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Chapter 11: Belarus

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NCSEER NOTE

This report is part of a Council-funded research project entitled Environmental Resources and Constraints in the Former Soviet Republics. Twenty one reports, listed below, resulting from this project will be distributed seriatim by the Council, and will collectively become the chapters of a book to be published in 1994 by Westview Press. Eighteen of the 21 (written by other authors) deal with the fifteen former republics, and three (written by Dr. Philip R. Pryde, the Principal Investigator) are summarizing reports.

Environmental Resources and Constraints
in the Former Soviet Republics

Belarus

Oleg Cherp and Nadezhda Kovaleva

Executive Summary

The following paragraphs summarize the main contents and conclusions of a chapter on Belarus, which has been prepared as part of a larger work on the environmental and economic-geographic situation in each of the former Soviet republics. The full study, edited by Philip R. Pryde, will be published by Westview Press under the title "Environmental Resources and Constraints in the Former Soviet Republics. Funding assistance from the National Council for Soviet and East European Research is acknowledged with appreciation.

In this chapter, the history, physical geography and ethnography of Belarus is briefly summarized, followed by a survey of its main economic resources and any significant environmental constraints (climatic, geomorphologic, etc.) that affect the country's development. The contemporary state of the development of industry and agriculture within the republic is reviewed, with a focus on the environmental disruption that has resulted from this development. The current situation with regard to biotic preservation is also discussed, including the establishment of nature reserves and parks, and the potential for ecotourism. The administrative structure for environmental management within the country is also briefly examined, as are non-governmental environmental efforts.

Particular discussion is directed to the problems that currently exist within Belarus involving radioactive contamination, land disruption in the Polesye region, and pollution in such industrial centers as Minsk, Mahilyow, and Solihorsk.

The main conclusion of the chapter is that the future of Belarus is potentially promising, assuming economic stability can be achieved. It is orienting its economy towards western Europe, while remaining a key entity within the Commonwealth of Independent States. The portion of the country affected by Chernobyl will remain a problem for the foreseeable future. The effects of Chernobyl are one of the main constraints to future development.

Philip R. Pryde, June 6, 1994


Figure III
BELARUS
Capital
Cities
Areas of worst impact from Chernobyl
LATVIA
RUSSIA
LITHUANIA
POLAND
UKRAINE
Western Dvina River
Polatsk
Novopolotsk (Navapolatsk)
POOZER' YE
Vitebsk (Vitsyebsk)
Lake Naroch
Berezina Nature Reserve
Vilnius
Belarusian Ridge
320+
342+
Minsk
346
Mogilev (Mahilyow)
Grodno (Hrodna)
Nyamun (Neman) River
Novogrudok (Navahrudak)
Berezina River
Byelovezhskaya Pushcha
BELARUS
Bobruysk
Soligorsk
Dnepr River
POLESSYE
Gomel (Homyel)
Brest
Pinsk
Pripyat River
Mozyr (Mazyr)
Pripyat Reserve
0 50 100 km
Chernobyl

Chapter 11. BELARUS

Oleg Cherp and Nadezhda Kovaleva

Belarus (previously Byelorussia or White Russia), is situated near the western border of the former Soviet Union, with a population of 10.3 million people (1990) and territory of 207.6 thousand km^2. Two recent events have made the world more aware of this little-known country. The first was the Chernobyl disaster, which severely affected the Belarusian population and territory. The second was the meeting of the heads of Russia, Ukraine and Belarus in December of 1991, which took place in an ancient Belarusian forest, Belovezhskaya Pushcha, and declared the end of the USSR and the establishment of the Commonwealth of Independent States. The central agencies of the new confederation were placed in the Belarusian capital of Minsk. As a result of independence, the spelling of the names of most Belarusian cities has been changed from the old Russian (Cyrillic) form to a preferred Belarusian form; in this chapter, the latter will be given first with the Russian version in parentheses.

Ethnicity and History

The Belarusians, who represent one of the three East Slavonic nations, constituted in the 1989 census about 78% of the population of the former Belorussian Republic, and of contemporary Belarus. The remainder includes Russians (13%), Poles (4%), Ukrainians (3%), and Jews (1%). The Belarusian language is close to both Russian and Ukrainian but is also influenced by the Polish and Baltic languages. Approximately three quarters of church-going Belarusians belong to the Russian Orthodox church, most of the rest are Roman Catholics.

In 1926, before the onset of industrialization, only 10% of the Belarusian population lived in towns. Vast areas of forests and swamps used to hinder the development of Belarusian villages. These features, as well as the unique location of the country as a frequent battlefield between East and West, and the variety of religions and languages of the people settling in Belarus, have formed the Belarusian character. The Belarusian self-image emphasizes secretiveness and reluctance to accept foreign ideas, but, at the same time, also embraces religious and national tolerance, cheerfulness and rich imagination. Perhaps these features help explain why Belarus remains virtually the only country of the former Soviet Union not affected by severe nationalistic tensions or political extremism.

About 15 centuries ago, the Slavs began to arrive at the territory of modern Belarus, which was populated by Baltic tribes. In the 8-10th centuries A.D., in the upper basins of the

Dnepr and Western Dvina rivers, the synthesis of Baltic and Slavonic populations resulted in the formation of the ethnic communities of the Belarusians' ancestors. In the 9th to 13th centuries, the territory of Belarus belonged to the early feudal state of Kievan Rus, a political and military union of Eastern Slavonic principalities.

In the 13th century, Kievan Rus was defeated by the Tatar-Mongols. The people of the western part of the country, however, managed to defend their independence. This fact accounts for one of the poetic legends of the name of the country, Belarus, which was first used in a Polish chronicle in the early 14th century. White Russia might mean the part of Russia that was 'free' or 'independent' (of Tatars).

The need to resist the pressure of Tatars and German crusaders forced the people of Belarus to consolidate around the rapidly expanding principality with the capital of Navahrudak (Novogrudok) ruled by a Lithuanian prince Mindaugas. By the middle of the 14th century, all the territory of modern Belarus was attached to The Great Principality of Lithuania, Russia and Zhamoytiya (GPL). By the 15th century, the territory of the GPL expanded from Brest to Smolensk and from Baltic to the Black Sea. The origin of the Belarusian language, the Belarusian culture and the Belarusian nation itself should be looked for in the GPL where 90% of the population were Slavonic and the state language was old Belarusian. The current borders of Belarus in the East, the South and the West almost coincide with that of the GPL in 16th century. The modern emblem of both Belarus and Lithuania is 'Pagonya' -- the GPL's coat of arms. The first Belarusian book (it was also the first book in an Eastern Slavonic language) was printed in 1522, in GPL's capital Vilniya (Vilnius), by Francis Scaryna, a Renaissance Belarusian enlightener.

In the 16th century, in the face of the threat from the East, the GPL united with the Polish Kingdom (1569) to form "Rzecs Pospolita". This state started a series of exhausting wars with the Russian tsars which once resulted in occupying Moscow (1610-1612). However, Rzecz Pospolita was not able to withstand Russia in the long term. At the end of 18th century it ceased to exist. In 1772, the eastern part of Belarus was attached to Russia, in 1793 the central portion, and in 1795 the western one. Ironically, the unification with Russia, a country close to Belarus in language and religion, led to the deterioration of the Belarusian culture. This was partly because Belarusians were always considered as Russians 'spoiled' by the Polish-Lithuanian rule, and much effort was exerted by the tsarist government to correct this 'discrepancy'.

After the Revolution of 1917 Belarus was one of the major battlefields of the Civil War. According to the Riga Treaty (1921), the western part of Belarus went to Poland. The Eastern

part formed the Byelorussian Soviet Socialist Republic -- one of the four founding republics of the USSR in 1922. In 1939, the two parts of Belarus were united as a result of the USSR's actions against Poland at the beginning of World War II. This war was most disastrous for Belarusians, as one in four died in the battles or during the three years of German occupation. The population returned to its pre-war level only in 1972.

The post-war policy of the USSR government was to convert Belarus into a country of modern labor-intensive industry. The industrialization was accompanied by rapid urbanization. This process was disastrous for the national language since the main practitioners of the language were rural dwellers. By the 1970s, the Belarusian language had been practically withdrawn from life in the larger cities. For example, there were no Belarusian schools in Minsk. Now, some efforts are being exerted to revive what the 19th century poet A. Mickewicz called "the most perfect and best preserved of the Slavonic languages".

Physical Environment

Belarus is situated on the western part of the Russian plain. It stretches for more than 500 km from north to south and for 600 km from west to east and shares borders with Lithuania, Latvia, Poland, Ukraine and Russia (Figure 11.1).

Belarus is mostly a plain with an average altitude of 160 m, crossed by the Belarusian Ridge from east to west with heights not exceeding 346 m (Dzerzhinsky Peak, near the capital). This chain of uplands serves as a watershed divide between the Baltic Sea basin and that of the Black Sea. Southward from the Belarusian Ridge elevations decrease gradually. Pleistocene glaciation of Scandinavian origin was the major factor responsible for the present topography. The country can be divided into three main physical-geographic provinces:

Poozerye, the lake province, is located in the north in Vitsyebsk (Vitebsk) oblast, in the terminal zone of the Valdai glacial deposits (comparable with the Wisconsin glaciation in North America), and has the freshest and most unchanged glacial relief. The widespread terminal moraines and numerous lakes of glacial origin are characteristic of this type of landscape and give the province its name. Similar landscapes continue northward into the taiga zone and westward past the border of Belarus, forming a vast lake belt.

The Predpolesye is in the central part of Belarus and is confined to the area around the Belarusian Ridge and its southern foothills, which are also of glacial moraine origin from the Moscow glaciation (comparable with the Illinoisan in North America). There are almost no lakes in this area.

The Polesye province in the South, in the Pripyat River watershed, is a flat bottomed basin formed by tectonic troughs. Its high water table causes large portions of it to be marshy, and of diminished fertility.

The climate of the country is moderately continental and relatively cool, with distinct seasons and western winds prevailing in winter and summer. The precipitation slightly exceeds evaporation. Belarus lies in the area of maximum precipitation on the Russian Plain (500--700) mm a year, with twice as much precipitation occurring in summer as in winter. Snow cover thickness is 10--30 cm on average. The average temperature in January varies from -4°C (in the south-west) to -8°C (in the north-east). In July it varies from +17°C in the North to +19°C in the south. Belarus' topography provides conditions for more than 10 thousand lakes and about 21 thousand rivers, the latter having a total length of 91 thousand km. Most of the Belarusian rivers are fed by snow and ground water and are frozen for 2--3 months. Some of the rivers are suitable for navigation; the largest of these are the Dnepr, Pripyat, Berezina, Western Dvina and Nyoman (Neman).

The surplus of precipitation, together with certain geomorphological features such as low soil permeability and the vast lowland in the south, result in a major characteristic of the Belarusian landscape: the abundance of wetlands. These are especially widespread in the Polesye region.

The central part of Belarus is situated in the mixed forest zone; Polesye is in the broadleaf forest zone while the northern forests are of the southern taiga type. Pine forests are more common for Poozerye and for the sandy soils of Polesye. Oak forests are typical for the southwest. The mosaic of relief types and the large number of lakes, bogs and forests result in the striking variety of soil cover, plant and animal species. 1050 higher plant species, 280 species of birds and 73 species of mammals inhabit Belarusian forests, which occupy more than one-third of the territory.

Major soil types are forest podzols (11% of the total), peat-bog (50%), and flood plain (37%). Most of the soils are acidic, low in both humus content and mineral salts.

Belarus has certain physical constraints on its industrial development and agriculture. Domestic energy resources (including wind energy and hydro energy) are too small to satisfy the country's demand. Belarus also lacks some other important natural resources such as metallic ores and direct access to a sea. Although the Belarusian climate is generally quite suitable for agriculture, its low winter temperatures impose constraints. Moraine topography in Poozerye causes interruptions in the region's arable lands. Combined with the stoniness of soils

due to glacial deposits, it also prevents the efficient use of agricultural machines. However, the main difficulties for agriculture are created by boggy landscapes.

The natural soil fertility in Belarus is not sufficient for intensive agriculture. Mineral soils (mostly podzolized) are low in humus content and basic nutrients; their structure is weak. Organic peaty soils are also low in nutrients and undergo wind erosion, as do some of the upland soils. On these types of soils nutrients must be added.

Favorable natural features of Belarus include its advantageous geographical position, diverse natural resources, availability of water, predominantly flat landscape, relatively mild and moist climate, and absence of natural hazards such as earthquakes, droughts and dry winds.

Natural resources and industry

More than 4000 mineral deposits involving 30 types of raw materials have been explored in Belarus, most of them in the Pripyat depression (Matesovich, 1990). Only a few of the deposits are of industrial significance, with potash salts among the most important. There are also numerous deposits of peat (about 800 extraction sites in all), rock salts, oil (small deposits in the south-east), and building materials. Among the resources of lesser importance are brown coal, dolomite, and mineral waters. Oil shale, phosphorites, and metals (mostly iron) have been found but are not extracted currently.

An important feature of Belarusian water resources is the availability of large volumes of near-surface ground water (normally, 0 to 10 meters). In 1990, about 40% of the country's water needs were satisfied by ground water (Ekologicheskiye..., p.44). Until recently, only ground water was used for domestic purposes in the capital.

Belarus accounted for 1.7% of the territory of the USSR and 3.6% of its population in 1990. At the same time, it produced 4.2% of its GNP. Among the major Belarusian industrial developments are the following:

-- extraction of potash salts (in the Solihorsk industrial region) and production of mineral fertilizers (53% of the USSR total);

-- oil-refinery and petrochemical industry in Navapolatsk (Novopolotsk);

-- synthetic fibers production (34% of the USSR total) in Mahilyow (Mogilev) and Svyetlahorsk (Svetlogorsk); and

-- manufacture of harvesters (54%) in Homyel (Gomel), tractors (14%) and heavy trucks in Minsk.

Raw materials for these industries are mainly brought in from other countries, while the final products are largely exported (93 to 96% of trucks and tractors, 87% of potash fertilizers, 70 to 74% of synthetic fibre).

Agriculture produces about a fifth of the gross national product of the country. The main branches of agriculture are livestock farming, and growing flax, potatoes, and buckwheat.

Peat was the main source of energy for a long time. Because of the new oil developments in the southeast of the country and the construction of a gas pipeline from Russia, a policy was adopted to switch the largest power plants to fuel oil and gas. However, because of the large concentration of energy-intensive industry in the country, domestic resources can provide for less than a tenth of the energy demand. Currently gas is supplied from the Urals, oil from the Volga region, and coal from Ukraine. This dependency in energy sources may lead to a political dependency on Russia or Ukraine. Thus, certain groups in the government feel there is a necessity to develop Belarusian domestic sources of energy. These might be either new oil or brown coal developments or nuclear energy. Such decisions could sharply increase the environmental problems of the country.

Major Environmental Problems

Unfavorable environmental situations exist in Belarus in the area affected by Chernobyl; in the largest industrial cities (Minsk, Navapolatsk, Vitsyebsk, Mahilyow, Hrodna, Mazyr, Homyel, Svyetlahorsk, Babruysk); in the Solihorsk industrial region; in the regions of Polesye negatively affected by land reclamation; and areas where large livestock and poultry farms are located.

Chernobyl. Due to climatic conditions, about two-thirds of the radioactive fallout from Chernobyl fell on Belarus. In May 1986, the radioactivity of ground-level air in Belarusian cities increased by anywhere from a few dozen to a hundred thousand times. The number of Belarusians who suffered from the disaster is estimated to be between 2.5 million and 4.8 million (or 25% to 45% of the total population). Twenty percent of the country's agricultural land and 15% of the forests have been lost. Over a hundred thousand people have been relocated. There are about 2 thousand suffering from thyroid cancer (one in five is a child), and the occurrence of this illness has increased dramatically since 1986 (see Table 11.1).

Although there is a little visible evidence of the effect of Chernobyl on the natural environment, this disaster strongly affected the economic situation of the country, by necessitating the diversion of sizeable funds from environmental protection programs, and in many other negative ways. For example, the withdrawing of agricultural land increased the

Table 11.1 Incidence of Thyroid Cancer in Children in Belarus

Region of Belarus	1986	1987	1988	1989	1990	1991	1992*	Total
Brest	0	0	1	1	6	5	5	18
Homyel	1	2	1	2	14	38	13	71
Hrodna	1	1	1	2	0	2	6	13
Mahilyow	0	0	0	0	2	1	1	4
Minsk	0	1	1	1	1	4	4	12
Minsk City	0	0	1	0	5	2	1	9
Vitsyebsk	0	0	0	0	1	3	0	4
Total	2	4	5	6	29	55	30	131**

* First six months of 1992.

** The World Health Organization reported that by April 1993 the total had increased to 168 children, and by December 1993 to 196.

Source: Kazakov et al., 1992; reprinted by permission.

Table 11.2. Largest cities in Belarus

City	Population (1000s) 1970	1989	% increase
Minsk	907	1589	75
Gomel	272	500	84
Mogilev	202	356	76
Vitebsk	231	350	52
Grodno	132	270	105
Brest	122	258	112
Bobruysk	138	223	62
Baranovichi	101	159	57
Borisov	84	144	71
Orsha	101	123	22
Pinsk	62	119	92
Mozyr	49	101	106
Belarus (total)	9002	10200	13.3

pressure to intensify land reclamation, the dangerous environmental consequences of which are discussed below. The economic impact of Chernobyl becomes more onerous because of the collapse of the USSR and cancellation of strategic assistance programs funded from former all-Union sources.

In October 1989, the USSR government asked the International Agency on Nuclear Energy for an assessment of the safety of people living in areas contaminated by Chernobyl. In 1991 the International Committee formed by the Agency issued a report with its conclusions (The International Chernobyl Project, 1991).

The principal disputable statement of the Committee was what it felt was an absence of evidence of the harmful consequences of radiation on people's health. The changes in the population's health were attributed to 'radiophobia' and the deterioration of social-economic conditions.

The scientists criticizing these conclusions indicate some inconsistencies in Committee's methods:

– they had examined only 1356 people, the vast number of whom had been relocated from 30-km zone, whereas the people who took part in the clean up at the site (some 600,000 to 800,000) were not considered.

– they employed a static rather than a dynamic approach, not taking into account possible long-term effects associated with migration and transformation of radionuclides.

In contrast with the Committee's conclusions, the "Nabat" independent newspaper reported 1638 people (including 55 children) suffering from thyroid cancer by January 1991. By the end of 1993, the number of children so afflicted had reached almost 200 (Table 11.1). For the twenty pre-Chernobyl years only 5 cases were registered in Belarus (all adults). The level of cancer diseases increased by 23% (Nabat, No.55). According to an article published in Nature, there were 80 cases of thyroid cancer per one million children in the Homyel (Gomel) region, while normally there is only one (Kazakov et al, 1992).

Air and water pollution. In general, the larger Belarusian cities (listed in Table 11.2) are relatively free of air and water pollution. Only one of them, Mahilyow (Mogilev), was placed on the list of the most polluted cities of the USSR in 1989. The main polluter in Mahilyow is the 'Khimvolokno' industrial association which produces synthetic fibers and has been identified as one of the most dangerous plants of the USSR (Yakubovich, p.4). Specific pollutants in Mahilyow are sulfur compounds and methanol.

Oil refineries and petrochemical plants have resulted in serious environmental deterioration in Navapolatsk where the air is polluted by hydrogen sulphide, benzene and

ammonia, and where bronchial sickness increased 1.5 times between 1985 and 1990 (Ekologicheskiye, p.4). The Navapolatsk industrial complex also pollutes air in Polatsk, one of the oldest of the Slavonic towns.

In terms of pollution subject to international treaties, Belarus emitted 281 thousand tons of sulfur dioxide, and the same amount of nitrogen oxides, in 1990. From 1980 to 1990, sulphur dioxide emissions decreased by 24%, and there were plans to decrease them by another 30% by 1993. The main means of combatting sulfur dioxide emissions is the gasification of power plants, but this may be difficult due to a sharp increase in gas prices after the collapse of the USSR. For example, recently, Minsk Power Plant 4 has had to switch from gas to oil with a high sulphur content (Ekologia Minska, 1992, no. 10).

Belarusian rivers are referred to as 'moderately polluted' (the third of seven categories in the water quality classification), the main pollutants being oil products, nitrates and ammonia (Ekologicheskiye, p.5). 93% of the discharges which require mandatory purification are treated (in 1988, this figure was only about 30% for the USSR as a whole). However, the inefficiency of the treatment plants is a serious problem, as is pollution from non-point sources. There is no provision for the treatment of urban and industrial run-off. Another major water pollution problem is associated with large livestock farms. For example, the Byelovezhski pig farm (108 thousand head) in Kamenets has a serious negative impact on the environment close to the Belovezhskaya Pushcha nature reserve (Matesovich, p.112). Agricultural pollution of ground water is a serious problem in rural areas, where one-fifth of the wells have become unsuitable for drinking because of contamination (Yakubovich, p.11).

Another water pollution problem is the eutrophication of small lakes. Half of all Belarusian lakes are being excessively silted (Yakubovich, p.12). The problem of eutrophication is affecting the biggest and the most beautiful of Belarusian lakes, Lake Naroch, which has important recreational and tourist value. The concentration of blue-green algae has increased 80 times in Lake Naroch over the last 35 years. In part, it is due to accidental *discharges from sewage pipelines which are too close to the shoreline.*

The Problems of the Capital

Overall, Minsk is a well-planned modern city, rebuilt after the Second World War (when 96% of its buildings were destroyed). In 1989 it had 1.6 million inhabitants. Minsk has a unique landscape in the form of its green belt. The afforestation of the Minsk district is 27%, extremely large for a big city. There are even plans to establish the Belaya Rus National Park in the Minskaya upland north of Minsk. The green areas and artificial water bodies in the city,

together with industry having been shifted away from the center, make Minsk much more attractive than most large industrial centers of the former Soviet Union. Perhaps this attractiveness has been among the reasons that made Minsk one of the fastest-growing cities in the former USSR. Its environmental problems, typical for such cities, are mainly associated with the failures of the USSR's planned economy.

Minsk was always famous for its high quality drinking water supplied from underground aquifers, which underwent a minimal chlorine treatment. The problems with the water supply began in the 1970s, and were caused not only by groundwater pollution but also by the uncontrolled consumption and wasting of water. Minsk dwellers consumed up to 330 liters/capita/day, more than people in western Europe and North America do. The ability to provide so much water was considered to be a great achievement of the socialist economy. In the late 1970s, the city government was forced to put into operation a surface water supply system in order to satisfy the growing demand in new residential areas. This resulted in a rapid increase in the sickness rate in those areas as it proved to be difficult to provide clean water from surface sources.

There is only one sewage treatment plant in Minsk. Its capacity is not sufficient to cope with the peak flows and therefore it permanently pollutes the river Svisloch. 100 km of the river downstream of Minsk are 'absolutely dead', and for 150 km it does not meet water quality standards (Yakubovich, p.7). Additionally, a single treatment plant serving a large city represents a high risk: the environmental consequences of any emergency situation at the plant may be disastrous.

Although the air in Minsk is relatively clean, some of the local levels of pollution are much higher than the standards. Most of all, this applies to the residential areas around the tractor plant. The plant was constructed in the post-war period in a southeast suburb, taking into account the prevailing westerly winds. However, some decades later, a new housing development took place around it, including portions that were inside the exclusion zone (Figure 11.2). In this area, the average annual concentrations of sulphur dioxide are 6 to 8 times the maximum permissible concentrations (MPCs), NO_x reaches 7.5 to 8 MPCs, and benzene 2–7 MPCs (Yakubovich, p.7). Vehicular air pollution is checked, but fines for violations are very small (Figure 11.3).

Similar mistakes were often committed in designing new road developments which resulted in disturbing the residents by noise and air pollution. One remedy envisaged by the city government is to require environmental impact assessment on all new developments (including housing and road construction) in the city (Fridlyand, 1992).

Figure 11.2 Industrial air pollutants being released adjacent to a residential area in Minsk. Photo by Boris Akhremichev.

The Negative Impacts of Mineral Extraction and Reclamation

According to Bulygina (1992), mineral extraction in the Solihorsk industrial region has the largest negative industrial influence on the Belarusian environment, and its consequences will be second only to the Chernobyl disaster if the proper measures are not taken immediately. Continuing to use the ore processing technologies of the 1960s means generating 1 to 1.3 m^3 of solid waste and 0.75 m^3 of liquid waste during the production of each ton of potash salt. Vast volumes of wastes (30 million tons of salts and brine annually) are dumped on the land, causing the loss of large areas of fertile land (at the current rate of 100 ha/year; five thousand ha of land has been withdrawn to date (Bulygina, p.3).

The moist climate of Belarus results in brine infiltrating from the waste storage sites into water-bearing strata. The effect of ground water salinization (about 300 g/l in aquifers covering more than 10,300 ha. means not only the loss of more agricultural land, but also an enormous threat to the whole hydrological system of Polesye, because the leading edge of the salinization moves towards the wetlands of Polesye at the speed of 60 m/year (Yakubovich, p.15).

The most realistic alternative to the storage of wastes in landfills seems to be to dump them into abandoned mines. This would also help prevent the problem of the 'sinking' of the surface in mined areas, which now covers 120-130 km^2 (Bulygina, p.11). Such a procedure, however, needs much more research to ensure the absence of leakages. Among other alternatives, lining and covering the landfills and the recycling of wastes are possibilities.

The total area of marshy land which needs some regulation of its water regime to be usable for crops is 48% of the total agricultural land in the country (6.1 million ha). As a result, a period of intensive land reclamation in Belarus began in the late 1960s. There has always been strong economic pressure to reclaim more land as its productivity increases by 5--6 times after such melioration (Skoropanov et al., 1982). Currently, the reclaimed areas yield 30% of Belarusian crop production. By 1 January 1990, about 3.19 million ha (36.1% of the agricultural land) had been meliorated (mainly drained), about half of this in the Polesye region. In some districts of Polesye, up to 65% of the agricultural land has been meliorated (Lishtvan and Yaroshevich, p.15).

Drainage of wetlands has led to severe environmental problems in the Polesye region, most of which are associated with developments in the 1960s that employed many archaic technologies. The primary problem was the alteration of the water regime and the disappearance of streams. From 1945 to 1973, the level of water in Polesye rivers decreased by 7 to 51 cm, and by 20 cm in the major river Pripyat, even though the climate remained the same (ibid., p.21).

Second, it leads to the deterioration of the soil moisture regime in adjacent territories. The peat formation is replaced by the destruction and mineralization of the soil's organic content. This also increases the problem of soil erosion which is already quite severe in Belarus, where 30% of soils are inclined to water erosion and about 8% to wind erosion. Because of erosion, the area of agricultural land decreased by 173.1 thousand ha for 1976-1985 and by 123.8 thousand ha for 1986-87. One million tons of soil are blown away by wind from reclaimed peat bogs each year.

Third, agriculture on reclaimed lands leads to increased water contamination by erosion products and fertilizers.

Fourth, soil drainage adversely affects water and marsh birds and reptiles. The majority of birds in the Belorusian list of endangered species (the Red Book) inhabit wetlands.

Last but not least, the loss of wetlands means great aesthetic damage. Wetland landscapes have played an important role in the formation of the Belarusian culture. It would be sufficient to note that there are almost two dozen words in the Belarusian language to refer to marshy land.

Forestry, Nature Conservation and Tourism

Forests occupy 34.7% of the territory of the country. This fraction has not decreased since 1973, but the quality of the forests has deteriorated. Mature forests account for only 2.4% of total forested land. Forestry mismanagement and the increased risk of fires on meliorated peat areas pose threats for Belarusian forests, including the most valuable and endangered oak woods. To help protect these forests, numerous protected natural areas have been created. There are 76 protected areas, including the Berezina and Pripyat nature reserves, one planned national park, the Belovezhskaya Pushcha hunting preserve, and 73 nature preserves (zakazniks) of state importance in Belarus (see figure 11.1 and Appendix 11.1). Additionally there are 186 areas designated as local nature monuments. The total area of protected territories is 4.4% of the country (0.67% in nature reserves); there are plans to increase this up to 10% (Matesovich, p.5).

Fluvioglacial and alluvial plains are represented in the Berezina Biosphere Reserve (established in 1925, 76201 ha.), and Belovezhskaya Pushcha (established in 1939, 87600 ha.). Belovezhskaya Pushcha (the Forest of White Tower), which is one of the oldest reserves on the territory of the former Soviet Union (and extends westward into Poland), has a special status of 'preserved hunting area'. In the 1930s, the population of European bisons (zubr) was protected and recovered there. Now, the zubr is often used as a symbol of Belarus since more

Appendix 11.1: Preserved Areas in Belarus

Type of Preserve (a)	Number	Total area(b)	Average size (b)	% of Republic (c)
Nature reserves (zapovedniki)	2	1384.14	692.07	0.67
Biosphere reserves	1	762.01	762.01	0.37
National Parks	0	0.00	0.00	0.00
Natural preserves (Zakazniki)	50	6067.00	121.34	2.92
Hunting preserves	2	985.47	492.74	0.47
Total	54	8436.61	156.23	4.06

Nature reserves (date created)	hectares
Berezina (1925)	76201
Pripyat (1969)	62213
Total	138414

Hunting preserves	
Belovezhskaya pushcha (1940)	87600
Telekhanskoye (1977)	10947
Total	98547

(a) For the definition of each type of preserve, see Appendix X to Chapter 1.
(b) In square kilometers.
(c) Area of Belarus equals 207,600 sq. kilometers

Sources: Pryde, 1991.

than two hundred of them live in the country. Recently, the World Bank has allocated a million dollars grant for the Belarusian and Polish governments to preserve the Pushcha.

The complex landscapes of Polesye, including peat bogs, are preserved in the Pripyat Reserve (established in 1969, 62213 ha.), which is situated in the broadleaf forest zone. A characteristic feature of this region is its high degree of afforestation (about 55%). All species of trees grown in Belarus are represented there. The landscape of the Pripyat Reserve symbolizes Polesye: vast picturesque oak forests on flood-plains with stork nests in the oaks.

The Polesye Radiation-Ecology Reserve was established in 1988 in eastern Polesye to analyze the impacts of higher background radiation on the ecosystems in the Pripyat basin where the Chernobyl disaster took place. There is a plan to establish Naliboksky reserve in the central part of Belarus in Minsk and Hrodna (Grodno) oblasts in the oak-dark conifer forest subzone. The most valuable area here is a large forested area where 23 rivers form the upper portion of the Nyoman (Neman) River watershed.

There are numerous problems to be solved with regard to nature reserves. First, the existing preserves do not fully reflect the variety of Belarusian landscapes. The following landscapes are completely absent in the existing nature reserves: a) glacial lake plains (in Poozerye); b) loess plateau (in Central and Eastern Belarus on the Belarusian Ridge); and c) high hill plains (outside the Valdai glaciation area, on the Belarusian Ridge). Second, the preservation of natural water bodies has hitherto been outside the scope of plans for new reserves. Third, it would be desirable to preserve high (oligotrophic) moors in the upper reaches of rivers, which help maintain the ecological equilibrium in the region.

The Belarusian landscape also provides favorable conditions for the creation of national parks, which require the development of tourist zones. In national parks, not only natural but also some cultural and historical sites might be preserved (cultural buildings, architectural ensembles etc.). One national park, Braslavskye Ozyora, is currently being planned.

Solving these nature protection problems will require considerable effort not only because the withdrawal of lands is difficult in this relatively densely populated region, but also because there is little experience in combining several uses in a single area (e.g. tourism and recreation) while at the same time preserving land use patterns and other cultural traditions.

For many reasons Belarus seems to be a good place for international tourism. Among these are the easy access from all parts of western Europe, the Baltic region and Russia. The road system is relatively good by Soviet standards. The moderate climate of the country is another advantage. Last but not least, Belarus provides a level of political stability which cannot be seen in any other republic of the former Soviet Union.

Some disadvantages must also be noted. The first of them is the effect of the Chernobyl disaster which forces even local Belarusian residents to leave the country for the sake of their health (see Figure 11.1 for the main areas impacted). The infrastructure for tourism in Belarus is much less developed than, for example, in the Baltic countries (on the other hand, it offers less expensive service).

Among the assets to tourism in Belarus are the picturesque hills and lakes of Poozerye which is an ideal place for boating, wind-surfing, fishing and camping; nature reserves (Berezina and Belovezhskaya Pushcha already have some tourist facilities); the Belovezhskaya Pushcha, which can provide sportsmen with hunting in a virgin European forest; and the old castles of Hrodna, Navahrudak, Mir and other cities (many of which need to be restored).

Visiting Belarus, tourists can enjoy vast woodlands and complex marshlands, wild heath moors and small forest lakes. They can also see the original way of life of Eastern Slavs which is still preserved in some of the Polesye villages. There is an opportunity for a visitor to learn much about the intriguing and little-known pages of European history --- dramatic battles between the Roman-Catholic West and the Orthodox East which took place on Belarusian territory.

Governmental Structure and Legislation.

The State Committee on Nature Protection of the former Byelorussian SSR was formed in the 1960s. At that time, its main function was the protection of natural water bodies and wild life. Occupational hazards, drinking water quality, and residential environment were under the authority of the Ministry for Health Protection, and air and surface water monitoring was the responsibility of Goskomgidromet (the State Committee on Hydrometeorology). In 1989, all environmental protection became the responsibility of Goskompriroda, renamed in 1991 to Dzyarzhkamecalogia of Belarus (the State Committee on the Environment). However, currently it lacks the necessary equipment and personnel to perform its responsibilities in full. Thus, for the time being, the Goskomgidromet and the Ministry of Health Protection continue their monitoring. Nature reserves are under the authority of a special agency within the Council of Ministers rather than the Dzyarzhkamecalogia. All of the environmental protection activity within individual Ministries is supervised by the Committee of the Council of Ministers on Emergency Situations, the Consequences of the Chernobyl Disaster, and the Environment. A special Parliamentary commission and governmental committee deal with the problems associated with the Chernobyl disaster, according to S. Rudneva, the Chief Environmental Specialist of the Belarusian Council of Ministers.

In terms of legislation, the first Belarusian environmental law was adopted in the fall of 1992 (The State Law on Environmental Protection). The Law on Environmental Safety and the Law on State Environmental Assessments were being discussed in the media in 1993.

Among the Belarusian non-governmental environmental organizations, the Belarusian Ecological Union (BEU) and the Belarusian branch of the Social-Ecological Union (SEU) should be mentioned. The Minsk branch of BEU succeeded in stopping a proposed industrial development in the city center in 1992. It also publishes the 'Ecologia Minska' weekly, the only city environmental newspaper in the former Soviet Union which in 1993 was being delivered to the U.S. Library of Congress.

There are also more than two dozen citizen groups and foundations dealing with the consequences of Chernobyl. The largest of them is the Belarusian Social-Ecological Union 'Chernobyl', affiliated with SEU, which for more than two years has published the 'Nabat' newspaper distributed in Russia, Ukraine, and some other countries.

Belarusian human and natural resources provide an excellent potential for resolving environmental problems and mitigating the devastating impacts of the Chernobyl disaster. The necessary preconditions for doing this are political factors such as peace, good relations with neighboring countries, and internal stability. To this end, Belarus took a significant step in 1994 towards closely integrating its economy with that of the Russian Federation including adoption of the Russian ruble and credit control by the Russian Central Bank. In return, Belarus would receive oil and natural gas from Russia on more favorable terms. The Belarusians demonstrated that maintaining these peaceful conditions remains the highest national priority, when on February 4th, 1993, the Belarusian Parliament voted to adhere to the Nuclear Nonproliferation Treaty and to ratify the 1991 Strategic Arms Reduction treaty. Thus, Belarus became the first state in history to give up its nuclear arms. This is a positive sign and an important step in forging a better future for this new country.

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