstand extra strong winds and floods. Wet snow and ice adhering to wires, especially in the coastal areas, also must be considered in building and power line engineering

*Vegetation and Soils*

The RFE vegetation types are represented by six clearly defined zones, which are characterized below from north to south (these zones are shown in Figure 1).

The northernmost zone is the Arctic Desert Zone, which has practically no vegetation or soil. This zone includes some islands in the Arctic Ocean.

The next zone to the south is the Tundra, which encompasses the islands and the narrow band of the shoreline along the Arctic Ocean, forming a relatively thin band in Yakutiya but a significant expanse in the Chukotskiy and Koryakskiy autonomous okrugs. It has a soil and vegetation cover, more or less, where lichens and mosses predominate. The plants are usually only a few decimeters tall, and are rarely greater than three meters in height.

In the next Forest-Tundra Zone, the tundra type of vegetation plays a significant role in shaping landscapes, but the typical large-trunk forests are developed to a small extent in this zone, and are found primarily on the floodlands of large rivers. These large-trunk forests consist of poplars, willows, and chosenia (Chosenia arbutifolia). Along with dense forests there are also stretches of light, sparse woods. The most widespread forest type, in terms of area, are scrub cedar forests. The soils in this zone are marshy, peat, and podzol-peat.

The most widespread area in the RFE is the zone of coniferous forests, or Taiga, which is covered by dense forests. The Taiga extends as a broad belt approximately between 70 and 50 degrees of north latitude. The northwestern and western part of the zone is dominated by larch and pine forests; the eastern and southeastern areas – by firs and spruces. Groups of all varieties of trees overlap here, producing mixed forests. This is one of the most extensive forests on the planet. The soils are podzol, peat, and peat-gley, with brown-taiga soil dominant in the south. The Taiga Zone usually is divided to three subzones: North, Middle and Southern Taiga.

South of the taiga is the Zone of Mixed Forests. This is an intricate mixing of floras, including coniferous and broad-leaved trees and a luxurious development of bushes and liana. The forests are structurally complex and productive; they naturally contain up to 700–800 cubic meters of wood per hectare when mature. The flora of the zone includes many valuable plants, including such indigenous species as ginseng, eleutherococcus (so called Siberian ginseng, Eleutherococcus senticosus), aralia (Aralia spp.), and others. The main types of timber are Korean cedar (Pinus koraiensis), spruce, fir, ash, oak, linden, maple, elm, nut-tree, cork tree (Phellodendron amurense), birch, and aspen. The soils are brown and brown-taiga. This is the most economically developed zone of the RFE.

In the southernmost vegetation zone of the RFE, forest tracts are interspersed with open areas of meadowland. This entire Prairie-Forests Zone has been developed; the natural coniferous and mixed coniferous-deciduous tracts have been forcibly transformed into oak, maple, and linden forests. They have lost their value for the logging industry, but their role in the defense and improvement of the soil is immense. The most fertile soils of the region (including the meadows and black soil of the "Amur prairie") are concentrated here.

In mountainous areas, these general description patterns appear not only in north-to-south but also in higher-to-lower altitudes. As a result, the borders of the soil and vegetation zones are

highly mixed, with an interpenetration of different types of flora in any one geographic area. All this determines the contrasts and diversity of vegetation in the region.

Plain areas in lowlands, and among low and middle-sized mountains usually are covered with marshes (*'mari'*). This generalization applies especially to the wide valleys of Amur River and its tributaries. The marshes have usually have a solid soil base at a depth of 1–1.5 meters, but still pose significant obstacles for construction, and especially for construction of extensive linear objects such as roads and power lines.

As to international transmission lines, they must be considered on the base of three types of the State frontiers (Figure 3):


**Figure 3. Scheme of frontier types allocation**

Source: author's composition on the base of "Loss of Natural Habitat" (2001).

1. The frontier along the wide rivers of the Amur and part of the Ussuri. This frontier stretches out from the southwestern corner of the RFE (the junction of China and the Amurskaya and Chitinskaya oblasts) to the outlet of Ussuri river to the China-Russian border near Lesozavodsk town in Primorskiy krai. Almost anywhere the frontier is crossed will require crossing of the main river channel (about 1 km and more), and will sometimes also require crossing of additional tributaries and extensive marsh belts.
2. The land frontier from the point near Lesozavodsk town south to the estuary of the Tumen river. This frontier is represented by hills, low and middle mountain ranges, and small and medium-sized rivers (some dozen meters wide). One part of this frontier (about 70 kilometers) crosses the large Khanka lake.

3. Laperuz Strait and Kunashir Strait between Russia's Sakhalin and Kunashir islands and Japan's Hokkaido Island. The width of both straits is about 40–50 kilometers. The approaches to the straits on all of the islands are mountainous.

## 2. Key Environmental Problems and Threats Facing the RFE

The RFE remains until now a region in which development is still ongoing. Development of the RFE began centuries ago, but steady development with increased intensity began in the middle of 19th century. The current development level differs markedly in the various parts of the RFE . However, the transformation of areas of the RFE from their virgin nature has been excessive in comparison with the level of development resulting from the transformation, because development has generally focused on the use of exhaustible natural resources, and renewable natural resources have often been exploited in an unsustainable manner. The average transformation of the RFE land areas from their natural states is about 40 percent, with a minimum of 25–30 percent transformation in Chukotka and Kamchatka and a maximum of 60 percent transformation in the Yevreiskaya autonomous oblast and in southern Primorie.

Environment disturbances occur in all natural spheres in the RFE, and are caused by all kinds of natural resource use. The discussion that follows focuses mainly on phenomena that are important for energy supply systems.

The widest environmental damage is caused by air pollution (Figure 4). The main sources of air pollution are the power industry and the transport sector. The high shares of total emissions contributed by these sectors are a result of the structure of the local economy (Figure 5). Stationary emission sources are situated in settlements, especially large and middle-sized cities, and along roads that are concentrated in only a part of the total regional territory. That is why, although the RFE covers more than one third (36.4%) of the Russian territory, its share of the air pollutant emissions of Russia was in 2000 only about 1/20th (4.7%) of the total. This statistic would seem to indicate that the RFE remains one of the ecologically "safe" Russian regions. However, this relatively small share of total emissions is applied only to the relatively small territory pollution, and mostly in areas where people live. As a result, some cities in the RFE have air pollution concentrations that are close to the upper level of air quality standards in Russia. Air pollutant problems are particularly severe for some specific pollutants.

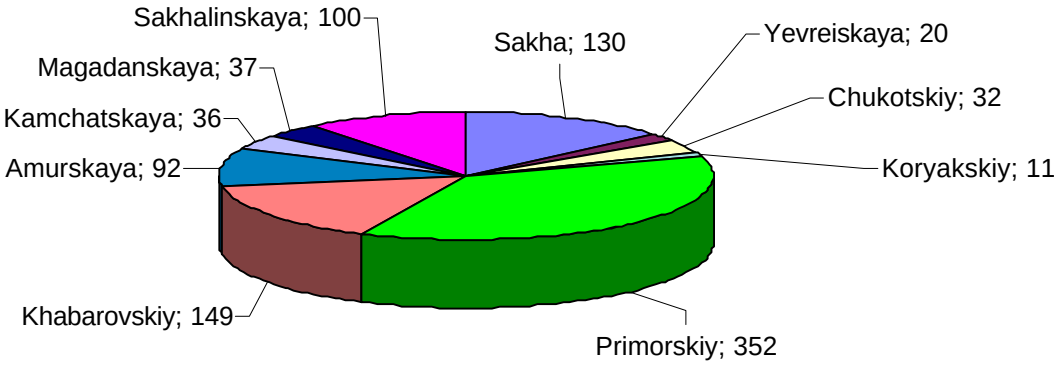


**Figure 4. Air pollutant emissions from stationary sources, 2000, thousand tons**

Source: Regions of Russia, 2002.

The main air pollutants included in the totals shown in Figure 4 are carbon monoxide, nitrogen oxides, sulfur oxides and carbohydrates. Specific pollutants that constitute small shares of emissions but are very dangerous include (in descending order of prevalence) soot, xylol, compounds of lead, toluol, ammonia, benzol, hydrogen sulfide, benzapilene, and others. An example of the structure of air pollution in one area of the RFE is shown in Table 1a.

**Table 1a. The Structure of Emission to Air in Khabarovskiy Krai, 2001 ã., percent**

| Substance | Stationary sources | | Transport | Overall Total |
|---|---|---|---|---|
| | Total | From energetic objects | | |
| Carbon oxides | 16.2 | 2.9 | 70.6 | 49.3 |
| Nitrogen oxides | 16.9 | 28.3 | 11.2 | 13.4 |
| Sulfur oxides | 24.3 | 31.0 | 3.3 | 11.5 |
| Carbohydrates | 3.1 | - | 13.1 | 9.2 |
| Other gases and liquids | 3.0 | - | - | 1.2 |
| Hard substances | 36.5 | 37.8 | 1.9 | 15.4 |
| Total | 100.0 | 100.0 | 100.0 | 100.0 |

Sources: The 2001 Annual Report of the Khabarovsk Krai's Environmental Department; Khabarovskenergo, 2001.

Causes of excessive pollution in the RFE are:

- Using fuel, especially coal, with high ash and moisture contents, and without significant pre-treatment to improve fuel quality;
- The lack of use of highly effective emissions treatment equipment at power plants and on Russian transport vehicles; and
- The ineffective system of pollution control.

The direct impact of air pollution on energy networks themselves, however, is not high.

The air pollution in the RFE includes a considerable contribution from forest fires that is left out of the official accounting of emissions data, which are shown in Figure 5 The average area affected by fire annually in the RFE is 500.5 thousand hectares (Figure 6). Catastrophic fires, however, occur about once every ten years. These fires do not envelope the entire RFE, but in the provinces where they happen they increase burnt area about tenfold from the annual average. Average forest fires produce a discharge of air pollutants that is about equal to the sum of industrial emissions. The main pollutants from forest fires are carbon monoxide, nitrogen oxides, soot and other particulates that create sometime very thick smoke. During catastrophic fire years, air pollution from forest fires generates real difficulties for the respiratory health of populations.

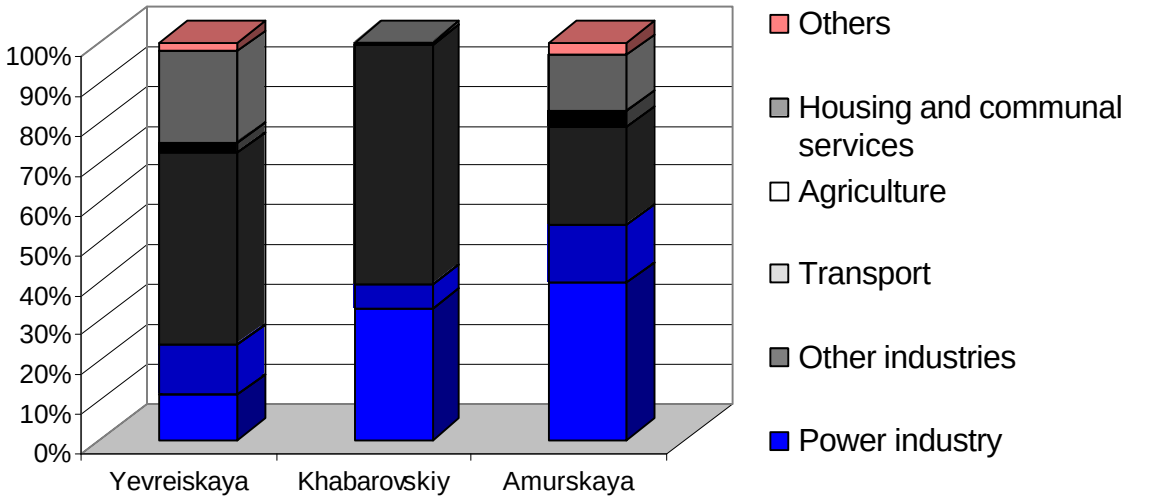


**Figure 5. Structure of air discharge by economic branches, 2001**

Sources: Amurskaya oblast in figures, 2002; Statistical handbook of Yevreiskaya autonomous oblast, 2002; State of Environment and Environment Conservation in Khabarovskiy Krai,, 2002.

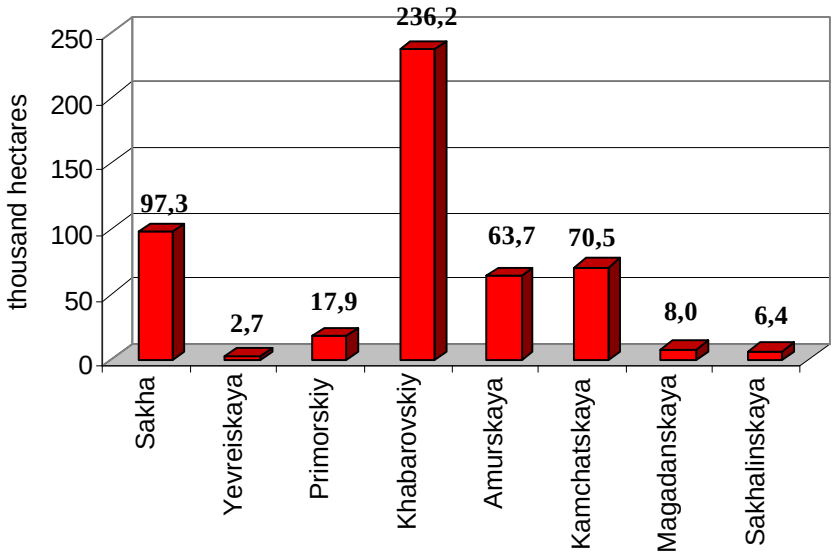


**Figure 6. Average annual area of forest fires by province in the RFE, 1991–2000**

Source: Database of ERI, 2002

Forest fires are direct threats for power lines, and especially for those medium and low voltage lines that are mounted on wooden poles. Sometimes heavy fires can be dangerous for underground cables as well.

The RFE power complex is not a main polluter of water. The majority of power stations have a recycling water supply system for boilers. Power lines themselves are not polluters in general. There is, however, water pollution produced at the time of line construction, especially in the places where power lines cross rivers and streams.

A significant water pollution danger is posed by the oil pipeline from north Sakhalin to Komsomolsk-na-Amure city because this pipeline is subject to almost constant breakage and leakage. The situation may become worse if a proposed large oil pipelines is constructed in the southern part of the RFE.

The bodies of water in the RFE remain pure as a whole. At the same time, however, such major bodies of water as the Amur river, Khanaka lake, and some other rivers in the populated southern areas of the region have a relatively high degree of pollution. The population concentration in those areas increases the significance of the pollution levels found.

Some of the big power stations use the water of the Amur River and other polluted sources. The pollution present in these waters creates a danger to equipment and additional costs for the preliminary purification of water prior to its use in power plants.

Another widespread environmental phenomenon in the RFE is soil disturbance. Soil disturbance in the RFE typically does not exhibit the classic pattern of soil erosion with deep ravines and humus layer washing away. In the RFE there are specific erosion forms caused by a prevalence of mountainous relief, low soil depth and a large share of stone pieces (gravel) in the soil structure. The permafrost mentioned above and the long-term soil freezing add to the impacts of soil disturbance. As a result, the soils in the RFE mostly are very fragile and unstable. Hidden interior erosion, degradation, solifluction, transformation of soil after permafrost melting, the transformation of soils to swamps, and other changes are the usual processes of soil disturbances in the RFE. Cutting of forests, forest fires, bog reclamation, and other human activities are major causes of soil degradation and even of direct erosion.

The problem of floods remains to be discussed. Some experts, especially those considered "very green", insist that floods increase after forest cutting in extended. This type of linkage was confirmed for streams and small rivers (Tarankov, 1970; Zhiltsov, 1975). However, the natural flood background in middle-sized and especially large rivers is so overwhelming that it is almost impossible to study the linkage between floods and forest cuttings in these rivers in a statistically valid manner.

Floods bring damage to power lines annually in the RFE. Flood damage is of concern especially for low voltage lines that were constructed without a proper design.

Forest landscapes dominate in most of the RFE. According the last available State Forest Account (of 1998), the share of densely forested lands consists is 45.7 percent for the RFE as a whole, with the magnitude ranging from 34.0 to 74.9 percent by province, excluding Chukotka, where tundra lands are predominant (see Table 2).

**Table 2. Forest Coverage of the RFE Province Territories, 1998**

| Provinces | Territory, thousand $km^2$ | Density forests, thousand hectares | Forest coverage of territory, percent | Protected forests, thousand hectares |
|---|---|---|---|---|
| Sakha Republic (Yakutiya) | 3103.2 | 144438.8 | 46.5 | 31033.9 |
| Yevreiskaya auton. oblast | 36.0 | 1636.5 | 45.5 | 377.1 |
| Chukotskiy auton. okrug | 737.7 | 5133.2 | 7.0 | 1108.0 |
| Koryakskiy auton. okrug | 301.5 | 10236.9 | 34.0 | 9249.7 |
| Primorskiy krai | 165.9 | 12432.7 | 74.9 | 3117.7 |
| Khabarovskiy krai | 788.6 | 53724.9 | 68.1 | 9213.4 |
| Amurskaya oblast | 363.7 | 23145.1 | 63.6 | 2514.2 |
| Kamchatskaya oblast | 170.8 | 9708.7 | 56.8 | 3493.0 |
| Magadanskaya oblast | 461.4 | 17746.6 | 38.5 | 2263.9 |
| Sakhalinskaya oblast | 87.1 | 5608.5 | 64.4 | 1301.7 |
| RFE Total | 6215.9 | 283811.9 | 45.7 | 63672.6 |

Source: The ERI database, 2002.

Forests are pivots of the ecological stability of heavy wooded territories. Given the important ecological role played by forests, forest harvesting is considered one of the main ecological threats in the RFE. Forest harvesting does not directly influence transmission line networks. The threat of deforestation, however, constantly compels government in the region to expand the areas of protected forests. During the period of the perestroika and economic reforms (1985–2000), the protected forest area increased in the RFE by 1.5 times. This protected status creates difficulties and additional costs for construction of power lines through those areas.

The extent of other protected areas have been increased as well. Currently the RFE has 25 *zapovedniks* (strictly protected areas) with a total area of 13.5 million hectares, 11 natural parks (11.0 million hectares) and a significant amount of local *zakazniks* (partly protected areas). During the same period of 1985–2000 the total extent of these other protected areas increased by a factor of 2.5 times. It is very difficult to obtain permission for transmission line construction through these areas.

There are many other environmental problems of the RFE (Karakin, Sheingauz, 1988):

- Biodiversity simplification as the territory develops economically;
- Declines in the landscape-stabilizing, hygiene and sanitary functions of ecosystems;
- Decline in and even full loss of the biological productivity of ecosystems, especially agricultural ecosystems;
- Violations of customary appearances of landscapes (a psychological aspect);
- Accelerating depletion of all kinds of natural resources;
- Destruction of habitats of first nation peoples;
- Chemical contamination of agricultural and wild food resources;
- A transformation of hydrological regimes in areas of the territory, especially after fuel and mineral deposit excavation, road construction, and bog reclamation;

- A transformation of biologically productive lands into waste lands in areas around mines, and especially around open pit mines and quarries;
- A transformation of sites around cities and along roads under the influence of a recreation, and declines in the recreational attractiveness not only of those sites but of many other landscapes;
- Microclimate changes around new water reservoirs created by hydroelectric power station construction;
- An increase of potential and actual burning of vegetation, especially forests;
- Reindeer pastures violations by geological prospecting, mining and wild fires;
- The pollution of underground aquifers that are sources of drinking water supplies for many settlements;
- And others.

The environmental violations listed above are not necessarily linked directly with the development of power line grids, but they contribute to an overall situation of transformations of the natural-resource potential. This transformation becomes apparent in different ways; and it accelerates in general with development. The natural environment is changing both quantitatively and qualitatively; it is losing features of virginity that have existed until now; tracts of virgin land are becoming environmentally compromised and disconnected from each other, and other environmental impacts are becoming noticeable.

Of course, the degree and kinds of environment transformations encountered are very different from place to place in a region as vast and diverse as the RFE. Thus there are different levels of acuteness of environment problems in the different RFE provinces and their parts.

The ecological capacity of the RFE, especially of its northern and mountainous areas, is relatively small, and the natural environment has indeed suffered serious damage as a consequence of the development of the territory. Moreover, these areas have enormous significance for preserving the bioclimatic equilibrium of the entire Northern Hemisphere, since they perform a vital "cleansing" role in the general system of circulation for polluted air masses.

Thus, the environmental situation caused by economic activities becomes more and more complicated, demands urgent solutions, and becomes not just an ecological or an economic but a social problem as well. The latter has given birth to a very new Russian phenomenon – the strong public ecological movement. This movement became possible after the establishment of a democratic society and the abolition of State censorship. Now there is a substantial portion of the population involved in non-formal and formal groups in the shape of non-government organizations (NGO).

There is no full list of environmental NGOs (envNGOs) operating in the RFE. According to our special investigation within just the Khabarovskiy and Primorskiy krais there are about 80 envNGOs. Within all of the RFE we estimate the number of envNGOs at about 300. These envNGOs make up a common partly formal, partly non-formal network that is linked with the international environmental society. The local envNGOs are very active, and try to involve themselves in virtually any activity associated with the use of natural resources particularly because current Russian legislation gives these groups some corresponding opportunities for intervention. Energy sector infrastructure including power grids are subjects of very rapt attention for these groups. This recent social phenomenon must be taken into consideration when planning any major energy infrastructure developments, and any new projects including

power line construction must have a good chapter on the assessment of the influence of the proposed development on the natural environment. Such an environmental assessment must be compiled in any project according Russian laws, but it is worth stressing that environmental assessments must be expected and prepared to undergo meticulous examination by NGOs and in public hearings.

All power plants that are likely to feed international transmission lines (excluding hydropower stations) are confined to cities or their outskirts. These areas are the most populated and the most polluted areas, and face the maximal environmental restrictions. In addition, along all State frontiers there are environmentally protected belts whose use is subject to different degrees of use restrictions and which are of different widths (in some places up to 3 kilometers). International transmission lines will obviously have to cross those belts, and as a consequence the presence of these belts will influence not only the allowed regimes of line exploitation, but also the procedures required to obtain permission for line construction.

An especially complicated situation exists in the southern parts of Primorskiy krai (southward of line Nakhodka – Spassk-Dalniy – Kamen-Rybolov) and on Sakhalin Island. These areas are prospective locations for transmission lines right-of-ways, but at the same time are stuffed with (include many) different protected areas including *zapovedniks* and *zakazniks*.

## 3. Environmental Legislation

The environment legislation of the Russian Federation includes many federal and local laws, and different normative-legislation departmental and local acts (instructions, manuals, regulations, etc.). The legislation is based on two clauses of the Constitution of the Russian Federation (Constitution, 1993). Clause 42 proclaims a right of any Russian citizen to have a favorable natural environment, and clause 58 requires the protection of nature and the natural environment.

Two laws, "On protection of natural environment" (2002), and "On ecological expert examination" (1995) form the basis of all environmental legislation. These basic laws are supplemented with more specific laws about each sphere of nature or field of activity.

The main body of specific laws is the Land Code, which contains the special chapter 2 "Land Protection". Other laws – the "Forest Code" (1997), the "Water Code" (1995), "On Free Air Protection" (1999), "On Animal Kingdom" (1995), and "On Depth" (1995) – either are devoted mostly to a protection of corresponding natural resources or include special chapters and clauses about protection and conservation. It is amusing but maybe at the same time very symptomatic that a law on the most uncontrolled resource – fish – is absent.

The number of laws on fields of activity is smaller. Primary them are "On Strictly Protected Natural Areas" (1995), and "On Territories of Traditional Nature Use of Small Indigenous Peoples of the North, Siberia and the Far East of the Russian Federation" (2001).

There are also a large number of indirect laws that influence protection of the natural environment. The most significant of these are "On Common Principles of Local Self-Government Organization in the Russian Federation" (1995), the "Tax Code", the "Budget Code", "On Payment for Land" (1991), "On Production Share", "On Land Delimination" (2001), annual budget laws, and others. These laws add power to, or sometimes restrict, the force of the basic environmental laws.

Federal laws are interpreted in detail and adjusted to local conditions in many provincial acts. Some of these acts are more or less comprehensive, such as, for example the "Forest Code of Khabarovskiy Krai". Others are devoted to very specific decisions. Local acts have two main

forms – provincial laws and governors' decrees. In any case they cannot be very independent because they must strictly correspond to federal laws.

Federal laws are also developed and elaborated in many Federal Government decrees and countless numbers of ministries' and other departments' instructions, regulations, manuals, etc. These elaborations mostly consider mechanisms and norms of law implementation, and very often have more influence on the real management of the environment than do the environmental laws themselves.

In general, the impact of national and regional legislation on the natural environment and on natural resource use depends on both the activity of federal governmental bodies and on the desires of the population, especially NGOs, to conserve and to increase the environmental wealth. These popular and NGO-led initiatives are often not coordinated, and frequently pursue interests of not only different but adversarial groups. These efforts are partially responsible for the numerous gaps and contradictions of the current legislation on nature conservation and on natural resource use.

A set of the most democratic principles of federal – regional cooperation and a division of power for all aspects of an environmental protection was defined in the law “On Protection of Natural Environment” (2002) including:

- A unified system of payment for resource use is applied for all natural resources;
- A compensation approach for the natural resource management;
- Requirements for the regeneration of resources;
- Prohibitions concerning involvement in the trade of rare and threatened species; and others elements.

All subsequent laws related to natural resources are inferior to this law in terms of their logic, consistency and coordination. Nevertheless, many acts contradict both each other and other documents on substantial issues. Moreover, the current legislation also has substantial gaps. For example, the declared principle of payments for the use of natural resources does not have sufficient regulation behind it. As mentioned above, a law governing use of fish resources and the fishery is absent. A basic act on the main principles of natural resource use was not adopted by the State Duma (the lower chamber of the Russian parliament).

Many other natural resource management issues do not have clear and unique explications and regulations at the federal level. Many recently adopted acts (such as the Tax Code, Land Code, etc.) are being undermined by rival groups who are seeking to promote different approaches to the implementation of acts or decisions.

The sectoral legislation at the federal level is fragmented, unstable, insufficiently based on the practice or the experience, and does not meet the requirements and the goals of sustainable development in Russia. For example, the "Fundamentals of the Forest Legislation of the Russian Federation" was adopted in 1993. In 1997 it was replaced by the "Forest Code" and in 2002 the process of replacing the Code was initiated by federal bodies once more.

Provinces whose economies are based on natural resource exploitation attempt to regulate conservation and use of natural resources taking into account the local context. Locally adopted acts have partially filled in the gaps resulting from insufficient federal legislation. In some cases, regional initiatives have preceded federal acts and provide interesting approaches to resolve problems connected with ecological, economic and social institutions. In some cases, provincial regulations made significant contributions to protect valuable territories and resources, respecting at the same time indigenous population interests and economic devel-

opment needs. However, in other cases, regional legislative initiatives contradict the federal legislation knowingly or unintentionally, threaten sustainable development of regions and cause devastating misuse of biological resources. The creation of the natural environmental legislative system of the Russian Federation is continuing; the system remains in flux and is far from completion. This situation creates uncertainty and increases risks of investment.

Relations between environmental legislation and transmission line construction are not completely clear at present. The Law on Environmental Protection identifies electrical objects as dangerous items and requires in common clauses 16, 22, and 55 that their impacts be controlled. The Law on Environmental Protection also contains special clause 40 on conditions for environment preservation during the allocation, designing, construction, reconstruction, installation and exploitation of energy facilities. The Law on Expert Examining does not mention energy facilities specially. It demands, however, a clear and complete examination (an impact assessment) of any project that can affect the environment. It also formulates the conditions for public examination of impact assessments.

Clause 7 of the Land Code divides all Russian lands into 7 categories. One of these categories is "lands of industry, power engineering, transport, communications, radio and TV broadcasting, information and space activities, defense, security and special destination". Chapter 16 of the Code considers the use and protection of those lands. Clause 89 is devoted specially to the subcategory "lands of power engineering", highlighting lands "for allocation of overhead transmission lines, land cable lines, substations, distribution centers and other energetic objects".

The Forest Code does not consider energy or electric facilities specifically. It does, however, contain some important clauses about the transformation of forest lands into lands of another use. Taking into account that the forest land use is the largest land use in the RFE (80 percent of the total RFE territory), the greater part of new transmission lines will likely be constructed through forest lands.

The law "On Territories of Traditional Nature Use" mentions servitudes that allow the possibility for development of transmission lines if lines do not violate traditional natural resource use by indigenous peoples.

The list of laws related to the environmental regulation of energy facilities could be continued, but it is possible to conclude that almost every law on the natural environment or on natural resource use has statements that bear upon the development of transmission lines and/or their operation, and must be taken into account from that point of view.

## 4. Legalization of Electric Network Construction

There are five sequential steps necessary to obtain clearance to construct electricity networks in the RFE.

*Step 1.* A feasibility study that outlines main transmission line parameters must be completed.

*Step 2*. Land rights must be obtained. This can be done by two methods:

A. A lease acquired through an auction. Leases are implemented mostly for private enterprises and include outlining of lot boundaries on the map and in the field; the determination of possible kinds of use and existing restrictions; decision-making on the holding of an auction, determination of the auction mode, the setting of an initial price for the lease, the setting of the size of a deposit toward the lease, setting of an auction place and time,

and preparing an auction announcement and other publicity; the preparation of an estimate by the State Land Cadastre; an carrying out the auction; drawing up the lease agreement; and the legal registration of land rights.

B. A permanent (termless) tenure. This type of land right is implemented mostly for state and municipal enterprises and bodies, and includes a land lot choice; a preliminary agreement on a lot allocation; outlining of lot boundaries on the map and in the field; the determination of possible kinds of use and existing restrictions; an estimation by the State Land Cadastre; a governor's decision-making on provision of a land lot; and the legal registration of land rights. The State Land Cadastre is the official list that contains description of parameters and characteristics of all land lots, including estimates of their economic-financial value. A special State Agency that is named *Roszemkadastr* compiles and maintains the State Land Cadastre on an ongoing basis under the principles of the special Federal Law "On the State Land Cadastre", which was put in operation at the end of 1999. As this law was only recently implemented, the State Land Cadastre has not as of yet been fully completed in most of the Russian provinces. Land prices of in State Land Cadastre are calculated based on the official pricelist. These prices are used for the determination of starting prices for auctions. Real market prices, however, including auction bids, are free to change, and can considerably exceed Cadastre prices.

Decisions on lands that are part of aboriginal traditional nature use require preliminary coordination between officials and aboriginal communities.

Under both of the methods of securing land rights, a special commission is appointed to choose a land lot. The commission consists of different experts that represent municipal authorities; the land use directorate; the forest service; controlling bodies of environment protection, construction and architecture, fire safety; the sanitation service; water, fish and hunting inspections; first nation communities, and others.

In the case of forest lands withdrawals (which, as mentioned above, are the most frequently encountered type of lands rights change needed) there is a special legal procedure that is composed of a forest survey, a concordance and an approval by the forest service and land use controlling bodies on the raion (district) and province levels; and agreement with other municipal and province authorities.

All Russian forests are legally classified into three groups: the 1st – fully protected, the 2nd – semi-protected, the 3rd – exploitable forests. A governor's decision on a forest land withdrawal is final for the forests of the 2nd and the 3rd groups. In case of a lot withdrawal from forest land of the 1st group, the final decision can be made only by the Federal Government.

A payment for a forest land withdrawal is calculated using the federal pricelist of "basic prices" that depends on the land allocation, tree species present, and the type of the land transformation (Figure 7).

The pricelist provides prices for two type of the forest land transformation:

- The long-term transformation of forest lands into non-forest lands without withdrawing them from forest land use categories;
- The permanent transformation of forest lands into non-forest ones including transfer of those lands from forest land use to energy land use.

A set of coefficients are used to adjust basic prices for land transformation. These coefficients reflect specific area allocations, protected groups and categories, mountainous slope steepness, the state of the forest cover, and the length of the transformation period of the given lot. As a result, in reality basic prices can be decreased by as much as a factor of 2.2 or increased

by as much as a factor of 39.0. These prices also serve as starting prices in the case of auctions, but in the process of bidding the starting prices can be increased.


**Figure 7. Basic prices of forest lands in Khabarovskiy krai for different types of the land transformation**

Source: Ministry of Nature Resources of the Russian Federation, 2003.

Prices for transformation of other lands (agricultural, industrial, built-up area) are estimated on the basis of the State Land Cadastre.

The entire process of land allocation requires cooperation among the federal, provincial and municipal bodies that are responsible for natural resources, especially for lands and forests. The process is very complicated, and has many stages and many required concordances. All decisions must go through review by state ecological experts, whose work can be augmented by that of public experts. Only the final federal government's or governor's decision awards land use rights. A refusal to award such rights can be appealed to an appropriate court.

During a month after the signing of a land use decision, a land user must sign an agreement with the municipality, pay a land payment, compensate losses of forestry, agriculture, fishery, hunting and other uses, and register its land rights. The land user obtains rights to begin construction activity only after the legal registration of its land rights. Such activity must be implemented within three years. In the case absence of activity of three years or more, the awarded rights can be officially canceled.

*Step 3.* If construction costs are covered from state or municipal budgets fully or in part, they must be included in the corresponding budget. There is a special procedure for including such funds in budgets, which requires a number of authorizations and is based during a preliminary year. If a construction project will continue for some years, a simplified form of the budgeting procedure must be repeated annually. Each annual fund must be used fully because if it is not used, part of the allocated funds will be charged off and lost.

*Step 4.* Technical project design. The Technical project design phase also requires many types of authorizations, including different inspections and services. After completing these authorizations the design must go be reviewed by the state ecological experts and may possibly be reviewed by public ecological experts and in public hearings. After that, the design

must be adopted by the corresponding construction department, depending on the size of the project.

This step can be implemented in parallel with the step 3.

*Step 5.* The construction of the project itself that must be reviewed by the state commission after the project completion, and the project must be registered in the property chamber.

All of these steps are covered by a large number of legislative and so called 'underlegislative' acts, norms, standards, instructions, etc., which together create the very complicate system of the construction legalization that a project must pass through in order to be approved and built.

## 5. Ecological Programs in the Russian Far East

During the totalitarian Soviet era, all ecological programs in reality were state ones even when they were proclaimed as public. Real and mostly non-governmental environmental programs were launched at the end of 1980s through the beginning of 1990s. It is necessary to recognize that a large fraction of the ecological programs now in place were initiated or strongly supported by native and foreign NGOs and foreign institutions.

Government bodies that control natural resource use and environmental state programs are carrying out their duties with more or less variable success on a continuous basis. There are some functioning environmental programs in the RFE.

The first fully designed provincial program with a scientific background was the "Long-Term Program of Nature Protection and Natural Resource Rational Use of Primorskiy Krai until 2005" (1993). It was adopted by the krai's administration and remains today as the guide to actions in these areas, but was not implemented in widely because adequate corresponding financing for the program was not provided in any of the past years.

Another program of that time – "Program on Reforestation and Forest Protection in 1996–2010" was put into operation in Khabarovskiy krai. This program also was implemented at a level about 50–60 percent of full implementation. After the catastrophic wild fires of 1998, the program was extended in the form of special program for reforestation of burnt sites.

One of the last and most extensive of the programs approved and implemented is the "Federal Program on Amur Tiger Preservation". This program embraces the southern part of the RFE and includes various preservation measures and financing from the state budget. Unfortunately, most parts of the program are not yet provided with "real money".

The all-Russian program "Forests of Russia" included almost all of the RFE provinces.

As of now, all of these programs have been absorbed by the federal targeted program "Ecology and Natural Resources of Russia (2002–2010)" (Ecology, 2001). This overall program was adopted by the Russian Government and is implemented by the RF Ministry of Natural Resources in cooperation with provincial administrations. It is a large and comprehensive program, and is financed from federal, provincial and private budgets. Many RFE provinces also have local environmental programs. At present, for example, such a program is implemented in the Khabarovskiy krai. Unfortunately, both federal and provincial programs are not fully funded at the levels intended when the programs were planned. For example, in 2002 federal program financing within the RFE was planned to be 1.9 billion rubles, but the actual financing included only 1.7 billion rubles, including 0.7 billion rubles from the federal budget, 0.3 billion rubles from provincial budgets, and 0.7 billion rubles from other sources.

It is possible to affirm that environmental programs fulfilled by NGOs are more effective than the state programs. From this point of view, foreign and international environmental NGOs and funds have played an important role for local Russian NGOs coming into being. These NGOs finance ordered projects, allocate grants, help to purchase communication equipment and to pay communication costs, cover costs of trips to environmental conferences, trainings, organize conferences and workshops, and carry out other activities. Some grant rounds directed at stimulating the establishment of local envNGOs were put into practice by the Initiative for Social Action and Renewal in Eurasia (ISAR), the US Agency for International Development (USAID), and other groups. ISAR alone carried out three large grant programs devoted to the creation and support of local NGOs. Foreign government funds were also involved in these activities, including funds from USAID, Canadian Agency for International Development (CAID), and others, however these funds also came to the RFE primarily through NGOs.

Adjacent countries and some international organizations are very interested in promoting conservation work related to the ecological situation in the RFE because of the global role of the region's natural environment. These countries and organizations are ready to invest funds in the ecological stability of the region. These types of investments have been implemented since the end of the 1980s.

One can identify five main foci of foreign and international activities in the ecological sphere of the RFE:

1) A "very green", alarmist propaganda and a resistance to the economic development;

2) Study, data collection, and dissemination of information;

3) Education and training;

4) Implementation of real ecological projects;

5) Supporting of ecologically sound business projects.

The first focus had its peak of activity in the RFE at the late 1980s – early 1990s. This was a time of ecological information opening in Russia and a liberalization of access to the formerly closed regions, among which the RFE was one of the most tightly restricted The California NGO "Pacific Energy and Resources Center" carried out the special "Siberian Forest Protection Project". Its members brought considerable information, presented many lectures, published many papers, and carried out other activities to prevent the granting of forest leases in the RFE to big foreign logging companies, and in particularly to argue against a lease to one of the biggest US logging companies, Weyerhaeuser, in Khabarovskiy krai. The main idea and main goal of this activity was and is the prevention of development in the territory, and the conservation of remaining virgin areas. Some RFE public persons and organizations helped to carry out these activities, but the ideas were not supported by the majority of the population because most citizens understood that development prevention was equivalent to stopping the local economy, which was very unpopular, especially in the face of economic crisis.

The positive result of the work of NGOs has manifested itself in the attraction of public attention to hot ecological topics and in the extension of the use of the Internet for information exchange.

RFE universities and research institutes mainly work in the area of research, data collection, and information exchange. These activities consist of different types of work: bilateral or multilateral studies including some local and foreign institutions; research projects initiated by local institutions to take advantage of grants awarded by foreign foundations such as The

John D. and Catherine T. MacArthur Foundation, Eurasia, Soros's Fund "Open Community", the Japan Foundation, the Sasakawa Peace Foundation, and others; training in foreign universities; the interchange of researchers; providing scientific conferences, symposia and workshops; publishing of handbooks, proceedings, monographs and others documents. Sometime these activities have resulted in recommendations either for the common public or for the local authority.

As example of such an activity was the three-year (1993–1996) Russian-China-US project "A Program for the Environmentally Sustainable Development of the Ussuri River Watershed" that was completed with the publication of a monograph and a map. The project consisted of the analysis of the land use situation in the Ussuri River watershed and the formulation of recommendations on land use improvement to promote ecological and economic sustainability. The cost of project was about US $1.5 million.

A second example of a collaborative project was a three-year project initiated by institutions of five countries (China, Japan, Mongolia, the Republic of Korea, and Russia) for the study of economic cooperation in Northeast Asia. One block of the project was devoted to natural resource use and environmental problems. The project resulted in some international conferences and the publishing of several books (Natural Resources, 1995).

The third direction noted above (education and training) now embraces a wide circle of organizations, most of them municipal or non-governmental. This local focus is one of the main positive achievements of the direction, which has really converted itself into a "grass-roots" system. The kinds of activities undertaken are very diverse. There are special programs in the kindergartens, ordinary schools, gymnasiums, and Lyceums. Other education and training-related activities include radio and television performances, video film productions, publishing of brochures and booklets, and presentation of lectures. The direction widely uses training in Russia and abroad, workshop and seminar activities, student exchanges, and other activities.

Education and training activities are financed by many governmental and non-governmental sources from different countries. These include USAID, the US Information Agency (USIA), the World Wildlife Fund (WWF), the International Research & Exchanges Board (IREX), ISAR, and others. Many of these institutions have grant programs. Especially successful in this field is the ISAR's Program of small grants because it is very flexible and operationally effective.

Possibly the brightest example of the education and training in the environmental area is the longstanding program of publishing the Russian "Zov Taigi" ("Taiga's Appeal") magazine that is prepared by Russian volunteers and financed by international funds. This publication has gained the sympathy of many local readers "who are not hurry up to Hawaii" (the motto of the magazine).

The results of the education and training direction cannot be easily estimated, however it is evident that more than 10 years of effort has manifested itself in a wider and more detailed common understanding of ecological and environmental problems by the local population.

The fourth direction (implementation of real ecological projects) includes some projects that planned and achieved concrete results. Usually these projects attracted the most attention of mass media and are known for the public. As a rule, the projects have been devoted to hot problems. The idea of "flag-species" is widely used. It focuses on the most known species that are under the most danger and are very endemic, such as the Amur tiger, the Far Eastern leopard, the Japanese and Dahur cranes, the Far Eastern white stork, the dikusha-bird (Falcipennis

falcipennis), and others. Projects of this type have different goals and are realized in the different ways.

One of the most well-known projects with an ecological focus is the program for Amur tiger preservation. In fact, this program has been composed of a collection of projects with different durations, costs, sponsors, and degrees of involvement. Many national and international bodies take part in the program: WWF, the Global Survival Network, the Rhinoceros and Tiger Foundation, the Hornoker Institute (USA), the National Fish and Wildlife Foundation (USA), the Institute of Wildlife (Idaho, USA), Frostburg University (Maryland, USA), the Institute of Wild Animals (Harbin, China), the Korean Society for the Protection of Wild Animals (Republic of Korea), and the Coca Cola Company, among others. Many organizations are involved in the program from Russian side. These include the Wildlife Foundation (Khabarovsk), the Far Eastern branch of the All-Russian Research Institute on Hunting and Wild Animal Breeding (Khabarovsk), the Pacific Institute of Geography (Vladivistok), and others. The program has been successful in reducing or eliminating poaching and trade in poaching-related contraband. A database on methods of trade in contraband was created. Special groups equipped with jeeps and communication means were organized. Each year these groups confiscate different illegal products from dozens of smugglers, products with values of hundreds of thousands of US dollars. It is possible that these groups could form the basis for a future "ecological police" force.

As by-product, the program has helped to cut off the contraband trading of trepang (sea cucumber) and of cabarga (local musk deer) musk glands. There are many other measures used in the program, including propaganda and publications. The total cost of the program was not announced and though it has probably not been formally calculated it is known that the cost of the program amounts some millions of US dollar. The program is continuing.

Perhaps one of the largest ecological programs implemented in the RFE was the Russian-USA "Russian Far East Sustainable Natural Resource Management Project", known also as the EPT/RFE-project (Environment Policy and Technology). This project was organized within the framework of Russian-USA cooperation under the Gore – Chernomyrdin Committee and lasted from 1994 to 1998. USAID has spent about US $18,000,000 on the fulfillment of the project. The EPT-project embraced the Primorskiy and Khabarovskiy krais. Many Russian and international experts were recruited to work on the project. From the US side the company "CH2MHill International" has been involved, as well as the Harvard Institute of International Development, the US Forest Service, the US branch of WWF, ISAR, and others.

The EPT/RFE-project had three blocks: policy and legislation, forest management, and biodiversity conservation. In the course of the Project the Forest Code of Khabarovskiy krai was developed, the first functional RFE zoning plan for the raion (district) level was designed in Primorskiy krai, and the forest greenhouse complex in Khabarovskiy krai was completed, along with other activities. The EPT-project included also a large portion of training and education support. The project has influenced the local ecological situation.

The EPT/RFE-project has been extended for 2001–2005 as the US-Russian project "Forest" financed by USAID and embracing several RFE and Siberian provinces.

The project "Gassinskiy Model Forest" was put into the practice in Khabarovskiy krai according to an agreement between the Russian and the Canadian Forest Services, and was a part of the world model forest network. The term of agreement was 5 years, 1994–1998. The Canadian side invested 3 million Canadian dollars and provided technical support. The Russian side invested forest area, studies, existing information, organizational efforts, etc. A non-governmental association was established for project realization. The association united the local Forest Service, the Far Eastern Forestry Research Institute, the Far Eastern Forest In-

ventory Enterprise, the Nanai leskhoz (the local forestry enterprise), and others. The project has resulted in the completion of a high-class survey of the Model forest territory, the design of a development plan, the construction of a modern office building for project administration, and the procurement of equipment. Unfortunately, it is difficult to predict how the further development of the Model forest will take shape without Canadian financial support.

The WWF project "Far Eastern Ecoregion", as a part of the world-wide "Global 200" project, covers many types of ecological activities, including Amur tiger and Far Eastern leopard conservation; the opposition to large forest cuttings (especially those planned by domestic and foreign companies); the struggle against illegal cutting; the preservation of the large Amur ecosystem and other topics.

It is impossible to list all of the current projects of this type. Two additional examples, however, are the project for Japanese crane preservation and the Plan for the conservation of biodiversity and for sustainable development of the Bikin river basin traditionally inhabited by indigenous peoples..

The Russian-USA program "Replication of Learned Lessons" (ROLL) must be especially highlighted. The program started at 1996 and is devoted to the dissemination of positive experiences of international ecological programs in the whole of Russia. Ten rounds of grants for this project have been completed, and an eleventh round is underway as of this writing. During 1996–2000, 21 local projects received grants totaling US $705,800 within the RFE alone.

In 2002, the Global Environmental Facility (GEF) launched the project "Protected Areas Network for Sikhote-Alin Mountain Forest Ecosystems Conservation in Khabarovsk Kray (Russian Far East)" with GEFs financing of US$750,000 and a total cost of US$1,750,000. The main project executor is the NGO Wildlife Foundation (Khabarovsk).

The fifth direction of activities in the ecological sphere, supporting of ecologically sound business projects, doesn't have a large impact in the RFE at present. Attempts to support local ecologically sound business were made in the EPT-project. It was planned preliminarily to establish a special trust fund that would allocate privilege loans for new small and middle-sized ecologically sound businesses. These attempts turned out to be futile. The Russian-Japanese program on fishery management can be considered as a positive ecologically sound business. It was established according to an inter-governmental agreement almost twenty years ago and includes construction of fish breeding plants (hatcheries). Some of these hatcheries were constructed on the Sakhalin Island. An other program of this type is the Russian-USA "Russian Ecological Partnership (REP)" that is devoted to ecologically sound business in the sphere of wood processing and production of non-timber material forest products. The term of program was 1998–1999; its total budget was US $1.5 million.

After a very long preparatory period, the Sustainable Forestry Pilot Project of the World Bank was launched in 2002 in three Russian provinces, including Khabarovskiy krai where the loan amount will be US$ 18 million.

This list of programs is not intended to be complete, but it provides an idea of the many different types of activities in the environmental area that are ongoing in the RFE.

None of programs described above consider transmission lines specifically. Many of the programs, however, mention the lines as a source of obvious potential environment damage. Programs that are linked with establishing new protected territories pay the main attention to the problem of transmission lines. These programs are strictly against lines. This point of view does not have a very firm scientific background, and can thus be called in question. The problem is considered in more detail in the Conclusion section that follows.

## 6. Conclusion

The information discussed above leads one to make the following conclusions:

- Russian legislation considers power electric lines as objects that are dangerous to the natural environment. The main threats posed by power lines are magnetic and electric fields; withdrawals of lands from biological production; destruction of soils and vegetation—especially in forests; and electrocution of birds.
- Electromagnetic fields from power lines do not create significant threats under RFE conditions where high-voltage power lines, and even the majority of medium-voltage lines, are built through unsettled areas. The same can be said regarding electrocution of birds. At least these problems have not been widely investigated, and are covered in no special publications that confirm their significance for the regional ecology.
- The problem of land withdrawals as a result of power line construction also is not so important overall, given the vast tracts of land available. There is, however, considerable opposition to agricultural or forest land withdrawals. Especially strong is the opposition in case of lines designed to pass through protected areas.
- None of the ecological programs considers power lines as their primary object of study. Current discussion on projects of East Russian pipelines, however, indicate that this lack of focus on the power line issue can quickly change with the first real steps for power line construction.
- The potential situation for development of power lines in the RFE can be looked at in two different ways. On one hand, the present environmental situation related to power lines in the RFE is not acute, but rather, moderate. On the other hand, the combination of environmental, economic, legal, and political conditions in the RFE suggest that there could be the potential for strong conflict if active development of power line networks comes to pass in the future. This potential for conflict on projects with international significance means that the situation demands wise management and campaigns organized beforehand that include:

    1) Cooperation with ecological programs and environmental NGOs, including pledges to contribute to the programs;
    2) Wide and transparent publicity, including the involvement of respected journalists and experts in reviewing power line plans and options;
    3) The strict observance of legislation and existing orders, especially as to ecological assessments, with the parallel coverage of the project's adherence to these requirements in mass media;
    4) A line design that stays as far from protected areas as possible.

The implementation simple and common approaches such as these can help to avoid many possible conflicts in the development of transmission line projects.

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