

*Europe and Central Asia Region
Environmentally and Socially Sustainable Development*

Building Blocks for a Sustainable Future

A Selected Review of Environment and
Natural Resource Management in the
Republic of Belarus

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Foreword

Year after year environmental protection issues are becoming more challenging.

Today Belarus has a well-developed environmental management structure enabling to enhance decision-making and to implement activities aimed at improving the mechanisms of the efficient use of natural resources.

The efforts in this field are upheld by considerable scientific potential which has allowed us to build up a positive and stable natural environment in the country.

The development of international cooperation in the field of environmental protection is one of the main priorities of the government. The Republic of Belarus maintains regular contacts with the international, inter-state and financial institutions such as the World Bank, the European Economic Commission of the United Nations, the United Nations Development Program (UNDP), the United Nations Environmental Program (UNEP), the World Meteorological Organization (WMO), the World Health Organization (WHO), the Organization for Economic Cooperation and Development (OECD), the European Union TACIS Program and various agencies established for the implementation of the international nature conservation conventions and etc.

The project "Phase Out of Ozone Depleting Substances" has been implemented within the cooperation framework of the World Bank and the Ministry of Natural Resources and Environmental Protection. At present two joint projects are being implemented: "Climate Change Enabling Facility" and "Environmental Compliance and Enforcement Capacity Building".

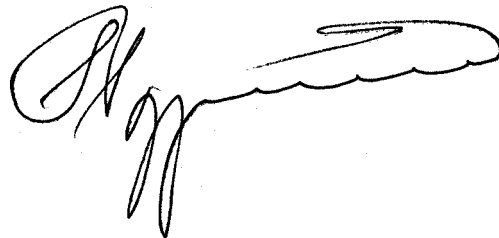
In December 1999 the Republic of Belarus signed and ratified the Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters" (the Aarhus Convention).

It is worth noting that the country has made considerable progress in building up institutional and legislative framework fostering the efficient use of natural resources and environmental protection. There are over 1000 regulations which form an integral legislative framework for addressing the issues of environmental protection and nature management. Besides, continuous efforts are made on upgrading the current legislation and enforcing the new laws. On 17 July 2002 the new revision of the Law "On Environmental Protection" was endorsed. The Law is built upon the current European trends and strategic dimensions in this field.

The nationwide sustainable development strategy which has been developed in Belarus is regularly updated. The strategy of the government policy on environmental protection for the period till 2015 has been prepared; it determines the main activities aimed at enhancing the efficient use of natural resources and further rehabilitation of the environment.

In conclusion, it should be noted that in Belarus environmental protection issues are given priority consideration. On behalf of the Government of the Republic of Belarus the Ministry of Natural Resources and Environmental Protection does its utmost to ensure the constitutional right of the Belarusian citizens to live in a friendly natural environment as well as the right of future generations to be able to use natural resources of the country.

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The Report draws on many documents but has particularly benefited from the earlier Bank Environmental Strategy prepared in 1993, and the OECD Environmental Performance Review published in 1997.

Abbreviations

AAS	atomic absorption spectrometry
BLS	building-level substations
BOD	Biochemical Oxygen Demand
CAS	Country Assistance Strategy
CDM	Clean Development Mechanism
CEC	City Executive Committee
CEE	Central and Eastern Europe
CHP	Combined Heat and Power
CIS	Commonwealth of Independent States
CO ₂	carbon dioxide
EA	Environmental Assessment
EAP	environmental action plan
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment
EMAS	Eco-Management and Audit Scheme
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FSU	Former Soviet Union
GDP	Gross Domestic Product
GNP	Gross National Product
GEF	Global Environment Facility
GHG	Greenhouse gas
Hydromet	State Committee for Hydrometeorology
IAEA	International Atomic Energy Authority
IBRD	International Bank for Reconstruction and Development
IDA	International Development Association
IFI	International Financial Institution
IPP	Independent Power Producers
IUCN	International Union for the Conservation of Nature
ISO	International Organization for Standardization
JI	Joint Implementation
kWh	kilowatt hours
MHCS	Ministry of Housing and Communal Services
MHME	Ministry of Housing and Municipal Economy
MEPNR	Ministry of Environmental Protection and Natural Resources
MNREP	Ministry of Natural Resources and Environmental Protection
MOE	Ministry of the Economy
NIS	Newly Independent States
NGO	Non-governmental organization
NO _x	Nitrogen oxide
OECD	Organization for Economic Cooperation and Development
PAC	Pollution Abatement Control
PREM	Poverty Reduction and Economic Management
PUD	Public Utility Department

RIR	Research Institute of Radiology
SEA	Strategic Environmental Assessment
SO ₂	Sulfur dioxide
TA	Technical assistance
TOR	Terms of reference
TSP	Total suspended particulates
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
URF	Unit Risk Factor
VOC	Volatile organic compound
WB	World Bank
WHO	World Health Organization
WPI	water pollution index
WTO	World Trade Organization
WWF	World Wildlife Fund

Executive Summary

i. This report, *“Building Blocks for a Sustainable Future: A Selected Review of Environment and Natural Resource Management in Belarus”*, was prepared following a request from the Republic of Belarus for World Bank assistance in updating the Belarus Environment Strategy Study carried out jointly with the Bank in the early 1990s and published in 1993.

ii. The purpose of this review of environmental and natural resource management in Belarus is to highlight how environmental management can contribute to a sustainable future for the country. The report summarizes major macroeconomic trends and associated environmental linkages, environmental trends, and institutional issues facing Belarus in its management of the environment. An extensive analysis of environmental aspects of energy efficiency in Belarus and the state of the water supply and sanitation sector is undertaken. Special attention is given to exploring the environmental impact of the Chernobyl accident and to suggesting additional ways to mitigate lasting radioactive contamination. Natural resource management issues, particularly relating to agriculture, forestry and biodiversity, are also examined.

iii. The Bank hopes that this report will be useful in establishing a dialogue with the government and segments of civil society to prioritize environmental problems, identify key reform measures to address urgent environmental issues in the near term, and set the stage for measures and actions needed to enhance environmental sustainability in the longer term. Following discussions with the government and civil society at a workshop in Belarus later in 2002, this report and suggested priorities will be revised and a final version prepared.

iv. Summary Table 1 (page iv) provides an overview of the main recommendations from the study, priorities for action, the time frame within which action is needed, and likely sources of financing. The priorities are defined as medium (M) and high (H). The high priorities, most of which require major policy reforms as well as investment, are seen as:

- a. Initiate economic reforms to renew growth, ensure macroeconomic stability, lower inflation, and promote efficient use of resources, particularly energy which is largely imported and requires payments in hard currency. Such a reform agenda is essentially to ensure that fiscal resources will be available to support the poorest segments of the population and to address critical needs, including those in the environment sector. Within this reform agenda, ensure that pollution charges are more sensitive to scarcity of resources and the impact of emissions.
- b. Introduce energy reforms, such as increasing fuel prices, to decrease energy intensity at the household and industry levels, reduce dependence on Russia for energy, attract investment for more fuel efficient and less polluting industries, and provide a major boost to macroeconomic and fiscal health.

- c. Review and increase the effectiveness of public expenditures financed via the Chernobyl fund to better target support to the poor, free funds for more critical purposes and help reduce the fiscal deficit.
- d. Improve rural and small town drinking water supply, a high priority given high health risks and the potential collapse of water supply that would be disproportionately hard on poorer segments of the population.
- e. Introduce policies for institutional, technical and financial reform of the water supply sector in urban areas to prevent the collapse of these municipal utilities and to address resultant health problems, the increased fiscal burden on local governments and pressure on the population to buy bottled water.
- f. Retarget some Chernobyl resources towards higher priority activities including radiation countermeasures for food production, increased support for agribusiness and improved monitoring of radionuclides in those areas most affected by Chernobyl, that is the Gomel, Brest and Mogilev Oblasts.
- g. Finance investment in solid waste management, particularly in urban areas where financial resources are scarce and waste is growing and not always properly disposed of, posing health risks.
- h. Reverse degradation in the protected Pripyat Basin wetland area, a relatively high priority since this is a unique and precious area in terms of biodiversity.
- i. Clarify the government's position (a legal issue) on the United Nations Framework Convention on Climate Change and the Kyoto Protocol. This is a relatively high priority as there is potential for Belarus to benefit financially from the joint implementation and flexibility mechanisms contained within the Kyoto Protocol.

v. Implementation of the environmental priorities identified above will be challenging for Belarus. While the government's overall reform strategy has always *in principle* been supportive of environmental improvements, and particularly those areas with direct economic benefits like energy conservation and protection of natural resources, the economic situation in Belarus is serious, making it difficult to finance any investments, including environmental protection activities. The economy came under particular strain during the 1998 Russian crisis. Since then, the pace of economic growth slowed, the multiple exchange rate became unmanageable and it was soon evident the country could not generate resources to increase capacity and modernize technologies. Although the official public deficit, financed mostly with internal resources, was relatively low at 1.2 percent of GDP in 2000, it increased to 1.8 percent in 2001, and is particularly responsive to rises in energy costs.

vi. To sustain a pattern of continued economic growth, Belarus needs to demonstrate greater flexibility in the allocation and use of resources and introduce hard budget constraints to reduce the deficit and guarantee a stable macroeconomic environment. More efficient public expenditure would help direct resources from the budget to areas requiring investment for technological modernization. An improved environment for the creation of new companies is also a much-needed complement that would enhance flexibility and help generate employment.

vii. In addition to economic reforms, the overall governance structure in Belarus will also need to be modified if the priority environmental issues identified in this report are to be addressed. Some of the major problems affecting Belarus' environmental institutions include: uncertainty over the government's future political and economic paths of development, which hampers sound strategic planning; susceptibility to declarative legislative provisions that can override and undermine carefully developed legislation; and, in some cases, inability of environmental bodies to control state-owned enterprises (e.g. impose tangible penalties). Due to these system limitations, Belarus' environmental institutions are less independent, and thus not as capable of addressing their goals effectively.

viii. There is also a need to increase public awareness and access to information in Belarus. Measures are being taken, but much more needs to be done. There is currently now legislation to provide for public hearings, but it needs backing with more independence for the NGO community. The government needs to implement a more proactive position in providing and disseminating environmental information to the population. For this task, the potential force of the mass media and of NGOs should be better employed. Addressing environmental problems in Belarus will be very difficult without the genuine and full involvement of civil society, and more fundamentally, the people of Belarus.

ix. The remainder of the executive summary examines in more detail the high and medium priority environmental areas identified in Summary Table 1, thus providing an overview of the major findings of this report.

Summary Table 1: Recommendations For Action and Identification of Priorities

Policy Area	Recommended Actions	Priority	Time (yrs)	Financing
Macro-economic and Fiscal Policy and the Environment	Introduce economic reforms to renew growth and promote efficient use of resources (particularly in the energy sector, for municipal services, and in terms public expenditure management), including those financed from the Chernobyl fund (see sectors below for more specific measures).	H	1-3	Internal resources and TA
	Develop tools for environmental management to encourage better environmental performance in a changing macroeconomic climate and make more effective use of economic instruments, in line with a more market-based pricing policy for the key sectors of energy, water, agriculture, forestry and minerals.	H	2-4	Internal resources and TA
	Strengthen methods for public expenditure review, including those that are environment-related.	H	1-2	Internal resources and TA
	Review and restructure natural resource and pollution charges to make them more sensitive to scarcity of resources and impacts of emissions.	H	1-3	Internal resources and TA
Energy	Raise overall energy price levels (especially for heat) and introduce metering to increase conservation, improve macroeconomic and fiscal health, and make investment in renewable energy more attractive.	H	1-3	Internal resources
	Reduce and eventually eliminate non-payments and cross-subsidies of domestic users by industrial ones to better reflect the real cost of energy.	H	1-3	Internal resources
	Encourage private sector supply to foster greater efficiency in the sector and improved fiscal health.	H	1-3	Internal resources
Water	Work in rural areas and small towns to improve water quality and supply.	H	1-3	Local plus multilateral funds
	Introduce institutional, financial and technical reforms in the water supply sector in larger towns, with investment support for rehabilitation to improve fiscal health of government and protect human health.	H	1-2	Internal resources/some TA/ possible multilateral funds
Chernobyl	Review the Chernobyl fund to determine the real need for its present structure and its cost efficiency.	H	1-2	Chernobyl and multilateral funds
	Introduce radiation countermeasures to improve quality of food.	H	1-3	Internal plus IAEA funds
	Support agribusiness in the Gomel and Brest Oblasts to help the sector become financially viable.	H	1-3	Internal plus IAEA funds
	Improve monitoring of radionuclides in the Gomel, Brest and Mogilev Oblasts to document health risks.	H	1-2	Internal plus IAEA funds
Air Quality	Better monitor all key pollutants, but especially particulate matter and ground level ozone with the acquisition of more and better monitoring equipment in order to document health risks and establish pollution areas.	M	1-3	Internal resources and some grants/loans for equipment
Solid Waste	Increase investment in disposal facilities (especially hazardous) for health and environmental reasons.	H	1-3	Not assessed in this report
	Initiate financial, institutional and technical restructuring to improve the management of solid waste.	H	1-3	Not assessed in this report
Agriculture	Use low productivity agricultural land for watershed protection and carbon sequestration.	M	2-4	Internal resources w/some GEF/other global funds
Forestry	Move to market-based pricing of timber sales to better reflect the real value of the resource.	M	1-3	Internal resources
	Introduce environmental certification of roundwood to ensure access of exports to international markets.	M	1-3	Internal plus some TA
	Monitor subsidies to forest enterprises to ensure that they are closely related to environmental services unlikely to be performed otherwise by commercial enterprises.	M	2-3	Internal plus some TA
Biodiversity	Increase allocation of budgetary resources for national parks to ensure that they are adequately protected.	M	2-4	Internal
	Promote private sector initiatives to ensure the sustainable use of protected areas.	M	2-4	Internal
	Reverse degradation to protect the Pripyat Basin wetland area.	H	2-4	Internal, multilateral/GEF
Institutional Reforms	Increase capacity in the Ministry of Environment to strengthen regulations governing:			
	MBIs and private sector involvement.	M	1-3	Internal
	Procedures for consultation.	H	1-2	Internal plus multilateral
	Integrated environmental monitoring systems.	M	1-2	Internal
	Government position with respect to the climate change convention.	H	1	Internal
	Eliminate institutional overlap and redundancy to clarify responsibilities and reduce expenses.	H	1-2	Internal
Decentralize responsibility for implementation of policies to ensure greater local community involvement.	M	1-3	Internal	

High Priority Actions

Macroeconomic and Fiscal Policy and the Environment

x. Belarus' environmental problems need to be seen and addressed in the broader context of its economic development. It is important for Belarus to examine the kind of macroeconomic reforms likely to take place if the country pursues a more market-based economy, and any associated environmental impacts, both positive and negative. Impacts include potential changes to the environment resulting from: price liberalization; energy efficiency reforms; reduction of non-payments; phasing out the use of direct methods to induce production and export; controlling quasi-fiscal expenditures; tightening monetary policy; reducing the inflation rate; and building up foreign reserves. Improved fiscal performance will require further streamlining of public sector expenditures, including excessive and integrated social assistance. Longer term measures that may also affect the environment include increased privatization and a more OECD-oriented trade structure and membership of the WTO. **This will require the development of policy and analytical tools to help prioritize reforms and determine whether environmental factors should set the design and pace of the reforms and to identify mitigation actions that may need to be taken to protect the environment as the reforms are implemented.**

xi. The government will also need to develop tools for environmental management that are pro-active in encouraging better environmental performance (e.g. environmental certification). There is also a need for more effective use of market-based regulatory instruments in line with more market-oriented pricing policies for the key sectors of agricultural, forestry and minerals.

xii. In facing new macroeconomic challenges, Belarus needs to ensure that scarce investment resources are allocated efficiently. This applies to the environmental and natural resource sector as much as to any other. Although overall levels of investment are quite high, and those allocated for environmental protection are not out of line with OECD countries, it is not evident that expenditures address the highest priorities, and the use made of some these investments can be questioned. **To address this deficiency, the government needs to strengthen its methods of appraisal and assessment of environmental investments.**

xiii. There is also untapped potential for using the country's natural resources to promote both sustainable economic development and an improved environment. Programs for increased tourism or export of sustainable timber can generate incomes for rural communities that will help reduce poverty. At the same time, part of the revenues can be used to manage protected areas, forests and wetlands in a more effective way. **The government should increase its support for programs that develop the potential of its natural resources and encourage the private sector to participate.**

xiv. On the financial side, there is a case for reviewing the whole structure of natural resource and pollution charges to make them more sensitive to the scarcity of resources and to the environmental impacts of emissions. Ensuring the appropriateness of pollution charges in a high inflationary environment is also essential however. Indexation may not

be enough. **A more comprehensive look at pollution and natural resource charges is warranted.**

Energy

xv. Energy use in Belarus is heavily based on gas, followed by petroleum products. Together, the two accounted for 93 percent of total primary fuel consumption in 1999. Belarus' macroeconomic stability is very much dependent upon Russia continuing to provide it with energy, primarily natural gas. About 99 percent of gas, 90 percent of oil and 30 percent of electricity consumed in Belarus is imported, mostly from Russia. **Although Belarus enjoys the lowest price among all Russia's natural gas buyers, it has become overly energy dependent and thus highly vulnerable to exchange rate fluctuations.¹ The country's lack of energy independence could also affect it negatively in the long run since there is a strong expectation that gas prices will rise over the next 2-3 years as Russia reorients its exports to Western Europe and raises domestic prices.**

xvi. On the more positive side, energy intensity in Belarus has declined over the past decade. In 1999, energy use per dollar of GDP was 44 percent lower than in 1990. This trend has had a positive effect on the environment. Emissions of air pollutants have declined as a direct consequence of the decline in energy consumption related to the economic downturn since 1990, and as a result of an increased reliance on natural gas. Additionally, the government has made some genuine efforts to increase energy efficiency, with investments of about \$370 million in energy saving activities between 1996 and 2000. By its own assessment, about 25 percent of the decline in energy intensity of GDP can be attributed to these measures, although the Bank was not able to evaluate this claim.

xvii. Despite these efforts, Belarus' economy is still four times more energy intensive than most OECD countries. The combined heat and power (CHP) plants and large heat only boilers (HOB) of Belenergo, which provide 50 percent of the heat consumption in Belarus, are in very poor condition, with total losses on average of about 30 percent. As Belenergo's current fuel mix is about 90 percent natural gas and 8 percent mazut, the losses mean expensive foreign exchange is being spent on costly natural gas only to have it completely wasted. Energy efficiency is also poor at the consumer level. The Ministry of Housing and Communal Services' (MHCS) boilers provide 35 percent of heat consumption in Belarus. Individual boilers in schools, hospitals, and enterprises satisfy the remaining share of consumption. The fuel mix for heat generating boilers is 60 percent gas and 32 percent mazut, with the remainder split among fuel wood, brown coal, wood chips, and peat. Although MHCS is pursuing a program of gradual replacement of

¹ This point has been vividly demonstrated by the recent macroeconomic developments in Belarus. Given the energy sector's critical importance in Belarus' economy, gas and oil importers were among the privileged few granted access to foreign currencies at the official exchange rate. About 65 percent of the surrendered foreign currency proceeds were used for energy imports. As a result, the energy sector was among the hardest hit with depreciation of the Belarusian Ruble as the official exchange rate was devalued. In the first seven months of 2000, for example, the energy import bill would have been BR 233 billion less had there been no devaluation of the official exchange rate ("The Social Consequences of Foreign Exchange Rate Unification In Belarus", Policy Note, ECSPE, October 2000).

the network pipes with modern pre-insulated pipes available through joint ventures with German and other European companies, the investment is proceeding slowly due to financial constraints and problems with metering. Moreover, lack of tariff and institutional reforms means that these investment costs are not being passed onto consumers, but are adding to the financial burden of local and central governments.

xviii. In order to reduce its dependence on imported fuel and electricity and further lower the country's energy intensity, the Government of Belarus has placed high priority on the implementation of an energy conservation agenda. *The National Program for Energy Savings to Year 2000*, which was approved by the Cabinet of Ministers in June 1996, had the following key objectives:

- a. identify energy-saving potential in Belarus and establish the most efficient ways of its realization;
- b. maximize utilization of local fuels and production waste to decrease fuel and energy imports;
- c. create conditions for reducing production costs and increasing product competitiveness;
- d. coordinate efforts and spending by all parties to promote more efficient utilization of fuel and energy; and
- e. decrease power consumption per unit gross domestic product.

xix. Pricing policies and non-payment: While the government-mandated energy saving programs have been quite effective and will continue to play an important role, they cannot replace true market incentives. Market price reforms are needed to accurately reflect the price of energy. *It is estimated that the prices paid by residential consumers for electricity currently cover less than 50 percent of electricity utilities' operating costs. For heat, this ratio is less than 19 percent, and it is about 11 percent for hot water. (See Chapter 5, especially Annex 5.1)* Non-payments, mutual write-offs and barter deals are still common in energy transactions, with only 30-40 percent of the payments for heat and electricity carried out in cash. Cross-subsidies between various consumers of energy are massive. **The Belarussian Government needs to raise energy prices, eliminate or reduce cross-subsidies of domestic energy users by industrial enterprises, tackle non-payments in the energy sector, and maintain hard budget constraints with unprofitable enterprises.**

xx. Communal services and cost recovery: At the communal level, the government will need to increase the tariffs for housing and communal services in order to have better cost coverage for household utilities. In recent years, there have been several efforts aimed at achieving better cost recoveries for these services through the elimination of cross-subsidies. In 1998, for example, the rapid tariff increases in water and sewage provisions led to full cost coverage in these two services. Better cost recoveries were also achieved for rent and electricity as a result of tariff adjustments.

xxi. Impact of high inflation: Since 1998, however, tariff increases have generally lagged behind overall consumer prices, let alone the less-controlled producer prices. As a result, the overall level of cost recovery deteriorated sharply in the course of 1999 from

55 to 23 percent. This trend continued in the first few months of 2000. *In May 2000, household payments covered just 4.9 percent of the costs of hot water provision, 8.7 percent of heating, and 9.5 percent of rent.* Continued tariff adjustments throughout the summer, combined with lower energy consumption during the winter, saw some improvement in the cost coverage of household utilities, but the average recovery rate is still lower than 20 percent.

xxii. Government efforts to increase energy efficiency: The State Committee on Energy Savings is moving towards a slightly greater use of price-based incentives. Further improvements in energy efficiency, the promotion of renewable energy and greater sourcing of electricity from independent power producers (IPPs) are planned. The investment program includes replacement of capital stock in CHP plants, introduction of new heat metering equipment, and replacement of sections of the heat network that are in a poor state of repair. No large scale replacement of group substations is planned. These measures are economically and technically viable and should be undertaken. Their adoption, however, will require further energy price reforms to provide adequate incentives for IPPs. **In other words, it is difficult to develop incentives for greater energy conservation because of low electricity tariffs and abundant cheap energy from Russia. As the economy becomes more responsive to price signals in general, however, the role of energy prices in conservation will become increasingly important.**

xxiii. Other reforms to reduce energy-related emissions: Belarus' emissions of CO₂ dropped from 94 million tons in 1990 to about 60 million tons in 1996² and have remained roughly at that level since. Further reductions in GHG emissions are possible if the prices of all network fuels (including natural gas) can be increased to levels better reflecting the economic cost of supply of these fuels to Belarus' energy system. Apart from price reforms, the following technical activities to further reduce GHG emissions are recommended:

- Replacement of the outdated power and heat generation capacities with modern and more efficient technology (notably, installation of gas turbines to enable the operation of Belenergo's CHP plants in a combined-cycle mode);
- Rehabilitation of district heating networks, including both the transmission (primary) and distribution (secondary) networks;
- Gradual reconfiguration of the networks with the introduction of building-level heat-exchanger substations allowing control of heat at the consumer level;
- Introduction of heat-metering equipment for the entire housing stock in cities at the building-level;
- Gradual introduction of consumer control equipment (such as thermostatic valves and heat meters) at the apartment level;
- Energy efficiency improvements for the housing stock (such as better insulation of buildings, installation of energy-efficient windows, etc.);

² World Development Report 2000/2001.

- Gradual introduction of renewable energy technology such as biomass (notably, the utilization of wood waste for district heating), small hydro-electric generation plants, etc.; and
- Introduction of local gas-fired boilers in areas where heat demand is presently covered by more carbon-intensive fuels.³
- Exploration of possible energy GHG reduction opportunities in other sub-sectors of the economy, e.g., industry, which need to be identified.

xxiv. There may be some scope for generating revenues for energy efficiency from one or more of the Kyoto Protocol's "flexibility mechanisms" that provide for financial transfers to developing countries and transition economies which undertake measures to reduce carbon emissions. The prospects for such a policy will depend, however, on negotiations between the government and the climate change convention secretariat.

Water Quality and Supply

xxv. Water coverage in Belarus, both in cities and rural areas, is quite good and microbiological indicators of quality in the public supply system have improved. But sanitary and chemical quality has not improved and a decade of little maintenance has left basic infrastructure seriously inefficient and in danger of collapse. *As a consequence, water losses and wastage are estimated to be more than 50 percent. Calculated average water consumption levels in Belarus are very high, with total production of water in Minsk exceeding water consumption levels in Western European countries of 130-200 liters per capital per day by 2-3 times.* The high levels of water usage in Belarus can be attributed to major inefficiencies in water supply systems including: excessive leakage from aging and deteriorating piping systems; poorly designed and maintained hydraulic systems for the distribution of water; operational difficulties, again from poor design and maintenance, in wastewater collection networks; and high energy inefficiencies in the operation of vodokanals.

xxvi. In addition to water supply problems, the quality of Belarus' water supply is also in serious jeopardy. Poor water quality is particularly acute in rural areas, where the population relies on open, unprotected wells that are prone to pollution, and where the lack of any rehabilitation has led to water quality becoming a major problem. *Between one- and two-thirds of water samples in rural areas do not meet microbiological or chemical sanitary standards.* Many in the population are forced to buy water for drinking. The situation particularly hurts the poor, who are least able to afford alternate sources of water and who are more likely to depend on wells. There are also concerns about the high iron and nitrate content in drinking water.

xxvii. Technical problems in the water sector essentially stem from a lack of financial resources. A standard feature of the socialist system was that water and sanitation

³ In principle, this idea can be extended to include the introduction of small-scale combined-cycle cogeneration units. However, the displacement of electricity produced by Belenergo by itself would not justify the introduction of small-scale, combined-cycle units on CO₂ reduction grounds alone given that the current fuel mix used by Belenergo is largely gas-based.

services were provided to residential customers at very low prices through government subsidies. The government also subsidized the water supply and wastewater industry, paying for maintenance and most capital improvements. As Government moves more towards a market economy, the expectation is that households will have more income and will have to pay more for utility services. This expectation, however, has not yet materialized, and now that the government is less able to provide the subsidies of the past, the sector is in the midst of an unprecedented financial crisis.

xxviii. *There are three major reasons for the financial crisis in Belarus' water supply and sanitation sector: low collection of water and wastewater fees; high cross-subsidization of residential consumers by other customers; and tariffs that are too low to ensure adequate maintenance, that do not consider the population's ability to pay, and that are not adjusted to keep pace with inflation.* These three problems are discussed in more detail below.

xxix. Collection levels: One of the most urgent problems is low collection of fees for water and wastewater services. Even more alarming than non-payment is the low collection of revenues in cash, although residential and commercial consumers pay a higher share of water fees in cash than government enterprises, which try to barter in goods or obtain official permission to write off their debts. The low collection of user fees has made vodokanals financially insolvent, making it difficult for them to pay suppliers, and in some cases, their employees. Another related problem is wastage and lack of incentives to conserve water. Increased metering would help to reduce high wastage, as consumers are presently charged the same amount regardless of actual consumption. Individual metering would also help vodokanals to generate bills that accurately reflect customer usage, and thus potentially increase payment of fees. Introducing meters can be challenging, however, as vodokanals might actually lose revenue if actual consumption falls below present, unmetered levels. The population may also continue to be unwilling to pay for service if fees are not reasonable.

xxx. Cross-subsidization: A second factor contributing to the financial crisis in Belarus' water supply and sanitation sector is the very high level of cross-subsidization of residential consumers by other customers. Most countries in Central Europe have already abandoned across-the-board price subsidies from the previous socialist system because of the very high burden that they place on the budget and on industries, their inability to properly target those most in need, and the wasteful consumption practices that they promote among households because of the low price of water. Although the 1999 budget planned to substitute cross-subsidization for a direct subsidy from the newly established Special Budgetary Fund, this has been insufficient and the cross-subsidy practice has continued.

xxxi. Tariff Levels and Costing Methodology: The final, and most fundamental problem is that tariffs are too low to cover the maintenance costs of Belarus' water and wastewater systems. Tariffs are theoretically calculated to cover operation, maintenance and depreciation costs. However, there are several cost items that are not included or significantly undervalued in the calculation of tariffs. The procedure used for calculating tariffs has severe flaws in the way "profits" are assigned, and costs are calculated on past

records, which use outdated or inappropriate norms rather than current needs. One key component that is not included in the tariff calculation is an adequate provision for unrecoverable debts as expenses. Vodokanals keep debt in book accounts as receivables for several years even if the likelihood of recovering such debts is poor. Tariff calculations also use a low rate of depreciation, which is linked to an inappropriate valuation of assets.

xxxii. Tariff approval: Another issue with respect to tariffs relates to the fact that they are set at the national level. As a result, there is no consideration of the local cost structure of each vodokanal, nor of the actual ability of the population to pay. The operational costs of vodokanals vary substantially across cities, a fact that should be taken into account when establishing tariff structures. Finally, many vodokanals have experienced substantial losses because of delays in adjusting tariffs to keep pace with inflation. Losses also occur because arrears to vodokanals are not indexed against inflation so the incentives for timely payment by debtors are minimal as the value of past debts erodes quickly.

xxxiii. **Without urgent action to address the financial situation in the water sector, supply systems, particularly in small towns and rural areas, will continue to rapidly deteriorate and portions may even collapse. This will translate into lower levels of service and safety of drinking water, negatively impacting the well-being of Belarussians.** This deterioration is progressing at a faster pace in small towns and rural areas, where fewer financial resources are available for maintenance of the system.

xxxiv. For the urban sector, the provision of adequate, reliable, and safe services will require investments in the following areas:

- replacing and rehabilitating existing plants and networks to prevent premature collapse;
- establishing rural water supply systems that are affordable for the population and easy to operate and maintain;
- increasing the efficiency of plant and network operations to reduce future operating costs, particularly in energy efficiency;
- strengthening of institutions and building of capacity in two areas: (i) to improve the productivity of utility management, administration and operations, and commercial performance; and (ii) to facilitate the organization of rural community groups that take care of the operation, financing and maintenance of their local systems;
- expanding water supply and wastewater services to those people presently without service, as soon as the safety of drinking water is improved via implementation of the measures noted above; and
- **introducing financial reforms, including fair and equitable tariff structures, adequate and transparent subsidy policies, cost-effective investments, linkage of service levels to willingness to pay and needs and demands of consumers, and increased metering, in an effort to improve the viability of the water supply and sanitation sector.**

xxxv. For rural areas, basic principles of demand-based provision of service (communities pay part of the capital cost in proportion to the cost of facilities, and all operations and maintenance costs) will need to be adopted, along with a change over to community ownership and management of local water systems. Addressing the problem may require targeted investments to rehabilitate specific parts of systems to avoid collapse, and institutional and financial reforms to allow them to collect sufficient revenues to operate and adequately maintain their systems.

xxxvi. In addition to the points above, reforms needed to arrest the decline of the water supply and sanitation sector can be grouped into four areas:

Institutional Reform and Decentralization:

xxxvii. Restructure and decentralize water utilities in rural areas so that responsibility and involvement is given to the communities served. Regional support service units can provide specialized technical services as needed. Control, however, should be local, as this solution has proven most effective and sustainable elsewhere in similar situations. Ensuring community involvement results in people receiving what they want, lower project costs, quicker project implementation, and local capacity building. Rural areas need systems that are relatively simple to operate and maintain. Communities should own, manage and help finance the rehabilitation of their water facilities. They should make informed choices regarding service levels and financing, through the introduction of more demand-responsive mechanisms.

xxxviii. In communities with populations larger than 10,000, water and wastewater systems require professional management and operation. The recommended institutional and governance setting would require restructured vodokanals, with responsibilities decentralized to the lowest appropriate level for managing the systems efficiently, and the introduction of more ownership and involvement of the communities served. As some of the vodokanals will not have the capacity to support a full-fledged water supply and wastewater operation with their own laboratory, engineering staff, planning and commercial system, and specialized equipment, the government would need to facilitate the provision of these services under contract to either centralized support service units at a regional level or to local private providers

xxxix. Larger cities need to: separate utilities from city budgets and control, making them legal entities with greater autonomy; improve the regulatory framework; institute performance based contracts for service, eventually contracting out large rehabilitation and maintenance jobs; facilitate the development of a stronger private support industry that helps the sector to provide better services; and introduce a regulatory framework that limits political interference.

Financial Reform:

xl. As noted above, rural communities of less than 10,000 people need water supply and sanitation systems that are simple to operate and maintain, with communities making informed choices concerning level of service and service delivery mechanisms, based on willingness to pay capital and operating costs. They should also set tariffs to meet the financial requirements of the services that they select. The communities would

own, manage and help to finance their facilities, with the government facilitating the process by encouraging stakeholder participation, setting policies and standards, and cofinancing facilities. Government subsidies for rural water supply should be transitional and targeted at communities on a one-time basis. The government should coordinate all sources of financing and balance urban and rural sector priorities.

xli. In urban areas, the priorities call for rigorous collection of bills in cash, increased tariff levels (subject to affordability and willingness to pay considerations) to ensure full cost recovery, the introduction of transparent, targeted and efficient subsidies, and improvements in financial management and planning. Involving the private sector would have substantial benefits and would provide additional sources of financing.

Technical Reform:

xlii. In rural areas and small towns, technical reform should focus on allowing communities the flexibility to choose service levels that are affordable and simple to operate and maintain.

xliii. In urban areas, reforms should aim to reduce operating costs and improve efficiency through reductions in water and energy losses. Reforms should be directed towards adopting realistic norms and improving the quality and safety of services using performance-based targets.

Service Reform:

xliv. Reform in this area should, especially in rural communities and small towns, focus on making water services more accountable to the poor segment of the population. More generally, reforms should be responsive to the needs of users, strengthen human resource capacity and meet national environmental protection goals.

Chernobyl

xlv. The social and health impacts of Chernobyl have been well documented in many studies. The economic consequences have also been discussed at length. An urgent priority, however, is to undertake a thorough review of the Chernobyl fund to determine the real needs and appropriateness of its present structure. It is also necessary to evaluate and increase the effectiveness of public expenditures financed via the fund. It is difficult, in budgetary terms, to obtain an accurate estimate of the costs of the accident since its occurrence in 1986, but the Chernobyl Committee estimates that it has spent 20 percent of its budget since then on Chernobyl-related activities. At present, the government spends about 3.5 percent of its consolidated budget on Chernobyl related programs, a figure that is down from 5.3 percent in 1998. On the revenue side, a special Chernobyl tax raises around 2.3 percent of consolidated public revenues. The major portion of expenditures are for the construction of new dwellings and schools, and for social support to victims of the accident. The targeting of these support programs, however, is not particularly focused. Payments are not closely related to ongoing disabilities. Furthermore, some of the investment in resettlement may be disproportionate to the benefits and should be monitored more closely.

xlvi. Until recently only a minor share of public expenditure on Chernobyl is allocated to environmental remediation or to agricultural countermeasures designed to produce foodstuffs that are legally described as ‘clean’. An increased effort in this direction is warranted given the fact that a substantial portion of the population remains in the affected areas and depends on agricultural activities for its livelihood. Indeed, numbers in some of the affected areas are increasing due to in-migration. It is encouraging to note that greater attention is being paid to these issues and in 2002 a greater share of expenditures went to promoting clean foodstuffs than to construction. As a result of discussions with the Ministry of Agriculture and the State Committee on Chernobyl, the report team recommends that greater attention be directed to the following four areas:

- Radiation countermeasures for food production.
- Support for agribusiness in the Gomel and Brest Oblasts.
- Improved monitoring of radionuclides in the Gomel, Brest and Mogilev Oblasts.

xlvii. Radiation countermeasures include:

- Regrassing pasture land
- Liming
- Application of potassium and phosphorous fertilizers
- Remediation of natural hay fields and pastures
- “Clean” feeding of animals prior to slaughter

xlviii. The government is already taking some action to introduce radiation countermeasures, but much more can be done. Technical support for agricultural enterprises, especially those that are privatized, could be undertaken through demonstration projects.

Support for agribusinesses in the most affected Oblasts (Gomel and Brest) includes:

- Grain milling
- Processing grain into alcohol
- Processing seeds into oil
- Potato pilling
- Processing milk into butter and cream
- Cooking and curing meat

xlix. As with countermeasures at the farm level, the measures listed above to support agribusiness in the Gomel, Brest and Mogilev Oblasts are already being implemented to some extent. However, external support in the form of financial and technical assistance would greatly advance the adoption of the new technologies through the transfer of knowledge to local enterprises. Ideally, such assistance should be in the context of a donor supported (IFC led) broader operation to support SME development. Greater seed fund support for the development of agro-processing is also needed. The International Atomic Energy Authority (IAEA) has already sponsored and is sponsoring some

demonstration projects for technology, knowledge transfer and seeds, but the number is limited by lack of internal and international financing.

l. Finally, better monitoring of radionuclides is of critical importance. Although the government continues to do its best, there are gaps and deficiencies. In particular, the timely monitoring of Stroncium 90 is not taking place owing to a lack of local laboratories with trained staff and required equipment. External support to establish local laboratories and to provide equipment and training as appropriate in the analysis of Cs-90 is urgently needed. Again, the IAEA provides equipment and training to a number of Belarus' laboratories.

Medium Priority Actions

li. Medium term, priority actions cover a wide range of interventions, most of which should be undertaken over the next 2 to 4 years. Summarized below are some of these activities:

Air

lii. Measures of air quality in Belarus have not deteriorated over the last decade, with several actually showing improvement. Emissions of pollutants have declined in absolute terms, and the data on air quality that is regularly collected indicates improvements in most locations. Reductions in air pollution have occurred to a large extent because of the efforts to replace coal with gas. **Air quality data are, however, incomplete, as ozone concentrations and some solid particulate concentrations (SP₁₀ and SP_{2.5}) are not measured. This should be corrected. Moreover the equipment for air quality monitoring is outdated and needs to be replaced.**

Solid Waste

liii. While waste management has improved in recent years in Belarus, a number of problems still remain. Not all, existing waste disposal sites meet modern sanitary and engineering standards and the practice of recycling is not widespread. A number of disposal sites are reaching capacity and expected increases in waste generation in the future require that new sites be built and that modern waste management practices be introduced. The government has developed regulations, guidelines and programs to guide and improve waste management practices in the country, and has made some progress in terms of implementation. Greater action is needed to close waste disposal sites that are currently unregulated, reaching capacity or pose a risk to the environment. Considerable effort is also required to develop systems for the separation, collection and recycling of waste. The government appears to be very committed to addressing the country's waste problems, but financing is not always readily available to implement all aspects of the programs that it develops.

Natural Resources -- Agriculture

liv. Unlike many of its neighbors, land under cultivation in Belarus has not declined since the breakup of the FSU. Yields, however, have fallen sharply, more so in large, public agricultural enterprises than for household plots. Ordinarily, declining yields prompt greater use of fertilizers, but instead there has been a decline in the application of fertilizers and pesticides, as these have become unaffordable for most farmers. On the

positive side, declining pesticide and fertilizer use has resulted in a reduction in contaminated water. Contamination from the application of organic manure, however, remains a matter of concern. Another issue is agricultural land affected by Chernobyl. Land classified as unusable in this area has been declining slowly and currently stands at around 249,000 ha (about 2.6 percent of all agricultural land). In total 1,298,000 ha have some restrictions on use due to contamination.

lv. **Aside from Chernobyl-related contamination, the most important environmental issue relating to agriculture is the continued use of marginal land when it could be better used to serve other functions such as ecosystem protection and flood control.** Currently, land under cultivation that is endangered by erosion amounts to about 1.2 million ha (12.9 percent of total agricultural land; 5.8 percent of total land area), and land already seriously eroded to about 500,000 ha (5.4 percent of agricultural land; 2.4 percent of total land area). This is out of a total agricultural area of 9.3 million ha. The government should reconsider the use of these lands for agriculture and retire those that would better serve the function of watershed protection or possibly carbon sequestration. The government is aware of these issues. For example, the Land Reform Committee estimates that about 7.5 percent of agricultural land (about 700,000 ha) would be better suited to non-agricultural uses, with 300,000 suited to forestry. However, a full scale assessment of these alternatives has not been undertaken.

Natural Resources -- Forestry

lvi. Belarus' forestry resources are growing in volume terms (34 percent to 38 percent of total land area since 1991) as a result of reforestation and reduced logging, but not in terms of the sustainable economic benefits they generate. The present management system encourages inefficiency in the use of raw materials and does not generate the maximum benefit in terms of income and employment. The hundred or so forest enterprises that manage forest resources are subsidized more than is justified for their 'public good' role. A full estimate of the extent of the subsidy to forest enterprises has not been presented, but can and should be, given that data is available. The government has the right intentions in that it wishes to phase out the subsidy to the forest enterprises so that they become self-financing by 2005. For this to be effective, however, a number of economic reforms need to be undertaken, particularly privatization and decentralization of administration.

lvii. On the commercial side, timber sales are still largely state controlled, with prices below market levels. These low prices lead to cutbacks in reforestation, protection, silviculture and ecosystem management, with negative impacts on forest growth and nature conservation. Furthermore, subsidies to an inefficient wood processing industry result in a lack of modernization. A move to market-based timber prices would generate benefits all round. The amount sold under auction is increasing, which is a positive development, but these auctions should be opened up to more buyers and to exporters. In addition, the government should consider expanding and making the export sector competitive and more sustainable. It should allow the export of roundwood, based on sustainable management of the stands from which it is logged, and develop a system of certification that would ensure such exports receive high prices in OECD markets. The World Bank Forestry Development Project is providing some support in this regard.

lviii. Increases in forested land can also contribute to Belarus' capacity for carbon sequestration. Such capacity is potentially valuable, but the mechanisms for realizing this value are complex and somewhat fluid. The international agreement governing the measurement of greenhouse gas emissions is the United Nations Framework Convention on Climate Change (UNFCCC). Under this convention, a number of countries have agreed to physical targets to reduce the level of their emissions (Annex I countries). In meeting these targets, they have access to three 'flexibility mechanisms'. These essentially allow a country to buy and sell emission reductions from and to other countries, to undertake emission reduction activities to obtain credits towards meeting its own targets, and to sell extra credit from undertaking emission reduction activities to other countries (joint implementation). In all three cases, activities that reduce carbon emissions will have a value. It is highly uncertain what this value will be, but prices have been estimated in the range of \$10 to \$50 per ton of carbon. Belarus, however, is in an anomalous position with respect to the convention, being neither in the group of countries that have targets for carbon reduction nor in the group that can 'sell' reductions. Action from the government to clarify its position on the treaty is urgently required, since the scope for carbon sequestration activities as identified in this report needs to be determined.

Natural Resources – Biodiversity

lix. Belarus increased protected areas by some 40 percent between 1991 and 2001. While real budgetary allocations to the Ministry of Natural Resources and Environmental Protection have also increased from very low levels in 1994, expenditures on areas under protection have not returned to 1990 levels in real terms. Donors have offered some help with much of the non-routine conservation work that is undertaken through foreign supported projects. Most of these projects have focused on wetlands, which are ecologically of international significance and which make up around 12 percent of the national territory.

lx. In addition to mobilizing funds from the international community, Belarus can do more to protect biodiversity by promoting tourism, both local and foreign. The scope for this is recognized, although a detailed assessment has not been made. The policy for most protected areas remains one of restrictions on use. Experience elsewhere suggests it would be prudent also for government to consider permitting potentially benign uses, such as bird watching, hiking, trekking and so on, for which income can be earned. Such activities can help finance the management of protected areas at the local level, or zakazniks at the local community level. This should provide a strong incentive for promoting such activities. In some cases, investment in basic infrastructure is needed, while in others some capacity building in terms of what services need to be provided and how they should be organized is required. This is also an ideal area for involving the private sector, with partnerships between the local community and private investors offering real scope for income generation, employment creation and poverty alleviation. The authorities are taking some tentative steps in these directions, and one of the zakazniks in Minsk Oblast has provided some tourism services and is collecting revenue from visitors. A major effort on this front is warranted and is likely to attract assistance from the international community.

lxi. *Pripyat Area*: An example of a biologically diverse region of Belarus that should receive priority attention so that it is protected, is the Pripyat basin in the Southern Polesye area (shared with Poland and Ukraine). **The basin is part of one of the largest stretches of boggy lowland wetlands in Europe and provides important habitat for birds and wildlife and plays a key role in flood mitigation, water filtration, and carbon sequestration.** A Ramsar site was recently designated in the area, **acknowledging its global and regional value.** Other sites may be designated in the future. Here, as elsewhere, agricultural use over the last 40 years has left a legacy of severe soil erosion, land degradation, and increased susceptibility to floods. A realignment of land use practices would lead to higher, sustainable agricultural yields as well as to improved flood and erosion control. These activities, set in the context of an integrated rural development plan for the region would include restoration and reclamation of degraded land in the Pripyat River floodplains, afforestation, development of alternative farming products such as reeds, and shallow well protection, could well contribute to sustainable development in the region.

Mineral Resources

lxii. Generally, Belarus manages its mineral resources well, although peat is a possible exception. Past excessive extraction of peat in the Polesye region has already taken its toll. Although the government already has a policy to restrict extraction in environmentally sensitive places, and now extraction in Polesye is very small, it may be necessary to further tighten licenses for extraction in some places on environmental grounds.

Institutional and Legislative Framework for Environmental Protection

lxiii. Belarus has made considerable progress in establishing and updating its institutional and legislative framework for environmental and natural resource management and today it has a highly developed structure to address a variety of issues. At the same time, however, there is still quite a lot to be done. **Relative to other FSU countries, Belarus has a small number of new laws but some of them are still only declarative in nature, without the necessary regulations and effective institutional mechanisms available to support their implementation.**

lxiv. This definitely inhibits the growth of civil society. Also inhibiting the development of civil society are the rule for NGOs. Although NGO numbers are increasing, organizations have poor means of communication and lack many of the tax and other incentives that are common in the West. Registration and control of NGOs remains somewhat cumbersome. At the same time, the government works well with some environmental NGOs to implement its policies.

lxv. **Other issues related to the management of the environment where institutional reforms are needed include:**

- **Decentralization of responsibility to the local level for implementation of policies where the effects are predominantly local;**
- **Increased role for private sector participation in natural resource management; and**
- **Development of an integrated environmental monitoring system.**

lxvi. Decentralization in government is a common theme across many sectors and the environment is no exception. Decision-making and implementation of policy are both more effective when those closest to the issues are given authority. The constraint in transferring this responsibility is weak capacity in modern environmental regulation methods at the local level, a problem that urgently needs to be addressed. In this context, the government should also seek to move towards increasing its use of market-based instruments, especially for the regulation of the use and exploitation of natural resources. This will require some capacity building.

lxvii. There are many situations in which the private or NGO sector can be more effective in protecting natural resources and ensuring their sustainable use than can a state regulator. Cases in point are management by forest enterprises and park management by operators providing recreational services. The government does rely to some extent on non-governmental organizations to manage such resources. More, however, can be done to encourage such involvement, especially through the use of fiscal incentives.

lxviii. *Data Collection:* Finally, there is a need to centralize and streamline the collection and recording of environmental data. A large amount is collected in the country but it is located in many different centers and is sometimes hard to obtain and often it is not collected on a consistent basis. An integrated monitoring management system should be set up so that all state agencies can supply information to one, designated center. This is an area where external assistance could be helpful.

I. Introduction

A. Background and Purpose

1. The purpose of this review of environmental and natural resources management in Belarus is to engage the government and local stakeholders in a dialogue on the links between the more technical aspects of environmental management and the underlying national policy framework. It leads to recommended policy actions in support of more environmentally sustainable investments in water, energy, solid waste and natural resources management -- areas where there is potential for World Bank follow-up activities¹. The Report should complement the Updated Belarus National Environmental Action Plan (approved by the Belarusian Council of Ministers in June 2001) and its Sustainable Development Strategy. The Report:

- Provides a critical review of the existing situation in four sub-topics (water, energy, solid waste and natural resources management, particularly those related to Chernobyl) selected for their articulated priority within Belarus, and potential for future World Bank follow-up;
- Assesses macroeconomic linkages and measures affecting long-term financial and environmental sustainability within these areas of focus;
- Reviews the poverty dimensions of these sub-topics and recommends actions for focusing interventions on the more disadvantaged segments of the population; and
- Establishes a dialogue with government and segments of civil society on key reform measures to promote/enhance environmental sustainability.

B. Rationale and Context for the Study

2. The Republic of Belarus has requested World Bank assistance for an update of environmental sector work as a follow-on to an environment review (Belarus Environment Strategy Study) carried out jointly with the Bank in the early 1990s and published in 1993. Although the Bank's low level of activity in Belarus in the following years² prevented any substantial follow-up by the Bank, the government moved forward and implemented many of the recommended environmental policy actions from this environment review (considered the government's National Environmental Action Plan) with little assistance from international or bilateral partners³. Much of this progress on implementation of actions was documented in a 1997 Organization for Economic Co-operation and Development (OECD) Environmental Performance Review of Belarus, and some has been achieved since this report. The Ministry of Natural Resources and Environmental Protection's (MNREP) commitment to move the environmental policy framework forward in line with international trends has been commendable

¹ The initial drafts of this report did not cover solid waste management. A subsequent Mission was asked to look specifically at this issue, following which a chapter on solid waste was added to the Report.

² The Bank has been in a low or "below-low" case lending scenario since 1994.

³ Follow-up actions have most significantly been on the integration of polluter pays principles and economic instruments into the legislative/policy framework for environmental management.

considering the challenges they face in implementation of these measures within the current national economic⁴ framework.

3. The Bank agreed to undertake some sector work that builds on, but is more targeted than the Belarus Environment Strategy Study or the OECD Environmental Performance Review study⁵. The present draft report is the outcome of this agreement. It recommends measures to help promote sustainable environmental and natural resource management with an emphasis on the links between the environment and the underlying national policy framework. It also reviews macroeconomic policies and programs currently in place and assesses what actions could be taken to provide a better enabling environment for achieving long term environmental management objectives.

4. The existing 1998 Belarus Country Assistance Strategy (CAS) is unusual because no agreement on development policy was reached between the country and the Bank. The CAS highlights the differences between the Bank's position and that of Belarus and outlines the potential cooperation scenarios stemming from changes in the country's approach to reform. The "below-low" case lending scenario of the Belarus CAS calls for economic and sector work, technical assistance, public education, and policy advice. In September 2000, the primary condition for resumption of a low case lending scenario in Belarus was met through unification of the Belarusian ruble exchange rates. Preparation activities for the Social Infrastructure Retrofitting Project (SIRP) have resumed on this basis and the Loan Agreement was signed on September 26, 2001. This proposed sector work would specifically focus on areas/topics where a shared priority between the government and the Bank existed prior to the interruption of the lending program. The findings and recommendations of the sector review are intended to help feed into a new CAS discussion and, in the case of a resumption of Bank lending scenario, help provide the foundation for follow-on investment projects.

5. The government's overall reform strategy *in principle* has always been supportive of environmental improvements, and particularly those areas with direct economic benefits like energy conservation and protection of natural resources. However, in practice, policies pursued to promote social protection such as price controls, subsidies, and state control of industrial assets have undercut the progress that could be made on meeting key environmental objectives. For example, in the water and energy sectors, a system of complex price controls and low utility tariffs, particularly at the consumer level, has created disincentives for efficient resource allocation and generates insufficient resources for long term investment needs. Limited privatization has left the majority of enterprises under state control, missing out on the opportunity to share the burden of environmental financing with the private sector. Belarus therefore has a tremendous challenge ahead to reconcile the desire for supporting sustainable environmental management and implementation of its program of measures to promote social protection.

⁴ Belarus' current Country Assistance Strategy (CAS) (1998) characterizes the Belarus economy as "tight centralized management" with administrative controls over prices, deferred privatization, and distortions from directed and subsidized credit programs.

⁵ The OECD study noted good progress on environmental legislation and recommends further efforts in areas where less progress has been made such as economic reforms to renew growth and promote efficient use of resources, and better inter-sectoral integration of policies.

C. Value Added of the Report

6. This study is meant to broaden the dialogue on environmental issues in Belarus and link it with a wider Bank dialogue on reform. As Belarus has a good “track record” with the Bank on implementing environmental projects⁶ relative to other areas, the environment provides a logical point of entry for such discussions. Environment is also a logical point of entry because of the inter-sectoral nature of environmental matters. Since any potential investment project will have to be carefully considered for its technical feasibility within Belarus’ existing macroeconomic framework, this review would help provide the Bank with better information to assess these linkages and risks.

7. The starting point of discussions on environment in Belarus can be more positive than in some other sectors, because its Ministry of Natural Resources and Environmental Protection has been surprisingly progressive compared to some other FSU neighbors in such areas as the introduction of a legislative framework for instruments like technology based emission standards; flexible permitting; and environmental auditing. Belarus has also initiated development of programs like green labeling and ISO 14000 certification that strengthen Belarusian industries’ access to outside (predominantly western) markets. In the longer term, the external partners of these programs will demand improvements in local environmental conditions.

8. Belarus also has a relatively strong environmental enforcement record in imposing legal sanctions (i.e. closing down enterprises in violation of environmental norms until problems are resolved) and in collecting environmental fees and fines.

9. The report emphasizes the issues of voice and involvement of the local community as they relate positively to environmental improvements. Better environmental information and awareness are critical to both promoting local community action and involvement on environmental issues, and for gaining confidence of the general population toward government actions in this sphere. A participatory approach to this sector work is proposed to enhance and broaden discussion on the subject matter and to help model the potential gains of bringing government and non-government stakeholders together. Belarus does not have a good track record yet in developing civil society and its legislative basis needs to be amended to provide the mechanisms for greater public involvement and information sharing within the framework of its environmental legislation.

Why these three areas of focus (water, energy, solid waste and natural resources management)?

10. Selection of the three areas of focus (water, energy, solid waste and natural resources management, especially as it relates to the consequences of the Chernobyl nuclear accident) for this sector work were based on the following considerations:

- Harmonization with priorities of the government
- Consistency with CAS - topics with global as well as local issues

⁶ The GEF Belarus Biodiversity Protection Project and GEF Belarus ODS Phase-out Project are both considered to have been highly successful with good project implementation and good prospects for sustainability.

- Existence of studies and available information
- Need to limit the scope for budget control.

11. Some of the priority areas identified by the Ministry of Natural Resources and Environmental Protection (MNREP) for further work included air and water issues; strengthening of monitoring and other environmental infrastructure; natural resource management; and waste management. In light of substantial work on the regulatory and administrative reform over the last decade, the government has asked for a document that would highlight and discuss specific priorities; propose a course of action to operationalize already completed regulatory reforms; and focus on the promotion of sustainable environmental and natural resource management. Additionally it would like this Report to help update the National Environmental Action Plan (NEAP). These priorities were discussed with government counterparts during a spring 2000 Mission including Bank participation in a seminar discussion of environmental issues organized by the Belarus Presidential Academy of Management.

12. Government priorities for follow-on lending activities with the World Bank have often raised the desire for involvement in the water sector⁷. Although there has been some backtracking on proposed energy operations in Belarus in the past, the government also continues to state its interest in energy efficiency and conservation investments that are closely linked with the environment. The government and the Bank's agreement on this issue is reflected in the only existing lending operation currently under preparation, a social infrastructure project targeting energy efficiency in hospitals and schools. Finally, the government places a high priority on finding sustainable solutions to the consequences of the Chernobyl accident and there is interest on both the Bank's side as well as that of the government to cooperate in this area.

13. The current CAS as well as follow-on CAS discussions have focused on the importance of the Bank continuing support to Belarus in areas of global importance where there may be few other actors. All three of the topics selected for further analysis have global or regional dimensions which are important in Belarus (water- transboundary issues; energy- climate change; natural resources management- biodiversity protection).

14. Each subject area also has a number of priority local issues that correspond to the larger global ones. For example, Belarus has started working on climate change issues and has selected the Bank as its partner in working on its communications to the Climate Change Convention. A closer look at environmental issues in the energy sector and a review of the linkages between sector programs and macroeconomic issues would help maximize the expected benefits of a GEF supported climate change energy efficiency program.

15. One area of priority for the government of Belarus that this sector work did not address in the first round was waste management. Although this is a key issue for Belarus, and an important one from the perspective of impact and lack of adequate control, was excluded from this study because it did not fit the Bank CAS criteria (few global or transboundary issues) and because of budget constraints. In subsequent discussion with the government it turned out that

⁷ The Bank had a proposed water sector loan under preparation (PHRD Grant) in 1997 at the time of the decision to freeze lending operations.

this was an important omission. Hence a rapid review of the sector was carried out and is included in the final draft (Chapter VII).

16. The report is structured as follows. Chapter II looks at macroeconomic developments in the country and their environmental implications. Chapter III provides some background information on the country and a review of key environmental trends. Chapter IV assesses regulatory reforms in the environmental sector, areas of success and failure, and how the sector can be better managed in view of the changing economic challenges facing the country. Chapters V to VIII deal with each of the sectoral issues that are the focus of this report – energy (V), water (VI), Solid Waste (VII), Chernobyl (VIII) and natural resources (IX).

II. Macroeconomic Trends and Linkages

A. Macroeconomic Background

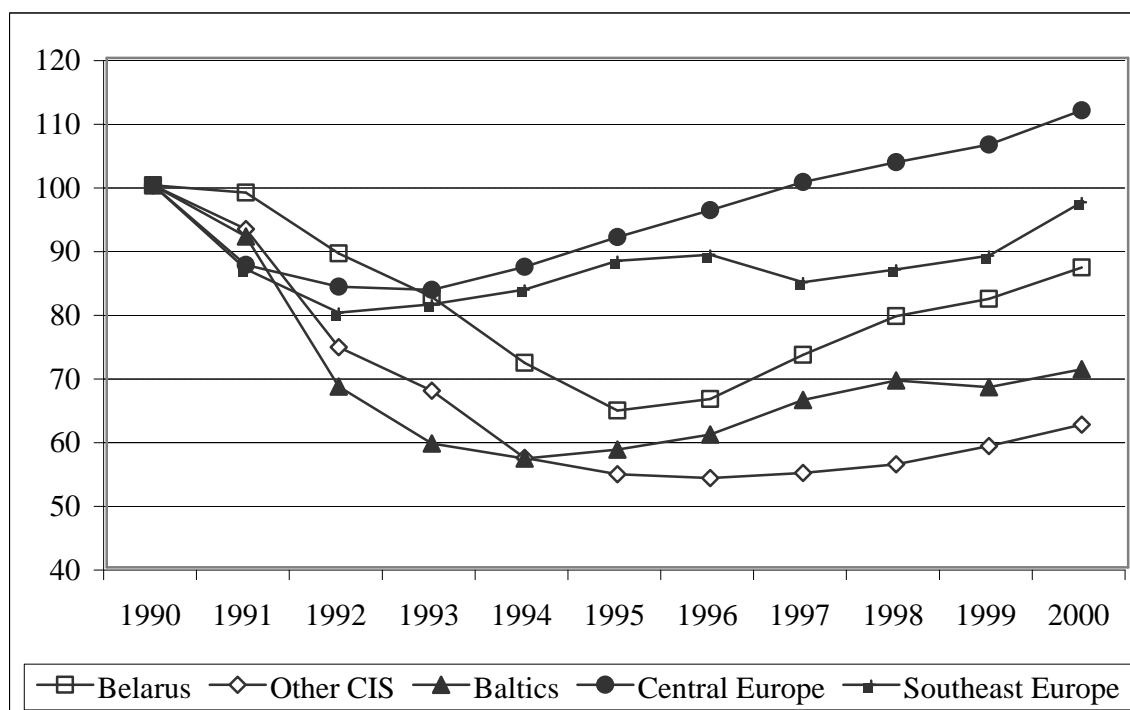
17. Belarus has pursued a strategy of very slow reform, following its declaration of independence in 1991. This transition strategy has yielded mixed economic, social and environmental results. From 1991 to 1995, real GDP fell by 35 percent, a not unusual performance among the NIS states. Since then, however, the country has recorded positive real GDP growth in each year, which is not been a universal experience in the region and indeed by 2000 it has achieved a higher level relative to 1991 than all but one of the FSU states⁸. In 2000, growth is estimated to have been 5.8 percent, with estimates in 2001 ranging from 2.5 to 4.0 percent. Nevertheless, by the end of 2000, real GDP was still about 11 percent below its 1990 level (see Figure 2-1). Belarus' lack of reforms has led to far higher inflation rates than in many other FSU states. From 1991 to 2000, the average annual rate of inflation in the country was 333 percent, compared to 270 percent for the CIS states (i.e. the FSU excluding the three Baltic states). Moreover, inflation is not falling as fast in Belarus as it is in the other countries; in 2000 it was 169 percent compared to 29 percent for the CIS as a whole. Latest IMF projections for 2001 and 2002 are, respectively, 75 and 55 percent for the rate of inflation and 2.5 percent for the rate of growth of GDP.

18. Other macroeconomic indicators relevant to the environment include changes in the structure of production and trade, 'genuine' savings, and changes in government budgets and levels of real incomes, including the quantity and quality of natural resources that people have access to. Also important in general is are trends in poverty.

19. The structure of output defined in broad categories demonstrates some significant changes. There has been a decline in the share of agriculture, which has fallen from 28 percent of GDP in 1990 to around 12 percent in 2000. Industry/construction's share has also declined, from 46 percent to 33 percent over the same period. The growth has been in services (up from 29 to 43 percent). Overall the shift has resulted in less emissions of air and water (but not solid waste) and lower pollution intensity (see below). Furthermore, the nature of the environmental problems have changed. Transport, for example, is included in the service sector and grew from 6 percent of GDP in 1990 to 10 percent in 1999. It is an important source of particle and ozone pollution as well as volatile organic compounds (VOCs). Within the industrial sector, the fastest growing sub-sectors are wood, pulp and paper and ferrous and non-ferrous metallurgy, each of which could result in an emergence of some past pollution problems.

⁸ Including the Baltic states, but excluding Uzbekistan.

Figure 2-1: Real GDP in Belarus and Other Countries in the Region



20. The structure of trade has also shown some important changes with environmental implications. On the import side there are substantial year on year fluctuations in the value of imports of minerals (mostly energy fuels), but of over-riding importance is the fact that over 85 percent of all energy needs must be imported. This change in total fuel use as well as fuel mix has had beneficial effects on air quality. Another factor that could influence air quality is the relative ease with which second hand vehicles can be imported. Often these would not meet emissions standards in the EU, and although there are controls in Belarus, they are hard to apply across the board. Of most concern from an environmental viewpoint on the trade side, is the sustainability of energy imports, which continue to be provided by Russia on a very subsidized terms. There is evidence that Russia will begin pressing for fuel subsidies as oil prices and energy demand worldwide lowers. It is critical for Belarus to move forward with energy reforms to prepare for this eventuality. If prices change too dramatically for the population, some may turn to alternative fuels, such as burning fuelwood, which could increase emissions. Perhaps, more importantly, higher energy costs will place increasing pressure on Government's ability to meet other social and environmental needs, such as preventing the collapse of urban and rural water supply systems.

21. On the export side, the share of mineral products increased considerably compared to 1995 while the share of chemicals has declined since 1995 and those of ferrous and non-ferrous products, timber, pulp and paper, and textiles have increased. Looking at exports in more detail, significant changes emerge in timber, pulp and paper (twofold increase in dollar terms from 1995 to 2000) and food and agricultural products (volatile, up 94 percent from 1995 to 1998 and then down 18 percent between 1998 and 1999). As these exports may have implications for the sustainable use of natural resources, they are explored further in Chapter VIII. Exports of and services based on natural resources also offer some prospects of raising rural incomes, and there

are some synergies here between environmental conservation and development in general. One way in which this can be enhanced is through a program of certification based on the production processes meeting certain environmental standards. There is an active program in the country on certification, details of which are given in Box 2-1 below. This is only in its infancy and needs support if it is to be successful. If the country is to develop markets in OECD countries, such a program is an important part of the national strategy and needs to be strengthened.

22. Further trade and environment related issues will arise as the government pursues its membership of the WTO. Environmental standards for exports and changing trade patterns as market access changes for both imports and exports could have major implications for the quality of the environment in the country. These implications should be studied carefully and the economic strategy for accession be designed in such a way as to be responsive to these environmental impacts.

Box 2-1: Environmental Certification in Belarus

In 1998 the Ministry of Natural Resources and Environmental Protection (MNREP) and the State Committee for Standardization, Metrology and Environmental Certification issued a joint resolution on establishing a sub-system for environmental certification within the National Certification System of the Republic of Belarus.

The sub-system is managed by the Central agency for environmental certification within the MNREP Center for international projects, certification and audit "EcologyInvest", which is accredited with the National Certification System of Belarus. An agency for the certification of environmental management systems was also established at the Belarusian research center "Ecology", which is also accredited to Belarus' sub-system for environmental certification.

For ecological certification most of the relevant regulations (11 guidelines in line with ISO 14000 standards) have been developed and approved, including a list of enterprises subject to mandatory ecological certification. In addition twelve experts have been trained in the application of the system, which has been designed to be comply with international standards as laid out in ISO 14000. The government recognizes, however, the lack trained people in the country and is seeking Bank assistance in the conduct of audits for selected enterprises as well as training of high-level expert-auditors. Many enterprises hold the view that certification would help with acceptance of their exports in Western European and other OECD markets and would thereby reduce their dependence on the Russian market. At present, three enterprises have been granted ISO 14001-96 certification. A total of 80 enterprises, 14 of which are private, have ISO 9000, which represents high quality assurance. Thirty of these have expressed a desire for newer certification, that is ISO 14000 and 14001. The government is also negotiating reciprocal recognition with some of the eco-labels in EU countries. The availability of local experts will substantially reduce the costs of obtaining the certificate.

On forest certification, a review of international experts has concluded that the country could obtain FSC (Forest Stewardship Council) assistance and that the Department of Forestry has selected several firms for participation in this program.

Poverty and the Environment

23. Trends in poverty have been reported in various surveys and are covered in the CAS and other documents. These point to some increase in the absolute poverty rate (in 1997, 32 percent of the population had incomes 60 percent below the value of the minimum consumption bundle; in 2000, this went up to 35.7 percent). The poverty situation in Belarus has to be seen in perspective, however. On an absolute poverty standard of \$4.30/person/day or \$2.15/person/day, the percentage below that level in Belarus in 1999 was lower than in any East European or FSU country, except Croatia, Czech Republic and Slovenia. In terms of relative poverty, taking the

percentage below 67 percent of the median income Belarus has a lower percentage than all countries except the Czech Republic, Albania, Hungary and Slovenia (data from 1996 to 1999)⁹.

24. From an environmental perspective, it is not this small increase that is so significant as the fact that among the poor, the rural population is over represented. Taking the minimum consumption budget as the benchmark, 50.2 percent of rural households were below that level, compared to only 35.6 percent of urban households. (In 2000 42.0 and 32.8 percent, accordingly). Rural households have a smaller share of their income in cash and are therefore more dependent on the natural resource base for their livelihood. With declining agricultural yields, the pressure on forest, fishery and other resources has increased and will remain high until rural poverty declines. Other links between poverty and the environment that are relevant to Belarus are: (a) declining water quality, especially in rural areas, which impacts more on the poor; (b) rising energy prices under macroeconomic reforms, which will affect poor households unless special measures are taken; and (c) increasing poverty and dependence on state subsidies or both among the population unless resources are injected into areas affected by Chernobyl. Each of these issues is discussed further under the relevant chapters dealing with water, energy and Chernobyl. In addition, improved sustainable exploitation of natural resources (e.g. through environmentally friendly tourism) can help to both reduce poverty and protect the environment.

B. The Pollution Intensity of Economic Activity

25. Two indicators of pollution intensity can be seen in Table 2-1 below, which gives wastewater and air emissions per unit of GDP in 2000 prices. Waste water discharges include all untreated waters discharged into surface water bodies, reservoirs and filtration fields. The air pollutants are the sum of the emissions of sulfur dioxide, nitrous oxides, carbon monoxide and VOCs. The data show a substantial decline in intensity between 1995 and 2000. The waste water intensity of GDP has declined by 30-70 percent since 1990 and the air pollution intensity has declined by 60 percent. Between 1990 and 2000, annual wastewater discharges decreased by around 800 million m³. The decline can be attributed to reduced volumes of waste water discharged by the fishing industry (reduction of 4.6 times or 60 percent of the total reduction) and by the energy sector (reduction of 2.3 times or 24 percent of the total reduction). Discharges of dirty waste water decreased 4 times from 104 to 25 million m³ per year, which is a result of the operation of 189 large wastewater treatment plants with overall daily capacity of 428,000 m³. For air, the biggest decline is in SO₂ (80 percent), although there have also been large falls in most pollutants. Measures of air quality for each of these have also improved substantially, largely as a result of the switch to gas in electricity production and household energy use. Unfortunately, adequate data on emissions of particles, as well as air quality indicators on particles and secondary pollutants such as ozone, are not available. Although emissions of these pollutants have also probably declined, it is important to monitor them, as of all air pollutants they pose the most serious health risks and could require action in the future.

26. It is useful to compare the economic-environmental performance in Belarus with other FSU states. Box 2-2 reports energy intensity of GDP in Belarus as well as a number of FSU

⁹ Data are from 'Making Transition Work for Everyone: Poverty and Inequality in Europe and Central Asia, World Bank, 2000. The minimum consumption budget in 1999 was valued at \$9.76/day converted at the 1996 PPP exchange rate. Hence 60 percent of that would be \$5.86/capita/day. Data include 24 countries in total and exclude Bosnia and Herzegovina.

states plus Poland, and pollution intensity in Belarus and in the neighboring Baltic states¹⁰. In terms of energy efficiency, Belarus was behind Poland, Estonia and Latvia in 1993, but ahead of Lithuania, Kazakhstan, Russia and Ukraine. Those relative positions still hold, but whereas Russia and Ukraine have actually declined in energy efficiency, the others have improved. The gains have been as follows: Poland (41 percent), Kazakhstan (35 percent), Latvia (34 percent), Estonia (25 percent), Belarus (13 percent) and Lithuania (7 percent). The latest data collected for Belarus indicates a further improvement between 1998 and 1999 of 10 percent in energy efficiency.

Table 2-1: Indicators of Pollution Intensity

YEAR	1990	1995	1998	1999	2000
GDP IN 2000 PRICES BILLION RUBLES	9,632	6,720	8,346	8,622	9125.6
TOTAL WASTE WATER DISCHARGE <i>MLN CUBIC METERS</i>	1982	1329	1181	1170	1302
UNTREATED WASTEWATER <i>MN. CU. MT.</i>	104	64	27	26	25
TOTAL EMISSIONS OF AIR POLLUTANTS <i>THOUSANDS OF TONS</i>	3403	2201	1788	1421	1312
WATER POLLUTION INTENSITY FOR TOTAL W/W <i>MN. CUBIC METERS/BILLION RUBLES</i>	205.78	197.77	141.50	135.71	142.68
WATER POLLUTION INTENSITY FOR UNTREATED W/W <i>CUBIC METERS/BILLION RUBLES</i>	10797.71	9523.98	3235.05	3015.68	2739.55
AIR POLLUTION INTENSITY <i>000 TONS/BILLION RUBLES</i>	353.31	327.54	214.23	164.82	143.77

Source: Ministry of Statistics

27. For air pollution, the comparative data are quite limited but indicate a substantial reduction in SO₂ emissions in all countries except Estonia. For Belarus, the reductions have been quite sharp and place it in a position similar to Latvia. Estonia is special in that it has very high sulfur emissions on account of its oil shale production and use. Finally, for water pollution intensity a comparison of GDP per ton of BOD is presented. Belarus has much lower emissions than the two Baltic States, and the fall since 1995 has been very sharp. Again, this partly reflects the changing structure of production in the country. While these trends are difficult to interpret, it should be noted that increased pollution efficiency is not observed in all the FSU countries. In Russia and Ukraine, for example, pollution intensity has increased according to a number of indicators, although there are signs that intensities have been declining in the last few years across the NIS. Hence, in a wider context the trend showing improvements in Belarus is encouraging.

¹⁰ The data for pollution intensity in the Baltic States is taken from a Lithuania Environment Agency paper, 'Economic transition: environment transition: A case study of the Baltic States based on headline indicators'. January 2001. Energy efficiency data are from the WDI database.

Box 2-2: Comparative Data on Environmental Performance Including Belarus

The table below shows energy efficiency in GDP measured in 1995 dollars per kg of oil equivalent (or, equivalently thousands of dollars per ton of oil equivalent).

	1993	1995	1997	1998
Estonia	0.952	0.992	1.050	1.190
Kazakhstan	0.379	0.385	0.485	0.512
Latvia	0.996	1.230	1.250	1.340
Lithuania	0.758	0.726	0.813	0.814
Poland	0.968	1.110	1.21	1.360
Russia	0.544	0.542	0.552	0.538
Ukraine	0.372	0.296	0.285	0.294
Belarus	0.821	0.813	0.906	0.932

Russia and Ukraine have shown a decrease in efficiency over this period, while all others have improved. Belarus was the fourth most efficient in 1993 and has retained that position. However, as discussed in Chapter V, it is still well behind the OECD and many CEE countries.

The next table shows the relative air pollution intensities in tons of SO₂ from stationary sources per billion dollars of industrial value added in 1995 dollars:

	1990	1995	1997	1999
Estonia	95	88	74	68
Latvia	11	27	21	14
Lithuania	44	43	35	n.a.
Belarus	48	32	19	13

Belarus has made some significant improvements in this measure of environmental efficiency. The high levels for Estonia are reflective of the use of oil shale for energy. For comparison the 1990 level in the UK was 32 tons per billion dollars of industrial value added.

Finally, there is a table illustrative of water pollution intensity. Data are for GDP in thousands of 1995 Euros per ton of BOD generated.

	1993	1995	1997	1999
Latvia	285	337	407	398
Lithuania	264	320	352	443
Belarus	513	465	723	924

Cross country comparisons are difficult but it is interesting that all three countries have shown a sharp increase in output per ton of BOD. For Belarus the improvements since 1995 are the greatest. They are a result of a fall in the relative output of industrial sectors such as chemicals and pulp and paper, rather than from improvements in industrial efficiency.

Source: World Bank and Ministry of Natural Resources and Environmental Protection, Belarus

C. Genuine Savings

28. One integrated measure of economic/environmental performance is the rate of 'genuine savings'. This is equal to net domestic savings, plus expenditure on education minus the value of energy depletion, mineral depletion, net forest depletion and carbon dioxide damages. The idea is that this represents the net additions to the stock of the country's wealth, that is what is passed on to future generations. A negative value would indicate an economy on an unsustainable path;

the more positive the number, the greater the increase in assets being passed on. Table 2-2 presents data from 1993 to 1999 for selected countries in the region (these include the energy efficiency comparison from Box 2-2). Since carbon dioxide impacts are a global damage, it could be argued that a national sustainability measure would not include them. Hence two rates of genuine savings – with and without carbon damages – are given¹¹.

Table 2-2: Genuine Savings as Percentage of GDP

Including Carbon Damages

	1993	1995	1997	1999
Estonia	11.2	10.0	11.8	12.9
Kazakhstan	-11.0	-6.1	-11.7	-8.2
Latvia	20.0	8.6	10.3	11.2
Lithuania	5.3	8.2	10.7	7.2
Poland	9.0	14.2	13.3	12.9
Russia	5.1	2.8	2.1	12.2
Ukraine	23.6	11.0	7.5	7.5
Belarus	18.3	14.5	13.8	15.5

Excluding Carbon Damages

	1993	1995	1997	1999
Estonia	14.2	12.1	14.0	15.1
Kazakhstan	-6.5	-1.2	-8.7	-3.0
Latvia	21.1	9.7	11.1	12.1
Lithuania	6.9	9.5	11.6	8.1
Poland	11.2	15.9	14.6	14.4
Russia	7.6	5.4	3.9	14.3
Ukraine	27.5	15.8	11.2	12.7
Belarus	19.9	16.2	15.3	17.1

Source: World Bank

29. The data show that Belarus has retained quite a high level of genuine savings. At the beginning of the period (1993), Latvia and Ukraine had higher genuine savings (both measures), but by 1999 Belarus had the highest level of all the countries in the group. This reflects a number of factors. First, domestic savings have remained quite high throughout the period, partly as a result of unfulfilled consumption demand¹². Second, domestic investment in education has remained quite high and third there has been little in the way of net forest or mineral depletion. By contrast, Kazakhstan has had huge amounts of mineral depletion (loss of net reserves) resulting in negative savings. The same was true of Russia until 1999, when savings increased, partly as a result of discoveries in minerals.

30. Although Belarus has retained a high level of genuine savings, its performance has deteriorated over the period, with rates falling by about three percentage points. The countries

¹¹ Excluding carbon increases, saving is the most in Ukraine and Kazakhstan and least in Latvia and Lithuania. Belarus, Russia and Poland have carbon damages per GDP somewhere in between.

¹² The relatively high levels of savings show up in high domestic fixed investment as there is little outflow of capital and additions to stocks have not been large since 1994.

that have shown the greatest increase over the period are Poland and Russia (the latter only in the last two years).

D. Allocation of Capital Investment for Environmental Protection

31. Overall, gross domestic fixed investment has held up remarkably well; in 1990 it was 22 percent of GDP and in 1999 it was 21 percent¹³. Within this total, the amount allocated to environmental protection has also been estimated and is given in Table 2-3¹⁴. As a share of investment, environmental expenditures have increased, from 1.0 percent in 1990 to 2.2 percent in 1998. As a share of GDP, they represented 0.2 percent in 1990 and 0.5 percent in 1998.

Table 2-3: Environmental Expenditures in Belarus^{1/}

Year	1990	1995	1998
Investment in Environmental Protection <i>Current rubles (Th. in 1990, Mln. in 1995 and 1998)</i>	92	568	3459
Total Investment <i>Current rubles (Mn. in 1990, Bln. in 1995 and 1998)</i>	9348	22382	158528
Environmental as % of total investment	1.0%	2.5%	2.2%
Environmental as % of GDP	0.2%	0.5%	0.5%

Source: Ministry of Statistics, Belarus

1/ Includes capital investment to address air pollution and manage water, including expenditure for replacing equipment.

32. The level of environmental investment expenditure in Belarus can be compared with other countries in the region and in Western Europe. The basis on which investment expenditures are calculated is the so-called Pollution Abatement and Control (PAC) system developed by the OECD (OECD, 1996, 2000). This provides, *inter alia*, guidelines on: how to account for end-of pipe technologies versus technologies that change the process itself; how to treat investments that are undertaken primarily on economic grounds but that have environmental benefits; and how to avoid double counting. The OECD EAP Taskforce has undertaken considerable work in applying these methods to the CEE/FSU countries (OECD, 2000). Although there are data problems, some comparative results have been obtained. The Ministry of Statistics in Belarus adopts the PAC principles in its calculations and so the data are roughly comparable. The OECD report gives PAC environmental investments as a percentage of GDP as follows: Georgia 0.04 percent, Hungary 0.6 percent, Poland 1.0 percent, Germany 0.54 percent, Greece 0.3 percent and Netherlands 0.4 percent¹⁵. A related study for Ukraine gives a figure of 0.4 percent of GDP in 1999 for that country. In this light, Belarus' level of environmental investment is not an 'outlier'.

¹³ It should be noted that there have been sectors where investment has been very inadequate, such as agriculture. Moreover, the fixed investment share for 2000 is believed to have fallen sharply, to as low as 17 percent. If confirmed, this needs further investigation.

¹⁴ The environmental expenditure figures exclude administrative expenses and the budget for Chernobyl, which is discussed separately.

¹⁵ Georgia data are for 1999, all others for 1995

33. Of course as important as the total allocation to the environment is the way in which the funds are used. Table 2-4 breaks down all environmental expenditures (including those undertaken by the enterprises and those directly undertaken by central and local government agencies) by current and capital, and by category. About half of the total goes to current expenditure, with most being allocated to 'preservation and rational use of water resources'. Of the balance, the capital expenditures are divided between forestry, water resources and air pollution control. Over the decade, the share going to forestry and water resources has been going down and that on air pollution control has been increasing. It has not been possible to review in any detail how individual projects are appraised and so one cannot make a judgment as to the effectiveness of the investments. The brief discussions on this subject would suggest, however, that this is an area where some improvements are possible. As noted in Chapter VI, expenditures for the maintenance of existing water supply and waste water treatment systems are inadequate and the financing of new and existing projects insufficient to ensure an environmentally satisfactory service. Increased recovery of costs from users would move the system to a more financially sustainable basis and release scarce environmental funds for the provision of those environmental goods for which there is less scope for private supply.

E. Environmental Expenditures and Their Financing

Expenditures

34. A portion of the revenues for environmental protection come from the environment fund, which receives payments from the budget in direct relation to the pollution fees and charges collected. The rest comes from direct budgetary contributions to those line ministries making the various expenditures included in Table 2-4, and from the enterprises themselves. The total amount allocated to the environment fund in 1999 was 4,200 million rubles or \$17 million. at the official exchange rate. In 2000 the comparable figure was 8,570 million rubles, or \$10 million at the average exchange rate for 2000¹⁶. Some of this was for items not covered under 'environmental expenditures' as defined in Table 2-4 – such as administration, scientific research and monitoring. The total amount spent on environmental investments in 1998 was 3500 million rubles, or about 27 percent of all environmental expenditures. Of this 973 million, or 28 percent, came from the Environmental Funds. The rest was undertaken by the enterprises themselves, or by other Ministries, such as Forestry, Health, Emergences and Industry. Hence the Fund has an important, but not overwhelming, role in environmental investment finance. This role has to be seen, however, in a broader light, as a source of support for administrative expenditure on environmental protection and monitoring. In that context, the earmarking of the pollution charges and fees for this purpose is justified – they effectively constitute charges for environmental services provided by the state. The balance, which is spent on environmental investment, should be subject to the same criteria for appraisal as all other investments by the public sector. The Mission was informed that something like this is indeed the case. All projects are reviewed and appraised by the Ministry of Economy. The methods used in the appraisal, however, are not transparent and it is not evident how the environmental dimension of such investments is assessed. The procedure would benefit from greater transparency and use of modern methods of appraisal of environmental impacts.

¹⁶ Exchange rates used are from *IMF Statistics*, April 2002, and are annual averages: per dollar they are 248.8 rubles in 1999 and 876.8 in 2000.

Table 2-4: Breakdown of Budgetary Environmental Expenditures: 1990 - 2000

YEAR	1990	1995	1998	1999	2000
EXPENDITURE ON ENV. PROTECTION	392	2,491	13,005	62,558	187,000
<i>Current rubles (Th.. in 1990, Mln. 1995-2000)</i>					
Of Which (%)					
Current Expenditure	49.2%	55.4%	52.2%	58.8%	64.2%
Capital replacement on wastewater treatment	3.6%	3.8%	2.3%	1.9%	2.1%
Capital replacement on air pollution control from stationary sources	2.6%	2.3%	1.8%	1.0%	1.1%
Maintenance of national parks etc.	0.8%	1.1%	1.7%	2.4%	1.6%
Expenses on forestry	20.4%	14.5%	15.3%	14.8%	15.0%
New investment on protection of water resources	16.6%	15.4%	12.4%	9.3%	5.9%
New investment on protection of air pollution control	3.6%	4.5%	9.4%	6.9%	4.8%
Other	3.3%	3.0%	4.9%	4.9%	5.3%
Total	100.0%	100.0%	100.0%	100.0%	100.0%

35. The value of environment funds is declining in real terms. In constant prices the amount spent in 1998 prices was double that of 2000 and 50 percent greater than in 1999. This decline has serious effects on the administration and monitoring of the state of the environment in the country and should be reversed. The structure of the funds and their role is discussed in Box 2-3.

Box 2-3: Environmental Funds in Belarus

As in all the FSU and many CEE countries, environmental expenditures are financed in part through pollution charges, and fines, which are earmarked for this purpose. In Belarus, 60 percent of revenues go to local funds, 30 percent to oblast level funds and 10 percent to the republican fund. The decision in 1997 of the Belarusian Government to advance the status of Environmental Fund to that of a budgetary fund means that the expenditures from the fund are subject to approval by the Cabinet of Ministries as part of the overall public investment plan for the country. This should result in better accountability. The issue of earmarking is controversial. In the traditional practice of public finance earmarking is discouraged; it can result in uneven rules applied to funds, resulting in low efficiency, and by equating expenditures and revenues by sector it can imply too high a level of expenditure or too low. Earmarking also prevents Government from having access to funds for higher priority needs. Some argue that retaining the funds, at least *pro temp*, can play an important role in making polluters pay, providing some resources to finance environmental services, and decreasing environmental spending. The most important factor is that all spending be made in a transparent way, prioritized according to need. Unfortunately, the Chernobyl Fund is an example of a fund that was established for environmental and social reasons but which now seems to have lost its transparency.

Revenues

36. The sources of revenue for environmental expenditures are the national and local budgets and enterprises themselves. Pollution fees and charges are the main source of revenues for the budgetary environment funds for which they are earmarked. Other environmental sources of revenue for the national and local budgets include taxes on land and charges for forest and mineral resources.

Pollution Charges

37. Charges for pollutant emissions have been simplified following earlier discussions with the Bank, which makes collection simpler and less costly.

38. The role of pollution charges is primarily to provide funds and not to act as an incentive for reducing emissions. In fact, this is counter to practice in developed countries where pollution charges are used to induce compliance, not to raise money. Otherwise, these charges come to be viewed as general tax. For charges to have incentive effects it is necessary that (a) enterprises operate on the basis of cost minimization with hard budget constraints and (b) the rates be set at levels which encourage compliance and which make it attractive to undertake abatement measures. In the case of Belarus, enterprises rarely accumulate payment arrears for pollution charges (collection rates are 97-98 percent), and the Ministry of Natural Resources and Environmental Protection rarely accepts barter deals. Both of these trends are common phenomena in many FSU countries. Furthermore, it is encouraging to note that special deals whereby enterprises receive exemption from payment when they make investments in abatement are rare (this is a common way in which charges are avoided without a full equivalent reduction in emissions in several FSU countries).

39. As state owned entities, however, the enterprises paying the charges benefit from being underwritten by the government budget. Hence, the extent to which the conditions in (a) apply is not clear. As far as the rates are concerned, they are now quite high, especially when emissions exceed the permissible limits. Some idea of how they compare with other CEE and FSU countries can be gained from Table 2-5¹⁷. The new rates for selected pollutants are higher than the Baltic States, and comparable to Ukraine and even the Czech Republic. Only Poland has higher rates, but it is believed that Polish levels are required to have a significant incentive effect in terms of abatement. Raising the rates to provide such incentive would imply quite significant increases in some cases. Furthermore there are some cases, such as waste water plants, where charges appear to have a perverse effect. Because they have to be paid up front, money that could have been devoted to maintenance is reduced and the tax is 'paid' by running down the capital stock.

Table 2-5: International Comparison of Some Air Pollution Charges (US\$/Tonne)^{1/}

	Year	SO ₂	NO _x	Non Toxic Dust
Belarus	2001	34.2	34.2	11.3
Czech Republic	1997	29.6	29.6	-
Estonia	1995	1.8	4.2	1.3
Latvia	1996	8.2	8.2	5.5
Poland	1998	86.3	86.3	-
Ukraine	1998	29.0	29.0	7.0

Sources: Bluffstone and Larson (1997), www.rec.org, Sourcebook on Economic Instruments.

OECD, Environmental Taxes database: http://www.oecd.org/scripts/taxbase/TaxRates_0.asp

1/ Exchange rates have been converted to dollars at annual averages. For Belarus the charges apply from January 2002. With expected inflation of 75 percent in the year, and a January 2001 rate of BRB1180 to the dollar, the average exchange rate for the year is estimated at BRB1622 to the dollar.

¹⁷ The charges in Latvia and Belarus are based on toxicity class. SO₂ and NO_x are classified as class II and Non-toxic dust as class III. Class one products are highly toxic, such as benzopyrene and asbestos dust.

40. Finally, it should be noted that incentives for reduced emissions are more likely to be effective if the basic price signals are in place, bringing natural resource prices and prices of products to levels representing their true economic costs. Indeed the adjustment of producers to these price signals would be a much more powerful factor in reducing emissions than the kinds of pollution charges currently in force.

41. Other changes to pollution charges that should be considered and some that have been made recently are the following:

- The rates of pollution fees, while generally reflecting the basic relationships between the chemical characteristics of pollutants and the impacts on human health and biota, are not in line with the latest studies on this subject. For example, the weight given to particulates appears too low given recent studies in the USA and elsewhere showing the degree of damage to human health from fine particulates such as PM-10 and PM-2.5. The Ministry of Natural Resources and Environmental Protection (jointly with the Committee on Hydrometeorology) would be well advised to consider placing particulate emissions into a higher class of toxicity than is presently the case.
- The fees for above-limit emissions would be a more significant deterrent for environmental negligence if the limits were adjusted in accordance with the actual level of utilization of industrial capacities. According to the methodology established throughout the former Soviet Union for calculating the limits of maximum allowable emissions, the limits were set at the level of full utilization of installed capacity. Most of the industrial plants are compliant with the limits set in this way, given the over-capacities inherited from the 1980s and early 1990s. Fortunately, since 1999, limits have been based on level of actual utilization of installed capacity, as opposed to full utilization as was done in the past. Pollution limits are now calculated by estimating actual utilization of industrial capacity and levels of production for the next year.
- Instrumental verification of emission levels is rarely done. Neither the equipment nor the organizational structure for such spot-checks is currently available for most industrial companies. This leaves both environmental inspection authorities and companies themselves dependent on the indirect methods of calculating emission levels – including those used to set the maximum allowable emissions for each source.
- More attention should be paid to mobile sources, which now account for an increasing share of emissions but are not subject to pollution charges in the same way as stationary sources. For these, some form of product charges (e.g. differentiated motor fuel taxes, differentiated tax on importation of dirty vehicles), along with more strict enforcement of emissions standards will probably be required¹⁸.

Natural Resource Extraction Charges

42. These charges serve mainly to provide local budgets with revenues (they do not go to the environmental fund). The basis for setting the rates is not clear; they do not serve a conservation purpose as the rates are very low relative to the value of the products, and the enterprises extracting them are not particularly responsive to such incentives anyway. If there is a

¹⁸ In its review of this report the Ministry of Transport noted that transportation-environment links needed further attention. The Ministry is preparing a program to reduce the negative environmental impacts of transport but has asked for external help, especially with the introduction of market based instruments.

justification it is to collect the ‘rents’ from the state ownership of the assets, in which case the charges should be related to these rents. The latter would depend on the market prices and costs of extraction and transportation and would vary by location. The levels of all these charges should be reviewed in this framework, taking account of changing market conditions.

43. In view of all these issues, a restructuring of pollution and mineral charges should probably be preceded by a careful analysis of the impacts of new charges and proceed at a pace that reflects the rate of industry privatization.

Forestry Charges

44. The Ministry of Forestry charges for timber through a forest tax fee, which goes to local budgets. The forest tax is very low; from 1992 to 1998 it was around \$1/cubic meter at the official rate but closer to around 35 cents at the market rate of exchange by the end of that period. These are very low even by FSU standards and should be raised to reflect market values of the timber¹⁹. A step in this direction has been taken with the reforms on stumpage fees in May 1998, which included a more differentiated structure of charges based on species, quality and distance to point of transportation. Forest exploitation takes place through about 100 state forest enterprises who sell timber and manage the forest concessions. Revenues cover only part of their costs and enterprises receive a subsidy of around 60 percent of their operating costs. An overall restructuring of the finances of forest enterprises, with commercial and environmental functions separated, and the former subject to commercial discipline and the latter paid for in a cost effective manner, is recommended. These reforms would result in both better management of the resource as well as increased revenues for better environmental protection. (see Chapter VIII-C.)

45. In real terms, the revenues from all sources have been falling over the last decade. Although there has been indexation of the charges, it has not captured the full underlying increase in prices²⁰. Table 2-6 shows charges for minerals, air and water pollutants. The real value of most mineral charges has fallen from 1993 to 2001. The only case where rates have risen is for mineral water. For air and water pollutants the rates have also fallen slightly compared with 1991 levels. This suggests that indexation needs to be more carefully implemented to capture the full increase in prices (possibly with an *ex post* adjustment to the stated increase at the beginning of the year, reflecting the difference between the estimated and actual increase in prices).

Environmental Finances in a Broader Context

46. The overall structure of environmental finance in the context of the national and local budget can be seen in Table 2-7, which provides some interesting findings. First, with respect to both revenue and expenditure, the Chernobyl-related outlays dominate the total of all environmental items (see below). Although the share of Chernobyl has been declining on both sides of the balance sheet, it still accounts for 2.5 percent of all taxes and 3.5 percent of all revenues. Since Chernobyl is in part an environmental disaster, Belarus is spending a large share

¹⁹ Charges are also levied on commercial exploitation of non-timber products but these too are very low.

²⁰ The MNREP staff have explained that while the inflation adjustment factors applied at the start of the year have invariably proved insufficient, they are never reconsidered at the end of the year or in the process of setting the next year’s inflation adjustment factor.

of its budget on addressing current and past environmental problems. The financing of Chernobyl mitigation and its macroeconomic consequences are presented in Box 2-4. It can be seen that most of the expenditure is aimed at social support for affected parties and very little to the improvement or amelioration of the environmental impacts of radioactivity.

Table 2-6: Charges for Natural Resources and Emissions of Pollutants

	Units	Rubles 2001/Unit	
		1993	2001
<i>Minerals</i>			
Molding Sand	Tonne	95	50
Sand for Construction	Cubic Meter	48	25
Sand Gravel Mixture	"	76	41
Clay	"	57	30
Dolomite	Tonne	152	62
Peat (40% moisture)	"	76	16
Sapropel	"	48	5
Construction Stone	Cubic Meter	380	201
Water from Surface Sources	"	6	2
Water from Underground Sources	"	8	3
Mineral Water	"	19	366
<i>Pollutants</i>			
Air Pollutants Toxicity Class I	Tonne	2,228,811	1,854,552
Air Pollutants Toxicity Class II	"		55,518
Air Pollutants Toxicity Class III	"		18,354
Air Pollutants Toxicity Class IV	"	11,144	9,120
Water Discharged Untreated Into Rivers	Cubic Meter	290	187
Discharged Water Into Rivers Meeting Norms	"	22	6

Note: The inflation adjustment is based on the CPI and is 8.63 for 1993 and 111.4 for 1992. In both cases, currency adjustment of 1000 in the year 2000 is also taken into account. Rates for pollutants apply to discharges within permitted limits. For discharges exceeding these limits the rate is multiplied by a factor of 15. Rates for natural resource extraction also apply when extraction exceeds permissible limits. For natural resource extraction exceeding the set limits (or without the limits) the rate is multiplied by a factor of 10. In 2001 the rates for air and water pollutants only applied for the first six months.

Source: Statistical Bulletin December 2000 and Ministry of Environment.

47. Excluding Chernobyl, total expenditures on other environment-related items for 1999 and 2000 amounted to about 1.6 percent of the budget and rose in real terms between 1999 and 2000. On the other side all environmental sources of revenue rose in real terms between 1998 and 1999 but fell again between 1999 and 2000. Broadly, pollution fees and charges make up about one-quarter of one percent of all revenues and natural resource taxes make up about 1 percent of the consolidated revenue. Of the latter, water and land taxes account for about 62 percent, forest taxes 30 percent and minerals charges only about 7 percent. Hence environmental charges are very small relative to the overall budget. There is scope for increasing them in a selective manner, taking into account the environmental objectives to which they contribute. If this is done, more resources will be generated for the provision of monitoring and management services for the environment. Further allocation of investment resources for this sector should, however, be subject to the same criteria of efficiency as all other sectors.

Box 2-4: The Budgetary Consequences of Chernobyl

There are major differences between sources estimating the past and present budgetary costs of Chernobyl. According to the Chernobyl Committee, the government has spent 20 percent of its budget since 1986 on Chernobyl-related activities. The World Bank and the UNDP, however, estimate that since 1997, 10 percent of total public expenditures have gone to Chernobyl-related programs. From 1995 to 1998 Chernobyl expenditures as a proportion of GDP fell from 2.5 percent to 1.9 percent. (see Table 2-7).

The largest single Chernobyl-related expenditure has been the compensation of affected individuals. According to the law “On Social Support for the Citizens who have Suffered from the Effects of the Chernobyl Nuclear Disaster,” affected individuals are entitled to some 40 different types of benefits and compensations including: improved and specialized medical care and treatment (psychological care, diagnostics, cancer treatment, genetic screening, annual medical exams); full compensation for all health needs related to Chernobyl plus monetary compensation to each member of an affected person’s family; free prescription medicines; free annual stays in spas or sanatoria (or the cash equivalent thereof); sick leave compensated at 100 percent of average wage regardless of work record; free kindergarten for children in families with an affected member; free access to public transport; priority access to housing; compensation for property costs; extra pension benefits and right to early retirement; and tuition support for students from families with an affected member. Benefits to residents of radioactively contaminated areas range from 11 to 22 percent of the national minimum wage. Fixed income support ranges from 11 percent of the minimum wage in the least affected areas to 110 percent in the exclusion zone, which, given the modest minimum wage, is low.

Other major expenditures include resettlement costs (primarily construction of new dwellings, schools, medical facilities, spas and other communal buildings), decontamination and razing of contaminated dwellings, disposal of radioactive waste, agricultural countermeasures, protection of water resources, monitoring and analysis, and maintenance of the exclusion zone. Recently, the share of these capital expenditures has fallen as a portion of total Chernobyl-related expenditures, while the share of benefits and income support has risen, even though the absolute level of benefits has remained unchanged.

Questions have been raised by the international community about the economic wisdom of some of these activities, particularly the resettlement program and the water resource protection program. In both cases, the magnitude of the effort and the corresponding diversion of national resources could be considered disproportionate to the hazard posed by actual radiation levels. Moreover, with regard to resettlement, both the government and the people may have failed to appreciate the many negative aspects of relocation, as evidenced in part by the extent of re-occupation of the resettlement zone. Also potentially questionable is the construction and maintenance of nine spas for the use of people affected by Chernobyl. Nonetheless, the government of Belarus considers these measures – similar to its stringent permissible levels for contamination of foodstuffs – as being responsibly conservative and responsive to public concerns about the possible effects of radiation after Chernobyl. It is worth noting as well that many of the needs and costs that are called Chernobyl-related are not specific to the affected regions and populations. These include the need for improved nutrition and dietary vitamin supplements, infrastructure improvements, elimination of substandard housing, and access to clean drinking water, all of which are nationwide rural concerns.

Chernobyl expenditures have been funded partly through a tax on wages. Additional funding and subsidies are also provided by the government under a wide variety of different programs, including transport and education, at an uncalculated cost. The expenditures, the wage tax rate and the share of expenditures covered by the tax have all fallen over time. The initial tax rate of 12 percent is now 4 percent. This decline reflects reduced evacuation, relocation and remedial expenditures, a decline in the number of persons receiving compensation, and a reduction or refocusing of available government budgetary resources. The part of Chernobyl expenditures funded by the tax has fallen from 96 percent in 1995 to 49 percent in 1998. Only a minor share of total Chernobyl-related expenditures are allocated to environmental remediation or to agricultural countermeasures designed to produce “clean” foodstuffs for market or self-consumption. In the Mogilev region, for example, about 2 percent of planned Chernobyl-related expenditures in 1998-2001 were for identifiable countermeasures and related improvements, and of this only 0.035 percent was earmarked for use on individual farms. The pattern differs little elsewhere. Yet these agricultural countermeasures offer a significant potential for revitalization of the region, its land use patterns and its agricultural sector.

Table 2-7: Revenues and Expenditures in the Consolidated Budget: Data Relevant for the Environment
Billions of Rubles, 2000 Prices

	Revenues				Expenditures		
	1998	1999	2000		1998	1999	2000
Total Billions of Rubles: 2000 Prices	2,539,234	2,837,700	3,133,809	Total	2,645,167	3,074,248	3,277,680
Chernobyl Tax	66,112	64,374	73,092	Chenobyl	138,852	130,764	113,308
Pollution Charges and Fees	4,143	11,010	8,590	Environment Fund	16,610	11,165	8,567
Natural Resource Taxes on Water, Land	7,376	22,352	20,224	Other Environment		37,595	48,173
Natural Resource Taxes on Forests	1,555	10,289	9,846				
Taxes on Extracted Minerals	644	2,954	2,572				
Rents on Land Leased	71	178	124				
<i>Taxes as % of Revenues</i>				<i>Expenditures as % of Total</i>			
Chernobyl Tax	2.60%	2.27%	2.33%	Chenobyl	5.25%	4.25%	3.46%
Pollution Charges and Fees	0.64%	0.39%	0.27%	Environment Fund	0.63%	0.36%	0.26%
Natural Resource Taxes on Water, Land	1.14%	0.79%	0.65%	Local Budgets		1.22%	1.47%
Natural Resource Taxes on Forests	0.24%	0.36%	0.31%				
Taxes on Extracted Minerals	0.10%	0.10%	0.08%				
Rents on Land Leased	0.01%	0.01%	0.00%				

Source: Ministry of Finance. Data on revenues and expenditures include all extra budgetary items. Figures for 2000 are planned amounts as of November 2000.

F. Conclusions on Environmental Policy and Macroeconomic Developments

48. From extensive discussions with government bodies and other stakeholders, the Mission is convinced that the environmental problems of Belarus have to be seen in, and have to be addressed in, the broader context of its economic development. In many respects, the country has done well on the environmental front, given the appalling legacy of Chernobyl. It has reduced emissions of air and water and reduced the intensity of pollution. It has also maintained a reasonable monitoring of the quality of the environment, although more can be done there. To some extent the country has been fortunate in being able to reduce the use of coal and switch to gas. Since this will not continue to make as big a contribution in the future, it is important to look at other measures to further environmental improvements.

49. Important in this forward looking exercise is to examine what kind of macroeconomic reforms are likely to take place, and assess associated environmental impacts. It is necessary to study the environmental implications of changes resulting from price liberalization; energy efficiency reforms; reduction of non-payments; phasing out the use of direct methods to induce production and export; controlling quasi-fiscal expenditures; tightening monetary policy; reducing the inflation rate; and building up foreign reserves. Improved fiscal performance will require further streamlining of public sector expenditures, including excessive and integrated social assistance. Longer term measures that may also affect the environment include increased privatization and a more OECD-oriented trade structure and membership of the WTO. This will require the development of policy and analytical tools to help prioritize reforms and determine whether environmental factors should set the design and pace of the reforms, and to identify mitigation actions that may need to be taken to protect the environment as the reforms are implemented.

50. To respond to these changes, the government will need to develop tools for environmental management that are proactive in encouraging better environmental performance (e.g. environmental certification, introduction of ISO 14000, ISO 14001 and EMAS (Eco-Management and Audit Scheme)) and to make more effective use of market-based instruments, in line with a more market-oriented pricing policy for the key economic sectors of agriculture, forestry and minerals. In facing these new macroeconomic challenges, the country also needs to ensure that scarce investment resources are allocated efficiently. This applies to the environmental and natural resource sector as much as to any other. Although overall allocations for environmental protection are not insufficient, the use of these investments can be questioned. Addressing the use of resources means strengthening appraisal and assessment methods for environmental investments.

51. In terms of environmental management more specifically, increased funds need to be allocated for monitoring and administration. Important pollutants are not covered adequately (ozone and particulates among them), and the resources for upgrading equipment are not sufficient.

52. On the financial side, there is a case for reviewing the structure of natural resource and pollution charges to make them more sensitive to the scarcity of resources and to the environmental impacts of emissions. Indexation is important but not enough; a more comprehensive look at the charges is warranted.

III. Environmental Trends in Belarus

A. The Country, its Geography and Economy

53. Belarus is a middle income country, with a *per capita* income in 1999 of \$2,620²¹ and a population of 10 million, both of which have declined since independence in 1991 (*per capita* income from \$3110 and population from 10.2 million). It covers an area of 207,600 km² (about two-thirds the size of Poland but little more than one percent of the territory of the Russian Federation). It is bordered by Poland to the West, Russia to the East, Lithuania and Latvia to the North and Ukraine to the South. A map of the country is attached.

54. The population is predominantly and increasingly urban (up from 67 percent in 1991 to 69 percent in 1999 and 70.2 percent as of January 1, 2001), with Minsk, the largest city, having a population of around 1.7 million and 5 other cities having populations of more than 250,000 (Gomel, Mogilev, Vitebsk, Grodno and Brest). The country is divided into six oblasts (provinces) named after the six largest cities listed above.

55. The country was declared an independent republic in September 1991. At the time of its independence in 1991, Belarus had one of the highest standards of living in the Former Soviet Union (FSU). Since then it has struggled, like all the Newly Independent States (NIS) formed out of the FSU, to balance the needs for market based reforms with those of maintaining social cohesion and reducing economic disruption and hardship. In this, it has pursued a path of very slow reform, one of the slowest among all 26 states of the NIS and the countries of Central and Eastern Europe²². This can be seen most clearly in the share of GDP generated in the private sector. In mid 2000 the average for all 26 countries was 58.5 percent, and for the former FSU it was 53.7 percent. In Belarus it was 20 percent²³. Other indicators of slow reform include administered prices for 'socially important' products, and direct credit, foreign exchange and other subsidies to state enterprises. Furthermore, the rate of reform has also slowed down in relative terms. After four years of transition, Belarus's ranking according to the EBRD indicators of transition was about 19th out of the 26 countries. Now it is second to last in overall score.

56. In terms of social conditions, the country has also deteriorated since independence. Life expectancy at birth has fallen from 71.1 years in 1990 to 67.9 in 1999 (69.0 years in 2000) measures of poverty have increased as has unemployment, insecurity in general, morbidity and crime (most morbidity and crime indicators rose sharply between 1990 and 1995 and have been relatively steady since then). In these negative changes Belarus is of course not alone; similar trends have been observed in almost all FSU and many CEE countries. In this report, comparative data are given where interesting and useful comparisons can be made.

²¹ World Bank data, 2001. Based on the Atlas method of computing GDP.

²² According to EBRD transition indicators, Belarus has had the slowest rate of enterprise reform since 1991. In market and trade reforms only Turkmenistan and Uzbekistan have had lower scores and in financial sector reforms only Tajikistan and Turkmenistan have had lower scores.

²³ Figures are based on unweighted averages and are taken from the EBRD (2000) Transition Report.

B. Environmental Pollution and Ambient Quality

57. This section reports on current trends in water and air quality, solid waste management, and radioactive contamination on the ‘brown side’ and agriculture, forests, biodiversity and minerals on the ‘green side.

Air and Water Emissions

58. As in most economies in transition, indicators of environmental quality have improved in the last decade. This is largely the result of a decline in economic activity and the change in its composition; little can be attributed to new investments in cleaner technologies or to the use of better waste minimization techniques. For air and water emissions, Table 3-1 gives some recent trends. Discharges of total wastewater continue to decline, as do discharges that are regarded as ‘polluted’²⁴. The latter as a percentage of the former has declined substantially since 1996. Air emissions from stationary sources have fallen by more than two-thirds since 1990 and those from mobile sources have fallen by half. (CO₂ is not included – it is dealt with in Chapter V). The fall from stationary sources owes much to the switch from coal to gas. As is noted in Chapter V, this trend is not likely to continue and may reverse, in which case emissions will increase. The situation in terms of ambient quality measures is less positive but still not critical at the national level.

Table 3-1: Water and Air Quality Trends in Belarus

	Units	1985	1990	1995	1996	1997	1998	1999
Water Pollution								
Total wastewater discharged	Mn. Cubic Meters	1985	2151	1461	1323	1296	1315	1315
Wastewater discharged not meeting standards	Mn. Cubic Meters	93	104	64	29	27	27	26
Percentage not meeting standards	%	4.7%	4.8%	4.4%	2.2%	2.1%	2.1%	2.0%
Air Pollution Emissions 1/								
<i>From Stationary Sources</i>	Thousands Tons	1437	1173	508	458	426	415	374
<i>From Mobile Sources</i>	Thousands Tons	-	2230	1693	1610	1655	1374	1047
Total	Thousands Tons	-	3403	2201	2068	2081	1789	1421

Source: Ministry of Natural Resources and Environmental Protection

Note: 1/ Air emissions include sulfur oxides, nitrogen oxides, carbon monoxide and VOCs.

Water Quality

59. For water quality, Table 3-2 gives information on piped water samples that did not meet hygienic standards for the major cities and for the republic. For sanitary and microbiological indicators the trends are not as serious as the fact that rate of failure has been unacceptable since the late 1980s. While there has been some improvement, much remains unchanged today (improvements are noted in Brest, Gomel (bacteriological standards); and Mogilev and Minsk City (chemical and bacteriological standards)). The problem is particularly acute in Brest, Vitebsk and Gomel. On the microbiological indicators the situation is better and the Vitebsk and Brest oblasts have improved over the past three years.

²⁴ The definition of what is regarded as polluted water is subject to some disagreement.

Table 3-2: Share Of Water Samples Taken from Communal (Com.) and Departmental (Dep.) Water Pipelines Which Fail to Meet Hygienic Requirements, 1997-1999

Oblasts	Share of water samples which fail to meet hygienic requirements, percent											
	Sanitary and chemical indicators						Microbiological indicators					
	1997		1998		1999		1997		1998		1999	
	Com ^{1/}	Dep ^{2/}	Com	Dep	Com	Dep	Com	Dep	Com	Dep	Com	Dep
Brest	30.0	37.7	14.8	31.8	31.0	34.4	9.1	15.9	6.4	10.3	5.6	9.1
Vitebsk	65.1	66.7	46.2	61.6	48.6	71.8	6.1	8.6	5.1	6.6	3.7	6.0
Gomel	38.4	47.5	46.2	17.6	32.4	44.6	4.0	5.9	4.8	6.3	4.4	6.1
Grodno	12.9	31.7	35.7	35.3	15.7	29.8	4.7	10.3	2.7	7.6	1.8	5.9
City of Minsk	10.8	22.3	14.8	26.8	7.6	8.7	5.3	5.5	5.5	5.9	7.1	8.3
Minsk	13.9	13.9	18.7	19.1	19.4	18.6	1.9	5.6	2.5	5.8	1.4	5.3
Mogilev	21.6	36.0	20.9	23.1	19.1	31.6	3.1	7.3	3.5	8.0	3.5	6.9
For the republic	24.1	45.0	27.9	24.9	23.9	33.8	4.8	8.6	4.3	7.3	3.6	6.6

Source: Ministry of Health, Republic of Belarus.

60. Water quality problems are, if anything, even more serious in rural areas served by shallow wells. Table 3-3 reports the percentages of samples that do not meet standards. The situation has deteriorated in the oblasts of Brest, Grodno and Minsk, and improved in Vitebsk, Gomel and Mogilev. Nevertheless the numbers are generally very high, and higher than for piped water, especially for microbiological indicators. Microbe pollution of water is one of the reasons why the incidence of acute intestinal infections is high, and, in some cases, causes epidemic breakouts. Outbreaks of water related acute intestinal infection were registered in 1999 for the villages of Kaldyky, Volozhin district, Minsk oblast. Overall, however, waterborne diseases show no trend.

Table 3-3: Percentage of Samples From Shallow Wells Not Meeting Hygienic Standards

	With Regard to Sanitation and Chemical Indicators				With Regard to Micro-Biological Indicators			
	1988	1996	1997	1998	1988	1996	1997	1998
City of Minsk	-	8.3	-	-	-	12.5	-	-
Brest oblast	33.0	68.7	68.3	61.4	18.0	44.6	46.1	41.0
Vitebsk oblast	79.0	35.0	38.6	36.3	49.0	29.5	32.2	28.6
Gomel oblast	57.0	51.1	53.4	53.2	41.0	36.4	35.1	34.4
Grodno oblast	36.0	52.7	55.2	53.8	42.0	45.0	58.5	49.8
Minsk oblast	31.0	54.5	61.9	57.0	32.0	46.0	40.8	41.3
Mogilev oblast	36.0	27.6	29.4	32.3	30.0	27.8	25.7	19.8
Belarus		46.2	49.8	49.7	-	35.0	42.8	32.4

Source: NEHAP'99 – MOH, MNREP and WB (1993).

61. There is also a high level of concern regarding iron in water. Maximum permissible concentration (MPC) is 0.3 mg/Liter but many samples in the country contain levels of 1.5 – 6 mg/Liter and there are even cases of concentrations of 12-18 mg/Liter. These issues are discussed further in Chapter VI, where data on waterborne diseases is also analyzed.

62. The problems of groundwater quality are not new to Belarus. The Bank's 1993 report also noted serious concerns about the quality of drinking water not meeting chemical and bacteriological standards, as well as the high nitrate levels, in shallow wells. Nitrate concentrations were well above the MPC of 45 mg/Liter in the late 1980s and 1990s (see also (Hertzman, 1995)). The more recent data confirm that these problems remain, and, moreover, the problems now are also serious in piped water. The problem of iron is now an additional concern.

63. Surface water quality is monitored extensively in the country and is reported using a water pollution index (WPI) for chemical quality and three indices for biological quality. For chemical quality the index is based on six parameters -- dissolved oxygen, BOD-5, ammonia, nitrite, oil products and phenols – and is constructed as follows:

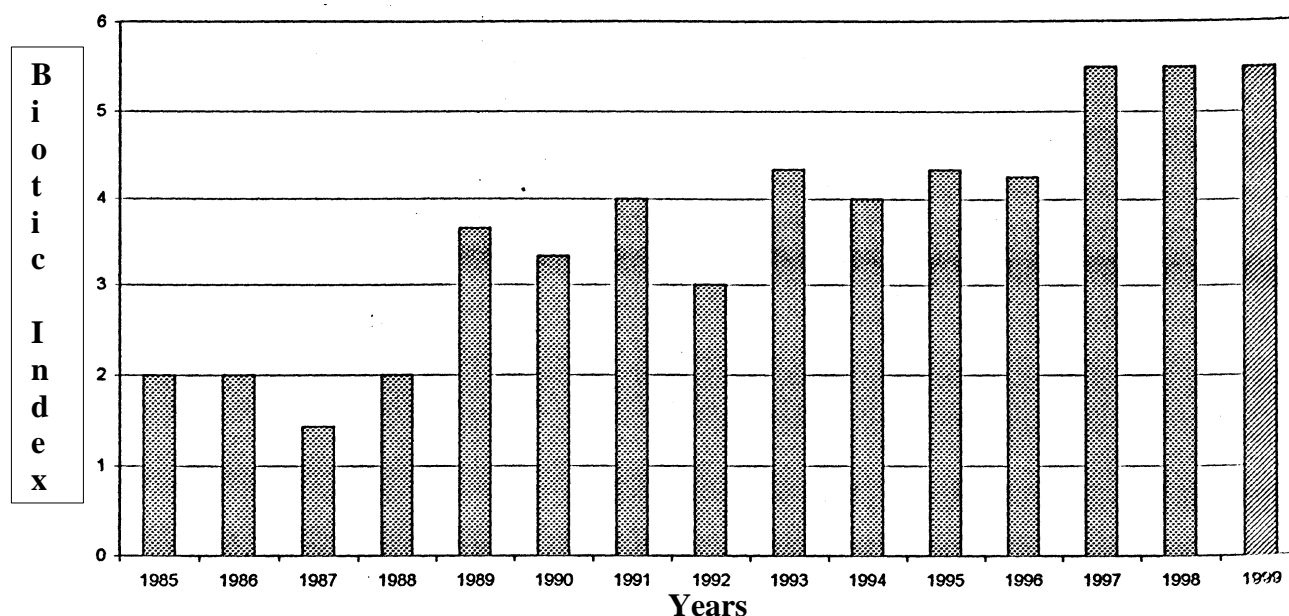
$$\text{WPI} = (\text{sum of the average concentrations for each parameter divided by the maximum permissible concentrations}) / 6$$

64. Based on the reported data, water bodies are classified into seven categories: I-Clean (WPI = 0.3); II-Relatively Clean (0.3<WPI = 1.0); III-Moderately polluted (1.0<WPI = 2.5); IV-Polluted (2.5<WPI = 4.0); V-Dirty (4.0<WPI = 6.0); VI-Very Dirty (6.0<WPI = 10.0); and VII-Extremely dirty (10.0<WPI). In 1991, 10 percent of the samples collected were classified as relatively clean, and most were rated as class III or moderately polluted. The river classified as polluted (class IV) was the Berezina near the city of Bobruysk, Category V classification was given to the Pripyat near Mozyr and the Svisloch near Minsk. In 1999, 10 percent remained classified as relatively clean, 80 percent as moderately polluted and 10 percent as polluted. None was classified in categories of V or higher. This suggests a small improvement in surface water quality over the decade. The most polluted river stretch remains the Svisloch near Minsk (maximum value 4.2) and has been for the last ten years. In contrast with 1991, WPI values are now lower in all rivers that had classifications of V or higher.

65. For biological quality, the index is calibrated from I to VI, based on the presence of certain organisms in the water, with class I labeled as Very Pure, II as Pure, III as Moderately Polluted, IV as Polluted, V as Foul and VI as Extremely Foul. In 1991, the percentage of monitoring stations in the main rivers having classes I and II water was 56 percent, classes III and IV 34 percent and classes V and VI 10 percent. The worst affected rivers were the Svisloch, Dnepr and Zapadnaya Dvina. In 1999, none of the samples were classified as I and exclusively as II. Most stations (65 percent) had classes II and III recorded samples, 16 percent had exclusively class III samples, and 12 percent had classes III and IV samples. There was one sample exclusively of class IV (the Berezina, one km above Svetlogorsk) and one of classes IV and V (the Svisloch, 10 km below Minsk). This indicates a deterioration in biological quality over a period of years, a fact that has been noted by the Ministry in its report on surface water quality. Perhaps this is brought out most clearly in Figure 2-1, which shows the value of the

biotic index for the Svisloch downstream of Minsk, from 1985 to 1999. The poor quality is directly the result of the fact that the Minsk sewerage treatment plant is overloaded and has been rendered partially ineffective by the release of toxic substances from several small industries in the Minsk area.

Figure 3-1: Average annual values of biotic index at the sampling point of the River Svisloch downstream Minsk (Korolevichi)



Source: Ministry of Natural Resources and Environmental Protection

Air Quality

66. Some key air quality data are given in Table 3-4. Based on a small number of monitoring stations, concentrations of sulfur dioxide, nitrogen oxides, 'dust' (or total suspended particulates – TSP), carbon monoxide and formaldehyde are reported. As can be seen, concentrations are generally falling and (with the exception of Vitebsk for TSP) below WHO or other international standards (WHO standards are generally the highest among those of industrialized countries and international organizations). Compared to the situation in 1991, when the last Bank Environmental Strategy was prepared, concentrations have fallen even further with the phase-out of leaded gasoline. Unfortunately, there is no routine monitoring of small particles and ozone, both of which are important pollutants. Furthermore the monitoring of TSP, which can provide a rough guide for small particles, is inadequate and needs to be improved.

Table 3-4: Air Quality Measures in Belarus: Annual Daily Averages, Selected Cities

Pollutant	1991	1996	1997	1998	1999	2000
<i>Sulfur Dioxide</i>						
Minsk	4	2	2	2	2	2
Gomel	9	10	10	9	6	5
Mogilev	14	3	3	3	4	3
Vitebsk	11	12	9	5	4	6
<i>Nitrous Oxides</i>						
Minsk	33	42	25	28	30	32
Gomel	27	26	20	12	7	8
Mogilev	104	43	55	91	46	78
Vitebsk	23	36	29	27	22	27
<i>Dust/TSP</i>						
Minsk	100	39	11	12	11	25
Gomel	103	-	-	-	-	-
Mogilev	133	47	38	38	46	33
Vitebsk	166	169	125	126	123	132
<i>Carbon Monoxide 1/</i>						
Minsk	1.00	0.82	0.88	0.95	1.15	1.57
Gomel	1.00	0.53	0.28	0.52	0.38	0.37
Mogilev	2.00	1.05	0.86	1.12	1.02	1.10
Vitebsk	1.00	0.86	1.79	2.06	1.38	1.30
<i>Formaldehyde</i>						
Minsk	n.a.	4	3	4	6	4
Gomel	n.a.	11	10	7	5	6
Mogilev	n.a.	15	12	10	8	5
Vitebsk	n.a.	9	6	10	5	7

Source: HydroMet, Belarus

1/ There are no EU limit values for carbon monoxide. WHO standards are for 1 and 8 hour averages. As the data given here are annual averages they are not appropriate for the standards.

2/ Standards for formaldehyde are only given by WHO for drinking water.

International Standards are as follows

Sulfur Dioxide	Microgram/Cubic M.	50 Annual Daily Average	WHO
Nitrous Oxides	Microgram/Cubic M.	40 Annual Daily Average	WHO
TSP	Microgram/Cubic M.	80 Annual Daily Average	EC
Carbon Monoxide	Milligram/Cubic M.	30 Maximum One Hour	WHO
Carbon Monoxide	Milligram/Cubic M.	10 Maximum 8 hour	WHO

67. Compared to other FSU and Eastern European cities, those in Belarus are relatively clean. Table 3-5 gives some estimates for major cities in recent years, taken from the EBRD report for 2001. The Minsk data in the report are for 1996. The sulfur and nitrogen estimates are not so different from those given in Table 3-4, and based on these, the air quality in Minsk is better than or comparable to the other cities in the region and indeed to France and the USA. For ‘particulates’, however, the reported figure for Minsk is quite high and considerably different from those for ‘dust’ given in Table 3-4. Furthermore it exceeds both WHO and EU standards. The particulate data in the EBRD report appear to have come from a separate source from that used by HydroMet. It was noted in the 1993 Bank report that the methods used by the latter are not satisfactory and result in poor accuracy (probable underestimation). The situation has, if anything, grown worse with regard to equipment used. More and better monitoring equipment and stations are urgently needed to obtain better estimates of air quality²⁵.

**Table 3-5: International Comparisons of Air Quality
(Micrograms/Cubic Meter, Annual Averages)**

Country	City	SO ₂	NO _x	Particulates
Belarus	Minsk	1	40	200
Latvia	Riga	43	75	100
Lithuania	Vilnius	9	42	95
Poland	Warsaw	12	25	140
Russia	Moscow	7	98	156
Ukraine	Kiev	30	100	135
France	Paris	14	57	14
USA	New York	26	79	62

Source: EBRD: Transition Report (2001)

68. The agency responsible for monitoring air quality recognizes these problems and has indicated that assistance is needed in this area. More recently it has become increasingly concerned about the levels of formaldehyde, which are notable in some cities in spite of falling levels of other pollutants. Aldehyde pollution is mainly the result of transport, but there is still some question of its impact on human health. Box 3-1 gives some information relating to this pollutant. Given the state of knowledge at the present time, and the other priorities, it does not seem necessary to target reductions in formaldehyde in Belarus. More attention should be paid instead to obtaining better data on particles and monitoring ozone.

69. The other pollution issues are radioactive contamination and solid waste.

²⁵ The EBRD data reported in Table 3-5 refers to the concentrations as ‘particulates’, which can mean total suspended particulates (TSP), black smoke or PM₁₀, each of which has a different standard. It is likely that the reported data are for TSP but this is not clear. To convert TSP into PM₁₀ a factor of 0.6 is commonly used (Markandya and Pavan, 1999).

Box 3-1: Formaldehyde

Formaldehyde is highly water soluble and most inhaled formaldehyde is deposited in the lining of the nose. It is a potent irritant and no clear threshold has been defined for its effects. Available evidence suggests that ambient levels of formaldehyde could produce irritant symptoms to the eyes and respiratory tract in a sub-group of the general population. It is unlikely to cause asthmatic symptoms in healthy subjects at exposures encountered in environmental settings, but could potentially exacerbate symptoms. Thus, an occasional mild effect (e.g. symptom day) among sensitive people cannot be ruled out where incremental formaldehyde from transport adds to existing relatively high background levels. However, effects are likely to be small and are difficult to quantify.

Formaldehyde is classified as IARC Category 2A, probable human carcinogen (IARC Monographs, Volume 62, 1995). There is however no convincing evidence of an effect at low ambient exposures and possible mechanisms suggest that in the absence of damage to the respiratory tract tissue, any cancer risks at low ambient concentrations are negligible (WHO, 1997, in press). The US Environmental Protection Agency (EPA) risk assessment for formaldehyde provides a unit risk factor of 1×10^{-5} per $\mu\text{g}/\text{m}^3$ (US EPA, 1990). A unit risk factor (URF) is the estimated probability that a person of 'standard' weight of 70 kg will develop cancer due to exposure (by inhalation) to a concentration of $1 \mu\text{g}/\text{m}^3$ of a pollutant over a 70-year lifetime. This URF may substantially overestimate the true risks from ambient pollution; we recommend that it be used for sensitivity analyses only. In the case of Belarus, with typical concentrations of 4-6 $\mu\text{g}/\text{m}^3$, the increased risk is less than one part in a million per annum. There is limited evidence that formaldehyde may contribute to the development of asthma, especially where there is co-exposure to environmental tobacco smoke (Krzyzanowski et al., 1990). However, effects are not well-established and are not reliably quantifiable.

Source: Adapted from EXTERNE/CORE Externalities from Transport: Final Report

Radioactivity

70. Radioactivity issues are discussed in detail in Chapter VII and relate exclusively to Chernobyl. As a result of the accident at the nuclear plant, some 1,700 km^2 of land is no longer used and will remain a total exclusion zone (Zone 1). Next to this lies zones of primary and subsequent evacuation, which also have very high concentrations (Zones 2 and 3). Together zones 1 to 3 made up about 264,000 ha (2,640 km^2) and agricultural activities are prohibited there. At a lower level of contamination is a larger zone (exposure more than 1 mSv and less than 5 mSv) where inhabitants have the right to resettle in "clean" territories (Zone 4). Finally there is a zone where exposure is less than 1 mSv but contamination of soil with Cs-137 is greater than $37 \text{Kbq}/\text{M}^2$ (Zone 5). In this zone some activity is permissible but periodic monitoring of exposure levels and food products is required. Zones 4 and 5 constituted originally about 45,000 km^2 . Together all five areas made up 47,600 km^2 or 23 percent of the territory. By 1996, after 10 years of radioactive decay, the total of all radioactivity still present in the environment had fallen to about 1 percent of the total activity released and was composed of long-lived radionuclides (Cs-137, Sr-90, Pu and Am-241 isotopes). Nonetheless, in that year 1996 some 46,500 km^2 of Belarus' territory was still reported as being in these five zones – i.e. contaminated above acceptable levels of Cs-137, requiring either continued relocation of the population or periodic monitoring of exposure levels. Remaining radioactivity will decline more slowly as long-lived radionuclides make up all the remaining deposition.

Solid Waste

71. Solid waste data are very limited, but unlike air and water emissions, point to a growing problem. According to an OECD Environmental Performance Review (1997), industrial waste generation in 1995 was some 19 million tonnes, three-quarters of which originated from a potash

mine near Soligorsk. Hazardous waste accounted for 1.3 million tons. The remaining 2.5 million tons was municipal solid waste. An inventory of waste disposal sites in 1995, revealed that there were 160 municipal solid waste sites (202 sites in 2002) and 80 industrial waste sites.

72. While waste management practices are improving in Belarus, there are still many waste disposal sites that do not operate with leachate collection systems, landfill liners (posing a threat to groundwater) or gas collection systems. Basic waste management practices such as covering and weighing of wastes are not used, and municipal and industrial waste are sometimes disposed of together. Many sites are reaching capacity and need to be closed. Illegal dump sites also require closure and remediation.

73. Recycling is still not widespread in Belarus. Some urban centers which are self-financing are able to hire private companies to recycle waste. According to the Belarusian Concern for Material Resources, rates of recycling in such centers were 9 percent in 1997 and 15 percent in 2001. Given the many landfill sites reaching capacity in Belarus and increasing volumes of waste that will be generated in the future, it is in the country's interest to develop recycling systems to reduce the amount of waste entering disposal sites.

74. The government is committed to addressing waste management problems and has worked hard to develop legislation on waste management, focusing on expanding recycling, remediating waste sites that have or could pollute the environment, and establishing modern waste disposal sites that are designed and operated to protect the environment. A number of guidelines have also been developed on selecting environmentally suitable and economically efficient waste disposal sites (these have been applied to the construction of new sites) and a database has been established to keep track of waste disposal sites and maintain a current inventory. With respect to municipal solid waste, the government has prepared a very ambitious program to acquire necessary waste collection equipment, separate 50 percent of waste, increase waste recycling, and significantly reduce the number of disposal facilities by 2005. Despite the government's strong efforts to introduce necessary legislation and waste programs, it still faces funding barriers. Tariffs currently in place are not differentiated and cover only 40 percent of waste management operating costs, and no capital investment.

C. Agriculture, Forestry, Biodiversity and Mineral Resources

Agriculture

75. Unlike many FSU countries, including Russia, the area of land devoted to agriculture has not fallen since independence. In 1991, some 9.3 million hectares were allocated for agricultural purposes and by 2000 this remained unchanged. The productivity of the land, however, measured as real agricultural value-added has fallen by 39 percent and the index of volume has fallen by 31 over the same period. As a share of national output, agriculture has also declined, from 23 percent in 1990 to 15 percent in 1996 and 11 percent in 1999. It is beyond the scope of this report to analyze all the reasons for these sharp falls. Undoubtedly, the decline in the level and quality of the capital stock in the sector (investment in the sector has been notably low – see Chapter II) are major factors. Csaki et al (2000) identify the following other reasons:

- A decline in the terms of trade – the ratio of the prices received for farm outputs to the prices paid for farm inputs. This made supply unattractive and thereby resulted in a limited purchase of inputs, especially pesticides and fertilizers.
- The shift in production from a livestock based agriculture to one in which crops and livestock have more equal shares. In previous years, the livestock sector was inflated due to large grain and imports from other parts of the Soviet Union. Now domestic feed production limits the level of livestock production.
- A system of government control that is taxing producers more than it is providing in subsidies; and that is setting production and procurement quotas at artificially low prices. This is especially true of the larger agricultural enterprises, where the scope for avoiding the controls is limited and where the falls in output have been the greatest.

76. In general, where production is under the control of the household, rather than a large enterprise, the decline in yields has been the smallest – see Table 3-6. The exception is grains, where both groups of suppliers have suffered a similar fall in yields. For potatoes and vegetables, which are markets in which the state is not so dominant, household plots have seen much smaller falls. In the case of milk, yields have actually increased for household plots and fallen for agricultural enterprises.

Table 3-6: Agricultural Yields in Belarus

	Units	1990	1999	2000	Change (percent)	2000 versus 1990
Grains and Legumes	Centners/ha					
<i>Agricultural Enterprises</i>		26.6	14.6	19.3	-45	-27
<i>Household Plots</i>		27.4	14.5	18.1	-47	-34
Potatoes	Centners/ha					
<i>Agricultural Enterprises</i>		137	92	12.9	-33	-6
<i>Household Plots</i>		132	116	132	- -12	-
Vegetables	Centners/ha					
<i>Agricultural Enterprises</i>		190	119	127	-37	-33
<i>Household Plots</i>		160	132	131	-18	-18
Milk Yield	Kg/cow					
<i>Agricultural Enterprises</i>		3220	2232	2154	-31	-33
<i>Household Plots</i>		2639	2939	2935	+11	+11

Source: Statistical Yearbook, 2000. 1 Centerer = 100 Kg.

77. As far as the environment is concerned, the impacts of changing quality of air and water on agricultural production are not likely to have been significant. Major air pollutants that affect yields are ozone, sulfur and nitrogen compounds – in wet and dry deposition. Information on ground level ozone is not available but it is unlikely to have increased sharply, given the trends in the other pollutants. Likewise data on concentrations of sulfur and nitrogen do not show appreciable increases.

78. Of far greater importance is the impact of radioactive fallout on agricultural land. This impact has been declining slowly. Initially, some 23 percent of Belarusian territory was within a region considered to be contaminated above acceptable levels from the fallout from Chernobyl.

By 2002, this had fallen to around 20 percent and the levels are continuing to fall, albeit at a declining rate. As noted earlier about 2,640 km² (1.3 percent of Belarus' total land area) is contaminated at a level exceeding 40 curies per square kilometer – the level at which land is declared off limits for all cultivation of crops, grazing of cattle and picking of wild mushrooms or berries²⁶. Under a wider definition, the total agricultural area declared as ‘contaminated’ – implying some restrictions on use -- was 1,298 thousand ha as of January 1, 2000. In 1993 the equivalent area was 1,364 thousand ha. Issues of contaminated land management are discussed further in Chapter VIII.

79. The flip side of the decline in agricultural activity has been a fall in the application of fertilizers and pesticides, with lower consequent impacts on groundwater. Consumption of fertilizers (NPK) was about 1.5 million tons in 1991, or about 261 kg/ha. By 1999 it had fallen to 786,000 tons, or 157 kg/ha (In 2000 – 850,000 tons or 169 kg/ha). These are well below the levels of Western Europe (e.g. in France applications are about 310 kg/ha). This development should help reduce groundwater nitrate and phosphate concentrations, as should the use of organic manure, which has fallen by about the same percentage amount since 1991. The problem with organic manure, however, is very location specific – it results in elevated nitrate levels in the soil and ground water around the animal feedlots where it is generated. This remains an issue that needs to be addressed.

80. The other environmental damaging input is pesticides, which have also declined steadily from a peak of 22 thousand tons in 1987. [More data are needed on pesticide applications and changes in recent years].

Forestry

81. Forest area in Belarus has increased since 1991 from 7 million ha (34 percent of total land area) to 7.8 million ha (38 percent). This is the result of a combination of reforestation and reduced logging. Areas reforested have returned to 1990 levels (30,000 ha) after dipping as low as 23,000 in 1995. Actual logging on the other hand, reached 5.6 million cubic meters in 1990 has fallen to 4.5 million cubic meters by 1999. Taking into account sanitary and other cuttings, the annual amount of logging has been more or less stable – 10.5 million cubic meters.

82. The forests of Belarus are managed largely by the Ministry of Forestry, and are generally categorized as either “production” forests (50 percent of forests) or “protection” forests (50 percent). In principle, production forests are primarily managed for timber and protection forests are managed for the provision of environmental functions (water, soil erosion control). However, timber is harvested in both types of forests, though in the protection forests timber production is restricted by a number of additional environmental constraints, wider application of silvicultural methods and environmentally sensitive logging techniques. Only national parks, nature reserves and reserved forests are managed exclusively for environmental purposes (although even here there is some unauthorized felling taking place).

83. Conifers are the dominant species, and most of the stands are less than 54 years old – the result of substantial reforestation and afforestation in the 1950s and 60s. The total standing stock of wood amounts to some 1.3 billion m³ or about 171 m³/ha. The growth in production forests is

²⁶ One curie equals 3.7x10¹⁰ Bq.

estimated at about 23 million m³/year (3.5 m³/ha/yr), which translates into an allowable cut of some 18 million m³, assuming that 80 percent of the forest is exploitable. Given the young average age of the forests (49 years), growth in forest production should increase to some 8 m³/ha/yr by 2005.

84. In its management of forest resources, the Ministry of Forestry attempts to allocate production to provide some beneficial combination of timber products and environmental services. To this end they classify lands according to their timber potential (based on tree growth), but not according to their economic or environmental potential. A review of timber production on sites better suited for environmental services would therefore be in order, and indeed the Ministry of Forestry has begun this process.

85. One issue of concern expressed in the 1993 Bank assessment was the level of thinning or sanitary cutting. If this are not undertaken in a timely fashion, the forests can be weakened and made more susceptible to air pollution and other damaging influences. Given the ageing of the forest, one would expect an increase in the level of thinning. The data, however, show a decline in the area thinned (305 thousand ha in 1990 versus 236 thousand in 1999), although there has been some increase from a low of 204,000 in 1994.

86. Productive timber sites tend to be flat, with deep soils and easy access. Some 20 percent of forestlands are wetlands, characterized by difficult access and environmental fragility. These areas, with high groundwater levels and shallow soils, have generally low potential for timber production, and are subject to high erosion when logged. But they may be excellent for erosion control and for flood control purposes. In the mid 1960s, the Federal Forest Service began a long range plan to drain some 400,000 ha of wetlands for timber production; lack of funding limited drainage to some 280,000 ha, of which only about 100,000 are suitable for timber production. The Ministry now plans to restore the rest to their natural state. Such a reallocation of resources, coupled with market efficiency criteria, could result both in increased timber receipts on a smaller forestland base and a higher level of environmental services. However, the success of such reforms would also depend on changes in the way that the forestry sector is financed.

87. In addition to timber and environmental protection services, the forests also provide sizeable quantities of mushrooms, berries, medicinal plants and animals. The quantities harvested appear to be quite sustainable. The Ministry has undertaken a survey and inventory of available forest products in various districts over the past decade, cataloguing and assessing chanterelle, bilberry and cranberry resources, and provisioning limits. The biological reserves of these products is estimated to be over 100,000 tonnes per year, and available utilizable reserves (available for provisioning) at around 60,000 tonnes, while total annual harvesting amounts to no more than 9,000 tonnes. The potential for expanding this industry in a sustainable way therefore seems considerable. The same applies to the recreational use of forest areas, where very little has been done to date (see the discussion on protected areas below).

88. Forestry in Belarus was also affected by the Chernobyl accident. About 0.5 percent of the forested area was destroyed and radioactivity levels in trees in the affected zones can still be quite high. In all, 270 thousand ha are considered heavily contaminated, with timber and non-timber forest products rendered unusable. There is also a risk of redistribution of radioactive

contamination from forest fires in the contaminated zones. Hence a large part of the land management effort in these areas is devoted to preventing forest fires.

89. Reforestation on some of the affected land, and on other land that is not currently forested, may be justified on the grounds of carbon sequestration. Under one or other of the mechanisms of the Kyoto Protocol, and using the vehicle of the Carbon Fund at the Bank, Belarus can receive payments for carbon sequestered subject to meeting certain criteria for implementation and monitoring. This possibility is discussed further in Chapter VIII.

Biodiversity

90. The territory of Belarus is home to a number of European ecosystems – especially wetlands -- fauna and flora that are of global significance and some of which are endangered. The government takes the preservation of these natural assets seriously and has been implementing an expanding program to protect what remains. Under a program launched in 1990 and reaffirmed in 1995, called the Ecologia, the government committed to increasing the protected areas of national significance to 8.5 percent of the territory. Currently about 7.9 percent is classified under one or other of the categories of protected areas. These are:

- (i) Strict nature reserves (Zapovedniki, IUCN category I), such as the Berezinski nature reserve, have a core zone with no use permitted and a buffer zone with some limited use allowed. There is also the Polleski radiological reserve with contamination of over 15 Curi per square km.
- (ii) National parks (IUCN Category II), which are used for research, recreation and educational tourism. Since 1996 Pripiatsky National Park with 83 thousand hectares, Narochansky National Park with 115 thousand hectares and Braslavskie Oзера with 69 thousand hectares have been added to the Belovezhskaya Primeval Forest National Park (96 thousand hectares).
- (iii) Less strictly protected natural areas (Zakasniki), divided into those of national significance (IUCN category IV) and those of regional significance (IUCN categories IV-V). Those of national significance have increased from 73 in 1991, covering 570 thousand hectares, to 90 in 1999, covering 810 thousand hectares. Those of regional significance have gone up from 676 in 1995 (with 400 thousand hectares) to 716 in 1999 with 412 thousand hectares. These areas have no conservation organization as such but depend largely on the residents to observe and enforce the limitations on use.
- (iv) Zelonia zona or greenbelts of protected forests, generally around urban areas.

91. In addition there are 682 protected natural monuments and about 3.5 million hectares of forests with some degree of protection (see above).

92. While the increased attention to protection of biodiversity is commendable there is less information on the achievements of the policy in terms of conservation goals and more can be done in this regard. On the whole, the problem of improved conservation is hampered by a lack of funds. Allocations to the nature reserves, national parks and zakazniks are small. Some funds from republican and local nature conservation budgets are directed towards improving zakazniks

and management plans have been prepared for a number of them. The plan for the “Sporovksy” zakaznik has been endorsed and allocations are earmarked for its implementation in 2002. A number of measures to generate further income for nature reserves and parks are being introduced. One is through a change in the management of hunting licenses, which has generated some income for selected national parks, but not zakazniks where hunting fees are not collected. A measure the government has not promoted as yet is raising additional revenues through ecotourism, which could provide both resources for conservation as well as some employment and income for poor, rural populations.

93. Even with an enhanced level of local provision, the country will need external assistance to meet some of the big conservation challenges it faces. A number of schemes involving international support are under way in Belarus. One of the most serious areas that needs increased resources are the low lying bogs of Polesse, which are one of the largest stretches of boggy lowland wetlands in Europe and which provide habitat to many birds and wildlife as well as serving key functional values of flood mitigation, water filtration and carbon sequestration. The area has become degraded and susceptible to floods through poor drainage and inappropriate agriculture. This and other international schemes are discussed further in Chapter VIII.

Mineral Resources

94. Data for selected mineral and other resources of Belarus are listed in Table 3-7. The table does not include metals; the country is not well endowed with these and although there are some commercial reserves, their development is not a priority for the government. Some minerals, such as gold and diamonds are being investigated further. For those that are in regular use, either current commercial reserves are adequate to meet expected demand for several years, or there are good grounds to believe that additions to the commercial reserves will take place.

95. In general extraction of these minerals does not raise significant environmental problems, with the exception of peat. The consequences of excessive extraction in the Polesse region have already been noted. The government has a policy to restrict extraction in environmentally sensitive places. The basis for classifying areas under this policy has not been reviewed. It is possible that they should be tightened on environmental grounds. Furthermore, it is possible to impose a variable charge on extraction, so as to cover the costs of any environmental mitigation. Charges for minerals and pollutants were discussed in the previous chapter.

96. Table 3-7 also gives some details on groundwater resources. Again the table shows that the issue is not quantity but quality, respecting environmental constraints and meeting supply and demand imbalances for groundwater in specific areas.

Table 3-7: Selected Mineral Resources in Belarus

Mineral	Commercial Reserves Jan. 2001	Proposed Annual Extraction 2001-2005	Commercial Reserves Forecast 2006	Comments
<i>Million Tonnes</i>				
Oil	64	8.5	61	Actual extraction in 2001 was only 1.8 million tons. Some addition to commercial reserves expected
Potash Salt	1,194	35.4	1,209	Prospecting expected to yield increased reserves
Rock Salt	21,995	2.5	21,992	
Dolomites	748	19.5	729	
Peat	238	19.3	201	Provision with prospected reserves is over 50 years. Much more can be extracted but it could have serious environmental impacts
Sand	37	3.5	33	Explored reserves cover needs for up to 40 years. Imports from Ukraine possible
Clay	12	0.0	12	25-30,000 tons imported from Russia, Ukraine and Tajikistan
Glass sand	18	1.5	17	Sand for higher quality is imported
<i>Cubic Meters/Day</i>				
Fresh Groundwater	6297	3000	6536	Issue is quality and finding sources to supply communities currently using surface water
Mineral water	14,557	>1000	14,557	Use is at sustainable rate. Further development possible for increasing supply but care must be taken with environmental impacts

Source: Government of Belarus, Ministry of Nature and Environmental Protection

IV. The Management of the Environment: Institutional Issues

A. Institutional Framework

97. Since its independence in 1991, Belarus has made some progress in establishing and updating its institutional and legislative framework for environmental and natural resource management. The country today has a highly developed institutional and legislative structure to address a variety of issues, backed up by significant scientific potential in the many fields. At the national level, it has a strategy for sustainable development and is continuing to update this by articulating strategic priorities in a number of specific fields, for example biodiversity conservation. Belarus is also actively engaged in a number of regional and international activities in the field of environment. These are all positive developments, but there is still quite a lot to be done. Annex I to this chapter provides a detailed review of the environmental regulations in the country relating to Environmental Impact Assessment and compares them with those of the World Bank. Relative to other FSU countries, Belarus has a small number of new laws and most of them are declarative in nature, without the necessary regulations and institutional mechanisms for their implementation. One area where this is particularly the case is with respect to public participation, which is discussed further later in this chapter.

98. The government institutions servicing the environment and natural resources are represented by different levels of the executive and legislative branches. The Parliament -- i.e. the National Assembly of the Republic of Belarus -- led by its committee on Chernobyl, Environment, and Natural Resources, determines the major dimensions of state environmental policy, adopts environmental legislation, and declares when necessary that territories become zones of ecological catastrophe. The President of the Republic of Belarus issues decrees and orders including those relevant to environment and natural resources. The President, directly or through specially created bodies, maintains control over compliance of local governments, self-governments and other subordinate bodies with the provisions of environmental legislation. Within the government, the Council of Ministers of the Republic is the central body of governmental control and maintains executive power in the Republic. It implements the state environmental policy, including development and execution of state environmental programs and large environmental protection activities, coordinates the activities of ministries and other national bodies of state control in the field of environmental protection and natural resources, and promotes international cooperation in this field. The monitoring of the state of the environment is the responsibility of the MNREP and its territorial agencies. Local budgets only receive partial funding for technical needs and financial management.

99. The governmental system also includes agencies of special competency that are responsible for environmental protection in accordance with existing legislative provisions. The Ministry of Natural Resources and Environmental Protection (MNREP), a successor of the State Committee on Ecology which existed in 1993, is the major state agent in the field of environmental protection. It has a broad range of environmental responsibilities for air, soil and water protection and waste management, as well as natural resource conservation and management. The MNREP (Figure 4-1) system includes six regional committees and the Minsk city committee, one hundred and twenty- one subnational inspectorates, a department on fisheries, "Belgeologia" republican unitary enterprise, all backed up by the technical support of

four research institutes, specializing in ecology (“Ecology” Institute), water use (Research Institute on Use of Water Resources), geological exploration (Institute of Geological Exploration) and remote sensing (“Ecomir” Science and Technology Center).

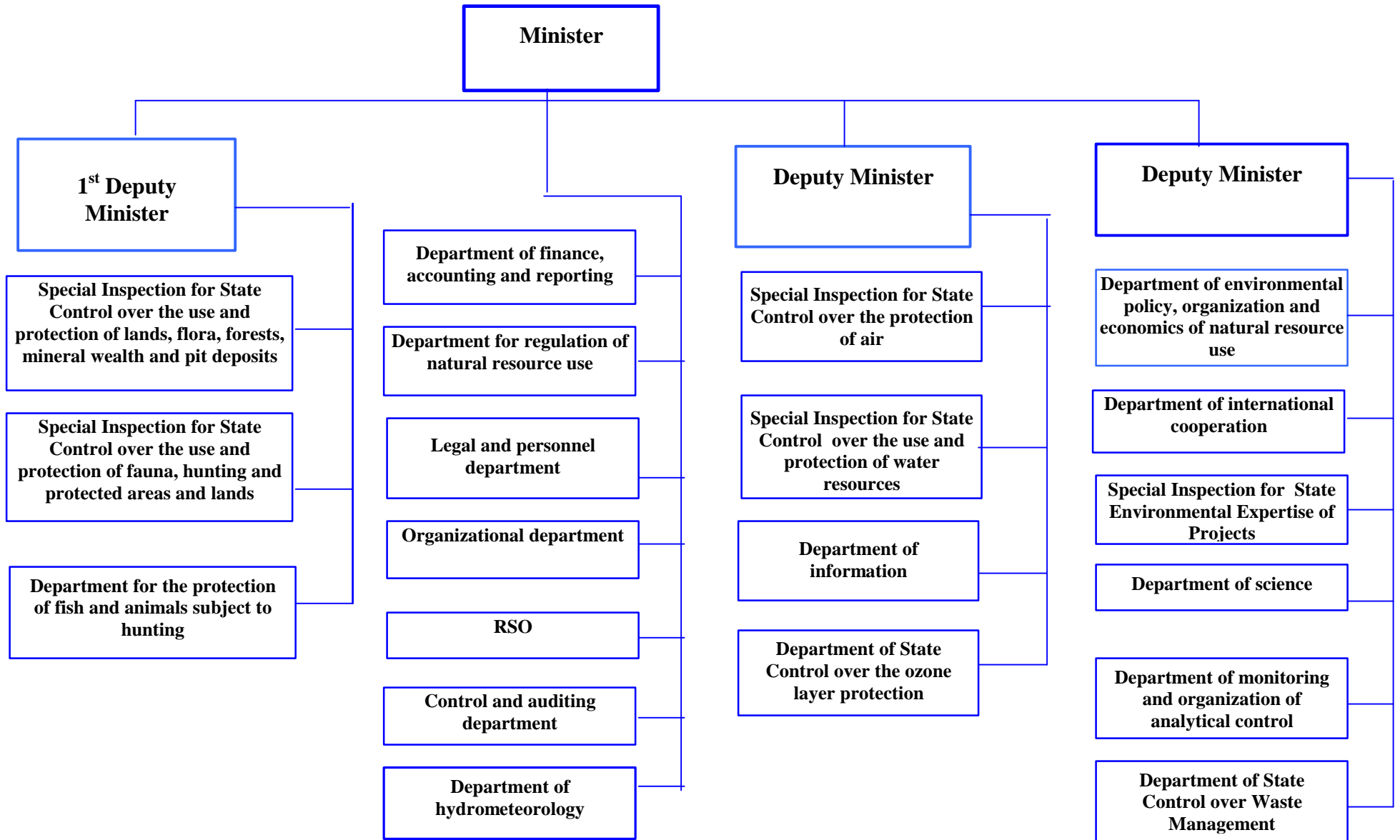
100. Other authorized governmental bodies with environmental responsibilities include:

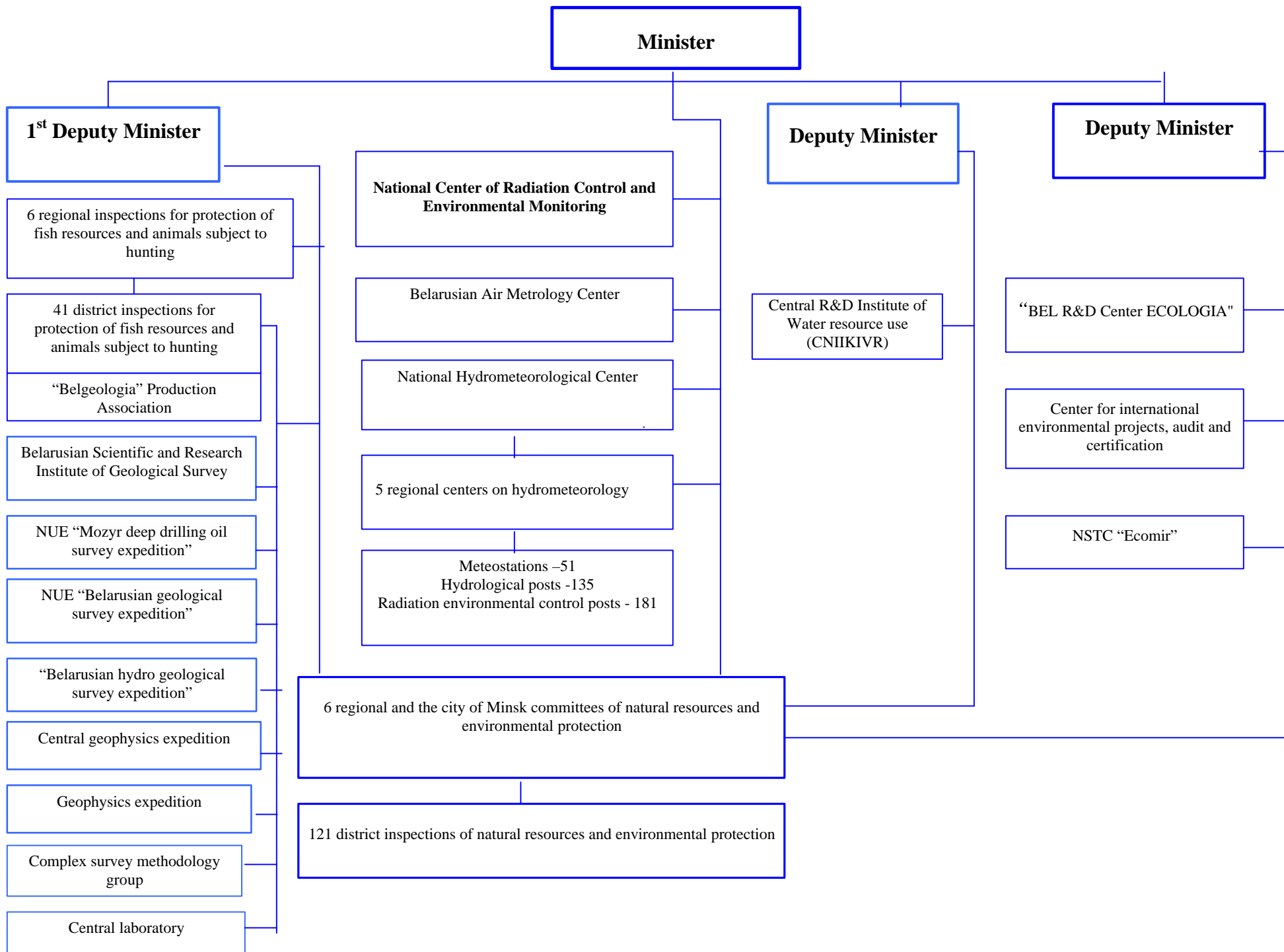
- Ministry of Health, which is responsible for living and working conditions and the quality of food and drinking water;
- Committee on Forestry under the Council of Ministers, overseeing forest conditions, harvesting, planting, maintenance, and protection (both within and outside the protected areas). The system of the ministry includes six regional industrial forestry amalgamations, eighty eight ‘forestries’, and fourteen enterprises directly controlled by the ministry;
- Ministry of Emergency Situations, responsible for handling emergency situations and their consequences,
- Committee on Land Resources, Geodesy, and Cartography under the Council of Ministers;
- Committee on Problems of the Consequences of the Catastrophe at the Chernobyl Nuclear Power Plant under the Council of Ministers;
- Office of the President, which has a special division responsible for the management of some protected areas;
- State Customs Committee, protecting unique species of fauna and flora from illegal export and protecting citizens and the environment from the illegal import of dangerous materials;
- Ministry of Internal Affairs, which controls mobile sources of air pollution by means of ecological police and assists other state control agencies in the field of environmental protection;
- Ministry of Housing and Communal Services, which in cooperation with municipalities controls water and waste management services; and
- Committee on Energy Efficiency under the Council of Ministers
- Ministry of Architecture and Construction, which implements urban development polices, a number of which focus on improving environmental quality.

101. Some important changes in the structure of government were enacted in Presidential Decree #516 of 26 September 2001. This decree introduced the following changes into the structure of government environmental institutions:

- The Ministry of Forestry was reorganized into a Committee of Forestry under the Council of Ministers; The Committee on the Problems of the Consequences of the Catastrophe at the Chernobyl Nuclear Power Plant under the Ministry of Emergency Situations was reorganized into the Committee on the Problems of the Consequences of the Catastrophe at the Chernobyl Nuclear Power Plant under the Council of Ministers.
- The State Committee on Energy Efficiency and Energy Supervision into the Committee on Energy Efficiency under the Council of Ministers.

Figure 4-1: Organization of the Ministry of Natural Resources and Environmental Protection





- The State Committee on Land Resources, Geodesy and Cartography into the Committee on Land Resources, Geodesy and Cartography under the Council of Ministers

102. In addition, the State Committee on Hydro- and Meteorology was liquidated and the function of government regulation in the area of hydro- and meteorology was assigned to a Department on hydro- and meteorology created in the Ministry of Nature Resources and Environmental Protection. The Committee on Fish Protection under the Ministry of Natural Resources and Environmental Protection was also liquidated; its functions are now performed by a Department for the protection of fish and hunting animal species created in the Ministry of Natural Resources and Environmental Protection.

103. At present, the administrative structure of the Ministry is being rationalized. Overall, these and other changes in the government structure are dictated by the need to harmonize it with that of Russia.

104. Although institutional structures are generally clear, responsibilities for the management, inspection, and control of the environment in some cases partly overlap with contradicting institutional mandates. **Institutional redundancy is not only costly to the government, but the overlaps in many cases can serve to also undermine some of the designated institutional functions. Institutional structures could be strengthened through clearer demarcations between the spheres of environmental regulation and policy making, environmental management and utilization of resources, and enforcement of regulations. Clearer demarcations also help to build public trust in the action of various agencies as they carry out their functions²⁷.**

105. One example of this problem was the divide between the controlling versus management functions of the Ministry of Forestry and MNREP. MNREP was responsible for inspections and enforcement of policies within all specially protected areas. In implementing its controlling function, MNREP relied on six Regional Committees and the Minsk City Committee on Natural Resources and Environmental Protection, and one hundred and twenty-one inspectorates at district and city levels. MNREP also carried out the coordination function and was entitled to control the implementation of the National Biodiversity Conservation Action Plan by other ministries and departments.

106. Another example is the Ministry of Forestry, which had the *same duties for protected forest areas* (namely inspection and enforcement) within and outside the specially protected areas. The Ministry of Forestry itself controlled forest enterprises and was responsible for the specific maintenance of controlled forests (e.g. sanitation cutting), in addition to issuing permits for various activities and collecting up to eighty percent of revenues. With the changes in decree No. 516 of September 26th, which reorganizes the Ministry of Forestry as a Committee under the Council of Ministers, it is hoped that some of these difficulties will be resolved.

²⁷ It is unusual for the Office of the President to have direct management responsibilities for some protected areas. One would normally expect this to be handled by a line Ministry.

107. In this case, the responsibilities for management, inspection and control of protected areas are legally defined but are partly *overlapping* with the inspection and control function of MNREP. The same is true for hunting grounds, which are both under the Ministry (now Department) of Forestry and MNREP. Currently, the Department of Forestry is responsible for both control and managerial functions, which means that beyond having some economic activity of its own, it also issues permits (e.g. for logging) to other agents and to the local population, while at the same time controlling the use of natural resources. A similar comparison can be made between the MNREPs role in management and control of protected areas versus the Department of Protected Areas located in the Presidential Affairs Office, responsible for ‘economic activities’ in National Parks²⁸.

108. The importance of clearly defined *individual* institutional roles and responsibilities cannot be overemphasized. However it is also important to note the importance of developing a *system* with good cross-sectoral communication channels for information sharing. Although seemingly contradictory, it is the precise combination of independent institutions with effective cross-sectoral coordination mechanisms that make a system versus individual institutions robust and resilient. Intersectoral issues such as the Sustainable Development Strategy offer ideal platforms to test the strength and resilience of an institutional system.

109. Other issues in the management of the environment where institutional reforms are needed include:

- Decentralization of responsibility for implementation of policy at the local level where the effects are predominantly local;
- Increased role for private sector participation in natural resource management; and
- Setting up of an integrated environment monitoring system.

110. Decentralization in government is a common theme across many sectors and the environment is no exception. Decision-making and implementation of policy are both more effective when those closest to the issues are responsible for them. The constraint in transferring this responsibility is capacity in modern environmental regulation methods at the local level, a problem that urgently needs to be addressed. In this context, the government should also seek to move towards increasing its use of market-based instruments, especially for the regulation of the use and exploitation of natural resources. This will require some capacity building (see Chapter II).

111. There are many situations in which the private or NGO sector can be more effective in protecting natural resources and ensuring their sustainable use than can a state regulator. Cases in point are management by forest enterprises and park management by operators providing recreational services. The government does rely to some extent on non-governmental organizations to manage such resources (see the example in Box 4-1 below and the discussion in Chapter VIII). More, however, can be done to encourage such developments, especially through the use of fiscal incentives.

²⁸ One of the reviewers offering written comments noted that the Presidential Affairs Office is not closely monitored in its environmental protection functions.

112. Finally, there is a need to centralize and streamline the collection and recording of environmental data. A large amount is collected in the country but it is located in many different centers and is sometimes hard to obtain and to ensure that it is collected on a consistent basis. An integrated monitoring management system should be set up so that all state agencies can supply information to this center. This is an area where external assistance would be required.

113. The overall governance structure of a country impacts the strength of its institutions, and therefore even if environmental institutional frameworks are clear, more systemic issues often impede well intended institutional designs. Some of the more systemic issues affecting Belarus' environment institutions include: uncertainty over the government's future political and economic paths of development, which hampers sound strategic planning; susceptibility to declarative legislative provisions that can override and undermine carefully developed legislation; and in some cases inability of environmental bodies to control state-owned enterprises (e.g. impose tangible penalties). Due to these system limitations, Belarus' environmental institutions are less independent and thus not as capable of addressing their goals effectively.

B. Environmental Education and Training

114. To address the challenges of environmental education, Belarus has developed a concept paper and a nationwide program. These documents draw on international experience in the field of environmental education and have been developed on the basis of the national education system. The programs aim to integrate environmental curriculum into primary school education. This integration began at kindergarten level and continued through primary and secondary school either as a part of already taught subjects or in some cases as separate subjects. At the post-secondary level, several new departments (environmental, and agrarian law, and environmental management) were established at the Belarusian State University and the Belarusian Polytechnic Academy. New courses were also established within existing programs (i.e. water supply, sewerage, and environmental protection courses). The Belarus Institute of Management has integrated environmental issues into its programs and hosts discussions and workshops on environmental management topics. The Academy of Sciences in Belarus continues to play a large role in training and in applied research on environment issues. It plays a key advisory role to government officials in support of technical policy decisions through the State Scientific Program "Ecological Safety". Belarus has accumulated considerable experience from environmental training by non-academic institutions whose efforts are coordinated by the Republican environmental center for children and youth. Specialist from the MNREP and other government bodies participate in regular post-graduate training to ensure that their environmental skills and knowledge are up-to-date.

C. NGOs in Belarus

115. Most environmental NGOs are relatively young and weak in Belarus, and they have faced many difficulties and constraints in their development process. According to the records of the Ministry of Justice of Belarus, there were about 1,000 NGOs in 1995. As of November 2000, the Belarusian Ministry of Justice had 1,817 such bodies on its list including 709 national, 937 local and 152 international NGOs, 18 political parties, 39 national trade unions and 18 confederations of associations. Approximately 60 percent of the NGOs operate in Minsk, 10

percent in the Vitebsk region, 9 percent in the Brest and Grodno regions, 7 percent in Mogilev, and 5 percent in Gomel. The United Way reports that only 5 percent of these organizations focus on ecological issues; while another 3 percent focus on Chernobyl problems. Of these, only a few are really engaged in environmental activities on a more or less permanent basis. The majority are concentrated in urban areas and deal with environmental awareness and education or specific technical issues like bird habitat preservation. The MNREP emphasizes the importance of strengthening contacts with environmental organizations and encouraging their involvement in joint efforts on rehabilitation and protection. In 1999, Belarus signed and ratified the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the "Aarhus Convention"). The Environmental Coordination Council has been established under the MNREP to ensure the implementation of the convention, to enhance collaboration between the MNREP and NGOs, and to discuss decisions on environmental management, education and training. Representatives of 16 NGOs have joined the Council.

116. Activities of NGOs are governed by the law "On Public Associations", enacted in October 1994 and amended in 1995 and 1999. The law has introduced a complex regulatory framework for NGOs, which results in extended periods of NGO registration and periodic intervention of the registering authorities (the Ministry of Justice or Justice Departments of the local Soviets). Work of non-registered organizations is prohibited on Belarusian territory and collaboration between registered NGOs and the media is not encouraged. Furthermore, NGOs are limited in their dissemination of information; unless the material is registered with the authorities only 300 copies may be printed.

117. NGOs may legally be involved in commercial activities, but are not entitled to any special tax relief²⁹. Access to the Internet is an acute problem in Belarus, particularly for NGOs. There are about 50,000 internet connections in Belarus, but a great difference exists in Internet use between Minsk-based and regional groups. This reflects the inadequate development of telecommunications as well as high prices for provider services in Belarus' provinces. Environmental NGOs have very few domestic sources of financing, and foreign aid has decreased or remained scarce over the past decade. The complexity of working with a system of multiple foreign exchange rates and complex taxes in the country has in the past decade diverted the interest of both donors and recipients because in real terms, the system cut off up to a half of the initial sum designated for a project because of numerous taxes and provisions. Fortunately, with exchange rate unification some of these impediments have been removed. Despite many barriers, a number of NGO programs supported by foreign donors have been undertaken: "Small Project Facility" (aimed at addressing issues of local concern such as water resource management and environmental education); "Environmental Education" (support for NGO publications, school environmental curriculum, textbooks, environmental events); and "NGO Forums" (regional capacity building and information exchange) within the UNDP/GEF program for environmental rehabilitation of the Dneiper River. (For more details see the section on international cooperation below).

²⁹ If fact the tax status is becoming even worse. Effective January 2002, charitable funds received from external donors not having a permanent presence in Belarus are considered as non-sales income and taxed at a rate of 30 percent.

118. Several local NGOs, like the Ecological Station “Olsa”, unite local nature amateurs and public environmental inspectors and assist local environmental bodies reporting on poaching incidents and the cutting of trees by local population. Some NGOs like the Belarusian Ornithology society, West-Belarusian Bird Conservation Union and Belarusian Center for Nature Conservation were developed around the research potential related to a specific topic. Other NGOs, like the recently created public environmental law association “Ecopravo,” deal with the legal aspects of nature conservation. Two major associations, the Belarusian Society of Hunters and Fishermen and the Belarusian Society for Nature Protection whose histories go back to Soviet times, are more formal and bureaucratic, but still play an important role in preventing poaching and promoting recreation, nature protection, and conservation activities. (see Box 4-1 and also Chapter VIII).

Box 4-1. Bird Conservation Belarus (APB): A Case Study

The National Union “Akhova Ptushak Belarusi” (APB, Bird Conservation Belarus) represents a unique and positive case to demonstrate how nature conservation activities can be implemented by non-governmental bodies in Belarus. The organization combines interesting solutions at a managerial level and in financing its operations that enable it to effectively deal with constraints.

APB is a fast growing nongovernmental membership organization established in 1998 with the purpose of studying and preserving rare bird species and their habitats, as well as the biodiversity of Belarus in general. The NGO has become a respected forum for the public, politicians, scientists, conservationists and many others who want to see Belarus preserve its unique natural heritage. APB, an official representative of BirdLife International in Belarus, engages in a number of specific research projects and policy related and educational activities.

APB has a typical structure, with the annual assembly of members as its highest authority and the national board, secretariat and president convening and working on a permanent basis during the year. The board consists of highly trained, well-respected environmental specialists who at the same time often occupy high positions at different official organizations. For instance, the director of the Zoology Institute of the National Academy of Sciences of Belarus is a member of the board of APB and its current president. APB’s projects attract many specialists from governmental agencies and institutions throughout the country for particular assignments on a temporary basis. A practical activity in the field relies on the participation of volunteers and members of APB, who are mostly university students, nature amateurs (other than students), lecturers and school-age children. As of January 2000, APB had 470 members, a relatively small number compared to some foreign foundations, yet a significant one relative to other, functional Belarusian NGOs.

The organization has developed and currently maintains a working relationship with foreign and international organizations and many domestic institutions. For instance, APB currently has a three-year project entitled “Management Planning for Conservation of Fen Mire Biodiversity in Belarus”. is the project is being implemented in cooperation with the Darwin Initiative, Royal Society for Bird Protection (UK), the UNDP, the National Academy of Sciences, the Ministry of Natural Resources and Environmental Protection, and local authorities. Funding comes from foreign and international donors, while domestic stakeholders provide other kinds of support.

Funds for APB’s operational activity total several hundred thousands of US dollars, quite an impressive figure for a Belarusian NGO. Work with international partners demands transparency and full accountability for resources spent. APB employs professional accountants to manage its funds.

Public Participation in Environmental Issues

119. Belarus has a relatively sound legislative framework to guarantee that its citizens have a clean environment in which to live. To implement this legislation, a number of laws have been passed stipulating the right of the public to know and to participate in environmental decision making. The constitution of Belarus provides the most basic rights for information, while the Law on Environmental Protection (2002), Law on Sanitary Well-being of the Population (1993), and Law on Social Protection of those who Suffered from the Chernobyl Disaster (1991) all contain specific provisions that stipulate the right of citizens to environmental information. In comparison with the neighboring NIS states, Belarus was assessed to be at the same level, or in some areas more advanced, than other countries in terms of its legislative framework for supporting public participation³⁰. However, in practice, as in many NIS countries, serious gaps between the legislative framework and actual practice are observed and Belarus is no exception. A key gap is the lack of any document that describes to the public how it can exercise its right of access to information and public consultation. It is this fact that makes NGOs in Belarus less strong than those in, for example, Russia, Ukraine and Moldova.

120. As noted above Belarus has approved the *Aarhus Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters*. Belarus' approval of the this Convention further extends such provisions and commits the government to proper implementation. Although some initial efforts have been made (in 2001, the MNREP jointly with respective ministries, government bodies and NGO's developed an action plan for this issue covering 2002-2005, endorsed by a resolution from the Council of Ministers) there is still great potential for further development of both legislation and institutions to follow the spirit of Aarhus resolutions. (See para. 114 above). In this context the government has passed two regulations relating to public consultation on ecological matters: (a) "Instructions on the procedures of the state ecological expertise" and (b) "Instructions on the procedure of the environmental impact assessment". Both contain mandatory provision to the public of information relating to the construction of environmentally hazardous facilities. If these are to be effective, however, the state will have to support more intensive and independent use of the media by NGOs for dissemination of the material.

121. On the positive side, the government works frequently with the general public and non-profit public associations. To a certain extent, the public has been involved in the activity of corresponding governmental bodies and in the preparation and discussion of the national sustainable development and other programmatic documents. However, the public environmental movement itself remains relatively weak and fragmented in Belarus. This is mostly due to the lack of traditional public participation in decision making, as well as to a general environment that has not been conducive to the development of sound civil society institutions in the country. The potential of public organizations is high in the fields of environmental education, awareness, and training, and there are a number of cases of successful practical work in other areas, such as biodiversity conservation, for example. Few funds, however, have been allocated to this area in the past but this is changing. In 2002, a new information department was established at the MNREP. The main dimensions of its efforts are

³⁰ Doors to Democracy, June 1998 – Current Trends and Practices in Public Participation in Environmental Decision making in the Newly Independent States, Regional Environmental Center for Europe.

the following: extensive collaboration with the media; enhanced work with NGOs; collaboration with international organizations; coordination of activities and implementation of the Aarhus Convention; development of information materials on environmental issues; and publication activities; and environmental education and training. Particular emphasis is placed on the dissemination of environmental knowledge. The information department has 6 staff members. The Ministry has an internet site with general information on the state of the environment which is updated on a regular basis.

122. Despite these efforts, much more work needs to be done on increasing the public's awareness of its rights and expanding available information channels. None of the NIS countries have legislation relating to public hearings, which are a more proactive way of sharing information with the public. Increased transparency of institutions by building more effective partnerships with civil society and businesses is needed. The government, through its agencies at the national and local levels should take a more proactive position in providing properly formatted, digestible environmental information to the population. For this task, the potential of mass-media should be better employed, and NGOs asked to provide assistance in information dissemination. Measures to foster public participation in environmental decision making should be further improved and developed, including not only environmental assessment procedures but other areas as well.

D. International Cooperation and Agreements

123. Belarus is a full participant in all the major international inter-government organizations such as the United Nations Environmental Program (UNEP), the UN Economic Commission, the UNDP, the World Meteorological Organization, the World Health Organization, the World Bank, the OECD, the EU TACIS Program, the Interstate Environmental Council and the agencies established for the enforcement of the international nature conservation conventions, protocols to the conventions etc. It is party to the following major international conventions and protocols:

- The 1979 Convention on Long-Range Transboundary Air Pollution;
- The Vienna Convention for the Protection of the Ozone Layer;
- The Montreal Protocol on Substances that Deplete the Ozone Layer;
- The London Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer;
- The UN Convention on Biological Diversity;
- The Convention on International Trade in Endangered Species (CITES);
- The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal;
- The Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters;
- The Ramsar Convention on Wetlands;
- The UN Framework Convention on Climate Change (UNFCCC).

The one major global environmental convention where Belarus has yet to regularize its position is with respect to the UNFCCC. The issue is one of setting reduction targets for its greenhouse gases, so that it can benefit from the mechanisms for carbon trading etc. This problem is discussed further in Chapter 5.

124. Given the limited resources available for nature protection within the country, Belarus has depended very much on external support and donor assistance to fund a range of projects in this area, especially those that have a global or regional dimension. Table 4-1 summarizes the recently completed, ongoing and planned projects in the country. The table shows that most projects are related to regional/global issues, especially related to regional waters (12 out of the 17 completed or ongoing projects are in this category). Others relate to capacity building and support for environmental problems from pre-independence activities. The same applies to the proposed projects. The value of the pipeline of projects is about 21 million euros and proposed projects amount to 4 million euros. These international projects also amount to a significant amount compared to national spending on the environment. To put the two in perspective, in 2000 total budgetary spending on the environment (excluding Chernobyl) was about 56 billion rubles, or \$64 million. In 1998-2000 external support was about 3 percent of that (\$2 million over three year), but in the period since 2000 external support is running at about \$3-5 million a year (depending on what period the ongoing projects are spread over) , which would make it about 5-8 percent of the budgetary expenditures.

125. The government is keen to expand its international cooperation in the environmental field and is seeking partners for projects specifically in the areas of renewable energy, construction of wastewater facilities and solid waste management, safe tire disposal and strengthening institutional capacity in MEPNR.

Table 4-1: Internationally Supported Environmental Projects in Belarus

PROJECT	Source	Amount 000 Euros
<i>Completed Projects 1998-2000</i>		
Development of the general environmental policies	TACIS	650
Expansion of environmental action plans		600
Regional development and nature conservation in the Niemen Euroregion		950
TOTAL		2,200
<i>Ongoing Projects</i>		
Identification of Ramsar grounds in Belarus with French organization "Migrating Birds in Western Arctic"	FRANCE	n.a.
Development and management of peat bogs of Polesye (With UK Drrwin Fund and Royal Society for Protection of Birds)	UK	n.a.
Water management of the river basin of the Zapadnaya Dvina, the Vitebsk oblast of the Republic of Belarus	TACIS	1900
Development of Belarus-Poland cross-border cooperation on monitoring and water quality assessment in the river basin of the		1900
Reduction of contamination of the Niemen river basin with industrial and agricultural waste		1700
Preparation of the Strategic Action Plan for the Dnieper river basin and development of mechanisms for its implementation	GEF	7920
Development of the system of management and control of the environment in the Dnieper river basin on the territory of the Republic of Be	IDRC	440
Protection and management of peat bogs in Central Europe; development of the strategy and action plan (1)	WETLAND INT. (NL)	385
Protection of biodiversity in wetland areas of former military sites in the Republic of Belarus (2)		22
An integrated biodiversity conservation and wetland management for the Mid-Pripyat Reserve and key adjacent territories		25
Establishment of the Belarusian national center for bird ringing	DENMARK	365
GEF Climate Change Enabling Activity for the preparation of the First National Communication to the UNFCCC	WB	365
Environmental Compliance and Enforcement Capacity Building IDF Project		406
Introduction of environmentally safe double-wall tanks for storing oil products	GERMANY	2250
Management and disposal of accumulated obsolete pesticides in Belarus	DENMARK	1980
Power production from radioactive contaminated biomass	DENMARK	990
TOTAL		20,649
<i>Proposed Projects</i>		
Reduction of contamination of the Niemen river basin with industrial and agricultural waste	TACIS	1700
Joint program for river basin management, monitoring and water quality assessment in cross-border rivers		1000
An Integrated Plan for the water management of the Pripyat river and its flood lands	GEF/NL	25.3
First stage of cross-border initiative of non-governmental organizations at the Belarusian-Polish border on the territory of the "Belovezhskaya Puscha" (3)		48.4
Reduction of environmental danger from accumulated sediment of waste waters at the Brest W/W treatment plant in Belarus		616
Publication of newspaper "Ecological News"	DENMARK	55
Consulting the population on disposal of the accumulated pesticides		476.3
TOTAL		3,921

Notes: (1) The full value of this project is \$15 million to be shared across 9 countries.

(2) This is only the first stage. The full project will cost \$3 million.

(3) An exchange rate of 1.1 euors to one dollar has been used.

Source: Ministry of Environmental Protection and Natural Resources

ANNEX 4-I: Environmental Assessment Procedures in Belarus

1. Legal and administrative framework for EIA

- 1.1 Legal provisions
- 1.2 Administrative framework
- 1.3 Guidelines and procedures

2. Operational and Institutional implementation of EIA

- 2.1 Coordination between responsible institutions
- 2.2 Screening, - methods and categories
- 2.3 Scoping
- 2.4 Basic requirements for EIA study
- 2.5 Public participation
- 2.6 Monitoring, enforcement and compliance

3. Proposed amendments to EIA system for compatibility with World Bank OP 4.01

1. Legal and administrative framework for EIA

1.1 Legal Provisions

The legal basis for the Belarus Environmental Impact Assessment (EIA) system is contained in the following laws: Law on Environmental Protection (1992, updated in 2002) (LEP); Law on State Ecological Expertise (new, approved 2001 law – update of 1993 version) (LSEE); and Law on sanitary insurance of the population (1993). In the LEP, there is a special chapter which presents the basic principles of the SEE (Chapter 8). Its scope is to evaluate the impacts of proposed economic or other human activities on the environment and health and the degree of ecological safety of proposed environmental protection measures. This is a mandatory procedure for all projects and is the closest analogue to the Western Laws mandating and determining the scope of an EIA. The construction of any objects without the approval of a State Ecological Expertise is prohibited.

According to Art 58 LEP and to Art.6 LSEE, all projects that might have an environmental impact must undergo an EIA. The law on sanitary insurance of the population stipulates the mandatory procedure of State sanitary-hygienic expertise for all projects and economic activities, land development projects, and development plans, in reference to the potential impact to human health.

1.2 Administrative framework

The Ministry of Environmental Protection and Natural Resources (MEPNR) is the competent authority for EIA and SEE, which is carried out through its special Inspection on Ecological Expertise. The "Inspection" has three divisions: (i) projects in land improvement and hydro technical infrastructure; (ii) water supply and sanitation and air protection projects; and (iii) industrial projects. Territorial Committees for environmental protection also have a unit on State Ecological Expertise. For the environmental assessment of complex and difficult projects, representatives from other state institutions, scientists, experts from universities, NGOs, etc., may be invited to join the SEE process (art 5, LSEE), otherwise only MEPNR evaluates the project.

1.3. Guidelines and procedures

The procedure for conducting State Ecological Expertise is contained in a special "Instruction On the Procedure of the State Ecological Expertise in the Republic of Belarus" (new 2001 version). The necessary guidelines for EIAs are stipulated in a special "Instruction on the Procedure of EIA of Planned Economic and Other Activities and a List of Projects and Activities Subject to a Mandatory EIA"(new 2001 version) in Belarus..

2. Operational and institutional implementation of EIA

2.1 Coordination between responsible authorities

The preliminary coordination of project documents and of EIA studies with other relevant institutions is required by LSEE. The procedure for this coordination is stipulated in the Instruction on SEE. Prior to the EIA of projects, it is necessary to obtain approval from the State sanitary-hygienic expertise and from local authorities.

2.2 Strategic Environment Assessment

According to Art 6 of LSEE amongst other types of projects mandatory for SEE, are “concepts, programs (including investment ones) and schemes of branch and territorial social and economic development; schemes of complex use and protection of nature resources;” i.e. Strategic Environmental Assessments (SEAs). However, there are no regulations or instructions regarding preparation of SEAs.

2.3 Screening - method and categories

The Belarus legislation does not contain any screening categories for projects.

2.4 Scoping

There are no legal provisions related to a scoping process in existing legislation. Scoping provides the Terms of Reference for an EIA Study, which should stipulate the procedure for evaluating impacts and indicate the impacts to be assessed.

2.5 Basic requirements for EIA studies

The requirements for EIAs are stipulated in a special "Instruction on the Procedure of EIA of Planned Economic and Other Activities and a List of Projects and Activities Subject to a Mandatory EIA" (2001). In accordance with these guidelines, EIAs should include the following:

- Names of organizations participating in the environmental impact assessment and formulation of EIA findings;
- Brief justification of the need for the project, the objectives and rationale of the project and references to the project background documents from earlier stages;
- Description of the interests of the population and opinions of individual groups taken into consideration in the process of developing the intended project;
- Justification of the location of the project/activity and discussion of selected and alternative sites;
- List of alternative options considered at the pre-project stage;
- Scope of EIA studies, references to the information sources used during the EIA process;
- List of environmental restrictions used in project decision-making;
- Description of EIA results;
- List of measures undertaken to reduce the negative environmental impact of the planned activity and protect the environment; and
- Programs to follow-up on the monitoring and an remediation of any negative environmental effects of the project;

EIAs are also require to collect and analyze information on:

- Methods of undertaking the activity including: the characteristics of proposed technical solutions with regard to construction, maintenance and decommissioning of the facility; input and energy sources; the required production infrastructure;
- Quantity and description of waste and emissions for different activities;

- State of the environment including characteristics of air, water and soils; climate, geological and other natural factors; description of flora, fauna, recreation and protected areas; other environmental characteristics;
- Social and economic characteristics of the region in which the project will be undertaken.
- Sources, types and generators of impacts; intensity and duration of impacts;
- Change in the state of the environment from the baseline resulting from the intended activity;
- Possible emergencies and their impact on the environment;
- Environmental and social impacts;
- Proposals made during public hearings;
- Ways to reduce (prevent) negative environmental and health impacts through the use of special, low waste technology and proper recycling and disposal of waste and measures to prevent emergency situations; and
- Alternative solutions for the implementation of the project and development of new options.

2.6 Public participation

According to Art 11 and 12 of the LSEE, accordingly, the SEE should take into consideration the decisions made by a public ecological expertise while a project proponent provides for the public involvement in the EIA. In support of these the government has passed two regulations relating to public consultation on ecological matters: (a) "Instruction On the Procedure of the State Ecological Expertise in the Republic of Belarus" (2001) and (b) Instruction on the Procedure of EIA of Planned Economic and Other Activities and a List of Projects and Activities Subject to a Mandatory EIA" (2001). Both contain mandatory provision to the public of information relating to the construction of environmentally hazardous facilities. If these are to be effective, however, the state will have to support more intensive use of the media by NGOs for dissemination of the material.

2.7 Monitoring, enforcement and compliance

Art. 9, LSEE stipulates that the MEPNR must control the SEE process. In cases where agencies implementing the SEE violate the requirements and ignore MEPNR directives, the Ministry has the right to stop any construction works or project implementation. Art.19, LSEE stipulates that initiators of planned economic and other activities can proceed with the implementation of a project only in case there is a positive conclusion of the state ecological expertise otherwise they bear responsibility in accordance with the legislation of the Republic of Belarus (Art.21, LSEE).

3.0 Amendments to the Belarus EIA system for compatibility with WB OP 4.01

The current analysis shows that there are many aspects of Belarus; EIA which could be improved. Table 1. provides the summary of recommendations~ including amendments, that could bring the Belarus EIA system into compliance with the WB procedures. Table 2 summarizes the comparison between Belarus EIA procedures and those of the World Bank.

Annex Table 1: Suggested Amendments to Belarus EIA System

#	Requirement	Suggested Action
1.	Formal provisions for SEA	Specific Regulation (Procedures need to be elaborated).
2.	Sectoral authority of EIA legislation or procedures	To be provided in the new EIA Law/Regulation (e.g. a Handbook).
3.	General and specific guidelines	Guidelines for EIA study for specific studies in major areas of National Economy need to be elaborated (see e.g. WB Guidelines, included in Pollution Abatement Handbook).
4.	Sector authority responsibilities	To be clarified and stipulated in the new EIA legal Act.
5.	Local government responsibilities	Stipulated in Art. 10 of LSEE.
6.	Role of other bodies	Stipulated in “Construction Norms of Belarus 1.03.02-96. Composition of and development/ clearance procedure for construction projects’ documentation”.
7.	Method of coordination with other planning bodies	Stipulated in “Construction Norms of Belarus 1.03.02-96. Composition of and development/ clearance procedure for construction projects’ documentation”.
8.	Screening categories	To stipulate the screening categories of projects.
9.	Screening method	To stipulate criteria for screening. To provide the list of category A projects.
10.	Scoping method	To be stipulated in the new EIA legal act.
11.	Content of EIA Report	To add: policy, legal and administrative framework; non-technical summary; records of public hearings; and environmental baseline data.
12.	Requirements for non-technical summary	To be added.
13.	Requirements for considering alternatives	To stipulate the necessity of technological alternatives and “zero alternative”.
14.	Requirement Environment Management Plan (EMP)	To be stipulated as in WB OP 4.01.
15.	Requirements for trans-boundary impacts	To be stipulated as in WB OP 4.01.
16.	Requirements for global impacts	To be stipulated as in WB OP 4.01.
17.	Method for review on content and substance of EA reports submitted	Comparison with TORs for EIA study – to be stipulated.
18.	Requirements for public participation	Stipulated in the new legal acts (LSEE, instruction “On the procedure of EIA”).
19.	Arrangements for access to EIA reports	To stipulate the availability of documents at all stages of the EIA process and to provide dissemination of information through mass-media.
20.	Expertise for conducting EIAs	International Panel for major EIA studies to be stipulated.

Annex Table 2: Summary of the Belarus EIA System and Comparison with World Bank

		Belarus EIA System	World Bank Procedures	Changes for Compatibility with WB
<i>EIA Legislation and Procedures</i>				
1	Enabling legislation for EIA	Law on Environmental Protection (LEP) 2002 Law on Sanitary Assurance of Population, (LSAP) 1993	OP 4.01 1999 <ul style="list-style-type: none"> EA is a process that is specific to each operation; both category A and B projects. Any report resulting from the process is an EA report. 	
2	Detailed legislation for EIA	Law on State Ecological Expertise (LSEE) 2001	BP/GP 4.01 1999	
3	Formal provisions for SEA	Art. 6 (LSEE) - stipulates the necessity of SEE of concepts, programs (including investment ones) and schemes of branch and territorial social and economic development, schemes of complex use and protection of nature resources and other documents.	Definitions of sectoral and regional EA are provided. Sectoral and/or regional EA is required when the project "is likely to have cumulative or regional impacts."	Need to elaborate on a new SEIA Regulation.
4	Local government EIA legislation or procedures	LSEE Art. 10	-	
5	Sectoral authority EIA legislation or procedures	LSAP Art. 10 21	-	To be added in the new Regulation/Law on EIA
6	General and specific guidelines	Instruction on the Procedure of EIA of Planned Economic and Other Activities and a List of Projects and Activities Subject to a Mandatory EIA (2001)	EA sourcebook and updates (1991-2000). Pollution Prevention and Abatement Handbook (1999).	Need to prepare both general and specific guidelines for different areas of EIA.
<i>Administration of EIA</i>				
7	Main administrative body for EIA	Ministry of Natural Resources and Environmental Protection (MNREP)	Regional Environmental Unit	
8	Competent authority for environmental acceptability	Specialized Inspection on State Ecological Expertise of the MNREP.	Director, Regional Environmental Unit	
9	Review body for EIA	Specialized Inspection on State Ecological	WB Regional environmental unit (BP)	

		Belarus EIA System	World Bank Procedures	Changes for Compatibility with WB
		Expertise of the MNREP.		
10	Sector authority responsibilities	Ministry of Health and Sanitary Expertise.	N/A	To be clarified and indicated in a new version of EIA Regulation/law.
11	Local Government responsibilities	Specified in the Law on State Ecological Expertise.	N/A	
12	Other bodies responsible for planning approval	None.	N/A	To be specified in the new document.
13	Method of coordination with other planning approval bodies	Specified in “Construction Norms of Belarus 1.03.02-96. Composition of and development/clearance procedure for construction projects’ documentation”. Preliminary approval by the Ministry of Health (Art. 10 of LSAP).	<ul style="list-style-type: none"> - Internally with environmental department anchor. - Externally with national environmental agencies and concerned ministries/entities - For risky projects Quality Assurance and Control Team (QACT) of the environmental anchor of WB. 	To stipulate the necessary procedures of coordination in the new EIA document.
14	Method of co-ordination with pollution control approval and regulation agencies	Specified in “Sanitary Norms and Rules” pertaining to environmental protection.	<ul style="list-style-type: none"> - Use of Pollution Prevention and Abatement Handbook available as guidance. - The EA may recommend alternative emission levels and approaches to pollution prevention and abatement of the project. Exceptions are rare. 	To be stipulated in a new EIA document.
<i>Stages of EIA Screening</i>				
15	Screening categories	None. Instruction on the Procedure of EIA contains a list of projects and activities subject to a mandatory EIA .	Screening categories: A, B, C and F1	To establish three screening categories as in WB Ops.
16	Screening method	None.	Individual screening for significance of impact, with illustrative lists (BP, GP) and on the basis of sourcebooks.	To elaborate on the lists of Category A and B projects, using WB approach.
<i>Scoping</i>				
17	Scoping method	None	Based on EA TORs for category A projects Approval of WB	To be stipulated in the new document, using WB OPS.

		Belarus EIA System	World Bank Procedures	Changes for Compatibility with WB
			EA TORs after scoping	
Content of EIA Study				
18	Content of EIA report	<ol style="list-style-type: none"> 1. Name and addresses of project owners 2. Necessity of the project 3. Interests of public or individual groups in developing of the project 4. Project location with alternatives 5. List of alternative options 6. Boundaries of conducted studies 7. List of ecological restrictions 8. Ecological and socio-economical estimation criteria 9. Description of EIA 10. List of mitigation measures for alternatives 11. Program for further control of safety of products and commodities 	<ul style="list-style-type: none"> - Executive summary - Policy, legal and administrative framework - Project description - Baseline data - Prediction and assessment of environmental impacts and mitigation - Analysis of alternatives - Environmental management plan - List of EIA report prepared - Record of consultations - References and supporting data (Annex B) 	To be added: <ul style="list-style-type: none"> - Non-technical summary, - Legal, administrative and institutional framework - Environment baseline data
19	Requirements for non-technical summary	None	Required	To be included in the EIA Content
20	Requirements for considering alternatives	Required (paragraphs 11.4, 11.5 of the Instruction on the Procedure of the EIA): Site alternatives Alternative options for the project Alternative mitigation measures	A policy requirement as EA evaluates the project's potential environmental risks and impacts in its area of influence, <u>examines project alternatives, etc.</u>	To provide "zero " and technological alternatives.
21	Requirements for environmental management plans	Paragraph 11.9 of the Instruction on the Procedure of the EIA requires mitigation measures.	Specifically required in the OP and also included as Annex C, OP strengthens and clarifies the role of the EMP by specifically listing EMP as a component of category A project EA reports, and citing EMP provisions related to the implementation of EAs.	To stipulate the necessity of EMP as in WB Ops.
22	Requirements for trans-boundary impacts	Art. 24 "International Agreements", LSEE	Compliance with all international treaties <u>Specified</u> . The Bank does not finance project activities that contravene country obligations under relevant international environmental	To be provided in the new EIA document.

		Belarus EIA System	World Bank Procedures	Changes for Compatibility with WB
			treaties and agreements.	
23	Requirements for global impacts	Art. 24 “International Agreements”, LSEE	Compliance with all international treaties <u>Specified</u> . The Bank does not finance project activities that contravene country obligations under relevant international environmental treaties and agreements.	To provide this aspect in the new document as in WB Ops.
	<i>Review, public participation and decision-making</i>			
24	Method for review of content and substance of EA reports submitted	Comparison with existing legal documents and scientific data	Comparison with TOR (BP) Consistent with TOR as specified in the guide for preparation and review of EA reports for MENA region.	Comparison with TOR for EIA study to be provided.
25	Requirements for public participation	<p>Art. 61 (LEP) stipulates that NGOs and individual citizens can initiate a public environmental review (ER)</p> <p>Art. 61 (LEP) mentions that findings of the public ER of projects can be presented to authorities in charge of the state ER, local governments and other related bodies and are of recommendatory nature.</p> <p>Art. 11(LSEE) materials from the public ER are to be considered while conducting a state ER;</p> <p>Art.12 (LSEE) stipulates that the proponent shares relevant information with interested individuals or NGOs and provides them with the opportunity to participate in the preparation of EIA. and discussion of materials on EIA.</p> <p>Ch. 4 (Instruction on the procedure of EIA) describes the procedure of public consultations.</p>	<ul style="list-style-type: none"> • For categories A and B projects the borrower consults with project-affected groups and local NGOs. • For category A projects, consultation occurs twice: <ul style="list-style-type: none"> - shortly after screening and before EA TORs are finalized (scoping) - once a draft EA report is prepared. 	
26	Arrangements for access to EIA reports	None	Disclosure: <u>Mandatory for A and B projects</u> . The borrower provides relevant materials in a form and	To stipulate in the new document the opportunity for the public to have access to

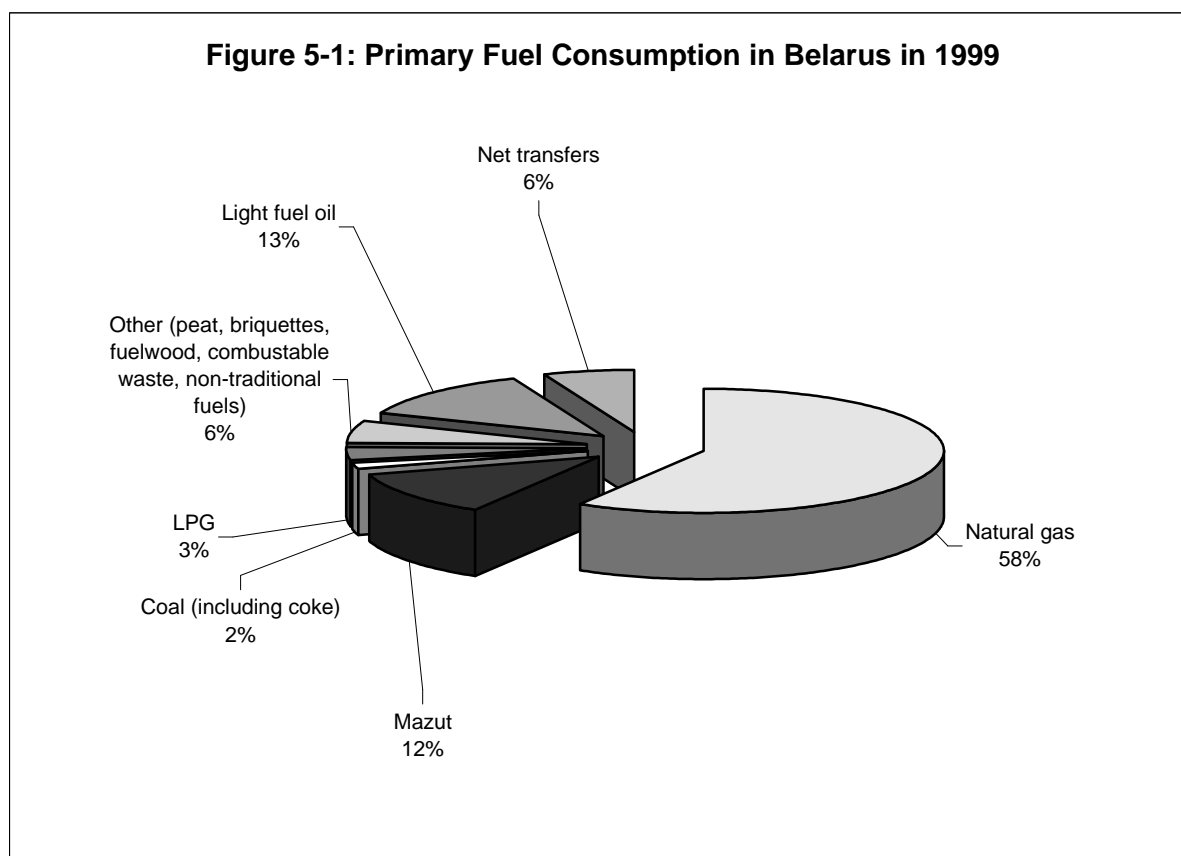
		Belarus EIA System	World Bank Procedures	Changes for Compatibility with WB
			<p><u>language</u> that are understandable.</p> <p>1) For Category A projects: <u>prior to project appraisal</u>:</p> <ul style="list-style-type: none"> • Same as OD • EA available at the Bank's Infoshop. <p>2) For category B projects financed by the International Development Association (IDA): <u>prior to appraisal</u>:</p> <ul style="list-style-type: none"> • Same as A. <p>3) For category B projects financed by IBRD for which a separate EA report is required (no time period given for the submission of EA report):</p> <ul style="list-style-type: none"> • EA report is available in a suitable public location in the borrowing country. • EA report is available at the Bank infoshop when received. <p>3) Guarantee operations:</p> <ul style="list-style-type: none"> • A or B reports must be submitted before the end of an appraisal. • For IBRD guarantee: A report at InfoShop 60 days before Board, B report 30 days. • For IDA guarantee: same as loans. <p>Borrower's permission to release the EA report is still required.</p>	EIA documents, project documents, and to make mandatory information dissemination of EIA results.
27	Decision-making authority	Ministry of Nature Resources and Environmental Protection for national projects and its territorial bodies for local projects.	Integrated with appraisal of project design and economic analysis (BP). Regional Environmental Unit	
28	Provisions for appeal	Art. 18 and 22 (LSEE) within one month at the Ministry, and then in the courts in the case	N/A	

		Belarus EIA System	World Bank Procedures	Changes for Compatibility with WB
		that the dispute is not yet solved.		
Monitoring				
29	Monitoring, Enforcement and Compliance	Art. 31(LEP). The project owner must control emissions and waste, and identify mitigation measures.		
30	Requirements for follow-up monitoring	Specialized Inspection on State Ecological Expertise of the MNREP controls the implementation of EIA requirements and has the right to stop the implementation of a project.		
EIA Capacity				
31	Expertise for conducting EIA by sector	Sector-specialized Research and Design Institutes.	Independent EA experts retained by proponent and independent international panel for major issues.	International panel of EIA experts in case of major projects.

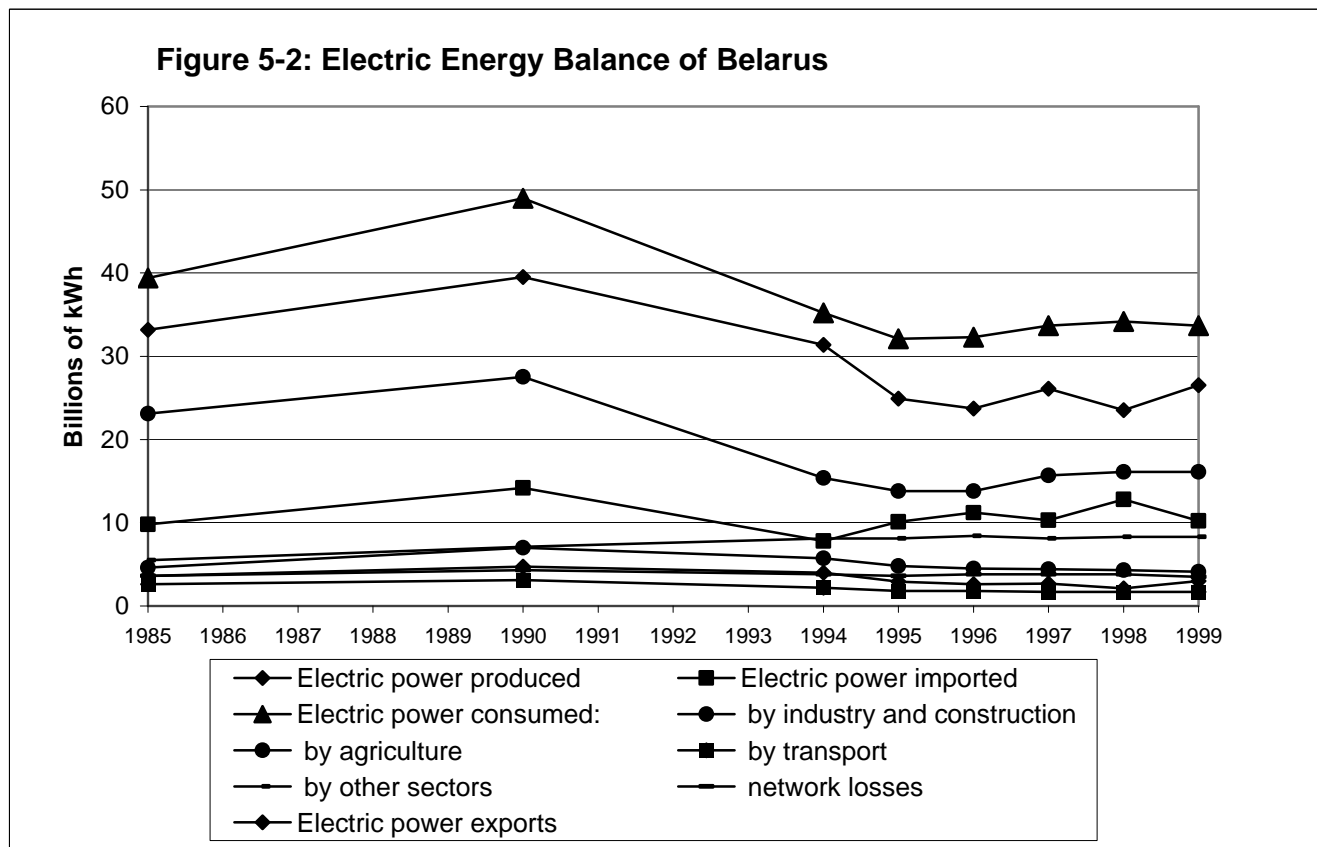
V. Environmental Aspects of Energy Efficiency in Belarus

A. Background and Regional Context

126. Energy use in Belarus is heavily based on gas, followed by petroleum products. Together the two accounted for 93 percent of total primary fuel consumption in 1999 (Figure 5-1). Trends in electric energy use can be seen in Figure 5-2, which show an upward trend from 1985 to 1990 and a sharp decline to 1996, after which there has been some stabilization in use and even a small increase. The declines since 1990 have been almost uniform in industry and construction, agriculture and transport (about 41 percent to 1999). Exports have also fallen over that period by 36 percent. In overall terms electric energy has declined by 32 percent between 1990 and 1999 and heat consumption by 36 percent, with both forms of energy showing some stabilization in use from 1995 to 1999.



127. With few indigenous energy resources, Belarus relies heavily upon its neighbors – mostly Russia and Lithuania – for natural gas, oil, and electricity. Two important export pipelines from Russia run through Belarus. The Northern branch of the Druzhba oil pipeline goes through Belarus on its way to the oil terminal in Ventspils, Latvia. The Northern Lights gas pipeline goes through Belarus to Poland.



128. About 99 percent of the gas, 90 percent of the oil, and 30 percent of the electricity consumed in Belarus are imported, mostly from Russia. The imports of electricity have the effect of reducing domestic environmental pollution, which is generated at power production sites abroad. The state concern “Belenergo”, the Belarusian energy utility and its six regional generation companies supply about 50 percent of heat and virtually all of the domestically produced electricity.

129. Belarus also buys significant amounts of electricity from Lithuania, although these imports have been unstable lately because of the huge debts accumulated over several years. In 1998, Lithuania supplied about 6,200 GWh of electricity out of the 34,200 GWh consumed in Belarus. In 1999, electricity imports from Lithuania fell to 2,000 GWh (in 2000 it was 700 GWh). Given the environmental pressures all over Europe to abandon nuclear energy, there is a possibility that the first unit of Ignalina nuclear power plant (the main source of electricity generation in Lithuania) will be shut down until 2005 and the second unit - until 2010. In that case, Belarus will have either to cover the shortage of electricity by engaging capacities of its own power plants (Lukoml, Bereza, Gomel) or by buying more electricity from the United Energy Systems of Russia. There are also interests in Belarus advocating the construction of its own nuclear power plant. All of these options will have implications for the future state of the environment in Belarus as well as in neighboring countries.

B. The Impact of Macroeconomic Developments on Energy-Related Emissions

130. Using as a point of reference some of the earlier studies (Belarus Environment Strategy Study of 1993 and the Belarus Energy Sector Review of 1995), it is worthwhile to discuss key linkages between the macroeconomic performance of Belarus and energy-related impacts on the environment. In particular, it is instructive to revisit the prediction of the Environment Strategy Study of 1993 that the sharp fall in the emissions observed in 1990 would continue until 2000 as a result of a deep structural transformation of the Belarusian economy, after which the level of energy consumption and emissions would start to grow again unless environmental standards were tightened.

131. The actual developments have included a drastic decline in overall economic output from 1990 to 1995, with the energy sector affected more than the economy as a whole. The energy component of GDP has decreased considerably since independence. At the same time, the past several years have seen less structural reform in Belarus than most observers anticipated. The network energy tariffs and fuel prices have not undergone any serious change and remain too low to motivate energy saving based on cost incentives. It is estimated that the prices paid by residential consumers for electricity currently cover less than 50 percent of the electric utility's operating costs. The ratio is similar for gas. For heat, this ratio is less than 19 percent, and it is about 11 percent for hot water (see Annex 5-1). Non-payments, mutual write-offs and barter deals are still common in energy transactions, with only 30-40 percent of the payments for heat and electricity carried out in cash. Cross-subsidies between various consumers of energy are massive¹.

132. In spite of the slow pace of energy pricing reform, it would not be fair to conclude that the Government has neglected energy efficiency goals. The long-term energy saving programs discussed below testify to the contrary. What is true, however, is that the Government of Belarus is treating energy rather like a public good and supporting energy efficiency objectives through top-down regulatory and public investment programs instead of giving consumers incentives to save energy and encouraging private sector participation in energy generation. Nevertheless, judging from the steady decline in the energy intensity of the Belarusian economy, it appears that the results of the Government's energy saving programs have been encouraging.

133. After reaching its lowest point in 1995, primary energy use in the economy has remained virtually unchanged over the past few years. At the same time, the economic recovery that started in 1996 has increased the level of GDP. Since 1996, Belarus' real GDP has been growing at an average annual rate of about 6 percent. The annual growth rate in 1997 reached 11 percent.²

¹ The average electricity tariff in Belarus is currently about 3.8 US cents per kWh. Industrial enterprises pay about 4.4 US cents and state budget enterprises except medical institutions pay about 3.6 US cents. In addition to medical institutions which belong to the Ministry of Health the population pays 1.5 US cents per kWh. It should be noted that the price of electricity grew faster than inflation in 2000 (the growth in nominal prices was 10-fold!). This means that, although starting from a very low base and with a cross-subsidy element still remaining, electricity prices have been steadily moving in the right direction.

² It should be kept in mind that making accurate estimates of Belarus' GDP and its growth rates has been quite difficult due to a large disparity between the official exchange rate and the "parallel" exchange rate governing transactions in a large part of the economy. The unification of the official and parallel exchange rates, which was a condition of the Bank for proceeding with any lending to Belarus, finally occurred in September 2000. The GDP growth rates cited here are based on the parallel exchange rate rather than the official one. These growth rates were used during the macroeconomic update done by a PREM team in November 2000.

As a result, the energy intensity of the economy has been on a decline, from 1.34 koe/US\$ in 1990 to 1.14 koe/US\$ in 1997 and 0.93 koe/US\$ in 1999. (Figures 5-3 and 5-4³, see also Box 2-2 in Chapter II).

134. Despite this decline, Belarus' current level of energy intensity of GDP is about four times higher than the average for OECD countries, three times the world average, and about 60 percent more than its Central European neighbors. As was seen in Box 2-2, however, it is lower than that of Latvia, Lithuania, Kazakhstan, Russia and Ukraine.

Figure 5-3: Belarus: GNP and Primary Energy Use

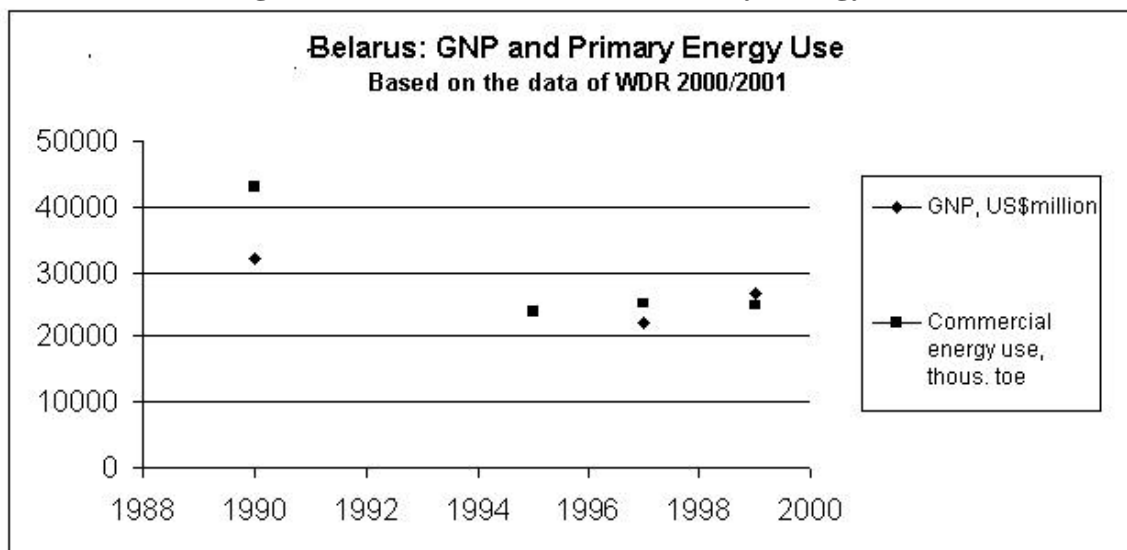
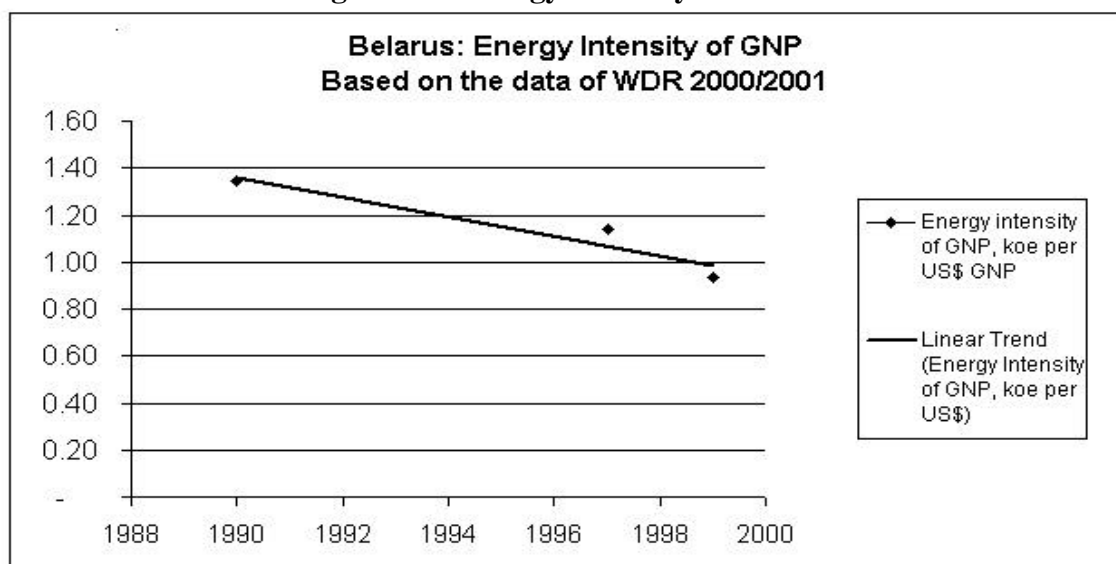


Figure 5-4: Energy Intensity of GNP



³ GNP data for Figures 5-3 and 5-4 were taken from the World Bank's World Development Report, 2000/2001. The income data used are based on the World Bank's atlas method rather than on the purchasing power parity (PPP) method.

135. The Environment Strategy Study of 1993 predicted that emissions into the atmosphere, including those from the energy sector, would decrease precipitously due to the impact of the macroeconomic adjustment. It is possible to say now that the forecast was mostly accurate, although the contribution of various internal and external factors was somewhat different.

136. Atmospheric emissions have declined sharply since the early 1990s, but this fall should rather be attributed to the (i) overall economic decline in 1990-1995⁴; (ii) the shift in Belenergo's fuel mix from heavy fuel oil (mazut) to natural gas; and (iii) the implementation of the energy efficiency and environmental management programs mandated by the Government of Belarus from 1995 onwards. (See Table 5-1). It is impossible, without further research, to make a quantitative assessment of the contribution of each of the above factors in reducing emissions.

137. While the environmental impact of the above-mentioned factors has been positive, the question remains whether these results can be seen as sustainable, secure or irreversible. The expectation of continued low emissions based on an economic decline would be neither realistic nor desirable. The permanent nature of the shift towards natural gas is also rather doubtful, since the current price offered to Belarus is obviously far below economic cost, as is the domestic price of gas within Russia itself. Moreover, the dependence on fuel supplies from Russia makes the economy vulnerable to exchange rate fluctuations.⁵ While the government-mandated energy saving programs have been rather effective so far and will continue to play their role, they cannot replace true market incentives.

Table 5-1: Concern Belenergo: Fuel Use for Electricity and Heat Production (percent)

	1990	1995	1996	1997	1998	1999	2000
Heavy Fuel Oil (Mazut)	59.1	32.7	29.0	16.2	17.0	13.7	8.3
Natural Gas	40.5	66.6	70.4	82.1	81.1	84.5	89.9
Associated Gas	0.4	0.7	0.6	1.7	1.9	1.8	1.8
Total:	100	100	100	100	100	100	100

Source: Concern Belenergo.

Russian Natural Gas Prices

138. As far as border prices are concerned, Belarus enjoys **the lowest price** among all Russia's natural gas buyers, being charged about **US\$33** per TCM (thousand cubic meters). For comparison, the average international price for export of 1,000 M³ of natural gas in August 2000 was **US\$98** (EEDB, December 6, 2000). At the consumer level, the benefits of the Russian border-price subsidy are mostly enjoyed by the residential sector, with industry in Belarus

⁴ In the sense that the decline was part of the adjustment process, the prediction of the 1993 study was on target.

⁵ This point has been vividly demonstrated by the recent macroeconomic developments in Belarus. Given the energy sector's critical importance in Belarus' economy, gas and oil importers were among the privileged few who had access to foreign currencies at the official exchange rate. About 65 percent of the surrendered foreign currency proceeds were used for energy imports. As a result, the energy sector is among the hardest hit by the depreciation of the Belarusian Ruble in the process of the devaluation of the official exchange rate. In the first seven months of 2000, for example, the energy import bill would have been BR 233 billion less had there been no devaluation of the official exchange rate ("The Social Consequences of Foreign Exchange Rate Unification In Belarus", Policy Note, ECSPE, October 2000).

(including the energy sector) paying around \$65/1000 M³. This latter price is not overly unreasonable considering Belarus' proximity to Russia, which makes the costs of transporting gas fairly low. Moreover, there is a strong expectation within the country that this price will increase. In discussions with the Belarusian and Russian participants of the thematic seminars, participants were told repeatedly that the price of gas from Russia will increase rapidly over the next 2-3 years. This is due to the fact that gas is becoming much less abundant within Russia itself as it re-orientes its gas strategy towards long-term exports to Western Europe. Domestic gas prices within Russia are also rising (the case for moving to world prices is now supported by the Russian Ministry of Energy, although the Federal Energy Commission (FEK) is still reluctant for social reasons to accept Gazprom's requests for rapid increases in natural gas prices).

139. The Belarusian Committee on Energy Efficiency is quite aware of these trends and is constantly in search of opportunities to develop domestic sources of energy. This explains the strong interest of Belarus in developing an environmentally acceptable technology for utilization of local fuels such as wood-waste and other biomass.

140. Although the consequences of the shift to gas have been positive for local air quality (inasmuch as more polluting fuels are displaced), the unusually low price of gas weakens overall incentives to conserve energy.

C. Energy Saving: Existing Programs and Options for the Future

The Energy Conservation Program for the years 1995 – 2000

141. Seeking to reduce its dependence on imported fuel and electricity, the Government of Belarus has placed high priority on the implementation of its energy conservation agenda. *The National Program for Energy Savings to Year 2000*, which was approved by the Cabinet of Ministers in June 1996, had the following key objectives:

- (i) identify energy-saving potential in Belarus and establish the most efficient ways of its realization;
- (ii) maximize utilization of local fuels and production waste to decrease fuel and energy imports;
- (iii) create conditions for reducing production costs and increasing product competitiveness;
- (iv) coordinate efforts and spending by all parties to promote more efficient utilization of fuel and energy; and
- (v) decrease fuel and energy consumption per unit of gross domestic product.

142. To enforce the energy conservation program, a ministry-like body, State Committee on Energy Efficiency, has been created with substantial political powers and budgetary resources. This is one of the pillars of the regulatory approach used in Belarus to enforce energy conservation. Energy conservation measures administered by the Committee are financed from several sources: (i) own sources of industrial enterprises; (ii) the Innovation Fund of the State Concern "Belenergo"; (iii) similar Innovation Funds established in other industrial sectors; (iv) national and local budgets; (v) World Bank funding under the Social Infrastructure Retrofitting Project; (vi) the special Fund for Energy Conservation. The latter fund is set up directly under the purview of the Committee. To support the fund, the energy generators are required to pay regular fees, and they are allowed to include corresponding surcharges in the tariffs. Fines for

non-compliance with national energy efficiency standards also contribute to the fund. The legislative base regulating the efficient use of energy includes a national law and 35 normative acts.

143. The other essential players are, of course, the power system company State Concern Belenergo and the Ministry of Municipal (Communal) Economy, which is the owner of numerous heat-only boilers supplying heat to the population. The Ministry of Economy, which is responsible for tariff policy formulation, is another essential player.

144. The program has been deemed effective by the Government (see Box 5-1), and a new phase of the program has been developed for the years 2001 – 2005. The quantitative claims of energy efficiency, however, could not be evaluated as no details were provided on the methods that were used to make the calculations.

145. The National energy saving program for the next five years aims at further reducing the energy intensity of GDP by 3 percent per year and increasing the share of local fuel in the country's fuel mix of primary energy consumption by another 2-3 percent in total by the end of 2005. The Government plans to meet about 4-5 percent of the estimated financing requirements for its new 5-year energy saving program with World Bank funds, which is feasible. The remainder of the needed investments in energy savings will be mobilized through budgetary allocations and revenues from surcharges on the prices of heat, electricity, and the products and services of other energy saving enterprises.

Box 5-1: The Energy Saving Program in Belarus

Under its *Year 2000 Energy Saving Program*, the Government of Belarus has undertaken significant investments to improve the supply and demand side of the district heating system. Between 1996 and 2000 US\$370 million was invested in energy saving activities focusing mainly on the installation of metering devices, design of new energy saving materials and technologies, rehabilitation of boilers, replacement of old heat boilers with more efficient ones.

The Government's own assessment is that energy saving activities between 1996 and 2000 resulted in (i) a 25 percent decline in the energy intensity of GDP; (ii) savings of 13 percent of overall energy consumption in 2000 alone; and (iii) a 0.7 percent increase in the share of local fuels in the fuel mix of primary energy consumption⁶ in the country, bringing this share to 18.3 percent. The basis for this assessment, however, was not available to the Bank and it is impossible to evaluate the claims without further research.

146. Applying command-and-control regulations such as the above to enforce energy conservation is a somewhat unusual approach from a Western point of view, but quite common also in other countries in FSU/Eastern Europe, for example Bulgaria, Romania. Nor is it the most efficient approach. Liberalization of energy prices could achieve more than a limited set of government-administered "economic incentives" (such as offering higher prices to certain types of energy--see below) and special budgetary funds. However, the Belarusian experience demonstrates that, at least to a certain extent, these government-administered incentives work.

⁶ Primary energy consumption includes consumption of coal, peat, wood, oil, gas and electricity (net imports).

147. In the new phase of the program, the State Committee on Energy Savings is moving towards a slightly greater use of price-based incentives. For example, it has championed the introduction of legal provisions to support non-traditional (renewable) sources by requiring that the utility (Belenergo) buy such electricity at a price two times higher than from conventional sources. The relations between the energy system and small non-traditional power producers are regulated by the Resolution of the Council of Ministers of the Republic of Belarus No.400 (April 24,1997) on the “Development of Small and Non-Traditional Power Engineering”, while price incentives are defined by the Resolution of the Ministry of Power Engineering No.45 of (May 25, 1997) on “Procedures for Setting Tariffs for Electricity Purchased from Small and Non-Traditional Power Engineering Units”. The applicability of the price provision to independent power producers (IPPs) of non-renewable energy is somewhat unclear, with the Energy Savings Committee claiming that all such sources are covered but Belenergo disagreeing.⁷ (See Box 5-2). Most importantly, the scheme is likely to have only a limited impact even if the Energy Savings Committee’s position is correct. This is because the present price of electricity is not high enough to provide adequate incentives for IPPs. In other words it is difficult to develop such sources for the same reason that investments in energy efficiency measures are not attractive – because of the low electricity tariffs and abundant cheap energy from Russia.

148. The goals of energy efficiency will also be better served by the government’s stated desire to eliminate cross subsidies in energy pricing. A Program to Eliminate Cross-Subsidies by 2004, developed by the Ministry of Economy, has recently been approved by the government and is awaiting approval by the President. This program could potentially be an important subject of dialogue with the Belarusian government regarding energy prices and the development of an enabling environment for renewable energy investments.

149. Another issue that has been raised with respect to the energy efficiency program is the scope for an increased use of biomass and its implications for the sustainable use of the country’s forest resources. A significant amount of wood in Belarus is presently wasted instead of being used for productive purposes such as combustion in boilers for heating. There are two principal obstacles to more effective use of wood waste. First, the infrastructure to bring the waste wood from logging sites to the market (e.g., to district heating boiler owners who could use it) is virtually non-existent. Second, the appropriate technology (e.g. modern boilers with automation and filters) for efficient and environmentally friendly utilization of wood waste is very rarely available in Belarus. The technology available from joint ventures (for example the JV “Comcont” with French suppliers) probably represents the best commercially available technology at this point, but environmental equipment such as filters to capture particulates is often lacking – especially, in the case of boilers with very small capacity (in the order of 0.25 MW). In old coal-fired boilers, a more basic switch to biomass is simply done by using firewood. Such boilers are rarely equipped with environmental equipment to reduce pollution.

⁷ Belenergo claims that the law does not oblige them to buy energy from these plants. More generally, Belenergo’s management has some reservations about the merits of the program to develop small IPPs, questioning its benefits and referring to capital shortages and implementation difficulties.

Box 5-2: The Role of IPPs in Electricity Generation in Belarus

The program to introduce independent power producers (IPPs) is called “The Program of Development of Electric Generation Capacity Based on Steam and Gas Turbines with the Creation of Small CHP Plants for the Years 2000 – 2005”. It was approved by the Council of Ministers by Decree No. 1232 on August 10, 2000. The plan is to develop a fairly large number of IPPs based on the existing stock of heat-only boilers larger than 10 GCal/hour with the preliminary target of 100-150 MW of new electric generation capacity outside the Belenergo system at a total cost of US\$40-50 million. This is a bold undertaking by the Belarusian Government whose resources are admittedly insufficient to finance the program in full. It necessitates cost-sharing with the enterprises whose boilers are converted into CHP plants and, potentially, with private investors.

From both economic and environmental perspectives, there are some potential benefits from the small CHP program, but estimating their magnitude would require further analysis. On the one hand, the environmental impact is likely to be limited given that the electricity displaced from Belenergo’s grid would also be mostly gas-fired. Besides, the electrical efficiency of small turbines is generally lower than that of larger ones. However, there are a few nuances that need to be taken into account. For example, it is important to observe that a significant portion of electricity produced by Belenergo is produced in large CHP plants operating in a condensing mode. In contrast, the small CHP plants tend to be designed to operate in a back-pressure mode (that is with utilization of waste heat from the steam turbine). Thus, they are generally more efficient than the marginal CHP plants on the Belarusian grid. It is these, much less efficient condensing plants on the grid that the new small CHPs would compete with. The economic efficiencies of the small CHP investments would result in some gas savings and associated environmental benefits. There are gas savings per kWh of output, which can justify an incremental investment in small CHPs, regardless of the level of electric tariffs. Second, it should be noted that the new CHPs are to be built on the basis of existing heat-only boilers. Thus, the steam turbine is the only real incremental investment cost. Third, the price of the steam turbines used in small CHPs is quite affordable in Belarus. In some cases, these turbines are available at a cost of around US\$140/kW.

This said, it is worth emphasizing that private investors would be much more likely to support the Belarusian IPP projects if the tariffs for electricity were substantially increased.

150. If, as has been the case in the past, emissions control equipment is largely unavailable for very small boilers, one way to address this technological barrier is to assist Belarus in developing its capacity to produce (or import) the required technology. The other option is to orient Belarus towards choosing somewhat larger boilers (i.e., boilers, for which particulate control equipment is commercially available) to convert to fuelwood. Many central district heating boilers at the *rayon* level are equipped with relatively large-sized boilers.

151. As far as the quantity of fuelwood and wood waste is concerned, there seems to be plenty available for utilization without harming the environment. Belarusian government sources (Strategy of Energy Sector Development until 2015⁸ and the Energy Saving Program developed by the State Committee on Energy Conservation⁹) provide the following information:

⁸ Main Directions of Energy Policy of the Republic of Belarus for 2001-2005 and until 2015. Approved by Resolution No. 1667 of the Cabinet of Ministers on 27-Oct-01.

⁹ The Republican Energy Saving Program for 2001-2005 (draft), Minsk, 2000. State Committee on Energy Conservation and Supervision.

"In Belarus, centralized collection of firewood and waste from wood processing is implemented by the enterprises of the Committee on Forestry and by the State Concern "Bellesbumprom" The maximum firewood utilization potential for Belarus can be calculated on the basis of the natural growth rate of wood. This is estimated to be 25 million m³ or 6.6 million t.u.t. per year (if the whole amount of growth is burned)¹⁰. Of this, 20 thousand M³ or 5.3 thousand t.u.t is in the contaminated areas of Gomel oblast. To utilize the wood from such areas, it is necessary to develop and introduce technologies and equipment for gasification and parallel deactivation. Considering that the production of timber is targeted to be doubled by 2015, and in light of a program to utilize wood wastes for heat energy production, the planned amount of firewood may reach 1.9 - 2 million t.u.t. per year by 2015¹¹".

152. Thus, the main impediments to the successful and sustainable use of wood biomass for energy in the country appear to be the adoption of the appropriate technology rather than the availability of the required fuel. Some of these technology issues are examined in Chapter VII.

The Role of State Enterprise "Belenergo" in Energy Conservation and Environmental Protection

153. Belenergo abides by the *State Strategy of Energy Development for the Years 2001 – 2005 and Until 2015*, which also has provisions for energy conservation and environmental protection measures. The priorities described by Belenergo management emphasize the need for replacement of the capital stock of its CHP plants, some of which are operating far beyond their economic life. One particular investment option, which would have some environmental benefits due to increased plant efficiency, is the installation of gas turbines in the existing CHP plants currently operating with steam turbines only. The combined-cycle CHP would have a higher efficiency resulting in lower emissions per unit of energy produced. The possibility of providing the resources of IBRD for this investment option should be considered. Among other ideas for energy efficiency, Belenergo is advocating *turbodetander* equipment, which is based on the principle of utilizing the kinetic energy from natural gas traveling through pipelines to produce electricity. Available Belarusian calculations show a quick economic payback on such "fuels" energy investments. Concerning the environmental investments *per se*, Belenergo is interested in reducing its NO_x emissions by introducing low-NO_x burner technology.

The Role of the Ministry of Housing and Communal Services (MHCS) in Energy Savings

154. MHCS has its own energy saving investment program. The weak point in this program (according to Belenergo) is that a large quantity of foreign heat metering equipment has been procured without long-term technical support contracts. As a result, the readings from these heat meters, when called into question, cannot be verified or asserted by the supplier of the meters. For their part, the local certification authorities have problems in reconciling the readings with the Belarusian state standard system and so the utility ends up charging based on norms instead of metered data.

155. The technical opportunities for further energy efficiency improvements are abundant. On the supply side, the systems of Belenergo and the MHCS are both in need of fundamental

¹⁰ T.u.t., or a ton of fuel equivalent, has a heat value of 7 Gcal (29.3 GJ). Please note that t.u.t is not equal to a ton of oil equivalent, a unit widely used in international literature.

¹¹ In the State Committee's program, the numbers are about 1.0-1.1 million tons of t.u.t. available now and 1.6 million by 2005.

overhaul to reduce losses and increase efficiency. On the demand side, the Bank's Social Infrastructure Project (managed by ECSIE) aims to increase energy efficiency in public buildings such as schools and hospitals (see Box 5-3 below). The industry and the housing stock provide plenty of room for similar improvements on a larger scale, but this is not part of this project's scope.

The District Heat System

156. The CHP plants and large HOBs of Belenergo provide for 50 percent of the heat consumption in the country. Belenergo's current fuel mix is about 90 percent natural gas and only 8 percent mazut. Boilers of the MHCS provide for 35 percent of the heat consumption. Individual boilers in schools, hospitals, and enterprises satisfy the remaining share of consumption. The fuel mix for the heat generating boilers is 60 percent gas, 32 percent mazut and the remainder is split among fuel wood, brown coal, wood chips, and peat.

Box 5-3: The Bank Social Infrastructure Retrofitting Project

The Bank's Social Infrastructure Retrofitting Project, to be financed with a US\$22.6 million loan, was approved by the Board on June 5, 2001. Its major objective is to increase energy efficiency in public buildings seen by the Government as having a high social value – specifically, schools and hospitals. The project will retrofit approximately 480 buildings by implementing the following measures: (i) full thermostatic reconstruction of 16 facilities (building envelope and selected technical infrastructure); (ii) reconstruction of windows in 30 facilities; (iii) reconstruction and insulation of roofs in 20 facilities; (iv) renovation of lighting in 320 facilities; (v) automation of heat consumption for 350 objects; (vi) reconstruction of 110 boilers with the installation of modern gas-fired or renewable energy units; and (vii) reconstruction of 29 district heating networks. The project is not designed to deal directly with energy sector reform, but it is expected to contribute to it indirectly by demonstrating the benefits of energy efficiency to a wide range of stakeholders. The demonstration effect would be achieved, by utilizing up-to-date methods and equipment and by reviewing and potentially reversing outdated energy planning approaches responsible for existing overcapacities.

157. Currently, the border line between Belenergo and MHCS lies at the entry of the primary network pipe into the group heating substation¹² (group or block substation usually serving several multi-apartment blocks) or at the entry of the network pipe into the building if there is no group substation.

158. The primary and secondary district heat networks are in very poor condition, with total losses typically about 30 percent. MHCS is pursuing a program of gradual replacement of the network pipes with modern pre-insulated pipes available through joint ventures with German and other European companies. The investment is proceeding slowly due to financial constraints.

159. MHCS has been pursuing energy efficiency investments aiming to start with heat generation plants, group substations and secondary networks, ultimately targeting also the housing stock. Some improvements have already been made to the heat-only boiler plants (bringing their thermal efficiencies to 85-90 percent) and to some of the group substations, where automatic control systems have been introduced. The pipes in the secondary network, which carry hot water from the central substation to buildings, are being gradually replaced with imported pre-insulated pipe. The pace of replacement is rather slow due to low availability of

¹² Belenergo is interested in transferring the ownership of the primary network, together with the responsibility for reducing the losses from it, to MHCS by moving the ownership border line to the point where the heat leaves the generation plant.

funding for these investments. Finally, investments in the housing stock have started but are proceeding at a very slow pace. Not all the buildings in Minsk have heat meters at the building level, and billing based on normative consumption is widely used.

160. As compared with the approach pursued, say in Vilnius, Lithuania, the DH utility is not planning massive replacements of group substations with building-level substations (BLS). Instead, MHCS is taking a gradualist approach in this regard, installing BLS in newly constructed buildings while retrofitting the old group substations. Both MHCS and Belenergo recognize that a network based on BLS is more energy efficient, but give several reasons for not pursuing the replacement of group substations with BLS more aggressively: (i) the general dislike of the idea of an abrupt and probably irreversible reconfiguration of the network system; (ii) physical impossibility to install a BLS in some buildings; (iii) the significant recent investment made in retrofitting the group substations; and (iv) lack of financial resources for a large-scale substation replacement program. Giving control of heat to the consumer is viewed favorably by MHCS, but the elimination of the group substations is not seen as a necessary element in this regard.

D. Global Emissions

161. A steady increase in the share of natural gas over the past ten years has led to a very favorable fuel mix in the Belarusian energy sector with respect to emissions of CO₂ and other greenhouse gases (GHG). The impact of this shift on GHG emissions was comparable to that of the economic contraction of 1990 – 1995. As a result, the emissions of CO₂ dropped from 94 million tons in 1990 to about 60 million tons in 1996¹³ and have remained roughly at that level since. Further reduction of GHG emissions is possible if the prices of all network fuels (including natural gas) can be increased to levels better reflecting the economic cost of supply of these fuels to the Belarusian energy system. Apart from this, the technical possibilities for further GHG emission reductions can be readily identified:

- Replacement of the outdated power and heat generation capacities with modern and more efficient technology (notably, installation of gas turbines to enable the operation of Belenergo's CHP plants in a combined-cycle mode);
- Rehabilitation of district heating networks, including both the transmission (primary) and distribution (secondary) networks;
- Gradual reconfiguration of the networks with the introduction of building-level heat-exchanger substations allowing control of heat at the consumer level;
- Introduction of heat-metering equipment for the entire housing stock in cities at the building-level;
- Gradual introduction of consumer control equipment (such as thermostatic valves and heat meters) at the apartment level;
- Energy efficiency improvements for the housing stock (such as better insulation of buildings, installation of energy-efficient windows, etc.);
- Introduction of local gas-fired boilers in areas where heat demand is presently covered by more carbon-intensive fuels.

¹³ World Development Report 2000/2001.

- Introduction of small CHP plants at the sites of existing heat-only boiler plants.
- Possible opportunities in other sub-sectors of the economy, e.g., industry, which need to be identified.
- Gradual introduction of renewable energy technology such as biomass (notably, the utilization of wood waste for district heating) and small hydro-electric generation plants.

162. With respect to biomass energy and developing the country's capacity to utilize it, the UNDP is currently assisting Belarus through a GEF-financed project development facility (PDF-B). This should result in a proposal for the GEF to support bankable projects to utilize local fuels such as wood biomass in several municipalities of Belarus. Similarly, the Bank is considering using GEF resources for a pilot project associated with the Social Infrastructure Retrofitting Project (see Box 5-3). Under the project, the best internationally available equipment would be used.

Special Status of Belarus in Relation to UNFCCC

163. While Belarus has been included in Annex 1 of the UNFCCC along with other transition economies, it ratified the UNFCCC only recently (in April 2000). The country remains behind the process required for Annex 1 countries and currently has a "non-Annex 1 country profile" with respect to some of the key elements of the UNFCCC process. Due to delays with the ratification of the UNFCCC, Belarus has not been included in Annex B of the Kyoto Protocol and has no set target for greenhouse gas emission reductions. The process of implementing a national inventory of GHG emissions and preparing a National Communication to the UNFCCC (the first for Belarus) is also lagging behind.

164. Although Belarus remains an Annex 1 country of the UNFCCC, the above-mentioned circumstances make its position in the UNFCCC process rather peculiar. This has provided the rationale for the Bank's proposal for the GEF to support an Enabling Activity for Belarus.¹⁴ For further discussion of the Kyoto Protocol and its implications for Belarus see Chapter IX.

E. Conclusions

165. Belarus was an energy intensive economy when it was part of the Soviet Union, with most of its primary supplies coming from Russia and Lithuania. That remains the case today, although the energy intensity has been declining as a result of the change in the structure of production – away from heavy industry and towards services - and in response to active energy efficiency measures taken by the government. In 1999, energy use per dollar of GDP was 44 percent lower than in 1990. Emissions of air pollutants also declined at the same time as a direct consequence of the economic downturn after 1990 and also as a result of the increased use of natural gas. The government has made some genuine efforts at increased energy efficiency and invested about \$370 million in energy saving activities between 1996 and 2000. On its own assessment about 25 percent of the decline in energy intensity can be attributed to these measures. This review was unable, however, to evaluate the role of the program relative to that of the shift to gas and the change in the structure of production. In any event, as a result of all

¹⁴ Enabling Activities are a form of GEF support typically provided to non-Annex 1 countries in conducting national inventories of GHG emissions and preparing National Communications to the UNFCCC.

these measures, energy intensity in Belarus is now lower than in the Baltic states of Latvia and Lithuania, but it is still around four times the average for OECD countries.

166. Further improvements in energy efficiency are planned by the government through investment in energy saving programs, increased use of renewable energy and greater sourcing of electricity from independent power producers (IPPs). The investment program includes replacement of capital stock in the CHP plants, introduction of new heat metering equipment, and replacement of sections of the heat networks that are in a poor state. No large scale replacement of group substations is planned. A growth in the use of wood biomass is expected, which will require the adoption of cleaner technology than is currently used for this source to prevent increased environmental problems. Special technologies will also be needed if use is to be made of the radioactive wood from areas affected by Chernobyl.

167. The Mission believes that many of these measures are economically and technically viable and should be undertaken. **It strongly believes, however, that the adoption of these measures will be enhanced by energy price reforms, which will, in and of themselves provide direct further increases in energy efficiency.** At the present time, investment in renewable energy is not attractive because of the low electricity prices. As the economy becomes more responsive to price signals in general, the role of energy prices in conservation will become increasingly important. The government is both aware of the need for these changes and of the fact that energy price increases will be imposed on the economy as the price at which it imports natural gas from Russia rises. To this end, it will be obliged to raise domestic energy prices and eliminate cross subsidies. The Bank can establish an important dialogue with the government in this area.

168. There may also be some scope for generating revenues for energy efficiency from one or other of the Climate Change convention's 'flexibility mechanisms', which provide for financial transfers to parties undertaking reductions in carbon emissions. The success of such a policy will depend on negotiations between the government and the convention.

ANNEX 5-1

Prices For Communal Services (Electricity, Heat, Hot Water, Sewage, Rent, Gas)¹⁵

1. One of the measures that the Government will need to take in conjunction with the recent unification of exchange rates is to increase the tariffs for housing and communal services in order to have better cost coverage for household utilities. In recent years, there have been several efforts aimed at achieving better cost recoveries for these services through the elimination of cross-subsidies. In 1998, for example, the rapid tariff increases in water and sewage provisions led to full cost coverage in these two services. Better cost recoveries were also achieved for rent and electricity as a result of tariff adjustments.
2. Since then, however, tariff increases generally lagged behind overall consumer prices, let alone the less-controlled producer prices. (See Table V-A1). As a result, the overall level of cost recovery deteriorated sharply in the course of 1999 from 55 to 23 percent. This trend continued in the first few months of 2000. In May 2000, household payments covered just 4.9 percent of the costs of hot water provision, 8.7 percent of heating, and 9.5 percent of rent. Continued tariff adjustments throughout the summer, combined with lower energy consumption during this time of the year, saw some improvement in the cost coverage of household utilities, but the average recovery rate is still lower than 20 percent.
3. The exact extent of the cost increases due to the depreciation of the official exchange rate will depend on the energy content of each communal service, as well as the Government's policies towards enterprise cross-subsidies. So far, the several-fold tariff increases have not created significant stress for the population on the whole, mainly because they are still extremely low.¹⁶
4. At the same time, about one in ten Belarusian families currently receive subsidies for the use of communal services. These subsidies represent between 3 to 6 percent of total communal service charges. Although the poorest 20 percent of the population receives roughly the same amount of communal service subsidies as the richest 20 percent, the subsidies help to pay for a bigger proportion of service payments for the lower income families than the others.¹⁷ These social transfers, though poorly targeted, will continue to be relied upon as a buffer to future tariff increases.

¹⁵ Excerpt from: The Social Consequences of Foreign Exchange Rate Unification In Belarus: Policy Note, ECSPE, October 2000.

¹⁶ Despite the low utility payment burden, 20 percent of Belarusian families failed timely payment for housing and communal services.

¹⁷ Families in the third quintile of the income spectrum receive the most rent and utility subsidies, while those in the lowest and the highest, the least.

Table V-A1
Tariffs and Cost Coverage for Households
1998 – 2000

	Unit Tariff, Belarusian Rubles				
	1-Jan-98	1-Jan-99	1-Jan-00	1-May-00	1-Aug-00
Rent	1.2	1.5	2.2	3.7	6.0
Heating	4.9	4.9	10.3	14.2	30.8
Water	0.6	4.2	10.7	15.7	19.4
Sewage	0.6	3.8	8.4	12.3	15.2
Hot water	14.6	14.6	19.7	68.6	148.4
Gas	10.2	17.1	35.2	48.3	78.4
Electricity	0.5	0.9	1.4	3.6	7.2
	Cost Coverage (percent)				
	1-Jan-98	1-Jan-99	1-Jan-00	1-May-00	1-Aug-00
Rent	31.1	35.2	10.8	9.5	15.4
Heating	45.3	38.8	13.8	8.7	18.9
Water	22.1	100.0	44.2	38.4	47.6
Sewage	28.6	100.0	49.1	41.0	50.9
Hot water	25.4	21.8	7.8	4.9	10.7
Gas	62.1	41.5	21.9	29.3	47.7
Electricity	44.9	48.3	14.7	24.7	49.3

Source: Ministry of Statistics and Analysis

VI. The State of the Water Supply and Sanitation Sector

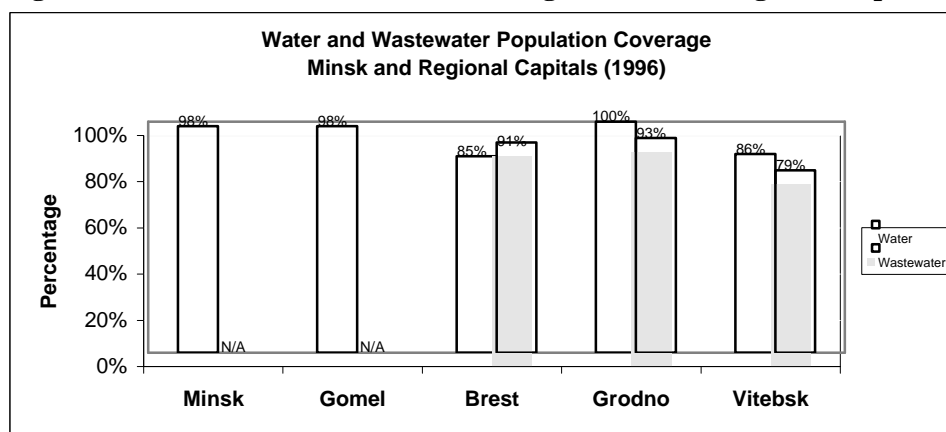
A. Main Issues and Constraints

Water Supply and Sanitation Service Coverage

169. A lack of reliable data makes it difficult to present a precise assessment of water and wastewater service levels and quality. In urban areas and small towns, the percentage of the population served by piped water supply is relatively high compared with the indicators for other countries with similar levels of per capita income. Around 98 percent of all households in Minsk are connected to the water supply system, about the same level as in primary cities. The piped water supply service drops to as low as 85 percent in secondary cities and considerably more in rural areas, where a large percentage of the population is not served with piped systems but relies on open wells, in most cases unprotected from pollution sources (see Chapter III).

170. The wastewater network in Minsk serves about 98 percent of the population. For the other regional capitals, the percent of wastewater collection coverage varies between 79 and 93 percent. Annexes 1 to 3 present a description of wastewater treatment facilities for the main regional capitals, a sample of small towns, and the City of Minsk. Many of the treatment facilities face substantial operational difficulties. The rural population relies on on-site solutions, primarily latrines and drain fields. Figure 6-1 summarizes the data on coverage.

Figure 6-1: Water and Wastewater Coverage Minsk and Regional Capitals



Safety and Reliability of Water Supply Services

171. Despite the high coverage of water supply in urban areas, the poor state of repair of facilities, lack of adequate maintenance and insufficient resources available for operations make the reliability and safety of the service a major concern and source of discontent for the population, even in large cities. Household surveys conducted in Minsk and Gomel indicate that inadequate drinking water is considered to be the most important environmental problem for 30 percent and 41 percent of the population respectively.

172. The reliability and safety of water services is unsatisfactory by many accounts. Inadequacy of service may be divided in two categories: reliability – service interruptions and low pressure – and water quality – color, taste, odor, and chemical/bacteriological contamination.

Household surveys to evaluate water and wastewater services in Minsk, Gomel, Brest, Grodno, and Vitebsk were undertaken in 1998. The results of these surveys are consistent in demonstrating the inadequacy and deterioration of services particularly in smaller towns. Figure 6-2 shows the average number of hours per day supplied to the population in each of the above cities. Figure 6-3 shows customer satisfaction with various aspects of water service quality (water quality, hours of supply, water pressure). The enormous losses in the system prompt the water utilities to reduce pressure in the evening hours (and in some cities during the day) to save on energy costs. The quality of service worsens in summer, when only 8 percent and 12 percent of the population receive water every day of the month in Minsk and Gomel respectively. Data on the above indicators is limited for other cities outside those covered by the household surveys. However, given the low level of financial resources and maintenance of infrastructure, correspondingly low levels of quality of service and safety of water would be expected. It is estimated that close to 44 percent of the urban population nationwide does not have a 24 hour continuous supply of water.

Figure 6-2: Average number of hours per day of supply

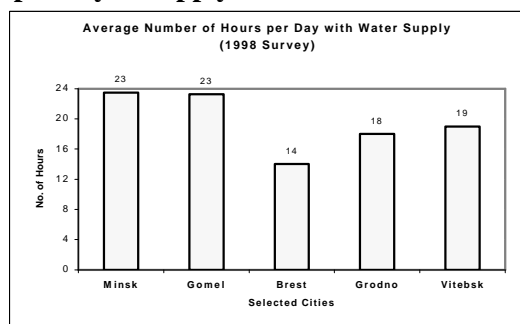
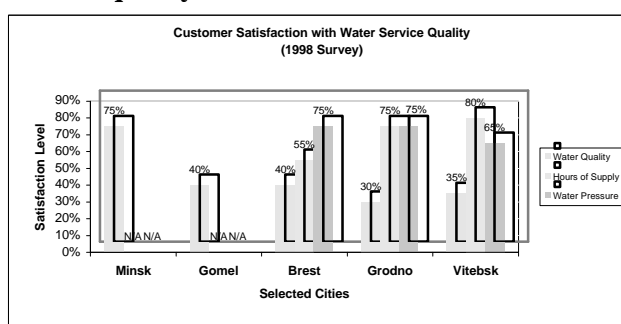


Figure 6-3: Customer's satisfaction with water service quality



173. Unsatisfactory quality of water is a major source of complaints and concern (see Figure 6-3). The information collected by the Sanitary and Epidemiological Service confirms this perception. For urban areas in 1999 (see Figure 6-4), 5 to 9 percent of the samples failed to meet bacteriological standards, while 9 to 72 percent failed chemical standards. For the centralized piped system, 7.4 percent of the samples taken failed bacteriological tests. For rural areas, the situation is worse. The great majority of the rural population (about 90 percent or 2.8 million) is served by open wells prone to contamination. In 1999, 34 to 51 percent of the samples collected by the Service failed to meet bacteriological standards and 33 to 64 percent failed chemical standards (see Figure 6-5). Further data are also provided in Chapter III of this report.

Consumer Coping Strategies and Impacts on the Poor

174. Despite the worsening indicators in drinking water quality, in recent years the number of cases of water-related diseases such as dysentery and typhoid fever have generally diminished (see Annex 4). This may be related to the coping strategies taken by the population to improve the quality of drinking water. The household surveys in Minsk and Gomel indicate that 60 and 80 percent respectively of the population boil their water. In addition, 20 percent and 14 percent purchase bottled water in these cities. Figure 6-6 illustrates coping strategies in these two cities. As these cities have the highest quality of water supply services in urban areas, it is expected that the percentages of the population implementing costly coping strategies in other cities would be even higher.

Figure 6-4: Water Samples Not Meeting Standards In Urban Areas

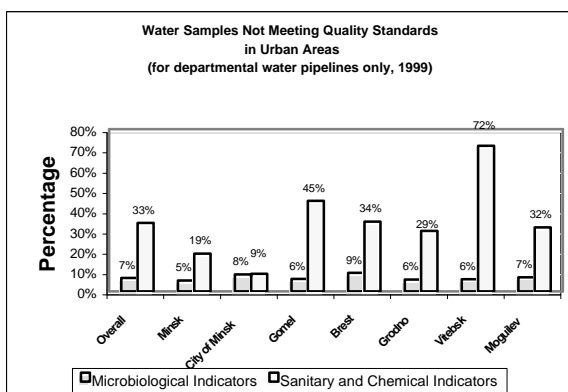


Figure 6-5: Water Samples Not Meeting Standards In Rural Areas

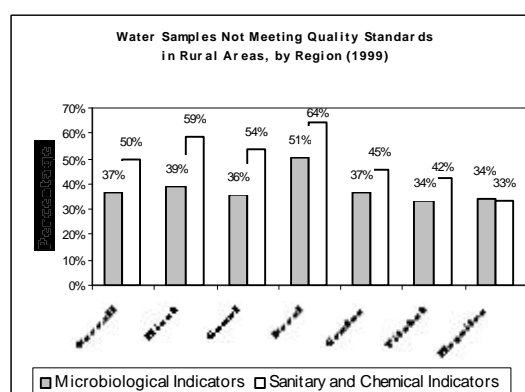


Figure 6-6: Coping Strategies for Water Quality

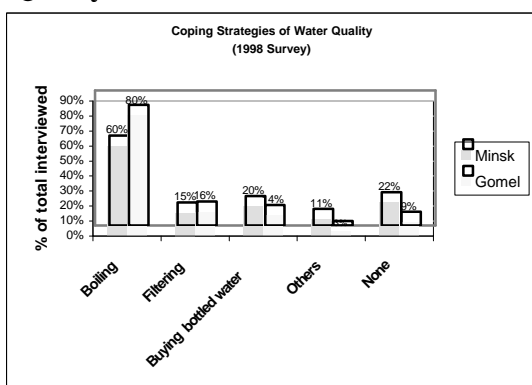
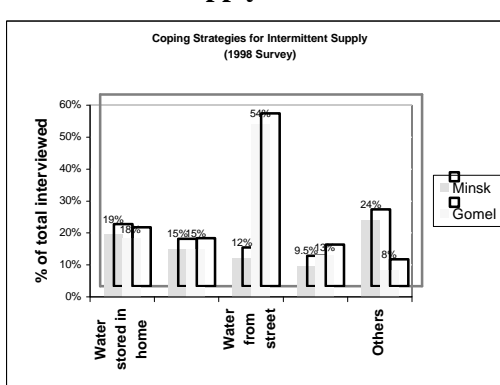


Figure 6-7: Coping Strategies for Intermittent Supply



175. The population also has to cope with the intermittent service of water supply. The household surveys indicate that 54 percent of households in Gomel have to supplement their supply with water from street taps. In Minsk 19 percent of the population store water in bathtubs and other containers, while 18 percent do so in Gomel. Figure 6-7 shows the different types of coping strategies used by residents of Minsk and Gomel to deal with intermittent water supply.

176. Although the household surveys did not differentiate their results based on family income, it is expected that households of varying incomes experience different levels of unreliability and respond in a variety of ways. For example, households with higher incomes and higher levels of education are more active in searching for safe solutions to their water supply problems than those with relatively lower levels of income and education. Households headed by women have greater difficulty in coping and appear to expend more labor than capital in doing so. Lower income households either spend a significantly higher percentage of their income on coping strategies than wealthier families or suffer more from the consequences of poor water quality.

Physical Condition of Water and Wastewater Systems and Technical Efficiency of Operations

177. The water supply and wastewater infrastructure stock in urban areas of Belarus is extensive. The coverage in urban areas is very high when compared to other countries with similar income levels, not only in water but also in wastewater. The current conditions of the system in the largest cities of Minsk and Gomel are much better than those in smaller towns. The technical studies prepared for proposed World Bank and EBRD-financed projects provide an assessment of the state of repair in 1998 of the systems serving Minsk and the regional capitals of Belarus. Table 6-1 illustrates the problems with the physical condition of the regional centers of Brest, Grodno and Vitebsk.

178. While no systematic assessment of the state of repair of the existing water and wastewater systems in small towns and rural areas has been conducted, the inspection of several systems and discussions with the managers of these systems during the preparation of this report indicate that much of the infrastructure has not received any major rehabilitation in the last decade, and therefore is in dire need of replacement and repair. The primary reason for the poor state of water and wastewater systems in small towns and rural areas is insufficient maintenance, repair and timely rehabilitation. In facing these very difficult conditions, the staff involved in the water and wastewater sector are doing a commendable job in keeping systems operational and are doing their best to deliver water to their customers. Given the lack of funds and the state of repair of the sector's assets, service quality will continue to deteriorate. Repair of the most critical components of existing systems, followed by a prolonged phase of enhanced maintenance and rehabilitation, is one of the highest priorities that needs to be addressed.

Table 6-1: General Condition of Water and Wastewater Systems in Smaller Regional Centers

Component	Brest	Grodno	Vitebsk
Groundwater well pumps	Poor	Poor	Poor
Condition of water treatment plant	Acceptable	Good	Poor
Distribution network, percent of pipes in bad condition	80 percent	30 percent	50 percent
Wastewater collectors percent in bad condition	14 percent	12 percent	44 percent
Pumping stations – mechanical equipment in bad condition	35 percent	75 percent	90 percent
Condition of wastewater treatment plant	Bad to reasonable	Reasonable	Bad
Environmental quality of receiving waters	Reasonable	Reasonable	Reasonable

179. Despite a lack of reliable data for many operational aspects of water and wastewater systems in Belarus, there are some indicators and anecdotal evidence that suggest very high inefficiencies that make the operation of the system extraordinarily expensive. Examples of inefficiencies in the system include:

- **High water consumption and wastage by consumers:** Although metering at the individual household level is very limited even in the largest cities in Belarus, calculated average water consumption shows that production levels are very high. For example, Minsk has a total production of water equivalent to 435 liter per capita per day (lpcd) of which residential consumption is about 302 lpcd. Brest, Grodno, and

Vitebsk have estimated residential consumption rates of 200-230 lpcd despite average service levels of less than 24 hours a day. These values are much higher than water consumption levels in most Western European countries, where water utilities generally provide 130-200 liters per capita per day or less with 24 hours of service.

- **Excessive leakage from aging and deteriorating piping systems particularly in small towns:** The estimated, specific water loss in the distribution networks of Minsk and Gomel is about 46 and 44 m³/km/day respectively, which is at least 5 times higher than expected from a well-maintained system. Losses in smaller cities with older and less maintained distribution systems are expected to be even higher. For example, data on the distribution network of Brest, Grodno and Vitebsk indicate that 30 to 80 percent of pipes are in bad condition. This is directly linked to the low levels of maintenance and replacement, which in recent years have been less than 0.1 percent of the total network, compared to renewal rates of 0.5 to 1 percent in Western European systems.
- **Hydraulic inefficiencies in the conveyance of water through the transmission and distribution system:** Poorly designed pipe networks with improper sizing of pipes, unclosed loops, improper pressure zoning, direct pumping into the system, system occlusions and bottlenecks, faulty valves, and insufficient storage capacity.
- **Significant operational problems in wastewater collection networks, especially in small towns:** Counter slopes, poor construction works, bad joints, blockages or corrosion, poor condition and efficiency of wastewater pumps, and worn out valves.
- **High energy inefficiency:** Although much progress has been achieved in this area, particularly in larger cities, current estimates of additional savings that could be obtained in energy consumption through well-targeted investments (linked to reductions in water wastage and improved operational efficiency in the water and wastewater system) vary between 30 to 50 percent. This has a very high impact on the operational costs of vodokanals (see Figures 6-8 and 6-9), where energy costs are as high as 54 percent of total operational costs.
- **Highly staffed water companies:** Vodokanals are generally overstaffed with levels that range in smaller towns between 400 and 500 consumers for every staff member, which is about 3 times higher than in Western systems. However, due to low wages, the proportion of total operating costs is less than 13 percent.

Sector Organization, Legal Framework and Governance Relationships

180. In general, vodokanals serving the urban areas are communal enterprises, defined as independent economic entities with the same rights as any profit-making legal entity. These vodokanals are subordinate to the municipalities, who authorize the City Executive Committee (CEC) as the responsible entity for all communal property. The CEC in turn acts through the City Public Utilities Department (PUD), which manages all municipal enterprises in the city, including the vodokanals.

Figure 6-8

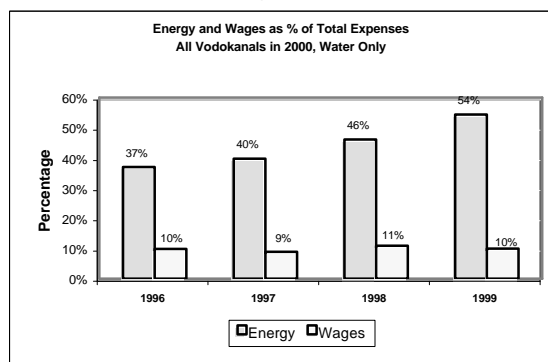
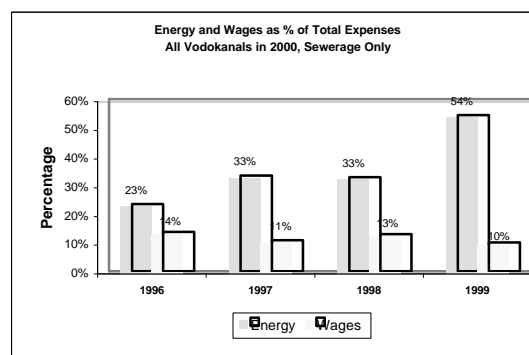


Figure 6-9



181. The vodokanals are regulated by a large number of organizations at the republican (national), regional (oblast) and local (city) levels. At the national level, the **Ministry of Housing and Municipal Economy (MHME)** is the line ministry charged with the coordination and formulation of national policies on water supply and, in some cases, the financing of investment although the oblast and city governments remain the major source of investment funding for vodokanals. All major capital investment projects are approved by the technical staff of MHME.

182. In the spring of 1999, a new institution was created under the MHME called the **State Concern Belvodokanal**, which is targeted to become the main policy body for vodokanals and the coordinator of tariff policies, standardization, technological development, training and international cooperation.

183. Other ministries are of importance to the vodokanals' operation, such as the Ministry of Natural Resources and Environmental Protection, which defines the norms for extraction of raw water and the discharge of wastewater, together with related taxes. The Ministry of Health is responsible for ensuring compliance with drinking water quality standards; while the Ministry of Finance sets the requirements for financial accounting and reporting. The Price Committee under the Ministry of Economy approves all changes in tariffs for residential consumers and is one of the most important actors with respect to the financial performance of the vodokanal. The State Committee on Taxes and the State Committee on Power Savings and Energy Supervision are also important government agencies that have role to play in ensuring the efficient operation of the vodokanals.

184. At the oblast level, the Department of Public Utilities is responsible for Oblast investments in public utilities, and the Oblast Committee for Natural Resources and Environment is in charge of the approval of new water intakes. In general, the oblast affiliates of the national ministries are in charge of controlling the performance of vodokanals at the local level. In the financial area, the oblast is concerned with the financing of major investments, tariff setting for non-residential customers, and environmental control (taxes and fines).

185. At the city level, the CEC holds most of the essential power regarding the vodokanals, including the appointment of a director, approval of operational plans and investment budget, and financing a portion of vodokanal investments. The vodokanals are directly subordinated to

the PUD in the CEC. The PUD is responsible for the coordination and control of vodokanal activities that have extensive reporting obligations to the PUD.

186. The vodokanals are defined as independent, self-financing organizations in charge of all operations, maintenance, implementation of investments, billing, collection, and customer services in their areas of service. As described above, the vodokanals are strictly controlled by both the MHME and the PUDs at the local level, a dual subordination that sometimes creates confusion and conflicts. The institutional capacity and productivity of these vodokanals are very limited particularly in smaller towns and are characterized by the following challenges:

- Vodokanals are predominantly technical/engineering-oriented organizations emphasizing production with insufficient attention to maintenance and efficiency in operations. The current reality of lack of capital funds from the central budget is forcing vodokanals to take creative action under very difficult circumstance to ensure that systems remain operational.
- Vodokanals are for the most part highly staffed, with low individual productivity, and support many non-core activities from construction divisions to social services to bottled water companies. Apart from the high level of staffing, salaries are very low. As long as levels of pay stay at present, low levels, overstaffing is more a management than a financial issue.
- The skill mix of vodokanals is primarily concentrated on engineering, with insufficient personnel in areas such as planning and financial and commercial management. The latter are generally considered little more than accounting departments for tax purposes.
- Management systems at vodokanals do not provide reliable information for effective planning and control. The reliance on planned values rather than actual information (both technical and financial) makes it difficult for management to effectively exert control and plan for the future.

Financial Situation of the Water and Sanitation Sector

187. A standard feature of the socialist system was that water and sanitation services were provided to residential customers at very low prices and the government, which controlled a very large share of the national income, provided subsidies in various forms to suppliers (either as direct transfers or through higher tariffs for industries and budget organizations). The government also paid for most capital improvements. With the transition to a market economy, the expectation was that households would have more income and would have to pay more for utility services. Now that the government is no longer able to provide the subsidies of the past (there are very few transfers for capital improvements and payment of water fees by government entities is very low), the sector is in the midst of an unprecedented financial crisis. The financial situation of the rural water supply sector is much worse than the urban sector since the mechanisms for collection of water fees are inadequate and there is low willingness to pay. The main reasons for the financial crisis in the urban water supply and sanitation sector are:

188. **Low collection of water and wastewater bills:** This is one of the most urgent and alarming problems behind the financial crisis of vodokanals as repeatedly indicated by all vodokanal managers. Even for the Minsk vodokanal, the enterprise with the best financial situation at the national level, revenue collection is low. Lack of collection results in very high

levels of both accounts receivable and debts to suppliers, as shown in Figure 6-10 for the Minsk vodokanal. The water supply companies are able to continue operation by increasing their payables to their suppliers and to the energy company. Total receivables include an accumulation of previous years' receivables, as the enterprises are reluctant to write off old debts.

189. Extremely low collection of revenues in cash: Even more alarming than the poor collection ratio is the fact that all water supply and wastewater enterprises receive a very small portion of their revenues in cash. Again, the level of cash collection depends on the type of customer. The residential and commercial sectors pay a higher share of their water fees in cash than other customers that pay mostly in non-cash form (offsets and in a small portion, goods). Figure 6-11 presents the division of cash and non-cash collection for the Minsk vodokanal. The situation in smaller cities is even worse. The low cash generation of the vodokanals makes them financially insolvent and it is not surprising that they have difficulties paying suppliers, or in some cases the salary of their workers.

190. Insufficient tariffs for maintenance and replacement costs: In the past, operating and maintenance costs for water and wastewater systems were paid for primarily by industrial enterprises, budget organizations and subsidies from government. Financing of capital investments was the responsibility of the state. Residential consumers paid only nominal fees for these services as part of their housing rent. In principle, tariffs are calculated to cover operation, maintenance and depreciation costs (see Figures 6-12 and 6-13). However, even if all revenues were fully collected, there are several cost items that are not included or significantly undervalued in the tariff calculation. The procedure used for calculating tariffs has severe flaws in the way "profits" are assigned, and costs are calculated on past records, which use outdated or inappropriate norms rather than current needs. One key component that is not included in the tariff calculation is an adequate provision for unrecoverable debts as expenses. Vodokanals keep debt in book accounts as receivable for several years even if the likelihood of recovering such debts is poor. Tariffs are therefore insufficient to provide the necessary collection of revenues to cover all expenses. A second key issue in tariff calculation is the use of a low rate of depreciation, which is linked to the inappropriate valuation of assets.

191. Lack of consideration of local cost when setting residential tariffs at the national level: The tariffs for residential consumers are set by the Ministry of Economy (MOE) calculated at the lower of two values: (i) the targeted cost-recovery level set by the government for all vodokanals; and (ii) the period assessment by the MOE of the residential consumers' ability to pay. The vodokanals provide their data on operational costs (with the limitations described above on adequate maintenance and other expenses), so that the Ministry of Housing and Municipal Economy can then calculate the average cost for all public utilities and jointly with the Ministry of Economy define the level of cost recovery. This level was 50 percent in 1998 and it was supposed to reach 100 percent but progress has been very slow (see Figure 6-14). The second value used in the calculation of the residential tariff is the population's ability to pay estimated by the Ministry of Economy based on the input from the Ministry of Statistics. The issue of affordability is commonly raised as the main reason to delay tariff increases. As the tariffs are set at the national level, there is no consideration of the local cost structure of each vodokanal nor of the actual ability of the population to pay. The operational costs vary substantially across cities as illustrated in Figure 6-15.

Figure 6-10

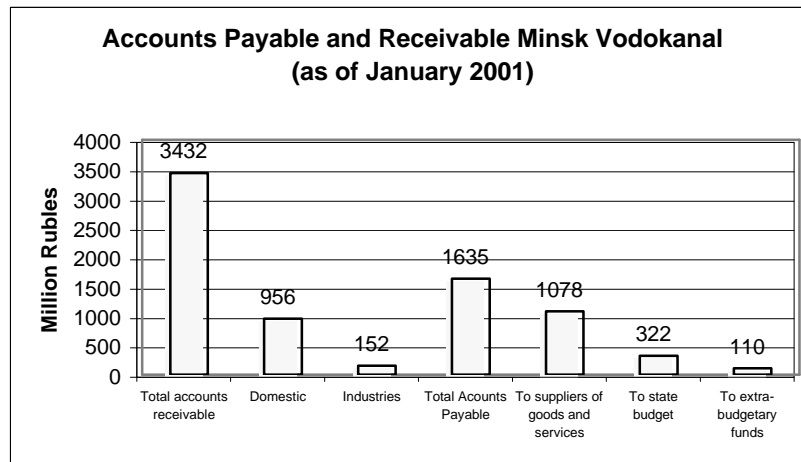
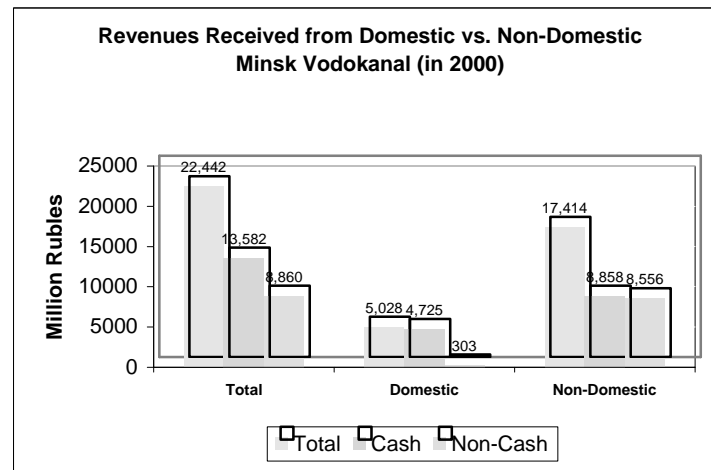


Figure 6-11



192. **Very high cross-subsidies for residential consumers from other categories of consumers:** One legacy of the socialist system that has not yet been changed in the water supply and sanitation sector in Belarus is the high level of cross-subsidy between categories of customers. Most countries in Central Europe have already abandoned across-the-board price subsidies because of the very high burden that they place on the budget and on industries, their inability to properly target those most in need, and the wasteful consumption practices that they promote among households because of the low price of water. Although the 1999 budget planned to substitute cross-subsidization for a direct subsidy from the newly established Special Budgetary Fund, this has been insufficient and the cross-subsidy practice has continued. Non-residential tariffs are calculated by the vodokanals on a monthly basis and submitted to the CEC and the PUD for approval. Figure 6-14 illustrates how, despite consuming a minor portion of the total volume of water, non-residential customers provide the large majority of revenues to the Minsk vodokanal.

Figure 6-12

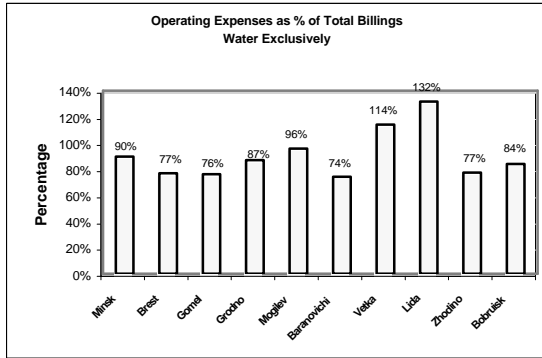


Figure 6-13

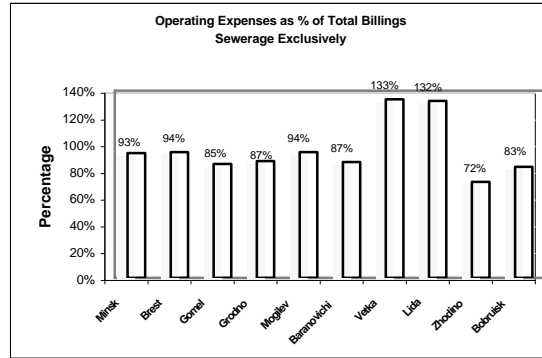


Figure 6-14

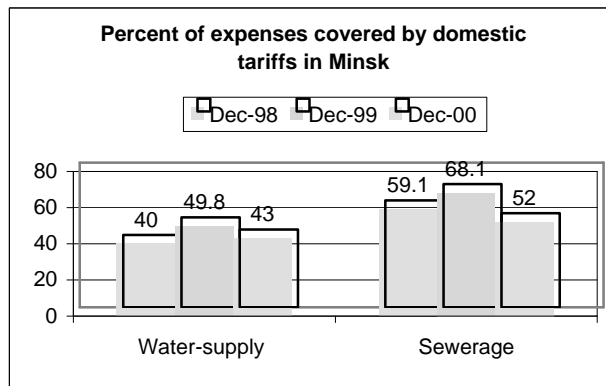
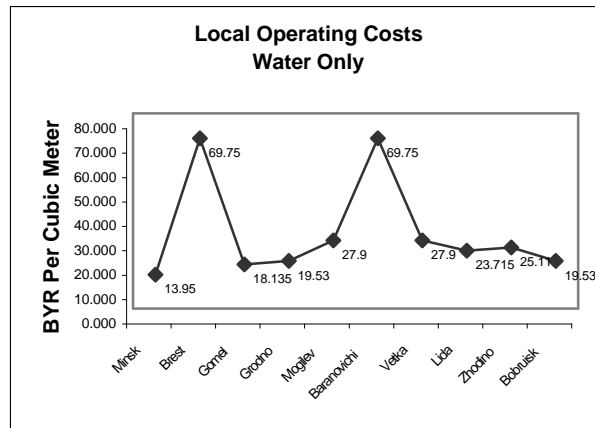


Figure 6-15

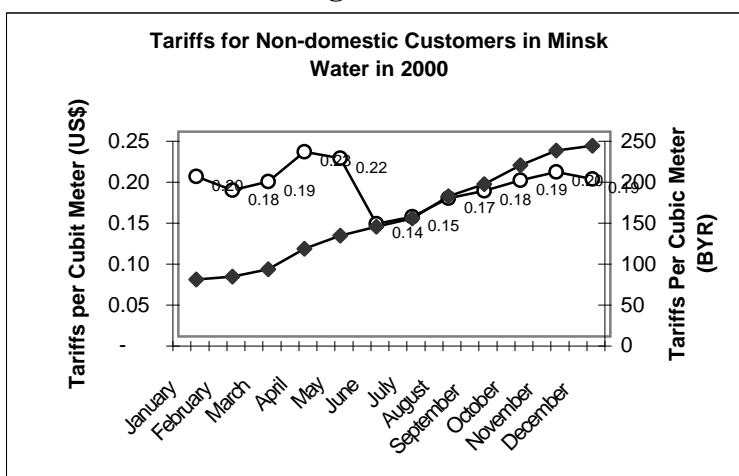


193. **Delays in tariff adjustment in a highly inflationary environment:** Since 1998, non-residential tariffs have been indexed against inflation, but only for energy costs. Although this is the largest component of the cost structure, the vodokanals face losses against internal inflation. In addition, the tariff increase approvals are usually delayed, which in a highly inflationary environment translates into substantial losses for the vodokanals. Finally, arrears to the vodokanals are not indexed against inflation, so the incentives for timely payment of arrears by

debtors to the vodokanals are minimal as the value of past debts erodes quickly. Figure 6-16 shows changes in non-residential water tariffs for Minsk on a monthly basis. The situation is reflective of the difficulties faced by other utilities.

194. **Billing of residential consumption based on norms rather than metering:** Although the large cities have high coverage of block meters, the coverage of individual meters is very low. The practice of group metering has resulted in billing the population for extremely high water consumption, in many cases far exceeding even Minsk's very high consumption norm of 300 lpcd. As a result, norms are still used intensively. However, wastage is dramatically reduced in households with individual meters. For example, in Gomel, where the consumption norm is 7 m³/month/person, block meters indicate an average consumption of 9-10 m³/ month/person. Households with individual meters, however, only consume 3-4 m³/month/person, a level that is more than adequate for their needs.

Figure 6-16



195. Lack of metering is one of the causes for high wastage of water, as consumers are charged the same amount regardless of their actual consumption. The high consumption norms per capita have additional negative effects: (i) over design of distribution networks, pumping capacity and treatment installations to accommodate the theoretical demand; (ii) no incentive to meter residential consumers, as in many cases the actual consumption is much lower than the norm resulting in lost revenues; (iii) billing based on per capita norms requires detailed housing occupation databases that need more frequent updating than norms based on fixed infrastructure and housing; and (iv) general reluctance of the population to pay for the high level of consumption they are charged, particularly in areas with low levels of service.

196. **Deficiencies in subsidies to the residential population:** Residential consumers receive three types of subsidies in Belarus: (i) across-the board household subsidies (funded through cross-subsidies); (ii) price discounts for certain households (such as WWII veterans and invalids); and (iii) no disconnection of non-paying residential customers. The design of each of these subsidies and their application in reality results in low targeting and protection to the truly poor and, at the same time, weakens significantly the financial position of all vodokanals.

197. The across-the-board household subsidy financed through cross-subsidies from industrial, commercial and budget organization customers was explained earlier in this section. This subsidy weakens the vodokanals, as the low collection from the subsidizing segment of customers forces the water company to absorb the burden. Additionally, this subsidy does not distinguish among poor and non-poor segments of the population. As the non-poor segments of the population have better access to the service, and in general consume higher volumes than the poor, the share of the subsidy they receive is higher.

198. The use of merit-based utility price discounts is a legacy from the former Soviet Union. The purpose of many of these privileges was not to reduce poverty but to reward service in certain occupations and categories of citizens. The targeting of this type of subsidy is very limited and it leaves large portions of those who are genuinely poor outside the system.

199. Finally, the utility is in effect providing a subsidy by allowing residential customers to continue receiving water and wastewater services despite non payment. This subsidy is not specifically targeted at the poor, and anecdotal evidence indicates that collections from the poorer segments of the population are higher than from those who are not as poor. The impact of the policy of non disconnection on the financial position of water and wastewater utilities is extremely detrimental, leading to the decapitalization of the companies, and reducing the reliability of service to all consumers. Additionally, water and wastewater utilities pass on this subsidy mainly to the energy company that cannot disconnect them for non-payment. In the long run, the budget and consumers will also pay a high price for the rehabilitation of run-down utilities.

200. **Inadequate accounting, financial management and commercial systems:** Water and wastewater enterprises face a number of deficiencies in their accounting, financial management and commercial systems that directly affect their financial viability. The most important problems are:

- Accounting is still seen by all water and wastewater companies as a tax-driven exercise rather than a tool for management. There are several distortions that present the water companies as profitable enterprises, while if an adjustment is made to account for doubtful receivables (bad debts) they would be highly unprofitable. In many cases, the book revenue of vodokanals is done on an accrual basis, while their accounting of expenditures is done based on actual payments rather than on an accrual basis.
- There are no systems to evaluate the age of accounts receivable, as customer payments received are allocated partially to accounts receivable and the rest to current bills. The valuation of accounts receivable is therefore very difficult.
- As accounts are organized to permit close government control over enterprise expenditures and assure full payment of taxes, all expenditures are rigidly defined to avoid any unforeseen reduction in profit and hence taxes.
- Management information is limited and there is no computerized information system. All recording is done manually, with little or no emphasis on standardized formats.
- Fixed asset records are generally incomplete, there are few fixed asset registries, and adequate valuation based on physical evaluation of assets and updated information is

lacking. These deficiencies translate in inadequate provisions for depreciation and lack of information for planning of rehabilitation and maintenance.

B. Strategy for Sector Reform and Strengthening

201. The preceding assessment shows a sector moving rapidly towards levels of deterioration that, if not reversed, will result in an ever decreasing quality of services and eventual collapse of the existing water and wastewater systems, with serious consequences for the well-being of the population of Belarus. This deterioration is progressing at a faster pace in small towns and rural areas, where fewer financial resources are available for maintenance of the system. The provision of adequate, reliable, and safe services will require investments in the following areas:

- replacing and rehabilitating existing plants and networks to prevent premature collapse;
- establishing rural water supply systems that are affordable for the population and easy to operate and maintain;
- increasing the efficiency of plant and network operations to reduce future operating costs, particularly in energy efficiency;
- strengthening of institutions and building of capacity in two areas: (i) to improve the productivity of utility management, administration and operations, and commercial performance; and (ii) to facilitate the organization of rural community groups that take care of the operation, financing and maintenance of their local systems;
- expanding water supply and wastewater services to those people presently unserved once the safety of drinking water provided to the population is improved with the measures above; and
- expanding waste water treatment coverage.

202. It is difficult to estimate with any degree of accuracy the magnitude of the investments that may be needed to provide a level of water services close to that found in Western Europe. Furthermore, it is clear that such investments are neither affordable nor justified in the present economic climate. The clear advantage of Belarus is that the coverage of the systems and the stock of water supply and wastewater infrastructure is very large. Therefore, investments are needed to rehabilitate rather than construct new systems. However, the level of investment needed is also linked to the urgency of the actions required. If the current practice of very little maintenance continues, the cost of rehabilitation will increase significantly and the systems will need reconstruction rather than rehabilitation. The pace at which progress towards better water supply and wastewater services is achieved will depend largely on the ability of Belarus to:

- ***Increase resource mobilization from all sources:*** Given that government budgets will not be able to contribute significantly, the only realistic source of financing will be higher payments by consumers augmented by resources provided by public and private lenders and grant contributions particularly for rural areas.
- ***Ensure the most cost effective use of resources:*** In urban areas by improving the productivity of the vodokanals and concentrating scarce resources on the most cost effective and highest priority investment opportunities. In rural areas by ensuring that communities are in charge of making the decisions on the effective use of their resources.

203. The only way to respond to this challenge is through an urgent paradigm shift in the sector. The management of the water supply and wastewater sector has not yet completely changed from its legacy of inefficiencies and huge state subsidies that provided services to the people without consideration for their needs and preferences. The state subsidies are no longer affordable and the resources needed to adequately maintain and operate systems properly are no longer available. The sector agencies believe that insufficient availability of financial resources is the only constraint for future development. However important, it is by no means the only one. In addition, the source of these financial resources cannot continue to be exclusively the central government and industry. Most political authorities at all levels and the sector community fail to acknowledge the seriousness of the crisis and harbor unrealistic expectations. There is still a wide belief that the crisis is temporary and can be solved within the old system of sector management. The old system of sector management cannot be a blueprint for the future, as its very basis, the subsidy based entitlement system is no longer affordable nor desirable. A new paradigm of sector management is needed to overcome the present systemic shortcomings in sector, policy and practices. A new set of principles such as local control, management responsibility and accountability, productivity and efficiency, capacity building, and consumer involvement and responsibility need to be introduced to first arrest decline and then to rescue the sector from collapse and put it onto a development path towards sustainability. Sector reform and capacity building are essential. Investment assistance without reform content provides temporary solutions that do not bring sustainable results, misuse scarce resources and only further postpone reforms.

204. Immediate action is required on several fronts under a clear strategy based on a vision of where the water supply and sanitation sector should be at present. This vision should be shared by all stakeholders and the government should take the initiative to air publicly the serious issues facing the sector and the steps that must be taken to address them. In searching for a way to overcome the present crisis in the sector, international best practice may serve as a guide. There are certain general elements that are common to successful water and wastewater enterprises worldwide and there are some basic policy and institutional elements needed to support the development of the sector. The achievement of the water and sanitation sector vision will require the implementation of four key reforms: (i) an Institutional and Governance Reform; (ii) a Financial Reform; (iii) a Technical Reform; and (iii) a Service Reform. These four reforms are closely interrelated and each has specific challenges that will be developed in detail in the rest of this document. Based on best international practice, while taking into account the present physical, economic, and social conditions of Belarus, Table 6-2 summarizes for each reform measure, the key challenges of sector reform and strengthening.

Institutional and Governance Reform

205. International evidence indicates that there are three key elements to achieving effective and efficient management of the water and sanitation sector: (i) a clear division of functional responsibilities between levels of government, the private sector, and other stakeholders; (ii) clear accountability that encompasses both regulation by central government and incentives for responsiveness to local constituents; and (iii) revenue sources corresponding to functional responsibilities. Ideally, on the one hand, government, both national and local, would set the policies and provide the legal, regulatory, and in some cases financial support under which the service is to be delivered to consumers. Ideally, on the other hand, service providers would manage and operate water supply and sanitation services in the most cost-effective way. Given

the specific geographical and technical situation in Belarus, there are three distinctly different segments:

- Rural areas: this is the segment of the sector that requires the most substantial institutional change to cover the void left by the former system that has disappeared. The rural communities of less than 10,000 persons need water supply systems that are simple to operate and maintain and require a demand-responsive approach where communities make informed choices regarding their participation, service level, and service delivery mechanisms. The communities would own, manage and help to finance their facilities, with the government facilitating the process by encouraging stakeholder participation, setting policies and standards, and co-financing facilities.
- Small Regional Capitals and Small Urban Areas: communities with populations larger than 10,000 and water and wastewater systems that require professional management and operation. The recommended institutional and governance setting would require restructured vodokanals, with responsibilities decentralized to the lowest appropriate level for managing the systems efficiently, and the introduction of more ownership and involvement of the communities served. As some of the vodokanals will not have the capacity to support a full-fledged water supply and wastewater operation with their own laboratory, engineering staff, planning and commercial system, and specialized equipment, the government would need to facilitate the provision of these services under contract to either centralized support service units at a regional level or to local private providers.
- Minsk and Large Regional Capitals: these cities have water and wastewater systems serving large populations that require organizations with advanced management structures and truly autonomous utilities. In many countries of the world, and more recently in Eastern Europe and NIS countries, utilities serving large cities have found that the involvement of the private sector can bring substantial benefits rapidly and provide additional sources of financing. However, this requires a process of reform to prepare these utilities, reform which is needed even if the private sector does not participate in the provision of the water and wastewater services. The recommended institutional reform for these cities would start with a corporatization process and a transformation of these utilities into joint stock companies. The main goal of these reforms would be to transform these utilities into truly independent self-reliant and self-sufficient organizations regulated but not controlled by the government.

206. So far these principles have not been part of the country's sector management policies. Their introduction will require careful rethinking of past strategies and a decisive change in approach. A new attitude is needed by both the government and village communities. Both the communities and the government have to accept that in view of severe fiscal constraints, community self-help is the only way to improve services. Many rural communities are in fact taking the initiative to improve the water supply situation. This is an encouraging development that should be fostered and promoted. The institutional and governance changes proposed in the rural sector are the most difficult to implement of the three levels described in this strategy, but

the urgency of the problems and the poverty levels of the regions requires a clear and decisive plan of action. Box 6-1 summarizes the reasons for community management of rural water supply and sanitation systems.

Table 6-2: Reforms and Challenges in the Water Supply and Sanitation Sector

Institutional and Governance Reform	<ol style="list-style-type: none"> 1. Strengthening the sector's institutional/regulatory framework and capacity to enable the development of stronger and better coordinated sector institutions especially at the local level. 2. Making communities and individual consumers key stakeholders in sector development and introducing demand, community responsibility and willingness to pay as the main criteria for future sector development. This is especially important in rural areas. 3. Preparing the ground to increase the involvement of the private sector (national and international) in all aspects of the management and operation of water and wastewater systems. 4. Facilitating the development of a stronger private support industry that helps the sector to provide better services.
Financial Reform	<ol style="list-style-type: none"> 1. Improving resource mobilization from all sources, including the users, local and central government sources, loans and grants. 2. Achieving financial viability of sector institutions based on the principle of cost recovery from consumers subject to affordability and willingness to pay considerations. 3. Ensuring consistent focus and coordination of international aid and financing.
Technical Reform	<ol style="list-style-type: none"> 1. Utilizing limited resources in the most cost-effective mix of institutional strengthening, maintenance, network and plant rehabilitation and efficiency improvements, and carefully analyzing expansions if truly needed. 2. Allowing flexible standards for rural communities to choose service levels that are affordable for them to operate and maintain. 3. Introducing commercial management and accounting practices.
Service Reform	<ol style="list-style-type: none"> 1. Making the sector responsible and accountable to the poor segment of the population, particularly in small towns and rural areas. 2. Choosing the level of service and design standards affordable and responsive to the users. 3. Strengthening the human resource capacity of all aspects of sector management and operations. 4. Meeting national goals of environmental protection and use of natural resources.

Financial Reform

207. Without a radical change in the financial policies and practices of the water supply and sanitation sector, its future viability and its capacity to provide a minimum level of service will be impossible. A financial reform of the sector is needed to improve resource mobilization and the financial viability of the sector through rational tariff structures, adequate and transparent subsidy policies, cost-effective investments, and linkage of service levels to willingness to pay for service.

Box 6-1: Reasons Why Communities Should Manage Implementation of a Rural Water Supply and Sanitation Program

- **Incentives are in the right place:** The community, and not the project, has the greatest incentive to make sure the goods and services received correspond to what the community wants. When the government, instead of the community, hires the service provider, it becomes the client.
- **Lower costs:** International experience has shown that when communities manage the implementation of a project, costs decrease by 30 to 50 percent. The transparency and speed of contract implementation increases and willingness to pay for services increases with community controls.
- **Government is poorly equipped to meet growing demand:** If the government wants to expand coverage in the rural sector throughout the entire country, a centralized supply agency, with limited delegation, will not be able to move quickly. When communities see the results of effective demand-responsive programs, the demand for service increases very rapidly and the implementation of the program moves faster.
- **Capacity building:** Learning by doing is especially important in the implementation of rural water supply and sanitation programs. The community will need the skills it learns from implementation to manage and sustain services once the project is complete.
- **Communities want to be involved:** This is one of the basic principles of the demand-responsive approach. Choice and sustainability are linked to willingness to pay and ownership of facilities.

Source: World Bank. Draft Water Resources Sector Strategy, 2001.

Financial Viability of Urban Water and Wastewater Enterprises

Rigorous Collection of Bills in Cash

208. Low collection of water and wastewater fees and payment in non-cash forms (barter and offsets) are two of the most critical and complex issues facing the water and sanitation sector today in Belarus. The policies that have allowed barter, offsets and non-payment of utility bills reach far beyond the water and sanitation sector but directly affect its financial viability and have trapped vodokanals into ever increasing arrears and receivables. Utilities are forced to provide an implicit subsidy to industries that do not pay or use non-cash forms of payment. The reforms to move away from low collection and non-cash payments require a concerted effort between the government and the vodokanals. The discussion on the best approach to dismantle the system at the national level goes beyond the strategy for the water and sanitation sector and requires coordinated action with other utilities. Box 6-2 summarizes the basic measures recommended to increase the level of collection and reduce non-cash payments.

Box 6-2: Measures to Increase Collections and Reduce Non-Cash Payments

- Create political consensus at all levels of government on the need for dismantling the system that allows for the non-payment of water fees and use of non-cash forms to settle payments.
- Make adequate budget allocations and ensure payment in cash for water and wastewater fees of budget organizations.
- Promote the use of water meters and water use reduction to decrease consumption of budget organizations and facilitate payments of water fees in cash.
- Support vodokanals in the implementation of service cuts to non-payers.
- Establish mechanisms to follow closely the accumulation of accounts receivable in vodokanals with respect to each budget organization and industry and support decisive and prompt action to ensure prompt payment in cash.
- Insist on prompt tax cash payments (VAT and profit tax) from vodokanals and resist the continuation of offsetting taxes for water fees of budget organizations.
- Proceed rapidly with social reforms in the context of a well-targeted social safety net.
- Implement mechanisms to eliminate arrears to vodokanals and control accounts payable as a condition for financial assistance from the central government.

Tariff Levels for Full Cost Recovery

209. To be able to eventually provide adequate services to consumers in a sustainable manner, water and wastewater utilities have no choice but to charge tariffs that cover all costs at the very least for operation and adequate maintenance and a portion of capital investments. The current regulations for tariff setting have the key elements necessary to support financing for the water and sanitation sector. However, there are some issues that require further refinement. The following principles may be considered in formulating and implementing the changes needed to achieve the goal of financial reform of the sector.

210. Any tariffs for water and wastewater services should be *fair*. They should reflect true recovery costs, openly demonstrated by the utility, and reflect cost-effective management, operations, adequate maintenance, and investments. Tariffs should be *equitable*, not imposing an undue burden on any consumer group. Industries should pay for the water they use and not be expected to subsidize residential consumers. They should also expect to assume costs for the necessary treatment of their wastewater so as not to impose a burden on residential consumers. Finally, tariffs should be *responsive* to the needs and demands of consumers. Utilities need to understand and have better information regarding income, expenditures, and ability and willingness of consumers to pay for various levels of service.

- ***Move gradually towards full cost recovery tariff levels particularly in the residential sector:*** Current residential tariffs are not sufficient to cover operation and maintenance costs. For a large portion of the population higher rates are socially feasible and may be acceptable if people are convinced that service improvements will depend primarily on their contributions. Consumers will be reluctant to pay more for water and wastewater services even if they can afford it because of their lack of trust in vodokanals. A new cooperative and open relationship between consumers and vodokanals will be needed to convince consumers of the relationship between value of service, cost-efficient use, and improved services associated with water and wastewater tariffs.
- ***Move towards a tariff structure that promotes less wastage.*** The existing high cross-subsidies between non-residential and residential consumers and the lack of metering are two key factors contributing to the very high level of water wastage and the weak financial situation of vodokanals. The redesign of the tariff structure needs to take into consideration efficient mechanisms to protect the poor (discussed in the following section) and metering needs to be introduced as a tool to reduce consumption, wastage and operational costs, and to improve revenue collection.
- ***Move tariff setting authority to the local level, increase frequency of tariff reviews and reduce political interference:*** The cost of providing water and sanitation services varies greatly among communities. Likewise affordability and willingness to pay is different from locality to locality. Setting tariffs nationally or regionally leaves some communities with tariffs that are too high and others that are too low. It may be better to let the community decide which level of tariffs and thereby which level of service it is willing to support. The choice concerning the level of service can be made in small towns and rural areas where the population can choose between different options: house connection, yard tap or stand post. Unfortunately, the current tariff

review process is very slow, not frequent enough, and subject to political influence. Liberating the process from these shortcomings is indispensable. The government should establish mechanisms to control the cost-efficiency of the operations of vodokanals but in return should commit to a frequent and fair review of tariffs.

- ***Include all costs in tariff calculations and avoid the trap of lowering maintenance costs:*** As discussed in the review of the financial situation of the sector, the response of vodokanals to low tariffs combined with low collection and cash payments is to lower expenses, beginning with maintenance. The evaluation of costs for the calculation of tariffs should include adequate provisions for maintenance, ideally linked to the actual valuation of assets of the vodokanal or in the transition period to proxies based on reasonable standards. Additionally, the tariff calculation should include an adequate provision for unrecoverable debts as expenses are closely linked to policies for reducing nonpayment, and to the financing costs of long-term loans taken by the vodokanal to implement its rehabilitation program.

Transparent, Targeted and Efficient Subsidies

211. Financial reform needs to move in parallel with required price increases for the provision of water supply and sanitation services, along with compensatory payments targeted at the poor. The subsidy policy for the water and sanitation sector requires a reformulation based on four elements: (i) an explicit statement and clear justification of the chosen social objective; (ii) well-defined target groups to ensure subsidies are received by those who truly need them and those willing to help themselves; (iii) a procedure ensuring a mechanism for collecting the necessary resources and transferring them to the vodokanal in cash; and (iv) a transparent and simple administration mechanism for allocating funds to the target group.

212. As the need for subsidies is not exclusive of the water and sanitation sector, the government should take an integrated view of the subsidy policy for all utilities, particularly as some of the most effective subsidy mechanisms are not always tied to a single service but to integrated household needs.

213. The government should adopt a policy that gradually reduces the differential between customer categories. Currently government organizations receive an unfunded subsidy that is not transparent. For industries and commercial customers, the tariff constitutes in effect a tax to cross-subsidize other consumers. It is not equitable and in the end not sustainable, as many industries will find alternative sources of water or will simply not pay the fees. The gap between industrial and household tariffs should be reduced, but with caution. Mobilizing resources is still the most important immediate task, and decreasing industrial tariffs too quickly may make financial recovery even more difficult. A good policy might be to keep tariffs for industry at present levels and let other tariffs catch up over time.

214. The immediate task at hand is to develop a subsidy mechanism to ensure that scarce funds are targeted carefully to deserving recipients and support only undertakings that are of highest priority and greatest cost effectiveness. It is most important that the government applies clear and transparent criteria to the objectives, targets of the subsidies and the conditions that need to be met to qualify for subsidies. The provision of subsidies could become an important vehicle for sector adjustment and strengthening. Communities should be competing for scarce

subsidies on the strength of their willingness to reform and to do the best they can do to help themselves. Box 6-3 gives the criteria for the selection of targets for subsidies in the water and sanitation sector.

Box 6-3: Proposed Criteria for Selection of Deserving Targets for Subsidies in the Water Supply and Sanitation Sector

- ***The poorest segment of the population:*** small towns, villages, poor urban fringe areas;
- ***Communities that have done everything possible to help themselves:*** those that have maximized their internal resource generation by increasing tariffs to a level affordable to the population, and that are collecting their bills;
- ***Utilities that only need assistance with investment cost:*** for sector institutions that meet maintenance and operation costs adequately;
- ***The highest priority, most urgent and least cost investments:*** oriented towards improving system efficiencies and water services;
- ***Minimum levels of safe service quality:*** in rural communities and on the fringes of urban centers, such investments would primarily be for providing water of safe quality through stand posts;
- ***Ability to contribute to investments:*** a substantial portion should come from the community through tariffs or direct contributions of labor, materials and equipment wherever possible and appropriate; and
- ***Sector institutions that are willing to embrace reform:*** committed to strengthening their productivity and institutional capacity.

Financial Viability of the Rural Water Supply and Sanitation Sector

215. The demand for water supply and sanitation services in rural areas is enormous but there has been little service expansion and the overall situation has continuously deteriorated in the last several years. Resources channeled to the sector by the government are minimal and not adequate to stop the decline in services. The only solution to this situation is to establish financial policies that support the demand-responsive strategy where communities pay part of the capital cost in proportion to the cost of facilities, and all operations and maintenance costs. Even under this approach, the financial resources needed to provide adequate water services to all rural areas are enormous. However, financial leverage from communities is necessary and this would require a major change of perception in rural communities, as water is still viewed in many cases as a service that should be provided free of charge by the government. Furthermore, communities will be reluctant to pay for low quality service, over which they have no influence or control. This critical situation has motivated some communities to take control of the problem and to improve their water services, but in most cases they are constrained by a lack of financing and resources. The limited resources that the government can dedicate to the water and sanitation sector in rural areas should be targeted at communities that demonstrate a commitment to the principles of the demand-responsive approach, particularly with respect to financing. The main features of this approach are:

- Communities decide if they want to participate and choose their preferred level of service (house connection, yard tap, stand post, communal systems, etc.) based on willingness to pay and contribute financially to the project.
- Communities pay the full cost of maintenance and operation of the systems that they select.
- Communities set their own tariffs designed to meet the financial requirements of the system. Tariffs should be directly linked to the cost of services. Communities that are able and willing to pay can decide on a higher level of service.

- The communities need detailed information on the costs of construction, operation and maintenance, that will allow them to make informed choices and reduce investment costs through the selection of lower cost options and more efficient delivery mechanisms.
- Robust financing mechanisms (both public and private) should be set up and financial intermediation options (such as household microcredit for on-site sanitation) should be explored to increase internal resource mobilization.
- Government subsidies for rural water supply systems should be transparent and based on pre-determined criteria reflecting poverty and basic needs, and the level of contributions that communities are willing to make.

Financing Sector Investments Through a Concerted Effort with Stakeholders

216. Ideally, investments in water and sanitation are met by a combination of cash flow from urban utilities or contributions from community members in rural systems, private equity, government grants, and prudent borrowing from commercial sources. Every water and wastewater utility requires access to long-term financing, without which the impact of infrastructure development on tariffs would be unsustainable. However, the current financial weakness of vodokanals and the absence of long-term domestic credit facilities make it impossible for vodokanals to secure access to required credit. The government should take the leadership to coordinate all possible sources of financing available in a concerted strategy targeted at different needs in the urban and rural contexts.

Technical Reform

217. Increasing the revenues collected by water and wastewater utilities through better collection, fewer payments in non-cash forms, adequate tariffs, and effective subsidies will not be sufficient to transform vodokanals into self-sufficient, financially viable enterprises. A major change in the approach to the technical aspects of water and wastewater systems is required to reduce operational costs and improve efficiencies through well-selected investments. This section presents some of the guidelines that should be followed in defining a cost-effective investment strategy.

Improving Operational Efficiency of the System to Reduce Costs

218. One way to spend scarce resources in a cost-effective manner is to make the best use of existing plants and networks before spending resources on system expansion. Specific measures that should be explored first include:

- ***Increasing the supply of water through the reduction of network leakage:*** Leak repair is among the most urgent and cost-effective investments opportunities. Reducing high leakage to a more acceptable level will require a long term strategic approach and commitment. Reducing leakage involves replacement, repair or relining of pipes, and pressure reduction. Cost-effective investment decisions depend on a thorough understanding of how the pipe network functions and on reliable information on the magnitude, location, and nature of leaks and the pressure distribution in the system. Beyond fixing the most obvious leaks, system monitoring and leak management are permanent activities requiring a sustained management and institutional commitment. Cost effective interventions are based on careful analysis and ranking of investment interventions. International experience shows that there

are no “quick fixes” for leak reduction. Much could be gained from assistance by consultants specializing in the area of leak management.

- ***Improving the Hydraulic Efficiency of Pipe Networks:*** Unbalanced pressure zoning, incomplete loops, system occlusions and bottlenecks, faulty valves, and poor operations reduce the capacity of many systems. Zones of excessive pressure contribute to increased leakage. Pumping stations, because of inappropriate designs and poor equipment, use more energy than necessary. All these deficiencies reduce system capacity and drive up energy costs. There is obviously great scope for improving the conveyance capacity and efficiency of transmission and distribution systems through the removal of occlusions and bottlenecks and the introduction of better pressure zoning. Adding storage capacity may help improve network efficiency and raise capacity. Many utilities in market economies are making an effort to improve the efficiency of their networks, thereby reducing operating costs and postponing system expansions. Cost-effective interventions, however, always depend on a good understanding of the network and the way in which it functions, and require computer modeling to arrive at optimal results.
- ***Metering as a tool to reduce consumption, wastage and operational costs, and improve revenue collection:*** As already observed with the small number of individual meters in Minsk and Gomel, substantial savings in water consumption and wastage can be achieved through metering. However, metering alone is insufficient to induce people to use less water, unless accompanied by: (i) consumption based billing which relates the cost to the amount of water consumed; (ii) tariff levels sufficiently high to induce consumers to use less water; and (iii) rigorous collection of bills. Vodokanals introducing consumption based billing will also have to install new commercial systems and provide training for people so that they know how to use the systems. Meter reading, and maintaining and repairing meters, will also require extra capacity and resources.
- ***Improving Maintenance to Increase the Life of Facilities:*** Faced with very low cash collection, all utilities in Belarus are spending less than 1 percent of the value of fixed assets on maintenance, that is routine preventive care of plants and networks. With the current financial crisis, there is almost no maintenance. Studies on infrastructure in market economy countries indicate that an annual maintenance expenditure of about 2-3 percent of asset value is necessary to maintain facilities in good operating condition. The present value of such annual maintenance levels amounts to 20-30 percent of the original investment cost. Conversely, failure to maintain facilities requires major reconstruction or replacement at a cost that may be five times as high as the present value of annual maintenance expenditures. Clearly, utilities would be well advised to place increased emphasis on maintenance. Adequate maintenance in the long run will save resources by reducing system downtime and extending the useful life of facilities.
- ***Reducing labor as a means to increase efficiency and lower costs:*** Vodokanals are generally overstaffed, not only in their core activities, but also because they maintain

departments in areas that are not central to their daily operations, such as design, construction, and even hotels and ancillary facilities. Maintaining these high staffing levels results in high operational costs that must be reduced if vodokanals are to reach financial viability and provide services at a low cost.

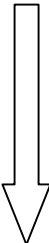
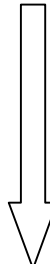
- ***Ensuring Proper Pre-treatment of Industrial Waste:*** Inadequately pre-treated industrial wastewater entering municipal sewer systems impairs the functioning of wastewater treatment plants and may also introduce toxic materials into the environment. Therefore, efforts are needed to better control industrial discharges and hold industries accountable to their obligation to provide adequate pretreatment of their waste. The problem may be less severe with the drop in industrial production, but by the same token, most industries are pressed to lower operational costs and pre-treatment is one of the areas where they can reduce costs because of low enforcement of existing regulations.
- ***Finding appropriate and low cost solutions for urban fringe areas and small and rural communities:*** The traditional house connection based system of water supply and water borne sewerage is not affordable for communities. In this situation, a gradual improvement in the level of service delivery should be considered. The choice of solution will depend on the capacity and willingness of communities to pay. Communities may begin in water supply with stand posts and as they become more prosperous, graduate to yard taps and eventually to house connections. Where appropriate, the use of hand pumps should be considered.
- ***Including source protection in investment planning:*** to combat the growing threat of source pollution, investments to protect water sheds, and well fields may be required to preserve or improve the supply of a good raw water supply.

Cost-effective Selection of Investments: A Combined Path of Service Improvement with Lower Unit Operational Expenses

219. Securing the investment needed to provide adequate services to the entire population will take many years. In the meantime only the most essential investment needs can be fulfilled. Making careful choices and setting priorities will be essential to obtain the largest benefits from the resources invested. Sector institutions may want to consider the following prime objectives in the selection of investment priorities and concentrate funding on interventions that:

- ***Improve the safety and reliability of water supply services:*** With special emphasis given to communities with existing or hidden public health problems that can be traced to deficient water services; and
- ***Reduce operating costs by investing in high pay back investments:*** For example, in demand management, leak reduction and energy savings.

220. The process for selecting priorities and cost-effective investments is given in Box 6-4.

Box 6-4: Suggested Sequence for Selecting Priorities and Cost-effective Investments	
<p>Selection of Priorities</p>  <ul style="list-style-type: none"> Institutional strengthening and capacity building Improving water supplies (health benefits and increased collection) Appropriate sanitation services (to reinforce health benefits through a good water supply) Wastewater treatment 	<p>Selection of Cost-effective Investments</p>  <ul style="list-style-type: none"> Increase maintenance expenses to an adequate level Rehabilitate existing assets in the worst condition and perform efficiency improvements to plants and networks: reduction of energy, leakage, industrial pollution. Consider capacity expansion after the existing system has reached optimum efficiency

Service Reform

221. The fourth key reform needed in the water supply and sanitation sector in Belarus is a reform that changes the objectives and incentives of sector providers from construction and planning to the provision of adequate and cost-effective services to customers. The following discussion of service reform focuses on four main themes: (i) service to the poor; (ii) standard and level of water supply and wastewater services; (iii) human resource capacity for improved service; and (iv) protection of the environment.

Water Supply and Sanitation Services to the Poor

222. A major reason often used for not undertaking many of the tough reforms needed in the water supply and sanitation sector is that poor people would not be able to afford services. Affordability is mentioned as the main reason for maintaining low residential tariffs but the lack of financial viability of vodokanals is one of the key factors in the deterioration of services that forces the poor pay higher prices for alternative sources of water. The poor are affected proportionally more than the non-poor by the lack of services and spend a significant portion of their income coping with deficient services. At the same time, the poor do not have a voice in the planning of the sector and key decisions in the sector are taken without consultation. Service standards are set at very high levels (piped connections with very high consumption norms for design) that are not affordable. As a result, the poor do not receive even the most basic levels of service.

223. A key component of the water supply and sanitation strategy for Belarus should be to ensure that all sector institutions are responsive and accountable to the poorest segments of the population. The following guiding principles are suggested for service reform:

- ***Understand the needs of the poor:*** Lack of information in the sector linking service deficiencies and poverty is a stumbling block for developing a strategy that is responsive to the needs of the poor.
- ***Make specific policies and set rules to target the poor, communities and vulnerable groups:*** Given the large service gaps in the country and the need to improve the financial viability of utilities, sector institutions should resist the temptation to serve only the most affluent segments of the population and ignore those consumers that

cannot afford the high level of service mandated by the technical standards selected. As part of the service reform of the sector, specific policies are needed to provide the poor with adequate standards that are affordable and with targeted and transparent subsidies.

- ***Support the creation and capacity building of membership organizations that engage the poor:*** The work of such organizations will be very valuable in the formulation and implementation of policies and interventions in the water and sanitation sector both in rural and urban areas.
- ***Subsidies should be designed to benefit those that are genuinely poor:*** As the sector moves towards cost-recovery and strict collection of revenues in cash, the subsidy system should be designed and put into place to ensure protection of the poor and to maintain the financial viability of the sector. By the same token, the perception that water provided by sector institutions should be free must be changed.

Standards and Level of Water Supply and Wastewater Services

224. Financial resources available for the sector will be extremely limited for some time to come. Only the most urgent and highest priority investments can be made. This will require making choices among competing investments. Innovative, unconventional and partial solutions to a problem will be needed. Present technical norms and standards and design practices, many of them demanding costly interventions, are not compatible with this approach and should be adjusted:

- ***Drinking water quality standards:*** Standards now in place are demanding in terms of the biological and chemical/physical standards that must be met. Investing in water treatment that would meet all of these standards may in many cases be prohibitively expensive and preclude funding for other important investment needs. While the bacteriological safety of the water through disinfection should **always** be assured, other treatment measures should be optional depending on the availability of resources and an assessment of the net benefits. Upon the request of the Ministry of Natural Resources and Environmental Protection, the Research Institute for the Use of Water Resources is now considering the possibility of changing certain approaches to water quality standards and norms for wastewater discharge. The main priority is to protect health of the population with affordable technical solutions.
- ***System design standards:*** Parameters such as water consumption, pressure, minimum pipe sizes, standby capacity, and planning horizons should be suspended and tailored to each specific situation.
- ***Standard designs for water and sanitation systems:*** Should be reviewed carefully and if found to be too expensive or inappropriate replaced with innovative and less costly designs and technologies.
- ***Standards for wastewater treatment:*** Present requirements for effluent standards are clearly not affordable. They should be relaxed to avoid investments of questionable

social and environmental justification and priority. Although in some situations with clear and specific environmental damages or health risks, the investments in advanced wastewater treatment may be justified, they should be analyzed carefully to invest the limited resources available in a strategic manner. While communities struggle to provide a rudimentary level of water supply, they should not be required to divert funds for costly secondary treatment and nutrient removal.

- ***Quality and level of service:*** Particularly for areas that are currently not served, should be governed by affordability and effectiveness. A working hand pump is more effective than an electric or diesel pump that cannot be maintained for lack of resources. A stand post is better if house connections are not affordable.

225. In the rural sector, the current standards and regulations may prevent the development of private sector and alternative delivery options. The rural water supply sector requires adaptable service levels tailored to the needs, and ability and willingness of communities to pay. The range of technology options should be expanded to include low-cost technologies (hand pumps, gravity flow systems, ventilated and improved pit latrines), building on existing resources in the community. The success of the proposed demand-responsive strategy relies on an adequate flow of information on all possible options and a competitive environment that allows communities to access a range of providers of goods and services for all aspects of the project regardless of the level of service the community chooses. A full understanding of the technical and financial implications of the options is indispensable if an informed choice that is sustainable in the long term is to be made. Programs to demonstrate simple technologies for wastewater and excreta disposal and treatment should be part of interventions in the rural sector.

Human Resource Capacity for Improved Service

226. The pace of the proposed institutional, financial and service reform of the water supply and sanitation sector will depend on the presence of leaders in government and the sector community that can take on the responsibility of shaping and implementing the changes that are needed. There are many highly skilled technical professionals doing an admirable job of keeping old facilities running in spite of insufficient funding for repairs and replacement. But, there are few who have the experience and skills required to lead the reforms. Building institutions takes time and sometimes involves restoring entire professions in areas essential to a well-functioning market economy. There is an urgent need for skills in non-engineering disciplines such as planning, and financial and commercial management. For present utilities to transform themselves into well managed and efficiently administered organizations, deep adjustments to staff composition and skill mix will be necessary. Above all, the adoption of a new management culture and organization based on personal accountability and initiative and in which non-engineering activities are given equal, if not higher, prominence is crucial.

Protection of the Environment

227. The water supply and sanitation sector in Belarus has a major role to play in the protection of natural resources and the environment in the country. However, the water supply and sanitation sector is only one of the stakeholders in the water management and environmental protection sector and as one of the users of the resource should not be in charge of regulation. The need for more coordinated planning, regulations, and policies in water management and environmental protection is clear. The following guidelines are suggested for incorporating the

protection of the environment into the operation, policies, and strategic planning of the water and sanitation sector:

- ***Unattainable norms and standards:*** Water resource management and environmental protection policies in Belarus are based on a set of rigid standards and norms that are currently unattainable given limited financial resources.
- ***Pool Resources for Investments on Priorities, “Hot Spots”:*** The challenge is to determine how scarce investment resources can be allocated to obtain optimal benefits in terms of downstream water use and environmental concerns. In place of the present uniform ambient water quality and effluent standards approach, it would be more cost effective to pool resources to concentrate investments on removing the most urgent pollution discharges, that is “hot spots.”
- ***Avoid Investments in Advanced Treatment:*** Unless special justification directly linked with an identified hot spot exists, investments in advanced treatment should be avoided since there is not a big gain to be made in marginal benefits of wastewater treatment from taking additional actions to reduce marginal costs. The resources that advanced treatment would require can probably be applied more effectively by supporting lower-level treatment where none exists at present.
- ***Implement a cost-effective approach to municipal wastewater treatment plants:*** including: (i) upgrade existing plants rather than expand or build new ones; (ii) reduce the hydraulic load on wastewater treatment plants by reducing water wastage and consumption and infiltration/inflow into the sewer system; and (iii) use appropriate and proven technology, particularly with respect to sludge stabilization and disposal, to increase plant reliability and reduce operating and investment costs.
- ***Strengthen the control of discharges from industry both into municipal wastewater systems and the environment:*** Industrial discharges into municipal wastewater systems demand special attention, as industrial wastewater contains toxic organic substances or heavy metals that cannot be treated in municipal wastewater treatment plants. Additionally, the benefits of municipal wastewater treatment may be lost if nearby industries discharge their untreated waste into the environment.
- ***Evaluate the impact of urban run-off pollution into water resources:*** In some cases, this impact may be significant and technically appropriate and financially affordable solutions should be considered.

C. Next Steps to Implement the Sector Reform Process

228. The implementation of proposed institutional, financial and service reforms in the water and sanitation sector will require several years. The Resolution of the Belarusian Government No. 52 of 17 January 2002 approved the National Program for Water Supply and Sanitation *Clean Water*. As this resolution was approved after completion of this strategy, there are some elements that may not have been fully covered or analyzed in coordination with this program and

further review may be necessary as part of a continuous improvement process in the sector. Given the current organization of the sector, the different stakeholders involved and the scope of the proposed reforms, action could be taken through three different programs: (i) a Municipal Water Supply and Wastewater Program for Small and Medium Size Cities; (ii) a Rural Water Supply and Sanitation Program; and (iii) a Policy and Human Resource Capacity Program.

229. Although three programs are described for the water and sanitation sector, the government should be selective in the activities it chooses to implement. The following sections outline the scope of each program framed within a specific sector segment. In choosing implementation programs, the government should take into consideration criteria such as: (i) areas where the potential for a public health disaster are greatest; (ii) areas where implementing agencies, responsible government agencies, and consumers are ready to commit to the reforms proposed; (iii) windows of opportunity where local conditions are adequate for testing new approaches to deliver service to the poor and underserved areas; and (iv) areas where limited government resources can be leveraged with private sector financing or where as part of program implementation the private sector is promoted.

Municipal Water Supply and Wastewater Program for Small and Medium Size Cities

230. There are several common issues among all vodokanals in small and medium size cities in Belarus and so a program focused on this segment of the sector is recommended. This program would be aimed at improving services provided by water and wastewater utilities of secondary cities outside Minsk, based on the principles and guidelines presented in this document. The program would serve as a transition towards greater involvement of the private sector in all aspects of the management and operation of the systems.

231. A large number of vodokanals exist, which makes it difficult for the government to initiate a program with all of them at the same time. Therefore, a phased approach to the implementation of the sector reform is recommended, focusing on a set of cities that demonstrate upfront their willingness and commitment to undertake specific reforms that are politically more difficult to implement (such as increases in tariffs, collection and cash collection from budget organizations and industries), particularly in areas that would support the financial viability of vodokanals.

232. The preparation process for this program would involve the following steps:

- Continue the discussion, initiated during the preparation of this document, with vodokanals of secondary cities in Belarus on the basic principles of the sector reform, and elicit interest in and commitment to the program's principles and approach. Establish a minimum set of reforms that the interested vodokanals have to implement in order to be considered during program preparation activities;
- Request technical assistance support to IFIs and donor countries for preparation of the program;
- Establish, as soon as possible, an interdisciplinary group within the responsible government agency (Ministry of Housing and Municipal Economy) for coordination of program preparation;

- Explore with participating cities their interest and commitment to try innovative approaches for the provision of water and wastewater services. This would entail significant community involvement and ownership, private sector and NGO involvement, and technological options to extend the service to disadvantaged groups;
- Contract with competent advisors the necessary studies (technical, financial, social, environmental, etc.) for those cities that have complied with the conditions for participation. These studies should not be traditional long-term investment plans including master plans and detailed feasibility work because these conventional supply-driven investment projects are not conducive to an efficient use of resources both in cost and size, and the lack of specific actual information in the vodokanals limits their ability to make any reasonable long-term definition of investments. Instead, the advisors would analyze the financial capacity of vodokanals under reasonable plans with initial steps that would be taken as conditions for participation in the project. The technical advisors would prepare a limited list of urgent investments along with a detailed program for technical assistance to give the vodokanal experts the support of international consultants and the time and resources needed to understand the present shortcomings of existing facilities, to identify, analyze and compare alternatives and then to set priorities and finally decide on least cost and priority investments. The technical assistance activities would also help to develop tools and methodologies to analyze and overcome the most significant stumbling blocks in the sector (for example, commercial systems, leakage management, community involvement and outreach and metering strategies). At the same time, the collection of technical and financial data from the first set of vodokanals would be strengthened in preparation for greater involvement by the private sector;
- The advisors would also evaluate the most appropriate strategy for involving the private sector in water supply and sanitation, at least in managing design, construction, supervision, supply of parts, and community intermediation; and
- Cities and vodokanals that comply through the self-selection process with the necessary conditions and improvements would be invited to participate in the program.

Rural Water Supply and Sanitation Program

233. The rural water supply and sanitation sector is the segment that requires the most assistance (financial, technical, and human resource capacity) and institutional changes. The specific approach for a rural water supply and sanitation program would require further analysis, particularly in its relation with other rural infrastructure needs. Within the water supply and sanitation sector, the program should be built around the basic principles of demand-based provision of services, community ownership and management of water systems, and facilitation by the government. It is recommended that a learning phase involving build-up and testing of institutional capacity and community and private sector participation be implemented before the

approach is rolled over at a national level. Again, the program should be initiated in districts with communities and local governments that are progressive and are interested in taking responsibility for developing water supply and sanitation services in their regions. An approach where the government would facilitate the mobilization of communities and the selection of the groups that demonstrate upfront their commitment to the program strategy and guidelines (including, among others, responsibility for ownership, management and operation of systems, financial contribution to capital costs and coverage of all operation and maintenance costs), is the most appropriate.

234. At present, the existing institutional structure in Belarus does not support the implementation of such a program in rural areas, and the capacity of the Ministry of Housing and Municipal Economy and the Ministry of Agriculture are limited in the areas that are most needed for the success of the project, including community mobilization, dissemination of appropriate technologies, interaction with NGOs and private sector actors, mobilization of international funds, and policy and legal reforms. The preparation of a rural water supply and sanitation program would involve the following steps:

- Initiate the institutional reforms needed to implement the program, such as clarifying the responsibilities of the central government and the specific agency that would facilitate the development of the rural water supply and sanitation sector;
- Meet with donor countries and IFIs interested in supporting the approach described in this strategy and define a joint and coordinated support program;
- Define and implement a technical assistance/preparatory program that would, among other activities: (i) support the government agency in charge of the program to develop human resource capacity needed for implementation; (ii) promote the program among communities; (iii) build capacity at the district level among communities, private sector actors and NGOs to prepare for program participation; and (iv) prepare and test tools and methodologies for the demand-responsive approach model;
- Establish as soon as possible an interdisciplinary group within the responsible government agency for coordination of program preparation. Establish a steering committee with the involvement of NGOs, community representatives, local governments, and the private sector to ensure broad involvement of all stakeholders in program preparation; and
- Contract with competent advisors and NGOs for necessary facilitation and preparation activities in order to have a group of communities with demonstrated commitment ready to start activities when the program is initiated.

Policy and Human Resource Capacity Program

235. In parallel with, or as part of the two programs outlined above, the sector stakeholders would greatly benefit from a program of activities aimed at improving the policies of the sector and human resource capacity in areas identified in this document as important factors for sector

reform. These areas include: (i) the role of the central government as facilitator and regulator instead of as direct implementing agency; (ii) understanding, monitoring and attending to the needs of the poorest segments of the population; (iii) financial management and accounting of water utilities and community systems; (iv) tariff and subsidy policies; (v) adaptable and appropriate standards and enforcement (environmental, construction, drinking water); (vi) procurement and quality control; (vii) information collection and management for investment decisions and policy formulation; and (viii) management of water utilities, among others. IFIs and donor countries can provide assistance as part of other sector programs or in the form of independent policy and human resource capacity activities.

**ANNEX 6-1: SELECTED TECHNICAL DATA ON WATER AND WASTEWATER UTILITIES
IN SECONDARY CITIES AND SMALL TOWNS**

Town name	Water					Sewerage	
	Source of Water	Design Capacity of Systems (000 m ³ /year) (1)	Population served (000)	Target level of service (lpcd) (2)	Water Sources and Production, units/thous. ? 3 per day	Availability of Sewerage Collection System (length of network, km)	Availability and Type of Wastewater Treatment Productivity, units/thous. ? 3 per day
Minsk	Ground water Surface water	351349	1688	301	1/147 – ground water 1/320 – surface water	1346 ??	Full bio treatment facility, 670 thous.m ³ /day
Vitebsk	Ground water	437890	341	216	7/182,2	264 ??	Same, 95 thous.m ³ /day
Gomel	Ground water Surface water	128991	486	191	5/172,2- ground water 1/103 – surface water	409 ??	Same, 186 thous.m ³ /day
Grodno	Ground water Surface water	49275	304	250	3/95 1/40	330 ??	Same, 92 thous.m ³ /day
Mogilev	Ground water	65262	359	190	6/197,5	361 ??	Effluent is sent to other enterprise' treatment facility
Zhodino Minsk Region	Ground water	8796	51	220	-	76 ??	Same, 30 thous.m ³ /day
Vetka Gomel Region.	Ground water	2044	6,8	140	1/5,0	21,8 ??	Natural bio treatment facility (filtration fields), 1,5 thous.m ³ /day
Lida Grodno Region	Ground water	12958	98	165	1/24	104 ??	Full bio treatment facility, 16,6 thous.m ³ /day
Polotsk Vitebsk Region.	Surface water Ground water	36098	87	185	1/93,5	117 ??	Effluent is sent to other enterprise' treatment facility
Bobruisk Mogilev Region.	Ground water	38690	227	193	1/20	200 ??	Full bio treatment facility, 220 thous.m ³ /day

Notes:

- (1): There is no metering of production and the only information available corresponds to the original capacity of the systems per their original designs. The actual production capacity is in most cases smaller than the stated capacity.
- (2): This number is usually called consumption per capita. However, the prevalent lack of metering means that this number is actually a target for level of service based on design capacity and population served. As actual water production is smaller, this target should be seen as a higher limit

**ANNEX 6-1: SELECTED TECHNICAL DATA ON WATER AND WASTEWATER UTILITIES
IN SECONDARY CITIES AND SMALL TOWNS**

Aggregate data on amount of sludge and areas covered with sludge by regions

Region	Area covered with sludge, square meters	Sludge stored, cubic meters	Sludge added to storage, tons/year
Brest	822486	240814	60293
Vitebsk	305153	497933	84291
Gomel	889997	310788	15620
Grodno	498213	918078	79794
Minsk	281330	736815	19258
Minsk-city	440000	2000000	82350
Mogilev	482370	532664	254349
Total	3719549	5246092	595955

At present, total amount of sludge accumulated at storage sites is approximately 5.25 million tons on the area of about 375 hectares.

**ANNEX 6-2: SELECTED FINANCIAL DATA ON WATER AND WASTEWATER
UTILITIES IN SECONDARY CITIES AND SMALL TOWNS**

	Total Billings (1000)	Total Domestic Billings (1000)	Operating Expenses (1000)	Domestic Tariffs (\$/m3)	Average Operation Cost (\$/m3) (1)
WATER					
Minsk	4024333	1262167	3609447	0,03	0,01
Brest	3090428	466942	2376151	0,03	0,05
Gomel	1247268	235554	947896	0,03	0,013
Grodno	886420	256345	769221	0,03	0,014
Mogilev	1446336	166196	1384656	0,03	0,02
Baranovichi	1430477	237935	1060215	0,03	0,05
Vetka	10540	2037	12034	0,03	0,02
Lida	155766	41470	205123	0,03	0,017
Zhodino	193306	26588	149455	0,03	0,018
Bobruisk	599707,4	110554,3	503807,8	0,03	0,014
SEWERAGE					
Minsk	2604679	1023498,5	2429018	0,02	0,007
Brest	525809	136872	494673	0,02	0,01
Gomel	778151	189262	662631	0,02	0,01
Grodno	538252	181831	470167	0,02	0,01
Mogilev	258348	33322	242718	0,02	0,004
Baranovichi	254292	70066	220087	0,02	0,009
Vetka	4224	1335	5638	0,02	0,012
Lida	125216	33224	165570	0,02	0,012
Zhodino	191788	21196	137817	0,02	0,015
Bobruisk	641269	74648	532447	0,02	0,01

ANNEX 6-2: SELECTED FINANCIAL DATA ON WATER AND WASTEWATER UTILITIES IN SECONDARY CITIES AND SMALL TOWNS

Water supply and sewerage service expenses of Vodokanals (in million rubles) as of January 1, 2001

Year	Total	Cash expenses (depreciation excluded)	Energy	Wages	Social charges	Depreciation of fixed assets	Other expenses		
							Travel allowance	Non-material services	Other
Water-supply									
1995	669,925.60	342,274.50		58,628.70	22,277.30		185.90	121,013.70	125,545.50
1996	975,811.60	11,051.90	360,507.40	96,070.90	38,653.00	100,746.90	652.30	102,230.30	265,898.90
1997	1,977,777.40	290,655.60	785,263.90	175,955.60	69,887.80	219,151.40			436,863.10
1998	4,955,873.10	726,795.40	2,284,982.70	540,639.20	222,194.30	403,318.50	2,489.40	305,594.50	469,859.10
1999	15,616,955.70	1,793,285.80	8,493,453.70	1,558,933.40	641,682.70	429,309.70	10,705.50	939,783.00	1,749,801.90
Sewerage									
1995	626195	43783	212906	56649		71334			
1996	846555	169730	197821	116423	36081.6	82841	580.8	114638.3	151160.5
1997	1546910	296686	516272	167104	65156.4	183154	1744.4	160843.8	228323.2
1998	2844678	457335	932172	367220	177958.8	371132	1996.2	227582.4	355583.7
1999	15614873	1793286	8493453	1558933	630848.2	411684.6	7047.7	869407.6	1193501.3

ANNEX 6-3: SELECTED FINANCIAL DATA FOR MINSK WATER AND WASTEWATER UTILITY

AGGREGATE VODOKANAL EXPENSES FOR SERVICES TO ALL CONSUMERS

EXPENDITURE ITEMS								
Year	Total, million roubles	Electricity, million roubles	Materials, million roubles	Water, million roubles	PERSONNEL		Depreciation, million roubles	Other, million roubles
					Number of people	General maintenance, million roubles		
Water								
1995	669925,6		342274,5		6836	58628,7		246745,1
1996	975811,6	360507,4	11051,9		7829	96070,9	100746,9	368781,5
1997	1977777,4	785263,9	290655,6		8231	175955,6	219151,4	436863,1
1998	4955873,1	2284982,7	726795,4		8926	540639,2	403318,5	777943,0
1999	15616955,7	8493453,7	1793285,8		9519	1158933,4	429309,7	2700290,4
Sewerage								
1995	626195	212906	43783		7188	56649	71334	241522
1996	846555	197821	169730		8020	116423	82841	279739
1997	1546910	516272	229686		8570	167104	183154	450694
1998	2844678	932172	457335		9014	367220	371132	716819
1999	15614873	8493453	1793286		9519	1558933	394605	3374595

**ANNEX 6-3: SELECTED FINANCIAL DATA FOR THE MINSK WATER AND
WASTEWATER UTILITY**

Water and Sewerage Tariffs for Non-Domestic Consumers in Minsk (BYR)

	Drinking water		Sewage	
	1999 VAT included	2000 VAT excluded	1999 VAT included	2000 VAT excluded
January	24.4	69.6	11.8	30.0
February	36.8	73.2	16.3	31.5
March	51.8	82.0	22.2	35.0
April	53.2	107.0	22.8	46.0
May	68.6	123.0	29.6	53.0
June	68.6	134.0	29.6	57.0
July	68.6	144.0	29.6	61.0
August	68.6	171.0	29.6	72.0
September	68.6	186.0	29.6	78.0
October	72.0	209.0	31.1	87.0
November	75.7	227.0	32.6	95.0
December	79.6	233.0	34.1	97.0

ANNEX 6-3: SELECTED FINANCIAL DATA FOR THE MINSK WATER AND WASTEWATER UTILITY

**Percent of expenses reimbursed from tariffs set on
water-supply and sewage services in Minsk (1998-2000)**

	Water-supply	% Change	Water sewage	% Change
December 1998	40.0		59.1	
December 1999	49.8	9.8	68.1	9.0
December 2000	43.0	-6.8	52.0	-16.1

**Statement of Revenues Received in 1999-2000
Minsk Vodokanal**

	Total				Population			Juridical persons (enterprises and organizations)			
	Total revenues	Of which			Total revenues			Total revenues	Of which		
		Cash	Clearing	Promissory notes (bills of exchange)		Cash	Clearing		Cash	Clearing	Promissory notes (bills of exchange)
Year 1999, million rubles	8026.9	5268.0	2538.8	220.1	2048.1	1919.7	128.4	5978.8	3348.3	2410.4	220.1
%	100	65.6	31.6	2.8	100	93.7	6.3	100	56	40.3	3.7
Year 2000, million rubles	22441.6	13582.1	8186.8	672.7	5027.8	4724.5	303.3	17413.8	8857.6	7883.5	672.7
%	100	60.5	36.5	3.0	100	94.0	6.0	100	50.9	45.3	3.8

ANNEX 6-4: WATER QUALITY INDICATORS

Incidence of Waterborne Disease in Belarus (per 100,000)

Nature of Infection	1994	1995	1996	1997	1998	1999
Typhoid	0.06	0.16	0.08	0.10	0.14	0.11
Bacterial dysentery	78.33	139.65	44.82	57.5	74.01	125.36
Viral hepatitis	54.56	44.58	42.72	52.38	47.13	38.02
Ascariadiazis	425.75	385.11	402.90	400.59	383.35	261.91
Trichocephales	114.18	97.85	90.76	80.40	65.57	41.88
Enterobiasis	1403.57	1386.86	1377.16	1313.57	1134.34	986.13
Hymenalepidosis	0.13	0.21	0.21	0.18	0.15	0.08

Source: Ministry of Health

Concentrations of iron in rural groundwater

Region	Total number of wells (samples)	Groups by concentration of iron						
		Up to 0.3	0.31 – 1.0	1.1 – 5.0	5.1 – 10.0	10.1 – 20.0	20.1 – 30.0	Over 30
% of wells (samples)								
Brest	1665	51.7	34.5	12.3	1.2	0.2	-	0.1
Vitebsk	1421	37.5	31.9	28.7	1.8	0.1	-	-
Gomel	1384	27.0	38.4	31.1	2.7	0.7	0.1	-
Grodno	659	39.0	40.1	20.6	0.3	-	-	-
Minsk	2079	38.6	36.2	23.2	1.7	0.2	0.1	-
Mogilev	1596	25.4	38.6	32.7	2.4	0.9	-	0.1
Belarus	8804	36.73	36.26	24.79	1.79	0.37	0.04	0.02

ANNEX 6-4: WATER QUALITY INDICATORS

Share of water samples taken from communal and departmental water pipelines for economic and drinking water supply which fail to meet hygienic requirements 1997 - 1999

Oblasts	Share of water samples which fail to meet hygienic requirements, %											
	Sanitary and chemical indicators						Microbiological indicators					
	1997		1998		1999		1997		1998		1999	
	com	dep	com	dep	com	dep	com	dep	com	dep	com	Dep
Brest	30.0	37.7	14.8	31.8	31.0	34.4	9.1	15.9	6.4	10.3	5.6	9.1
Vitebsk	65.1	66.7	46.2	61.6	48.6	71.8	6.1	8.6	5.1	6.6	3.7	6.0
Gomel	38.4	47.5	46.2	17.6	32.4	44.6	4.0	5.9	4.8	6.3	4.4	6.1
Grodno	12.9	31.7	35.7	35.3	15.7	29.8	4.7	10.3	2.7	7.6	1.8	5.9
City of Minsk	10.8	22.3	14.8	26.8	7.6	8.7	5.3	5.5	5.5	5.9	7.1	8.3
Minsk	13.9	13.9	18.7	19.1	19.4	18.6	1.9	5.6	2.5	5.8	1.4	5.3
Mogilev	21.6	36.0	20.9	23.1	19.1	31.6	3.1	7.3	3.5	8.0	3.5	6.9
For the republic	24.1	45.0	27.9	24.9	23.9	33.8	4.8	8.6	4.3	7.3	3.6	6.6

Share of water samples taken from open wells which fail to meet hygienic requirements 1997 - 1999

Oblasts	Share of water samples which fail to meet hygienic requirements, %					
	Sanitary and chemical indicators			Microbiological indicators		
	1997	1998	1999	1997	1998	1999
The city of Minsk	-	-	-	-	-	-
Brest	68.3	61.4	64.1	46.1	41.0	50.6
Vitebsk	38.6	36.3	42.0	32.2	28.6	33.7
Gomel	53.4	53.2	53.5	35.1	34.4	36.2
Grodno	55.2	53.8	45.4	58.5	49.8	36.6
Minsk	61.9	57.0	58.9	40.8	41.3	39.1
Mogilev	29.4	32.3	33.4	25.7	19.8	33.8
For the republic	49.8	49.7	50.0	42.8	32.4	36.8

VII. Municipal Solid Waste Management in Belarus

A. Main Issues

236. It is only recently that Belarus has started to devote attention to its solid waste management problems. Waste practices for many years were sub-standard. While legal dump sites existed, waste often did not reach them because of poor collection systems. As a result, waste was dumped close to where it was generated, creating unsanitary conditions, especially in urban centers. Even if waste was collected, it did not always reach legal disposal sites, but was instead discarded in scattered, unregulated dumps. In addition to the existence of a large number of unregulated dump sites, industrial, municipal and hazardous wastes were often disposed of together, creating dangerous, toxic conditions because of the mixing of many different solid and liquid wastes. Improper siting of disposal sites and a lack of modern engineering design (liners and collection systems for leachate) were also problems, which have led to concern about potential groundwater contamination, which some regions rely on for their drinking water. No efforts were made to collect methane gas from the decomposing waste at disposal sites for electricity generation. Simple waste management practices such as covering wastes and weighing garbage were also not used.

237. Although some of the waste problems of the past continue to exist in Belarus, overall, waste management in Belarus has improved over the past decade. Legal sites are now better regulated and efforts are being made to address the problem of many unregulated, scattered dumps. This is an enormous challenge however, given the large number of disposal sites, many of which will reach capacity soon and need to be closed. Prior to closure, many legal and illegal disposal sites will have to be remediated to ensure that they do not have or continue to have an impact on the environment and health of the population once closed. The government has made progress in terms of developing new waste management legislation to regulate the construction and operation of new landfill sites. Enforcement of these regulations will help to ensure that modern waste management practices are fully adopted in Belarus.

238. Adding to current problems of outdated waste collection and disposal facilities, is the potential for waste generation rates to increase in Belarus with economic growth in the future. It is expected that municipal solid waste will grow very quickly when consumption connected with higher incomes increases. The waste stream could also change, with more packaging leading to the generation of new and different types of waste. The problem is particularly serious in cities, especially in Minsk where two of the three waste disposal sites serving the city of nearly 2 million have almost reached capacity. Given the potential for higher waste generation rates, it is important that Belarus develop modern recycling systems, including household waste separation, to reduce the amount of waste being disposed of at dump sites. While some state recycling plants were in operation in Belarus, they are today either not functioning or not modern enough to effectively separate and process waste for secondary use. A number of private enterprises specializing in recycling are being established. Only a limited amount of composting occurs. The government recognizes the importance of recycling and has initiated a number of pilot recycling programs in selected cities to help in the development of a recycling system that could be introduced to many other cities and eventually nationwide.

239. The Government of Belarus is committed to addressing waste management problems. The Ministry of Environmental Protection and Natural Resources (MEPNR) has initiated changes in the legal framework for waste management and has prepared a program to address key problems. Unfortunately, a lack of funding has impeded efforts to improve the waste management system. Waste tariffs only cover 40 percent of the operating costs of providers of the service, with no funds available for capital investment. Significant technical, institutional/governance, financial and social reforms and assistance are needed if Belarus is going to be able to successfully address its solid waste management problems in the near term.

240. This chapter will only focus on municipal solid waste management. As will be shown, while municipal solid waste accounts for only 12 percent of all waste generated in Belarus, it is spread across a larger area with more point sources than industrial waste. Furthermore, while industrial, non-hazardous waste represents over 80 percent of waste generated, three-quarters of this waste is generated by one potash plant alone. Industrial and hazardous wastes also tend to be found at the site where they are generated or a stored and thus are more contained, although in some cases more dangerous, than municipal solid waste. The government has indicated that municipal solid waste is a priority, given the health concerns that improper municipal waste management is posing to the country's primarily urban population.

B. Characteristics of Municipal Solid Waste

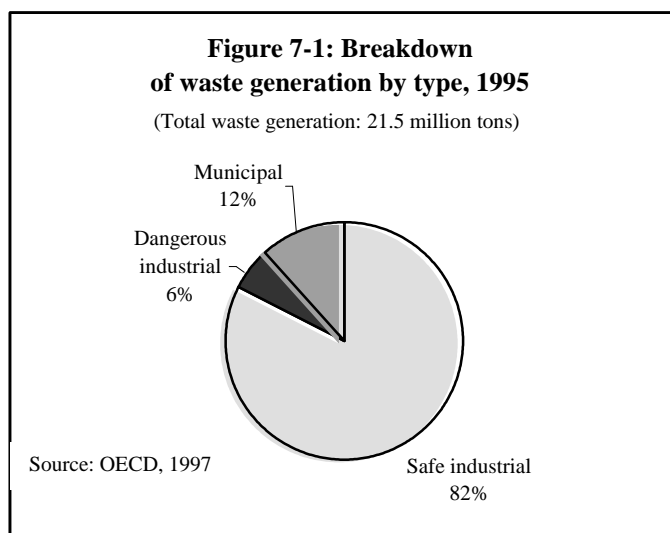
Waste Generation Rates

241. Belarus is a country with a population of over 10 million. Approximately 70 percent of the population is urban (residing in 102 cities and towns and 106 urban settlements) and 30 percent is rural. Waste disposal poses a greater problem in urban areas where there is a high concentration of waste generated and a greater human health impact from unsanitary conditions.

242. According to a 1997 OECD report on the environment in Belarus, a total of 21.5 million tons of waste were produced in the country in 1995 (see Figure 7-1 below). Municipal solid waste (MSW) accounted for 12 percent of the total waste stream or 2.5 million tons. The level of annual waste generation remained the same from 1993 to 1995. A later study of MSW undertaken by the Ministry of Housing and Utilities of Belarus found that a total of 8.76 million cubic meters (1.75 million tons) of MSW was generated in Belarus in 1997¹ (see Table 7-1). Factors affecting the amount of waste generated include wealth and the level to which households are equipped with amenities such as gas, water, sewerage and heating.

243. A deeper analysis of MSW by the Ministry of Housing and Utilities revealed sharp fluctuations in both the overall annual volume waste generated. This indicates that municipal waste disposal sites and landfills receive waste in and uncontrolled (no weighing) fashion. Thus, the data presented may not be entirely accurate, but still help to provide a good, general quantitative view of municipal solid waste generation in Belarus.

¹ The decrease from 2.5 million tons in 1995 could be associated with a decline in the economy and thus consumption, or from methodological differences in the way in which waste generation was calculated in the two studies.

**Table 7-1: Waste generation by region, 1997**

Region	Population '000 people	Municipal solid waste (MSW) annual accumulation, '000 m ³		MSW specific accumulation, m ³ / person/ year	
		Total	of which households	Total	Of which households
Belarus	7,122	8,758	5,292	1.23	0.74
Minsk	1,716	1,812	1,529	1.05	0.89
Brest oblast	930	1,348	654	1.45	0.70
Vitebsk oblast	950	1,208	792	1.27	0.83
Gomel oblast	1,087	1,444	642	1.32	0.59
Grodno oblast	749	871	554	1.16	0.74
Minsk oblast	816	1,046	587	1.28	0.72
Mogilev oblast	874	1,029	534	1.18	0.61

Source: Ministry of Housing and Utilities, Minsk 1998.

Table 7-2: Per capita waste generation rates in selected countries/cities

Country/City	Waste generation (m ³ /person/year)
Country comparison	
Russia (1993)	1.36
United States (late 1990's)	3.73
Belarus (1997)	1.23
Cities	
Soviet cities (1980's)	1.00
Minsk (1997, population 1.7 million)	1.05
Toronto (1994, population 4.5 million)	2.28

Note: Some data was converted using the following: 1 tonne = 1.000 kg and 1 m³ = 0.2 tonnes and 1lb = 0.45 kg
Sources: Ministry of Housing and Utilities, Minsk 1998; State Report on the Environment, Russian Federation, 1993; World Health Organization.

Table 7-3: Comparison of waste generation levels as a proportion of GDP in selected countries

Country	Municipal Waste (kg/US \$1000 GDP)	Industrial Waste (kg/US \$1000 GDP)
Belarus	242	129
Czech Republic	400	232
Hungary	420	104
Poland	260	117
Finland	410	232
France	560	48
Japan	410	61
United States	730	142

Source: OECD, 1997.

244. Table 7-1 shows a breakdown of total waste generation by region. The City of Minsk, with a population of nearly 2 million, generates the most MSW, but produces less waste per capita than Brest Oblast, where each person generates 1.45 m³ of waste every year. As shown in Table 7-2, per capita waste generation rates in Belarus are far below those in the United States and Canada where incomes and consumption levels are higher. The same holds true for cities, with Toronto generating more waste per person than Minsk. In addition to lower per capita waste generation rates, Belarus also produces less MSW per US\$ 1000 GDP than other countries (see Table 7-3). The United States generates the most MSW per US\$ 1000, explained by its strong economy and high level of consumption.

Waste Composition

245. The largest components of MSW in Belarus (see Table 7-4) are paper/cardboard and food waste, followed by glass, plastic and metal. Together, these items represent 85 percent of the MSW stream. The origin of the different types of wastes is given in Table 7-5.

Municipal Waste Collection

246. A variety of locally manufactured, metallic containers are used for storage of MSW in Belarus prior to collection. The containers come in three sizes: 0.6, 1.1 (low capacity) and 12 m³ (special).

247. A total of 1,031 vehicles collect MSW (see Table 7-6). Both low capacity (GAZ and ZIL trucks) and high capacity (MAZ and KAMAZ trucks, MTZ tractors) vehicles are used for MSW removal. Over 40 percent of these vehicles are outdated and require replacement. Table 7-6 also provides information on vehicles and containers by region.

248. Special collection fleets collect garbage in Minsk, Brest, Vitebsk, Gomel, Grodno, Mogilev, Bobruisk, Borisov, Baranovichi, Pinsk, Orsha, Novopolotsk, Polotsk, Mozyr, Lida, Zhodino, Soligorsk, Molodechno. Collection in remaining towns and settlements is undertaken by groups from town or production associations that are affiliated with housing and utility services.

Table 7-4: Composition of the MSW stream in Belarus

Type of waste	Percent
Paper, cardboard	28%
Food waste	27%
Glass	13%
Polymers	10%
Metals	7%
Textiles	7%
Screenings	3%
Leather, rubber	1%
Wood	1%
Bones	1%
Stones	1%
Other	1%

Source: Ministry of Housing and Utilities, Minsk 1998

Table 7-5: Sources of different types of MSW

Physical condition	Place of generation	Type of waste
Solid	Residential buildings household	Food waste, street rubbish, glass, leather, rubber, paper, metal, rugs, plastics, ashes, slag, wood, current repairs waste
Solid	Institutional, administrative and public buildings	Paper, glass, rugs, wood, plastics, street rubbish, etc.
Solid	Catering facilities, kindergartens, schools, institutes, markets, public facilities	Food waste, paper, glass, timber, street rubbish, trees branches, etc.
Solid*	Medical treatment, sanitary and epidemiological institutions	Textile, rugs, paper, glass, plastics, etc.

* subject to treatment and neutralization by special plants

Source: Ministry of Housing and Utilities, Minsk 1998

Table 7-6: Waste collection equipment by region

Towns & regions	Low-capacity transport		High-capacity transport		No. of containers		
	Availability pcs	Depreciation %	Availability pcs	Depreciation %	Up to 0.6 m ³	Up to 1.1 m ³	Up to 12 m ³
Belarus	856	41	175	41	1,920	36,768	371
<i>Minsk</i>	<i>166</i>	<i>37</i>	<i>37</i>	<i>37</i>	<i>1,664</i>	<i>10,154</i>	<i>5</i>
Brest Oblast	123	43	21	43	256	1,861	86
Vitebsk Oblast	81	42	22	42	-	5,786	-
Gomel Oblast	155	37	42	37	-	5,391	30
Grodno Oblast	85	38	17	38	-	5,674	34
Minsk Oblast	109	50	17	50	-	2,897	174
Mogilev Oblast	137	40	19	40	-	5,005	42

Source: Ministry of Housing and Utilities, Minsk 1998

Municipal Waste Disposal

Waste Disposal Sites

249. The primary method of waste disposal in Belarus is landfilling. While some effort is taken to consider soil type and water tables when locating landfills, these important factors are not always taken into account. Nor do all landfills incorporate modern engineering and waste management practices. Many landfills lack liners and leachate collection control systems (e.g. “Trostenets”, Minsk, Gomel, Mogilev, Borisov, Polotsk, Lida, Volkovysk and Krichev landfill sites). Groundwater contamination from landfill leachate is of concern at a number of sites (e.g. landfills in Borisov, Gomel and Lida). There are at least 10 uncontrolled waste sites in Belarus that have been identified as posing a serious threat to the environment. No plans have been made however, to close the sites.

250. In addition to being poorly designed from an engineering perspective, many old landfill sites do not operate in accordance with basic waste management standards. As a result of a lack of earth-moving machinery, waste is not compacted at landfill sites, covered daily or insulated. The removal of leachate from wells and water sampling is not undertaken on a routine basis. Waste is not weighed when it arrives at dump sites, nor is it categorized according to type (e.g. industrial, municipal, hazardous). Efforts are being made to improve waste management practices at existing waste sites but given the number of sites, the task is very challenging. Considerable progress has been made in terms of ensuring that new MSW landfills are built in accordance with modern waste management practices.

251. The total area of land (suburban) in Belarus occupied by dump sites and landfills is between 800 to 1,000 hectares. As shown in Table 7-7, there are a total of 59 dump sites and 123 landfills in Belarus. As of 2002, the Ministry of Environmental Protection and Natural Resources (MEPNR) reported the existence of 202 disposal sites for MSW, covering an area of 1000 hectares, much larger than the 160 hectares covered by industrial waste sites. Every year the amount of land needed for waste disposal increases by 40-60 hectares. Most waste storage and disposal sites close to towns and cities have reached capacity. In Minsk, 2 or the 3 landfill sites serving the city are reaching capacity. New sites are now being planned and in some cases have been built anywhere from 25 to 44 kilometers away from cities.

Table 7-7: Number of waste disposal sites in each region of Belarus

Regions	Dump sites		Landfills		Biomechanical treatment works	
	quantity	area, ha	quantity	area, ha	quantity	capacity, '000 m ³
Belarus	59	269	123	548	2	600
<i>Minsk</i>	<i>1</i>	<i>27</i>	<i>1</i>	<i>41</i>	<i>1</i>	<i>400</i>
Brest oblast	13	73	12	70	-	-
Vitebsk oblast	9	35	23	101	-	-
Gomel oblast	9	36	24	110	-	-
Grodno oblast	7	31	19	85	-	-
Minsk oblast	14	44	18	79	-	-
Mogilev oblast	6	23	26	62	1*	200

* Not operational due to dangerous condition of process equipment

Source: Ministry of Housing and Utilities, Minsk 1998.

Special Waste Processing Facilities

252. Two, major, state municipal solid waste processing plants for resource recovery and production of compost were in operation in the early 1990's in Belarus. The plants are located in Minsk and Mogilev (see Table 7-7). The Minsk "Ecores" plant has the capacity to process 400,000 cubic meter per day. In the early 1990's, the plant was recovering 1,500 tons/year of ferrous metal, 45 tons/year of aluminum and produced 25,000 tons/year of compost. The plant however has not been modernized since it was first built and thus is not equipped to sort waste, use biomass processes to accelerate waste decomposition or apply fine purification processes to produce higher quality compost. Similar technology to the Minsk plant was used in Mogilev (annual capacity 200,000 m³) and it also recycled ferrous metals, aluminum, plastic and glass and produced compost in the early 1990's. This plant however, is no longer in operation due to a lack of maintenance of equipment. An incineration station is located in Minsk, equipped with foreign technology. It is, however, no longer operating for sanitary and environmental reasons.

253. There are number of private enterprises in Minsk that have been established to recycle waste. The system is coordinated by the Belarusian Concern for Material Resources (Belresursy Concern). Urban centers in Belarus that are self-financing arrange contracts with enterprises to recycle waste. According to Belresursy Concern, some centers recycled 9 percent of waste in 1997, and 15 percent in 2001. The government acknowledges the importance of expanding Belarus' recycling capacity and improving waste disposal sites but lacks financing to take action. Some efforts are being initiated however. A pilot program is being undertaken the City of Lida, where metal and plastic containers for different types of waste have been introduced to test the success of source separation. Separation rates in the pilot program are quite low (1.4 percent of households) but could increase with more time and improvements in design.

C. Financial and Economic State of the MSW Sector

254. Financial and economic systems for waste management in Belarus are weak. No differentiated, thoroughly considered tariffs are in place. Current levels of investment in waste management in Belarus are too small to have an impact. Only around 1 percent of total investment in environmental protection is spent on addressing waste management problems. This level of investment will not go very far in addressing problems and implementing plans and programs that have been developed.

255. Table 7-8 shows average tariffs for and costs of waste collection and disposal in 1997 broken down by regions. Population size, annual volume of waste and costs incurred at time of waste collection and disposal were considered in calculating the figures. Overall, waste collection and disposal activities in Belarus in 1997 when the data was collected were profitable. When examining profitability by region however, waste management services in the Grodno, and especially Minsk and Mogilev Oblasts, are operating with considerable losses.

256. Fees collected from the population covered only 30 percent of waste collection and disposal costs in 1997. The shortfall was made up with money from the general budget or from environmental funds. Inadequate funding remains one of the primary barriers to improving Belarus' waste management system. At present, only 40 percent of operating and monitoring costs are covered by tariffs, with no resources being contributed to capital costs. Requirements for capital equipment must thus be met from the state budget, which is grossly inadequate.

Collection trucks and plant facilities need to be upgraded but this cannot happen without investment.

**Table 7-8: Tariffs, costs and profitability
of MSW collection and disposal services across Belarus, 1997**

Region	Average collection and disposal tariff for 1m ³ of MSW, BYR '000	Average collection and disposal tariff for 1m ³ of MSW, BYR '000	Outcome (profit +, loss -)
Belarus	48.9	46.3	+2.6
<i>Minsk</i>	33.8	26.7	+7.1
Brest oblast	55.6	47.7	+7.9
Vitebsk oblast	41.7	42.3	-0.6
Gomel oblast	52.1	42.6	+9.5
Grodno oblast	52.7	53.9	-1.2
Minsk oblast	60.6	65.0	-4.4
Mogilev oblast	58.0	67.1	-9.1

Source: Ministry of Housing and Utilities, Minsk 1998

257. Different options need to be considered to raise the level of available funding. In terms of MSW, fees paid for collection and disposal of waste need to be reviewed and increased. Any increases will need to be considered in the context of the ability of the population to pay for MSW management services. Some increase in tariffs, perhaps with a differentiated structure which rewards separation should be implemented.

258. Another way to increase investment which is supported by the Ministry of Housing and Utilities, is by encouraging private sector involvement in waste recycling (collection and use of secondary materials). Special tax incentives have been made available to interested firms but only a few enterprises have been established to date. A major problem for firms is obtaining sufficient quantities of separated material to make recycling profitable. The rate of separation in Belarus is currently very low, with only around 1.4 percent of households sorting their waste. This separation rate is based on pilot recycling schemes currently underway in Lida and Minsk, involving about 140,000 inhabitants. Without a system of separation that is effective and in which there is a high participation rate on the part of the population, it will be difficult to create a secondary materials industry that is profitable and attracts private investment.

259. Despite the lack of financing for waste management, the government has developed waste management laws. A system of permits also exists to collect payments for waste disposal and there have been improvements in the collection and monitoring of waste data. Programs and regulations have been developed to manage waste and some investment has been made, albeit limited, to create new and properly designed waste disposal sites and facilities for recycling waste.

D. Organization of Municipal Solid Waste Sector

Legal Framework

260. A number of laws related to waste management exist in Belarus: the 2002 law on "Environmental Protection", the 1993 law on "Industrial and municipal waste", and the 2000 law on "Waste". All of these have a number of aims in terms of MSW. One goal is to expand the scale of recycling and use of secondary materials in Belarus. Another is to restore regions that

have been polluted by waste dumps. Finally, the laws and program aim to establish new controlled and legal sites for waste disposal.

261. The law on “Industrial and municipal waste” provides a basis for the development and introduction of standards relating to the generation, storage, processing and disposal of wastes. Regulations under the law provide guidelines for a number of areas including the following: state control for the environmentally-friendly use of waste; rights and responsibilities of enterprise owners; internal transport of wastes and the process for the disposal of dangerous wastes; the collection, storage, disposal of medical waste; and the closure of waste disposal sites.

262. In addition to the laws discussed above, building code standards exist in Belarus to regulate the design and operation of landfills and waste processing facilities. A number of technical documents outlining the process by which waste should be handled also exist but were adopted in the 1970’s/1980’s and thus do not advocate modern waste management standards. Building codes and sanitary standards can be interpreted differently resulting in improperly designed dumpsites, transfer stations and other facilities and unrealistic construction and operation budgets. New methodology introduced in 1997 however, outlines the optimal procedure for selecting environmentally suitable and economically efficient waste disposal sites. These new guidelines have already helped in developing siting schemes in the Mogilev, Grodno and Minsk Oblasts. An environmental passport system was also introduced in 1996 to help track waste disposal sites and maintain a current inventory.

263. Most recently, the MEPNR initiated new changes to the legal framework for waste management in Belarus and prepared a management plan. The legal changes, which draw on similar legislation in Austria and Italy, were introduced in a new law in 2001. The law has three main directions: the application and development of clean production processes to reduce the amount of waste generated; the maximization of the use of waste for the production of secondary materials or for energy; and the provision of modern and safe conditions for the proper treatment and disposal of waste. The law is supported by and links to national programs for resource saving, energy saving and environmental safety.

Governance Relationships

264. The MEPNR has primary responsibility for waste management in Belarus. It is in charge of establishing environmental standards through the development of legal regulations, coordinating the activities of different ministries and local self-governing bodies, issuing permits to large industrial enterprises, collecting payments for waste disposal, issuing licenses for the transboundary movement of waste and promoting international cooperation. MEPNR’s inspection department plays an important role in issuing permits and monitoring enterprises to ensure that they are in compliance with regulations.

265. Local authorities are responsible for the collection and disposal of MSW and play an important role in establishing and running waste disposal sites and facilities for processing both municipal and industrial waste. In big cities and some oblast towns, waste is collected and disposed of by special transportation services. In small towns, special departments or units of the government have responsibility for collection and disposal. In the case of Minsk, a special collection service is provided by the housing department of the city executive committee. The committee also has responsibility for waste disposal and has contracted a commercialized entity

(ECORES) to operate its landfill sites. The company is fully autonomous and has been operating without subsidies for a number of years. It can operate commercially based on the tariff it receives from operating the landfills.

266. In some cases, responsibilities for waste management are not always clear and can be fragmented. This has led to confusion among different levels of government and waste management firms and to the duplication of activities and lack of attention to others. Further clarification of regulation and guidelines is needed to establish the responsibilities of different groups and to increase the efficiency with which waste is managed.

E. Reform Strategies, Plans and Programs for the Waste Management System

Government Priorities and Programs

267. The priority according to the government is to develop legal and well-managed waste disposal sites and build the country's capacity to separate and recycle in order to reduce the amount of waste going to landfill. Better control of existing sites and the construction of new, modern disposal facilities are of primary concern. There is also a need to ensure that MSW, medical waste and industrial wastes are not combined at disposal sites, where the mixing of different substances can produce dangerous conditions. The existence of numerous, uncontrolled dump sites also needs to be addressed since these sites were created without a proper geological assessment and so pose a threat to groundwater. Many controlled sites are reaching capacity and need to be closed in the near future. Once closed the disposal sites will have to be monitored carefully since the waste they contain will decompose for many years. The closure process for sites that have reached their capacity should consider installing modern technology such as leachate and landfill gas collection equipment to safeguard the environment and human health from the pollution created by decomposing waste.

268. Significant capital investment is required to address the many issues raised in the previous paragraph. The costs and benefits of the different disposal (including incineration) and recycling options need to be considered so that the best outcome, both in terms of the environment, human health and the economic value and sustainability, can be selected.

269. The Ministry of Housing and Utilities developed a program in 1998 to address waste management problems in big cities, medium-sized towns, and selected regions (the latter will also address small towns, cottage areas). The program acknowledges the environmental importance of separating waste at its source and removing hazardous wastes from the MSW stream prior to disposal. Better waste management is also beneficial from an economic standpoint since MSW represents a source of secondary materials that can provide revenues.

270. Table 7-9 provides a summary of the program's contents and goals for 2000 and 2005. The program focuses on acquiring all necessary vehicles and containers, collecting 50 percent of waste in separated format, increasing the amount of waste recycled, and decreasing the number of waste disposal facilities by 2005. It will also aim to reduce the amount of waste being channeled through transfer stations, expand recycling facilities and increase the production of garbage containers. The total cost of implementing the program is estimated at 7,700 billion BYR (1998 prices).

Table 7-9 – Waste Management Program Targets for 2000 and 2005

Indicators	Unit of measurement	Base 1997	2000	2005
A. Waste collection, transportation and disposal				
1. Provision of special vehicles and equipment				
- transport vehicles	%	63	85	100
- regular and special containers	%	61	85	100
2. Collection of separated waste in big cities, medium-size towns and selected regions	%	0.1	15	50
3. Recycling of secondary resources (waste paper, textile, polymers, metals, glass, organic matter and organic compounds)	'000 tons BYR billion	0.4 1	20 50	830 2,030
4. Waste disposal				
- non-equipped landfills	%	62	20	-
- dump sites	%	33	43	17
- sorting and dump site complexes	%	-	20	26
- industrial complexes	%	5	20	54
5. Waste disposal in rural areas, at summer houses and at cottages settlements	'000 tons %	- -	100 33	300 100
B. Establishment of industrial and semi-industrial complexes				
1. Sorting and transfer stations	'000 tons of waste	-	420	30
2. Sorting and dump site complexes	'000 tons of waste	-	329	90
3. Sorting and biomechanical works	'000 tons of waste	80	220	630
4. Thermal decomposition of waste ballast	'000 tons	-	-	50
5. Production of plastic garbage containers	'000 units	-	50	300

Source: Ministry of Housing and Utilities, Minsk 1998

271. In order to implement the objectives of the waste management program, the government plans to increase expenditures by up to 70 percent in some cities (see Table 7-10). Expenditure increases will be achieved using a combination of financing from waste suppliers' funds, state environmental funds, municipal budgets/local environmental funds, bank loans and the state budget. The program also foresees an increase in tariff payments of 65 to 75 percent (depending on the region) over 1998 tariff rates during the 2001 to 2005 period. It is not clear whether the impacts and effectiveness of a tariff increase of this magnitude have been studied.

272. The government has also studied potential economic returns from the recycling and sale of secondary materials recovered through separation of MSW. Table 7-11 shows expected revenues in selected cities from the sale of recycled waste. Overall, the greatest revenues are expected to come from paper and plastic recycling, which together represent 70 percent of total expected 2005 recycling revenues (1,330 billion BYR) for major cities in Belarus. Not all of the cities included in the study of recycling revenues are included in Table 7-11. If however, recycling plants were built in all the cities studied (processing capacity of 850,000 tonnes) and resource separation recovery rates were high, total expected revenues for 2005 would be around 2,000 billion BYR (1998 prices) across Belarus.

Table 7-10: Expenditure and tariff targets for 2000 and 2005

Major Cities	Average current (1997/98) tariff payment for 1 ton of MSW BYR'000	1999 – 2000				2001 - 2005			
		Expenditures BYR bn	Sources covering expenditures		Base tariff of payments for 1 ton of MSW, BYR'000	Expenditures, BYR bn	Sources covering expenditures		Maximum tariff payment for 1 ton of MSW, BYR'000
			Description	Amount, BYR bn			Description	Amount, BYR bn	
Minsk	180.0	351.3	SF EF MB BL RB	351.3	600.0	1,339	SF EF MB BL RB	1,200.0 139.0 - - -	750.0
Brest	222.0	89.4	SF EF MB BL RB	72.0 10.0 7.4 - -	600.0	400.1	SF EF MB BL RB	180.0 56.0 74.1 70.0 20.0	750.0
Vitebsk	222.0	133.5	SF EF MB BL RB	96.0 16.4 21.1 - -	600.0	462.8	SF EF MB BL RB	240.0 62.4 76.4 64.0 20.0	750.0
Gomel	222.0	375.0	SF EF MB BL RB	180.3 48.0 56.7 - 90.0	750.0	472.2	SF EF MB BL RB	360.0 57.0 55.2 - -	750.0
Grodno	222.0	131.6	SF EF MB BL RB	72.0 18.0 21.6 20.0 -	600.0	289.6	SF EF MB BL RB	180.0 37.2 42.4 30.0 -	750.0
Mogilev	222.0	247.8	SF EF MB BL RB	118.3 28.0 48.0 - 53.5	750.0	220.8	SF EF MB BL RB	220.8 - - - -	600.0

RB – republican budget; EF – republican ecological fund; MB – municipal budget, local ecological funds, Chernobyl nuclear power plant; SF – waste suppliers' funds; BL – bank loans.

Source: Ministry of Housing and Utilities, Minsk 1998

Table 7-11: Estimated potential revenues for selected cities from the sale of secondary materials in Belarus (BYR bn, in prices as of January 1, 1998)

Towns and regions sanitary purification complexes	Capacity, '000 tons Commissioned	Total revenues for 2005	of which					
			Polymers	Waste paper	Textile	Organic matter	Metals	Glass
Minsk	<u>100</u> 2001	300	60	120	37.5	37.5	30	15
	<u>100</u> 2004	80	16	32	10	10	8	4
Brest	<u>60</u> 2003	90	18	36	11.25	11.25	9	4.5
Vitebsk	<u>80</u> 2003	120	24	48	15	15	12	6
Gomel	<u>60</u> 2000	220	44	88	27.5	27.5	22	11
	<u>60</u> 2002	120	24	48	15	15	12	6
Grodno	<u>60</u> 2001	180	36	72	22.5	22.5	18	9
Mogilev	<u>60</u> 2000	220	44	88	27.5	27.5	22	11
Total	580	1330	416	532	166.25	155	133	66.5

Source: Ministry of Housing and Utilities, Minsk 1998

273. In order to implement the priority measures outlined in the government's waste management program (Table 7-9), efforts will be made to improve management and planning capabilities, introduce modern methods, system and technologies for handling MSW, streamline relevant laws, and ensure that required scientific and technical capacity is available (see Annex 7-1 for more details). In terms of scientific competency, Belarus possesses scientific and technological capacity to design modern waste management systems. With assistance, this local capacity could be guided and developed to ensure long-term know how and sustainability in the management of MSW.

274. A number of specific priorities have been identified to achieve the program's goals. They are as follows:

- Development of comprehensive waste management master plans for Minsk, Oblast capital cities and selected regions;
- Creation and introduction of a system of differentiated tariffs to fund waste collection and disposal operations and investment in upgrading old and building new waste infrastructure;
- Development of guidelines and standards for the construction and operation of engineered landfill sites and recycling plants;
- Introduction of a waste source separation and collection systems in cities and regions;

- Construction of facilities to manufacture waste containers for MSW collection;
- Design and construction in selected cities of modern recycling plants with the aim of ensuring a maximum 80 percent recovery rate of secondary materials including metal, glass, paper, plastics, textiles, and organic matter;
- Application of the most advanced technologies and equipment for waste reduction at enterprises;
- Initiation of thorough research to collect accurate and current information about waste generation rates (weight, volume), physical and chemical composition, and other properties of waste and recyclable materials;
- Establishment of an analytical center to gather information on and assess regional programs and recommend potential capacity building projects; and
- Collection of waste tariff payments in special accounts where they will be used as intended to improve the waste management system in Belarus.

The Bank's Role

275. The World Bank is considering providing assistance to Belarus to help it achieve some of the goals presented in its waste management program. One area in which the Bank could provide assistance is in helping Belarus to develop new economic instruments to encourage the separation of waste at the household level and to promote the development of the private sector in the processing of secondary materials.

276. The Bank could also help in developing a waste management plan for the City of Minsk, which could be used as a model for other cities. The following considerations, among others, would be included in the waste management plan: i) the best method for disposal of household and industrial waste; ii) recommended changes in the tariff structure for the collection of waste; iii) instruments to encourage the separation of waste; and iv) public awareness and education programs. The plan would explore a range of waste management options and select those that provide a least cost solution to the city, given the physical and financial constraints under which it is operating. The use of energy cell technology to accelerate the decomposition of waste and generation of landfill gas would be an option seriously considered, since considerable revenues can be obtained through the sale of electricity generated from the combustion of landfill gas.

F. Conclusions

277. Belarus currently faces a number of waste management problems:

- Poorly sited and designed landfills resulting in a risk of groundwater contamination.
- Absence of modern waste management practices at landfill sites including, covering of waste, compaction, water sampling, weighing, separate disposal of municipal, industrial and hazardous waste, gas collection, and lining and drainage collection equipment for protecting groundwater from leachate contamination.
- A large number of uncontrolled dump sites which has resulted in a scattering of waste and improper siting.
- Many landfill sites are reaching capacity, requiring new solutions for waste disposal.
- Landfills nearing capacity and uncontrolled dump sites which need to be closed.

- A low level of waste separation and recycling (lack of maintenance of old facilities and little investment in new plants, equipment and technology).

278. A major impediment to reforming MSW management practices is the weak financial state of the sector. Tariffs currently in place are not differentiated according to incomes or region and those that are collected only cover 40 percent of operation costs, and not capital investment. Very few resources are invested in the system to upgrade infrastructure.

279. Despite funding problems, the government has made some progress in reforming the legal framework for waste management in the country. Ensuring enforcement of regulations however, is harder and responsibilities for overseeing different aspects of the waste management system are not always clear.

280. The government developed a very comprehensive MSW program in 1998 to focus attention on waste problems. Some of the major program objectives include: acquiring all necessary vehicles and containers for waste collection; recovering 50 percent of waste in separated format; increasing the amount of waste recycled; and decreasing the number of waste disposal facilities. The program is quite ambitious, requiring around 7,500 billion BYR (1998 prices) to meet all of its goals by 2005.

281. While the government has produced an excellent program, funding its plans will be hard to achieve. The program projects an increase in expenditures and tariffs of around 70 percent, with financing originating from a broader range of sources. It is unclear however, what effect these tariff increases will have the population and whether sufficient funds can be raised and used as intended to improve the waste management system. Nevertheless, it appears that the government is very committed to addressing the country's municipal waste management problems. Some financial and technical assistance from IFI's would help Belarus implement the measures it has outlined in its program and develop sustainable, local capacity to address waste problems in the long term.

ANNEX 7-1 Structure of priority measures for implementation of MSW management program in 1999 – 2000

1. Improving management and planning of the MSW management system	2. Developing and introducing modern methods, systems and technologies for MSW management	3. Streamlining the legislative, MSW management framework	4. Increasing scientific and technical capacity to support the program
1.1. Develop integrated master plans for waste management in Minsk, oblast capital cities and selected regions	2.1. Gradually introduce a system of separate MSW collection in Minsk, Brest, Baranovich, Vitebsk, Orsha, Polotsk – Novopolotsk, Gomel, Mozyr – Kalinkovichi, Zhlobin – Rogachev, Grodno, Borisov – Zhodino, Mogilev, Bobruisk	3.1. Restructure the Building Code of the Republic of Belarus:	4.1. Commercialize the production of technology and equipment at domestic enterprises for the collection and transportation of waste
1.2. Devise a structure and system for calculating waste management tariffs	2.2. Establish on a pilot base the separation, collection and industrial treatment of waste in Lida and the adjacent region	3.1.1. Dump sites, sorting and transfer complexes for MSW	4.2. Commercialize the production of equipment for waste treatment and secondary resource recovery
1.3. Develop specific technical and economic indicators of MSW collection, transportation, treatment, and disposal	2.3. Ensure construction and upgrading of sorting and biomechanical works at Gomel, Mozyr – Kalinkovichi, Borisov – Zhodino, Mogilev	3.1.2. Transfer stations and sorting equipment for MSW	4.3. Develop domestic facilities for the manufacture of special plastic containers for recycling and separate waste collection
1.4. Monitor results of introducing a separated waste collection pilot systems for MSW in Lida and produce guidelines for its application nationwide	2.4. Gradually replace obsolete containers with containers designed for separate collection of communal waste for recycling	3.1.3. Recycling facilities intended to process MSW	4.4. Devise integrated, automated and computerized systems for the processing and recycling of waste
1.5. Establish the state enterprise “Tekhno-Resurs” as an analytical center to develop and monitor recycling programs and projects	2.5. Renew the fleet of special vehicles required for collection recyclable material from MSW	3.2. Develop a set of waste management standards for the Republic of Belarus:	4.5. Conduct research and provide projections for generation and physical and chemical composition of MSW

1.6. Establish an educational system “Environment and Young People” to expand knowledge waste management		3.2.1. MSW, Terms and definitions, collection, recycling treatment and disposal	4.6. Conduct research and produce recommendations as to composting composition and properties, as well as its application in agriculture and urban greening
		3.2.2. MSW. Technical facilities for waste collection, transportation, treatment, and recovery	4.7. Conduct research on harmful environmental emissions created during the treatment, destruction and burial of MSW
		3.3. Develop guidelines for waste management:	
		3.3.1. Regulations on placement, and operation of disposal sites and processing facilities for rural, summer house and cottage settlements	
		3.3.2. Technology guidelines for operating urban recycling complexes	
		3.4. Devise specific indicators for the design and construction of sanitary recycling complexes	
		3.5. Establish legal acts dealing with MSW handling as applied to the EC system	

VIII. Environmental Impacts of Chernobyl¹

A. Background

282. On 26 April 1986, as a result of a combination of factors, a sudden, uncontrollable surge in power took place at unit 4 of the Chernobyl nuclear power plant, resulting in the destruction of the reactor and a fire in the graphite moderator. This caused a prolonged release of radioactive materials to the environment and was followed by further releases, associated with the high temperatures reached in the core, between day seven and ten after the initial event.

283. The environmental impacts of Chernobyl in Belarus arise from the deposition of radionuclides, carried over Belarussian territory from the explosion and fire at the Chernobyl nuclear power plant. Due to the various countermeasures taken during the accident to bring the fire under control and to mitigate its effect, the release of radionuclides was erratic. This erratic release, combined with temporal variations in weather and wind, led to a heterogeneous deposition of contamination over the affected regions. The variation in contamination levels is so large that it can vary by more than an order of magnitude within the same village thus making decisions regarding evacuation, remediation and compensation difficult and complex.

284. During the initial periods after the Chernobyl accidents, a considerable rise in exposure dose of gamma radiation was recorded across Belarus. Almost 47,600 km², or 23 percent of Belarussian territory, which was occupied by some 20 percent of the national population, was heavily contaminated, primarily by radioactive isotopes of short-lived iodine (mainly I-131) and long-lived cesium (Cs-134 and Cs-137). Strontium (Sr-90) contamination was more local and more limited, affecting about 10 percent of the nation's territory closest to Chernobyl, in parts of the Gomel and Mogilev regions. Plutonium contamination is still more limited, affecting around 2 percent of the nation's territory, primarily in the 30 km zone around the Chernobyl plant. The affected territory included some 3,600 settlements with some 2.5 million inhabitants, of which one-half million were children. Approximately 2,650 km² of agricultural land has been removed from use in these contaminated areas and around 17,200 km² of forests have been contaminated, 400 km² (23% of all forested area) of which are contaminated with C2-137 in excess of 40 Ci/ km².

285. Initially, as noted above, 23 percent of Belarussian territory was within a region considered contaminated above acceptable levels from the fallout from Chernobyl. Approximately 85 percent of this fallout was composed of radionuclides (radioactive isotopes) with half lives shorter than about a month (mostly I-131). Another 13 percent was composed of radionuclides with half lives of several months (Zr-95, Nb-95, Ce-144) and about 1 percent had half lives of around 30 years (Sr-90 and Cs-137), while about 0.001 percent had half lives greater than 50 years (Pu-239, Pu-240, Am-241). By 1996,

¹ Subsequent to the preparation of this report, a separate study was carried out by the Bank on the Chernobyl Accident and its Impacts. For this reason many of the detailed issues relating to Chernobyl have been shifted to that report and the focus here is on the environmental aspects of this event.

after 10 years of radioactive decay, the total of all radioactivity still present in the environment had fallen to about one percent of the total activity released and was mainly composed of long lived radionuclides (principally cesium, and to a lesser extent, strontium). Nonetheless, in 1996, 20 percent (or 46,500 km²) of Belarus territory was still reported as being contaminated with Cs-137 above acceptable levels, requiring either continued relocation of the population or periodic monitoring of exposure levels. Remaining radioactivity will decline more slowly as long-lived radionuclides make up an increasingly higher proportion of existing deposition.

286. The most contaminated area immediately closest to the Chernobyl plant (the Bragin, Khoyniki and Narovlya districts of the Gomel region) has been declared a 1,700 km² exclusion zone from which all persons were evacuated in 1986 and the lands taken out of economic activity save for basic safety and maintenance, forest fire fighting and scientific research activities. where there are no inhabitants. Specifically, where surface deposition of Cs-137 exceeded 15 Curies (Ci)/km², or 555 kilobecquerels (kBq)/m², evacuation was obligatory while in areas with levels of 5-15 Ci/km² or 185-555 kBq/m², voluntary settlement has been permitted. The impact of these surface contamination levels on humans is expressed in terms of radiation dose which is measured in sieverts. The criterion for permanent relocation is that the expected avertable lifetime dose should not exceed 1000 mSv. As noted in para. 70 in Chapter 3, zones where land use is totally excluded amounted to 2,640 km² and the area where some activity was permissible amounted to about 45,000 km².

287. To date, around 135,000 persons have been resettled including those evacuated from the exclusion zone, those from land deemed sufficiently contaminated to require resettlement, and those having the right to resettle. While contamination levels in much of the resettlement zone do not reach levels requiring relocation, people do have the right to relocate, and some have done so. Many of the vacated contaminated settlements have been razed to prevent re-use, but many are left standing, and a certain degree of re-occupation has occurred. In the most heavily contaminated Khoyniki region, for example, some 25 percent of the population has returned, along with a number of immigrants from Russia and Kazakhstan.

288. Exposure levels in the resettlement zone are high, though in fact not as high as the natural background radiation found in a number of inhabited regions of the world. In the contaminated territories outside the exclusion zone, the total anticipated lifetime exposure (internal and external, and assuming no countermeasures) for the most contaminated regions of Belarus are within the levels of exposure due to natural background radiation in parts of Western Europe, and only one-fourth as great as the highest of these natural background levels. This is not to minimize the impact of the Chernobyl accident on Belarus, but it is relevant to the discussion of efforts made since 1986 to reconstruct the livelihood of those affected by the contamination, and for assessing the countermeasures that might still be recommended.

289. Each of the four, major radioactive isotopes deposited by the Chernobyl plume has its own pattern of distribution and its own effects. These isotopes are worth mentioning as they affect both the need and the potential for different countervailing

efforts. In the case of radioactive iodine, the prominent radioisotope is I-131 which has a relatively short half-life (approximately 8 days). This short half-life precluded accurate measurements to determine levels of exposure because the I-131 had decayed to non-detectable levels by the time international teams arrived to measure the dose. Nonetheless, the major impact of exposure to radioactive iodine in Belarus was a significant increase in thyroid cancer – normally non-fatal and treatable – limited primarily to those who were under 15 at the time of exposure to fallout from the Chernobyl plume. The uptake of radioactive iodine may have been exacerbated among the affected population by a chronic iodine deficiency. The type of thyroid cancer induced by the Chernobyl fallout is not a frequently occurring cancer, which facilitates detection and monitoring of this effect as well as prediction of the total number of expected cases. As of 1998, there were more than 1100 cases in Belarus. A marked increase in thyroid damage was also found in cows in the initial period.

290. Unlike I-131, both Cs-137 and Sr-90 have long half-lives (30 and 29 years respectively), so that contamination from these radionuclides will diminish gradually: in 100 years the levels of both radionuclides will be approximately one-tenth of their initial level. Analyses have shown that Cs-137 contamination greater than 1 Ci/km² in 1986 will decrease by 1.5 times by 2016 and by 2.4 times by 2046. In the interim, these radionuclides constitute the major source of radiation exposure in the environment and food chain for the population. These elements bind successfully with many of the soil types in Belarus and so are susceptible to uptake by certain plants, becoming concentrated in crops, pasture grasses and forest products, and ultimately in meat and milk. The level of external exposure will diminish as a function of environmental processes and radioactive decay over time. Internal exposure - intake of radioactive nuclides through the food chain - can be more readily adjusted through a variety of agricultural countermeasures. Since the principal pathway for internal exposure – (from 40 to 80 percent) is through milk, Belarus has concentrated a large part of its mitigation efforts in this area.

291. Americium-241 (Am-241) and the isotopes of Plutonium (Pu-238, Pu-239, Pu-240 and Pu-241) predominantly exist as isolated and chemically inert particles, which are very insoluble in the environment and therefore have very low uptake by plants and vegetation. In addition, the minute quantities of these radionuclides that are available are strongly bonded to the soil and therefore have limited possibility for re-suspension and air transport. The highest concentrations of these radionuclides are in the 30 km zone where human exposure (both external and internal) is precluded and therefore are not of concern for this report. In spite of this, however, some monitoring is justified as concentrations will increase over time and could be a factor in the inhabited territories in the future.

B. Environmental Effects

292. Health impacts and the broader social impacts from Chernobyl were covered in the Bank's 1993 Strategy Assessment and, since there is little, new information to add, they are not discussed in detail. It suffices to note that the focus of public health efforts and general population concerns to date, besides the detection and treatment of thyroid

cancers among exposed children, has been the assurance of a "clean" food supply for the population. Nor does this report focus on an extensive cataloguing of past damages. Rather, the intent is to note the progress made in environmental clean-up and the mitigation of the environmental impacts of Chernobyl since 1986, and to explore the potential for future mitigation activities. For purposes of discussion, the environment is divided into the natural environment and the agricultural environment. Both were affected by Chernobyl, but the available responses are different in the two cases.

293. Environmental impacts on non-human populations are not measured in terms of individuals but in terms of relevant populations. An extensive survey of flora and fauna in the resettlement and exclusion zones indicates that direct radiation injury of plants and animals was reported only in localized areas within the 30 km exclusion zone and within the first one to three years after the accident. Most damaged were conifers and some small mammals. The rest of the environmental damage came from deposition of radionuclides from the Chernobyl plume.

Natural (Non-agricultural) Environment

Forests and Forest Fires

294. Some 500-600 ha of trees in the vicinity of the reactor received very high doses of radiation resulting in the death of pine trees and partial damage to the crowns of other trees (especially birch and alder), the crowns being the part receiving the bulk of the deposition from the Chernobyl plume. Conifers are extremely sensitive to radiation. Over an area of 3,000 ha which received high doses, 25 to 40 percent of pine forests died, and 90 to 95 percent of the trees showed some damage to reproductive functions. By 1988/89, however, most had recovered their reproductive functions. The total of trees that died amounted to less than 0.5 percent of the forested area of the zone.

295. Nonetheless, radioactivity resides to varying degrees in the wood of affected trees, sometimes limited to the rings grown after 1986 and sometimes pervading the tree. Around 270 thousand ha of forest heavily contaminated with caesium-137 (mostly the Vetka, Chechersk and Narovlya forestry enterprises) were retracted from normal economic activity to avoid radiation exposure to personnel. Radionuclides also tend to concentrate in certain forest products, notably mushrooms, berries and game, which traditionally have formed part of the local diet. Levels of contamination in these products can be very high, and people are no longer permitted to forage or hunt for them except in declared safe areas.

296. There is a risk of redistribution of radioactive contamination from forest fires in the contaminated zones and consequently a large part of the land management effort in these areas is devoted to preventing forest fires. These efforts include making mineralized strips on quarterly cuttings, plowing around the resettlement villages, digging fire fighting reservoirs, maintaining roads to the most fire-prone sites, flooding part of the peat fields, ground patrols, and setting up fire-chemical stations. Both regional and national resources are devoted to fighting fires in the exclusion and resettlement zones. Monitoring stations are placed in the zone for early warning of such fires and monitoring the direction of the smoke, which is also tracked by the national environmental monitoring system of Hydromet, though not as a priority. Hydromet has 8 passive air

monitoring stations in the Gomel region, but only one active monitoring station capable of detecting elevated radionuclide concentrations. No specialized firefighting training program has been established for the Chernobyl areas.

297. As for other vegetation besides trees, some physical abnormalities were noted in plants subject to initial exposure, but no visible changes in growth or reproductive function were observed in most species of herbaceous plants. Within three years herbaceous plant seeds for most species had already regained relatively normal production and viability, though contamination levels remain high in some areas.

298. Small mammals such as mice with high initial doses of radiation were observed to have reproductive and genetic disorders, and population instability. In some cases, the populations returned to normal in a few years; longer term effects, as with humans, cannot yet be determined. Some species of frogs initially showed a 30 percent increase in sterility. Insect and spider populations in the 30 km zone, whose habitat of forest litter and topsoil accumulated radionuclides, showed marked declines in the first year after Chernobyl.

299. Aquatic organisms have shown high levels of tolerance to elevated levels of contamination without reproductive damage. Benthic organisms showed high levels of contamination reflecting concentration of radionuclides in bottom sediment. One mollusk population was seen to decline, but of the 31 species of fish examined in the 10 years after Chernobyl, none showed any damage or effects, despite high levels of Cs-137 uptake.

300. Within the exclusion zone, animals and birds have benefited greatly from the lack of human predators. Some 252 species of birds are found within the reserve, as are bison and wolves. Hoofed animals are being introduced.

Water and Floods

301. Direct deposition from the Chernobyl plume occurred in rivers, lakes and seas. Within one month or so of deposition, the concentration of radionuclides in surface waters had fallen dramatically with sedimentation, and within three years was negligible or undetectable even in the most contaminated Pripjat River. Flooding can be a serious problem in areas where agriculture has been extended to marginal, peat-bearing lands. After storms and floods, which roil the rivers and disturb bottom sediments containing settled out radionuclides, elevated amounts of radioactivity are detected, but at levels that, according to international standards, pose no hazard to human health even for persons using the Pripjat directly for drinking water during their lifetime. Concentrations of radionuclides in the Black and Baltic Seas (into which Belarus' rivers flow) register very low levels, and it is unclear how much of this can be attributed to transport of contamination from the Chernobyl region.

302. The government authorities took early and extensive steps to protect drinking water sources and underground aquifers from contamination. An intensive program was undertaken to first seal artesian wells and then shaft wells in the resettlement areas. At present, the possibility of radionuclide contamination of drinking water in the

resettlement zones does not seem to be a major concern either for the population or the authorities, whereas iron and nitrate contamination are serious.

Agricultural Environment

303. Contamination levels on agricultural lands immediately after the Chernobyl fire resulted in 2,650 km² of land being removed from productive activity, one-third of which was in the 30 km exclusion zone. Livestock and farm animals in this exclusion zone were destroyed and buried. In the resettlement zone, where contamination levels are lower, it has not been necessary to completely suspend agricultural activities. But some changes are needed in agricultural practices and crop and fertilizer choices, and food processing, in order to assure the production and sale of “clean” food products from these areas for consumption and sale in Belarus markets. The efficiency of these agricultural and processing practices in reducing contamination of final food products can be impressively high (see below).

304. Contamination of fields, pastures and cows by I-131 and Cs-137 immediately after Chernobyl was the first urgent concern for the agricultural sector, requiring stringent controls on milk, milk products and meat consumption, and on pasturing and harvesting practices. After six months, I-131 contamination was no longer a major concern. Instead, contamination of agricultural lands was primarily from Cs-137 and to a lesser, but increasing extent, from Sr-90 depositions was of major concern. As noted, the degree of contamination retained in the soil varies widely according to type of soil, soil moisture and uneven patterns of deposition. Uptake of radionuclides into crops can vary even more (by several hundred times) depending on the clay, organic, pH and moisture content of the soil, and especially on the type of crop. Since most of the radioactivity is typically in the top few cm of the soil, remediating natural hay fields and pastures, together with chemical blocking of radionuclides, can reduce uptake significantly.

305. Crops have widely different uptake patterns from soil to harvested food, due to variations in their radionuclide transfer factors for the soil-plant-fruit pathway. Thus, some crops, such as corn (maize) and apples have very low concentrations of radionuclides in the final fruit, while others such as beans, have exceedingly high levels. The uptake of cesium and strontium into plants can be partially blocked by using other chemicals (notably potassium and phosphorous) as fertilizer. Where such fertilizing is not economical or accessible, cows that graze on contaminated lands can still provide “clean” milk and meat if the cows are fed ferrocyanide compounds (commonly called “Prussian Blue”) prior to milking or to slaughter in doses appropriate to the level and type of contamination. On dairy and cattle farms located in contaminated regions where none of these countermeasures are used, it has been observed that the milk contains excessive levels of Sr-90 and Cs-137, while the meat contains excessive levels of Cs-137.

306. Changing crops and fertilizers, coupled with food processing as discussed below, can thus result in foodstuffs that meet national and international standards, without major capital or technological investments. Nonetheless, access to and application of such countermeasures is not universal, even among collective farms, due in part to lack of funds or shortage of materials. Inertia in the traditional farming sector may also account for part of the failure to apply countermeasures. In the two percent of farms in the

affected regions that are individual farms, agricultural countermeasure practices are particularly scant, due in part to lower access to blocking fertilizers, deep plows and agricultural extension services.

C. Economic Impact

307. The State Chernobyl Committee of Belarus estimates that the cost to the economy in the aftermath of Chernobyl has been \$235 billion. This figure is broken down in Table 8-1 below.

Table 8-1: Social and economic damage to Belarus as a result of Chernobyl catastrophe by sectors of the economy (in billion dollars)

Sector	Period (years)				
	1986-1990	1991-1995	1996-2000	2001-2015	1986-2015
Public health	4.05	16.77	18.13	54.32	93.27
Agro-industrial complex	18.30	20.00	15.60	18.10	72.00
Forestry	0.58	0.68	0.70	2.15	4.11
Industry	0.06	0.13	0.11	0.33	0.63
Construction	0.15	1.25	0.32	0.96	2.68
Mineral raw materials and water resources	2.00	0.12	0.15	0.40	2.67
Transport and communications	0.93	1.20	0.36	0.90	3.39
Social sector	2.84	5.45	2.96	6.45	17.70
Decontamination of polluted areas	0.04	4.19	22.48	10.12	36.83
Radiological monitoring	0.05	0.21	0.19	1.27	1.72
Total	29.00	50.00	61.00	95.00	235.00

308. Public health, which includes the costs of resettlement, social benefits and compensation to the affected population, has over time accounted for a growing share of these aggregate damage estimates, amounting to some 40 percent of aggregate social and economic costs over the 1986 to 2015 period. Agricultural costs have also been high. It has not been possible to ascertain how much of these estimated damages are accounted for by actual financial outlays, how much by losses in production or productivity, and how much are external or opportunity costs. Where there are opportunity costs, it is unclear whether these would have materialized given the current structure of the economy. Indeed much of the assessment could be questioned and its validity challenged².

309. In terms of actual expenditures, rather than assessed damages, the total Chernobyl budget amounted to around \$100 million in 2000 at the end-year exchange rate. About 28 percent of this was for capital investments and the bulk of the rest (\$70 million) for social support for the affected population. Of the investment total, a major portion has

² The Mission could not establish the full economic rationale of the calculations and feels that some of these figures may be exaggerated significantly.

gone to the construction of dwellings (83 percent in 1989, down to 73 percent in 1999). Of the balance, only a small amount has gone to agricultural countermeasures of the kinds identified above. Long range plans for rehabilitation of radioactively contaminated areas in Belarus require significant investment in revised agricultural practices and countermeasures to produce agricultural products that meet national and international standards for permissible levels of radioactivity. The plan is to increase the share of investment in this area substantially over the next three years (Ministry of Emergencies, 1999). This will, however, require external support given the size of funds required.

310. As far as the Mission could ascertain, no assessment has been made of the impact of different expenditures in terms of poverty alleviation. Is it more effective to shift funds at the margin on agricultural countermeasures than on social support programs with respect to this objective? Such a study is merited, and should be undertaken, but some preliminary evidence suggests that an increase in agricultural investment could provide a bigger benefit. First, much of the social support is not targeted towards the poor (see Box 2-4, Chapter II). Second, many other studies attest to the high effectiveness on poverty reduction of rising yields and the increasing value of marketable produce. Hence, on poverty reduction grounds, a shift in expenditures towards improving agricultural productivity would seem to be merited.

D. Agricultural Countermeasures: Producing "Clean" Food

311. Different opinions exist about whether people should occupy the resettlement zone at all. However, the fact is that people do inhabit this zone (in those areas where there is right of resettlement) and they will continue to do so. Moreover, they will continue to seek their livelihood largely through farming and by producing food for their own consumption. It is therefore important to assure that the food produced in this region, whether for marketing elsewhere or for local consumption, meets appropriate standards for acceptable levels of radioactivity.

312. Belarus has consistently maintained stringent standards for permissible levels of radioactivity in foodstuffs. However, where more stringent standards exist for particular foodstuffs in the Russian Federation, Belarus' most important trading partner for agricultural products, Belarus now aims to have its agricultural products meet those more stringent standards. This should improve the marketability of dairy and meat products from Belarus' contaminated areas in Russian markets. However, meeting these standards will require serious and widespread application of a variety of agricultural countermeasures in Belarus. This is not possible under present circumstances, and will be possible only through a long-term and targeted investment program.

313. Nonetheless, concerted efforts are being made. The Ministry of Agriculture has issued guidelines for agricultural practices and food processing techniques recommended for use on contaminated lands to produce "clean" food products that conform with required standards. These guidelines proceed from the premise, based on experience in the early days after Chernobyl, that decontamination of the fields and pastures by removing the contaminated top few centimeters of topsoil is prohibitively expensive, difficult to manage and unnecessary. Rather, they build on extensive knowledge about

relevant pathways for the transmission of radioactivity through the food chain. They describe in detail the range of techniques that block the uptake of radioactivity from one stage of the food chain to the next. These include: selection of soil composition, soil pH and ideal moisture content to block the uptake of radionuclides; selection not only of the type of crop, but crop brands, which vary widely in their blocking and uptake capabilities; selection of ideal planting times; optimal application of appropriate fertilizers; and a variety of intermediate and final product processing measures. Table 8-2 gives some details of sample countermeasures and their potential impacts.

314. To reduce the concentration of radionuclides in the soil, and in fodder, some of the countermeasures being applied include: re-grassing of hayfields and pastures; removing marginal lands from cultivation; and eliminating pasturing from wetland meadows, forests and lands adjacent to roads, where radionuclides tend to concentrate. Lands that are unsuitable for growing fodder within permissible levels, even after remedial measures have been taken, can still be used to grow crops such as rapeseed and other seeds for processing into oil, or grain for processing into alcohol.

315. To block the uptake of Cs-137 and Sr-90 from the soil to plants, one of the most effective measures used in Belarus is the application of potassium and phosphorous-based fertilizers to lands used to grow both food crops and fodder. These fertilizers reduce the uptake of radionuclides by around 1 to 6.5 times, while increasing the fertility of the soil, for a double benefit. The government has distributed or made available such fertilizers both to collective and to individual farms, though need outstrips available supply. Liming of acid soils can also be used to achieve the optimum pH level for reducing the uptake of radionuclides in a particular soil. Experiments are being tried with careful crop selection to further reduce uptake from the soil to the plant, as certain crops either do not take up these elements at all, or do not pass them on (at least not in detectable or significant quantities) to the final fruit. Apples and corn are two such crops. By contrast, bean plants tend to concentrate radionuclides in the bean, and so are not recommended for growing on contaminated lands. Local farmers and authorities acknowledge the need for specialization in "clean" products, but there is little evidence that major crop shifts have occurred to date in the affected areas.

316. At the next level of the food chain, cattle and hogs that have grazed on contaminated lands are "cleaned" and fattened prior to slaughter, much as range-fed cattle are corn fed before slaughter. This is a far more economically viable approach than mechanical decontamination of pasture lands. The "cleaning" is accomplished again by the use of chemical blockers and cesium binding preparations in the feed, such as ferrocyanides that adsorb the radionuclides and prevent their uptake in the animal tissue, effectively reducing their biological half lives by 50 to 97 percent. The cleaning process can take from a few days to a month or so, but can be extended for the duration of the fattening process. This practice reduces the transmission of radionuclides from animals to meat by a factor of 2 to 5. A similar application of chemical blockers reduces the levels of radioactivity in milk from cows that have grazed on contaminated pastures. Reductions by a factor of 3 to 10 are not uncommon. However, sheep raising, unlike hogs and cattle, is not recommended in the contaminated regions, because the principal cash crop of wool from sheep raising cannot be readily decontaminated.

Table 8-2: Sample Countermeasures and Their Relative Effectiveness

Agricultural Countermeasure	Ratio of Decrease of Radio Sorption	
SOIL TREATMENT AND PREPARATION	PRODUCT	REDUCTION FACTOR
Regrassing pasture land	Milk	1.5-1.7
Liming		6-7
Fertilizers		1.1-6.5
Deep plowing	Grasses, cereals	5-10
CROP SELECTION		5-100
"CLEAN" FEEDING		
Ferrocyanide and cesium binders	Meat	2-5
	Milk	3-10
FOOD PROCESSING	Percent Reduction in Radioactivity	
	From Raw Products	
Grain milling		60-90
Processing grain into alcohol		99-100
Potato pilling		20-98
Milk into butter and cream		93-100
Cooking and curing meat		20-80

Source: "Belarus and Chernobyl – the Second Decade" (Ministry of Emergencies); and "Guidelines on Agricultural Production in Conditions of Radioactive Contamination of the Ground in the Republic of Belarus, 1997-2000" (Ministry of Agriculture).

317. Wider spread use of these practices and technologies could improve the viability of the agricultural sector through utilization and processing of appropriate agricultural products even in the most contaminated areas. Agricultural products that exceed permissible levels for food may be used as forage or seeds, or processed, thereby significantly reducing the radionuclide content of the final products.

318. Food processing is the final stage of the chain. Processing enterprises are of interest for several reasons. First, processing raw food can effectively decontaminate the final products. Second, processing provides some value added to the farm products, making sales potentially more profitable. Third, food processing can serve as an organizational focus for agricultural restructuring and for regional development.

319. Certain food processing practices in Belarus are highly effective in reducing radioactivity levels in final products. The effectiveness of these decontamination processes depends on the solubility of the radionuclides, which can be separated out in liquid form from remaining products. Milk, for example, can be processed into cheese and butter, since the contamination is largely in the whey, and not the curds. This whey can either be fermented or processed into caseine for making glue, further reducing the

amount of radioactive liquid waste. Similarly, the refining of sugar from sugar beets produces sugar and a radioactive liquid waste product which may then be used for feed. Other technologies are being used to process contaminated grain into "clean" distilled grain alcohol, with the radionuclides left behind in the distillation process. Radioactive seeds, such as rapeseed or sunflower seeds, are being processed into "clean" oils, with the radioactivity concentrated in the sludge of the hulls. Margarine is also being made from contaminated grasses. Some of the residue from these processes is made into fodder.

320. Lack of processing facilities results in substantial losses to some farms, particularly in the Gomel region because of the difference in prices for food and forage grain. In the Khoiniki district, virtually all grain output (30,000 tonnes) fails to comply with permissible radionuclide levels for food grain. Distillation is clearly a preferred solution, but the facility for spirit production in Strelitchevo (Khoiniki district) has insufficient capacity for the Khoiniki and surrounding districts. Grain that cannot be distilled is used as animal feed. Milk producers would also benefit from distillation facilities. Whereas current processing plants produce cheese, cream and caseine, the whey from contaminated milk, a byproduct of cheese-making, could also be processed into spirit. Around 25,000 tons of contaminated whey are produced in the Khoiniki cheese factory alone, the discharge of which could be prevented or reduced by distillation.

321. Effective combinations of crop selection, fertilizer application, and intermediate and final product decontamination, can be designed to maximize the total decontamination effect. Effective decontamination of raw agricultural products can reach 30 percent by combining countermeasures. Processing of these products can then further reduce the radioactivity by a factor of 10. Thus application of such measures can and does produce final products that are well within permissible levels of radioactivity for foodstuffs. Successful application of these techniques has produced impressive results, but is severely hampered because of a lack of funds.

322. Dissemination of agricultural countermeasure techniques and food processing capacities lags seriously behind total farm production in the affected areas, a trend driven largely by employment considerations. Nor have farm production levels been altered significantly to accommodate limited processing capacities. The Ministry of Agriculture estimates that countermeasures are applied to less than half of the agricultural production that needs decontamination. Contaminated grain is either processed or used as fodder, but cannot be used in food production. Farmers are thus operating at a loss since fodder prices are much lower than those for grain sold as food.

323. In another area, Belarus is experimenting with approaches for decontaminating and making commercial use of peat lands and wood, to provide employment as well as local, adequate and affordable energy supplies. Although the Yamal pipeline runs through this region, carrying natural gas from Russia to Western Europe, much of the region's inhabitants and enterprises are not connected to receive this gas. Within the State Committee on Chernobyl's present program, about 15 percent of the budget is scheduled to be allocated to a gasification program for areas where forests and peat lands are contaminated and are considered a hazard to health when used as energy sources.

This program has been given high priority but even with increased access to gas for some of the regions, a need for these local sources will remain. Hence there would certainly be some value in looking carefully at technologies for decontaminating local fuels. Peat lands, which retain radionuclides in the top few centimeters from the surface, can be used by stripping off the contaminated layer, and making peat briquettes from the remaining, uncontaminated peat. Where it is possible to strip off the outer contaminated rings of trees, wood from contaminated areas can also serve as fuel. Neither option is necessarily cost effective or desirable from an environmental point of view, but they may serve as a useful stop-gap until the whole region has access to adequate quantities of natural gas.

324. It should also be noted that, while some of the forest area contaminated with radionuclides has been withdrawn from commercial activity (mostly in the Gomel region), a considerable amount of wood in the contaminated areas is fit for use. Its harvesting is highly mechanized and primary processing is done directly on site in order to substantially reduce individual and collective radiation doses. These activities could be expanded. Commercial lumber products are being exported from the region after the contaminated outer bark and rings have been removed. Plans are also being made for a plant to produce cellulose from local wood. While sufficient quantities of uncontaminated wood are available to supply such a plant, the process could, at least to some extent, use decontaminated local wood.

E. Monitoring

325. A separate, critical and significant aspect of dealing with the aftermath of Chernobyl has been to establish a national, regional and local system of monitoring and analytical laboratories. The objectives of the system include tracking the environmental dispersion of radionuclides and measuring the product contamination level of crops and animals, food inputs, food products, the inputs and outputs of food processing plants, products at local markets, and industrial inputs and outputs in industries such as metal recycling.

Environmental Monitoring

326. The national environmental and product monitoring systems sample air, water and soil at hundreds of sampling sites around the country. These samples are analyzed State Committee for Hydrometeorology (Hydromet) laboratories for a variety of radioactive and non-radioactive pollutants. Monitoring of food products and drinking water is the responsibility of the Ministry of Agriculture and Food, Ministry of Health, Committee of Forestry, Ministry of Communal Services and other agencies. The need to track radioactive contamination levels raises the costs of these sampling systems, a cost directly related to the impact of Chernobyl, but not considered directly as a Chernobyl-related expense.

327. The Center for Radiation Control and Environmental Monitoring in Hydromet in Minsk has five laboratories and four radiology labs. The five general environment labs include:

- An air monitoring laboratory for the City of Minsk that analyses emission gases in air samples and toxic elements in air particulates collected at 10 permanent stations. The laboratory measures for formaldehyde (from industrial and vehicle exhausts), phenols, Pb, Cd, SO₂, NO, NO₂, NH₃, CO, and suspended particles;
- A physical and chemical analysis laboratory that performs toxic and heavy metal analyses for samples of water (precipitation and surface waters), air particulates and soils using atomic absorption spectrometry (AAS). Water and soil samples are analyzed for Cu, Ni, Pb, Cd, Mn, Zn, Na, K, and chloro-organic, triasin and phosphoro-organic pesticides. Air quality is measured in terms of Pb and Cd;
- Soil pollution laboratory that monitors soil contamination from man-made toxic substances in cities, within industrial areas and along roadsides, in addition to the concentration of pesticides in agricultural land.
- A hydrochemical laboratory that performs the following determinations in samples of surface waters and precipitation: anions (HCO₃⁻, Cl⁻, SO₄⁼, PO₄⁻⁻⁻⁻, NO₃⁻, NO₂⁻, NH₄⁻) and by titrimetry; chromium species (Cr(III) and Cr(VI)); organic contaminants including phenols and detergents; total suspended solids; pH; total dissolved oxygen; CO₂; biochemical oxygen demand, and conductivity; and
- A hydrobiology laboratory that studies surface waters and bottom sediments using bio-indication methods and associated hydrobiological indicators: phytoplankton, zooplankton, phytoperyphon and macrozoobentos.

328. The four radiological laboratories belonging to the Hydromet's Center for Radiation Control and Environmental Monitoring include:

- A radiochemistry laboratory that analyses Sr-90 and plutonium isotopes in samples;
- A radiometry laboratory that monitors the levels and composition of all radionuclide concentrations in the air, mostly using passive and active samplers. Sampling is conducted across Belarus, including Gomel Oblast, as well as areas where nuclear power plants border neighboring countries. Between 20 and 35 air samples are taken and analyzed at the laboratory every day;
- A radio-spectrometry laboratory that measures gamma-emitting radionuclides (primarily cesium-137) in air filters, and soils and water samples. It analyzes some 1000 to 2000 samples a year; and
- A mobile radiological laboratory equipped with state of the art radiometric and spectrometric technology for direct field work and for emergency purposes.

329. These radiology laboratories, like the other laboratories of Hydromet, are sorely lacking in equipment and training. The radiochemistry laboratory has only one alpha-spectrometer of poor efficiency and resolution and no ancillary equipment or supplementary radiochemical supplies. Half the staff is near retirement, but all staff are qualified. The Head of laboratory attended a course in Germany on measuring

radionuclides. Other staff could also benefit from such training. The radiometry laboratory is not equipped with active air sampling stations, and the one in Gomel can only detect whether radionuclide concentrations in the air around Gomel are elevated relative to the levels of uncontaminated regions. Virtually all of the equipment in the radio-spectrometry laboratory, largely already obsolete (installed in 1986), has failed. There are insufficient funds for repair or replacement, and the lab has only survived by taking from the mobile laboratory, which is now no longer functional as a mobile lab.

330. The extent of the monitoring and analysis effort in Belarus, including the number of samples tested, as well as the scope and quality of results, is impressive, particularly considering the age, scarcity and condition of equipment. In general, the size of the laboratories and qualifications of the staff in both the Center for Radiation Control and Environmental Monitoring and the Research Institute for Radiology in Gomel Oblast are adequate to meet the sampling and analysis requirements for environmental monitoring of radioactive pollutants. However, this is not the case for environmental monitoring of radionuclides in food products where a very limited number of trained and qualified staff are available to deal with a large sample load. This leads to considerable delays between the receipt of samples, their analysis and the reporting of results. As described below, this poses problems particularly for the monitoring of acceptable levels of radioactivity in milk and milk products.

Monitoring Radionuclides in Agricultural and Other Products

331. Immediately after Chernobyl, the USSR Ministry of Health established strict permissible levels for radionuclide content in foodstuffs, consistent with the international guidelines that recommend a *total* annual exposure for humans not to exceed 1 mSv. In 1990, Belarus obtained the right to set its own standards differing from those of the rest of the FSU. It continued to use the annual external exposure standard of 1 mSv. In 1999, Belarus tightened standards regulating permissible levels of cesium-137 and strontium-90 content in foodstuffs and drinking water. MPL-99 standards were developed in accordance with international recommendations requiring that total exposure for humans should not exceed 1 mSv/year. This maximum exposure is calculated as a function of what is called *external* exposure that comes from radionuclides deposited in the surrounding environment, and *internal* exposure through the food chain or inhalation. For Belarus, both factors in this equation can account for significant exposure levels. In other countries that establish similar standards but where *external* exposure is virtually nil, permissible levels of radioactivity for *internal* (from food) exposure can be and often are set higher. Belarus also bases its permissible levels on the highest rather than on average exposure levels. As noted above, since Belarus is now in an economic union with the Russian Federation, their principal trading partner, they are in the process of merging their requirements with Russian standards, which in some cases are even more stringent than those of Belarus.

332. Monitoring permissible levels in foodstuffs across the country entails a massive sampling and analytical effort. A network of hundreds of laboratories, including those of the Ministry of Agriculture and Food, Ministry of Health, BelKoopSouz and Forestry Committee are used for monitoring. The Ministry of Agriculture's network alone includes 928 laboratories with radiation monitoring capacity, which is used to conduct 3

million tests per year. The Ministry of Health conducts around 180,000 tests per year to measure the radionuclide content in food. In total, more than 1,400 stations exist to monitor radiation contamination in food products sold in Belarussian markets, as well as food produced for self-consumption on individual farms. Food products are monitored on the farm, at the input and output points of all food processing plants, and in markets prior to sale.

333. The RIR is responsible for monitoring food and environmental samples for the State Committee for Chernobyl. The staff of 15 carries out sample processing and measurement for gamma-emitting radionuclides on almost 3000 samples per year and radiochemical analysis of around 2000 samples per year for Sr-90. The Institute is just starting to analyze for plutonium. The samples consist of soils, milk and biological materials (plants). The laboratories are equipped with two gamma-spectrometers, one automated beta-counter for Sr-90 and three alpha-spectrometers for measurement of alpha-emitting radionuclides (plutonium, americium). They are in need of additional and more up-to-date equipment to improve sample analysis capabilities and reduce sample turnaround times. They also lack supplies and ancillary equipment, tracers, reference materials for quality control of measurements, and training for staff.

334. Monitoring foodstuffs for gamma-emitting radionuclides (e.g. Cs-137) is adequately performed at all four stages, since the analysis can be performed relatively quickly and simply, can be automated, and non-technical staff can be trained to perform the routine measurements. This is not the case, however, for the analysis of pure alpha (Pu) and beta-emitting (Sr-90) radionuclides. This requires tedious and time-consuming, destructive radiochemical separations, analysis and measurements, and well qualified staff who have been extensively trained in radiochemical analysis.

335. For Sr-90 in particular, laboratories in Gomel and Minsk often require two weeks to provide results on samples sent from food processing plants. This delay is unacceptable. These plants (especially those producing fresh milk) need to decide on an appropriate course of action within a short period of time after receiving raw farm products for processing. In the case of milk, the level of Sr-90 and whether it exceeds permissible levels, will govern whether the milk will be processed as milk, cream, cheese, or caseine, or whether it needs to be destroyed. The acceptable delay for detecting Sr-90 levels in milk is no more than one day. Meeting the analysis needs of food processing industries for Sr-90 would require establishing many local laboratories, adequately equipped and with properly trained staff, capable of processing all samples received in one day.

336. To further improve monitoring of radionuclides in the agricultural sector, Belarus would also like to implement chemical and radiological testing of agricultural soils. This should permit pre-selection of land for growing fodder and allow for a more scientific selection of lands, crop types and brands, fertilizing and watering techniques, and cattle pasturing sites and feeding techniques, all aimed at reducing the overall uptake and transfer of radionuclides from soil to milk and meat. Grass could also be tested in the fields before pasturing and haymaking to determine its radionuclide content, and hence its best use or its need for additional treatment or processing. The Ministry of Agriculture

estimates that regional agricultural chemical and veterinary laboratories could do this work if properly equipped and trained. Meeting increasingly stringent standards for meat production may also require the installation at slaughter houses of more sophisticated monitoring, such as life-cycle radiation control units for cattle supplied from contaminated zones.

337. Three laboratories performing environmental analyses were visited in the course of the mission, two in Minsk and one in Gomel. A detailed report on the three laboratories visited is available on request.

F. Future Implications And Outlook

338. The Ministry of Agriculture and the State Committee on Chernobyl have provided two proposals that offer interesting possibilities for agricultural land use reform, better application of agricultural countermeasures and forestry improvements:

- (i) radiation countermeasures for food production.
- (ii) support for agribusiness in the Gomel, Brest and Mogilev Oblasts.

339. Under the former, the following activities would be supported:

- Regrassing pasture land
- Liming
- Application of potassium and phosphorous fertilizers
- Remediation of natural hay fields and pastures
- “Clean” feeding of animals prior to slaughter

340. The government is already taking some action in all of these areas, but much more can be done. Technical support for agricultural enterprises, especially those that are privatized, could be initiated under this first proposal through demonstration projects.

341. In terms of the second proposal, that is supporting agribusiness in the Gomel, Brest and Mogilev Oblasts, the Mission identified a number of interventions in the area of food processing that could ameliorate the effects of radiation. Table 8-2 lists these as:

- Grain Milling
- Processing grain into alcohol
- Processing seeds into oil
- Potato pilling
- Processing milk into butter and cream
- Cooking and curing meat

342. As with the countermeasures at the farm level in the first proposal, the measures above to support agribusiness in the Gomel, Brest and Mogilev Oblasts are already being implemented to some extent. However, external support in the form of financial and technical assistance would greatly advance the adoption of new technologies through the

transfer of knowledge to local enterprises. Greater seed fund support for the development of agro-processing is also needed.

343. In addition, there is a need for improved monitoring of radionuclides in the Gomel, Brest and Mogilev Oblasts. As noted above, monitoring of the radionuclides is of critical importance. Although the government continues to do its best, there are gaps and deficiencies. In particular, the timely monitoring of SR-90 is not taking place owing to a lack of local laboratories with trained staff and required equipment. External support to establish local laboratories and provide equipment and training for the analysis of Sr-90 is urgently needed.

IX. Natural Resources Management in Belarus

A. Background

344. Although the share of the economy directly dependent on its natural resource base has contracted, the agriculture and forestry sectors are still of great importance in supporting the livelihoods of many poor people. Furthermore, the country's legacy of biodiversity is sufficiently important for the government and the international community to be concerned that the present (temporary) economic and social crises do not result in serious irreversible losses, losses that future generations, both inside and outside the country, will regret. The links to poverty and sustainability have been discussed in the sections on energy and water and are raised again in Chapter VII as far as Chernobyl is concerned. This section looks at natural resource management issues relating to agriculture, forestry and biodiversity. Basic information on these sectors was provided in Chapter III.

345. As a general point, it should be noted that, over an extended period, the areas under cultivation have expanded at the expense of the environment. For example, peat lands have been drained and forests cleared to make marginal farming lands. Much of this happened in the post war expansion of agriculture, during which wetlands were drained and new areas brought into cultivation. The result of these and similar practices is that Belarus has a lot of marginal farmland, marginal wetlands forestland. Natural resource management reforms could restore many of these lands to their original status or to a higher use, for a more efficient and profitable exploitation of their potential. Lands that are marginal for one use or resource management purpose may be highly valued or valuable for another.

346. The incentives for efficient economic use of these lands and the natural resources they harbor, however, are weak. The structure of natural resource management within the government and within the economy tends rather to subsidize inefficient state enterprises, to increase output by increasing the area of land under production rather than the efficiency of land use, and to encourage production without regard for marketability, pricing and cost realities. Reduced exploitation of marginal lands must go hand in hand with increased efficiency of land use.

B. Agriculture

347. The main features of the change in agriculture were noted in Chapter III-C. To recap, despite the fact that agricultural output has declined since 1990 by some 15-50 percent (depending on the product), little rationalization of the sector has occurred, and arable and permanent croplands and grasslands have remained relatively unchanged as a percent of total land area since 1990. Yields have fallen for most products and on most types of farms, but more so for large agricultural enterprises than for individual household plots. At the same time the terms of trade for agriculture have declined and the market for livestock has shrunk. In terms of environmental impacts, applications of pesticides and fertilizers have fallen.

348. The most widespread methods of government involvement in the agricultural sector include price controls, trade restrictions, centralized distribution of credit and obligation of agricultural producers to sell produce to the state. The agricultural sector is said to have received a total of \$2.5 to \$3 billion in direct and indirect subsidies between 1990 and 1999, but agriculture's share of total public investments is supposed to have fallen from 30 percent to 6 percent in the same period. Since 1990, fixed assets have depreciated, corporate debt for agricultural enterprises has outstripped corporate funds available, money is lacking for fertilizers and pesticides, and institutional transformations have not even started. Ownership is still primarily in the form of large state agricultural enterprises. In 2000, only 76.6 thousand hectares were operated as private farms, out of a total of 9.2 million hectares (less than one percent). Of the rest, household plots accounted for 1.4 million hectares (15 percent), the balance being collective farms of one kind or another.

349. Much of the reform that is needed will consist of developing a vibrant private sector for agriculture. This will improve economic performance and thereby contribute to reducing poverty. It may increase the environmental pressure on land and water resources through increased use of fertilizers and pesticides but, given the low levels now being applied, the additions should be manageable. The government will need to ensure that good practice is instituted, particularly where water contamination is an issue¹. This has been a matter of concern, for example, in the application of organic manure from pigs and cattle onto land in a way that resulted in high nitrate levels in the soil and water. Training and education, along with support for investment in improved handling and disposal facilities will be required.

350. Although these are matters of concern, they are not the main environmental issues arising from agriculture. The most serious problem facing the sector is the continued use of lands that are prone to erosion (about 3.4 million ha) or already seriously eroded (500 thousand ha). A particularly bad case is that of the Southern Polesseye area of Belarus, where wetlands were drained to provide for cultivation and where the drainage infrastructure is in a poor state of repair, which has resulted in increasing land degradation, flooding and damage to what remains of the wetlands. The return of these lands to flood control and wetland protection would generate more environmental benefits than would losses in agricultural production. Box 9-1 provides some details. This region is being studied intensively at present and there is international interest in supporting a program of conservation.

351. In other areas where agriculture is practiced and where erosion is a serious problem, biodiversity is threatened and yields are poor. The government should reconsider the use of these lands for agriculture and take out of use those that would better serve the function of watershed protection or, possibly carbon sequestration. These are issues that the government is aware of. For example, the Land Reform Committee estimated in a meeting with the Mission, that about 7.5 percent of agricultural land (about

¹ There is also a concern about the storage of agrochemicals. Present facilities are deteriorating, increasing the risk of leakages and losses.

700,000 ha) would be better suited to non-agricultural uses, with 300,000 going to forestry. However, a full scale assessment of these alternatives has not been undertaken.

352. The government has a program on improving the agribusiness sector, some aspects of which have environmental implications. The principal ones are:

- efficient and effective use of land and water resources, with land-use optimization requirements being taken into account;
- safe farming in the Chernobyl accident-contaminated areas;
- switching over to resource and energy conservation technologies contributing to the reduced emissions;
- efficient use and remediation of reclaimed land specifically in the Polesie region and rehabilitation of radionuclide-contaminated melioration systems;
- ecological monitoring of land and water resources and agricultural produces quality;
- prevention of emergencies and flooding of settlements and agricultural lands in the Polesie region.

These overlap to a considerable extent with the priorities identified in this Report – i.e. the need to develop clean food production in Chernobyl affected areas and to rationalize agricultural activities in the Polesie region.

Box 9-1: Agriculture in the Pripyat Basin

The Southern Polesie area of Belarus (shared with Poland and Ukraine), drained by the Pripyat River, is part of one of the largest stretches of boggy lowland wetlands in Europe. It provides important habitats for birds and wildlife, and serves key environmental functions such as flood mitigation, water filtration and carbon sequestration. From the mid-1960s to the mid-1980s, some 50 percent (over 2 million ha) of this land was drained for agricultural land. The conversion of more than half of the region's natural wetlands, forests, bogs and wet meadows, and the loss of their environmental functions, was done, for the most part to create agricultural land, most of it only marginally suitable for agriculture. Farming in these marginal areas has proven difficult, with high rates of soil erosion, peat depletion and low crop yields. Peat depletion is a particular problem for this region, both from an agricultural standpoint and for environmental reasons. The peat runs off, causing silt and water tables to rise, thus making the land more prone to flooding. The drainage infrastructure necessary to maintain dry land is currently poorly maintained and in some cases not functioning, resulting in further deterioration of the quality of the reclaimed farmland.

The environmental legacy of the drainage has been severe. Widespread soil erosion, land degradation, and increased susceptibility to floods has resulted in water quality and drinking water degradation. As noted above, the government is considering a program to restore up to 75 percent of these wetland areas, but it has not yet initiated this has not happened yet. Nevertheless, flood control and wetland protection in the Pripyat Basin are high priority concerns for local and regional governments and several NGOs. Afforestation will have to be a key part of this recovery program since there is a strong linkage between loss of forests and increased flooding.

C. Forestry

353. Forests are one of the few exploitable natural resources in Belarus. The forest sector, however, has suffered from the loss of its traditional export markets and from a rise in energy prices since the collapse of the Soviet Union. Both timber harvest and wood processing have declined with continued the use of obsolete and inefficient

machinery, budgetary constraints and unfavorable economic policies and market conditions.

354. As noted earlier, logging volumes fell by about 16 percent in the 1990s. Around 30 percent of the wood is useful only for pulpwood and fuel. Logging is carried out by some 100 local forest enterprises, who are also responsible for the management of the forest area under their control. Wood processing is dominated by 'Bellesbumprom', a partially privatized state-run organization that encompasses logging, pulp and paper production, and furniture manufacture. Its facilities, however, are outdated, have insufficient capacity and are not equipped to handle the small wood that dominates the forest harvest.

355. The forests of Belarus are managed using a biological maximization model that emphasizes even flow of timber harvest volume over time – referred to as even aged management – which is generally unresponsive to prices, factor costs and discount rates. The model leads to uniform management across all sites. The applied harvest criteria focus on volume rather than value maximization, designed to achieve a desired volume of saw timber and even-aged management. This requires that stands be harvested later than what is considered to be economically efficient, and only after the mean annual increment of the stand has been surpassed. Even-aged management requires an intensive level of silviculture characterized by low quality harvests and dense re-planting, which involves intensive tending and results in low biodiversity. Uniform timber management is likely to result in timber production on sites where timber values are negative: output is increased not through increased efficiency but by increasing the number of hectares under silviculture. This effectively reduces the provision of environmental services from what would be obtained if timber production were governed by economic criteria. The model contains no financial parameters and so provides no basis for evaluating forest management efficiency².

356. The forestry sector is mainly financed from the budget. As noted above, the practical management of the forests is organized through around 100 forest enterprises, working under local forest ministry administrations. The enterprises pay a stumpage tax based on the amount logged, as well as the usual taxes payable by any legal enterprise. In return, they receive budgetary support to cover part of their costs and are allowed to retain any income derived from the sale of logs or other forest-related, commercial activities. A justification for the subsidy from the budget is that the enterprises act to provide environmental and conservation services. The relation between the subsidy and the level of expenditure, however, is not strong, as can be seen from Table 9-1 below, which gives categories of expenditure and sources of revenue for three selected forest enterprises.

² The forestry sector was reviewed for the Bank in 1998 by consultant Jeczek Siry. Part of this discussion draws on his report.

Table 9-1: Categories of Expenditure and Sources of Income for Selected Forest Enterprises: 1995 and 1999

	Lyuban		Krupki		Vetka	
	1995	1999	1995	1999	1995	1999
<i>Expenditure</i>						
Forest protection	34.6%	32.5%	25.6%	35.9%	15.8%	12.9%
Replanting	4.0%	5.7%	10.1%	4.9%	0.0%	4.9%
Other operations	61.4%	61.8%	64.3%	59.2%	84.2%	82.2%
<i>Income</i>						
Allocation from budget	66.0%	69.5%	50.1%	44.5%	90.0%	94.8%
<i>Mobilization of own funds:</i>						
Timber byproducts	34.0%	20.4%	44.5%	32.0%	10.0%	5.2%
Market sale	0.0%	5.1%	0.0%	16.9%	0.0%	0.0%
Other	0.0%	5.1%	5.3%	6.6%	0.0%	0.0%
TOTAL	100%	100%	100%	100%	100%	100%

Source: Ministry of Forests

357. The amount spent on forest protection varies a lot (as would be expected), from as low as 13 percent to as much as 36 percent. Allocations from the budget, however, are always higher than that, from a low of 45 percent to as much as 95 percent. Moreover, increases in the forest protection share are not accompanied by increases in budgetary contributions, or vice versa. A full estimate of the extent of the subsidy is not available but can and should be made, given the data available.

358. The other noteworthy feature of the data in Table 9-1 is the increase in income from 'market sale', which includes obligatory sale to state enterprises at prices fixed by the government as well as open auctions. The Council of Ministers sets the price for timber, which generally is less than one-third of what is received in the limited number of timber auctions that are held. These auctions are opposed by the politically influential wood processing industry. They are limited to the sale of some 10 percent of standing timber, and foreign buyers are excluded from bidding; timber exports are tightly and exclusively controlled by the government. The remaining timber is sold by negotiation (some 50 percent) or is centrally allocated (some 20 percent).

359. These low prices lead to cutbacks in reforestation, protection, silviculture and ecosystem management, with negative impacts on forest growth and nature conservation. Furthermore, they are used to subsidize an inefficient wood processing industry, which is shielded from competition and has few incentives to modernize, conserve resources or become competitively efficient. If timber prices were higher, the processing industry would have to reduce other production costs, apply new technologies or become more efficient in its resource use. Originally organized to process mature logs from other parts of the former Soviet Union, it now consumes a large share of high quality timber from the country's forests, producing wood products that are generally less desirable or profitable in export markets than the more restricted roundwood exports. There is some indication that the amount sold under auction is increasing (probably motivated by the fact that even at the subsidized prices the processing companies cannot afford to buy the timber). If so, this is a positive move and should be advanced. In addition, the government should look to expand and move the export sector to a competitive and

sustainable footing. It should allow the export of roundwood based on sustainable management of the stands from which it is logged and develop a system of certification which will ensure that such exports receive higher prices for OECD markets³. As noted in Chapter II, work on certification under the Forest Stewardship Council (FSC) has started in Belarus. Under the WWF-World Bank Alliance, two international experts have reviewed forest management procedures in Belarus and have concluded that the country could obtain FSC certification relatively easily. It is expected that this assessment will be followed by a second visit by these experts, who will list the concrete measures needed to achieve the goal of FSC certification for at least some wood products.

360. Although the government obtains forest tax revenues (see Chapter II-D), taxes in each forest district are returned to the local state administration unit. The tax per cubic meter of wood withdrawn or stumpage fee has, since May 1998, been more closely based on the 'economic value' of the timber, taking account of the species (coniferous, hard-leaved, soft-leaved), wood quality (large, medium, small), distance to the point of transportation and cutting type (main logging or thinning). Since the values themselves are too low and distorted, however, the taxes tend to be the same. If reforms in the pricing of forest products take place, the taxes will adjust *pari passu*.

361. The government has the right intentions in that it too wishes to phase out the subsidy to forest enterprises – the Ministry of Forestry proposes that each district and local forestry enterprise become self-financing by 2005. However, this plan will be superimposed on a forest management plan that is generally not responsive to prices or costs: it does not consider the need for cost control when incomes decrease. Moreover, the Ministry proposes to establish a fund into which profitable districts will contribute a part of their revenues to subsidize unprofitable ones. While some support in this fashion can be justified for valid common administrative and environmental expenses, the propping up of unprofitable enterprises cannot. Financial reform, then, should be linked to changes in forest management that are oriented towards achieving greater economic efficiency. Privatization, and decentralization of administration would also be helpful in achieving reform.

362. The World Bank has been supporting reforms in the forestry sector through a Forestry Development Project, launched in January 1995. The main objectives of this project were to:

- (i) support forest sector reforms, principally increases in stumpage fees and open market price setting and reductions in subsidies for production;
- (ii) promote private sector services to forestry, particularly in contract harvesting and transport;
- (iii) improve sustainable management of forest resources through intensified silviculture and better equipment;

³ If the government was willing to reconsider or re-orient its support for this industry, a possible avenue to explore is the use of contaminated wood from the Chernobyl area for processing into pulp. Another is to use wood biomass as energy – with appropriate technology, most radionuclides can be collected in the ashes and the technology can be environmentally quite clean. If this can be achieved it will offer a much lower cost alternative to providing gas as a replacement for the use of contaminated fuel in the Chernobyl affected areas (see Chapter VII).

- (iv) improve the supply of high quality planting materials by upgrading storage and nursery facilities;
- (v) provide adequate protection against forest fires;
- (vi) strengthen Ministry of Forests regulatory and enforcement capacity, especially in environmentally sensitive areas and better monitor specific forest ecological problems; and
- (vii) promote local investment in the wood industry through support for a Forestry Strategic Plan and a Prototype Development and Testing Fund that would develop local forestry equipment that is internationally competitive.

363. The project originally had a cost estimate of \$55 million, of which \$42 million was World Bank funds. It is expected to close in April 2002 and an Implementation Completion Report is being prepared, which will include a full evaluation of the project. While it would be inappropriate to preempt the contents of that evaluation, some general comments can be made at this stage. One is that, while a number of the original objectives were not achieved, several factors affecting the sector, notably the massive economic and financial upheavals from 1995 to 1999, made some of the stated goals, such as the establishment of a prototype fund for forest enterprises, unfeasible. The second is to note that the project was one of the first operations by the Bank in Belarus. Procedural and process issues did not go as smoothly as desirable and this affected success with respect to several components of what was quite an ambitious project. At the same time, the project did achieve some important goals, namely the establishment of a seed center in Minsk, a telecommunications system to improve forest fire fighting, and the forest certification program referred to earlier. It would have been more effective had the underlying pricing and subsidy reforms identified in this section been implemented. This is a useful lesson for further intervention in this sector.

Other Forest Products (Mushrooms, Berries, Medicinal Plants, etc.)

364. A small cottage industry has developed for the exploitation and marketing of comestible forest products, such as wild fruit, berries and mushrooms. Traditionally harvested for self-consumption, these products are increasingly being provisioned for sale. These activities are strictly regulated, controlled by the MNREP, which licenses all activities related to the “provisioning (purchase) of marketable wild plants, mushrooms, technical and medicinal raw materials of vegetative origin for the purpose of industrial processing and selling thereof.”

365. Individuals and enterprises may selling or purchasing more than 30 kg of berries and 20 kg of mushrooms annually are considered to be operating commercially and require a license for entrepreneurial activity. Some 670 licenses are held, mostly by forest enterprises, pharmacies, canning and processing plants, business entities, as well as some individual entrepreneurs. The licenses set harvest limits, based on the availability of harvestable resources (wild plants, mushrooms, medicinal raw materials of a vegetative origin) within the given area, and include access contracts with the forestry enterprises who own the land. In Chernobyl affected areas, the licenses also specify those areas that are radiologically “clean” and where forest products are acceptable for consumption. Private individuals can harvest as much as they wish without a license, as long as the forest products are for their own consumption.

Box 9-2: Climate Change and Carbon Sequestration in Belarus

Belarus is party to the United Nations Framework Convention on Climate Change (UNFCCC) as an Annex I country – that is, it belongs to the group of countries that have a commitment to reduce their overall emissions of six greenhouse gases by at least 5 percent below 1990 levels over the 2008 and 2012 period. The Kyoto Protocol to the UNFCCC establishes three flexibility mechanisms to assist Annex I Parties meet their national targets cost-effectively: an emissions trading system; joint implementation (JI) of emissions-reduction projects between Annex I Parties; and a Clean Development Mechanism (CDM) to encourage joint projects between Annex I and non-Annex I Parties.

The operational details governing the use of the mechanisms was one of the crucial tasks facing COP-6. Key decisions that needed to be made included the accounting rules for allocating credits, as well as the roles and responsibilities of various institutions. For the CDM and JI, countries had to decide on project eligibility and baselines for measuring emissions reduction contributions. A particularly controversial issue was whether to allow only projects that reduce emissions, or whether to include projects that remove existing or future carbon from the atmosphere – carbon "sinks" projects such as reforestation. In the discussions in Bonn in July 2001, further agreement was reached on including sinks as eligible ways of reducing emissions. Details, however, on whether there should be a limit or ceiling on how much of a country's emissions reduction target can be met through the mechanisms still need to be worked out. Generally speaking, the use of the mechanisms is considered supplemental to domestic policies and measures. On emissions trading, an ongoing concern has been that countries with economies in transition that have experienced reductions in their greenhouse gas emissions due to economic recession in the early 1990s will be able to sell large quantities of emissions credits - or "hot air" – to other Annex I Parties. This would reduce pressure for domestic action.

The use of carbon sinks to meet emissions targets is both complex and controversial. Plants and soils can act as carbon sinks, but the science of estimating how much carbon is being removed from the atmosphere is uncertain. Including the use of sinks in meeting targets on emissions requires a clear definition of a sink, as well as clarity on what changes are the result of deliberate climate policies. Parties also need to agree on accounting systems that set baselines and measure carbon changes. Issues concerning the permanence of carbon storage achieved through forests and other sinks must also be resolved, given that such carbon can be lost due to felling, forest fires and other factors.

As far as Belarus is concerned, it is not eligible for the Clean Development Mechanism except as a seller, since it has joined Annex I to the UNFCCC. Whether it can take part in JI is now more a political than a legal matter, since Belarus needs to obtain an assigned amount (i.e. a target of GHG emissions defined as a percentage of 1990 emissions). The reason why Belarus does not have an assigned amount is that it did not attend the Kyoto discussions (!). Now that the Kyoto Protocol has been adopted (not ratified) without an assigned amount for Belarus, the only way for Belarus to obtain an assigned amount is for the Protocol to be amended. Generally, international treaties cannot be amended before they come into force, though there have been precedents in which unanimous agreement has sufficed to make modifications. The same could theoretically apply to the Kyoto Protocol. However, in practice, this is unlikely, given the political controversies surrounding the Protocol, including "hot air" (see above).

Belarus is justified in requesting that the question of the assigned amount be placed on the agenda of the next Conference(s) of the Parties. The government would have to argue the case with the Secretariat, and might want to first gauge political support. The Bank could provide some support in this regard.

366. Penalties for exceeding licensed restrictions are high. All harvests may be subject to duties, and exports are tightly controlled through export licensing. At present, there is a greater demand for exports than for domestic processing and consumption. This is due in part to the lack of processing facilities, to low domestic demand, and to a growing market for such products in Western countries. Given that present rates of extraction are well below sustainable rates (see Chapter II-C), there is considerable scope for expanding

this activity through support for marketing, certification and credit for investment in proper processing.

Carbon Sequestration

367. Other areas where forestry practice can be developed are recreational use and carbon sequestration. Since recreational use is more central to protected areas it is discussed in greater detail below. In terms of carbon sequestration, the situation is potentially important, but complex and somewhat fluid. The Kyoto Protocol under the United Nations Framework Convention on Climate Change (UNFCCC), is the international agreement governing the measurement of greenhouse gas emissions. Box 9-2 describes the basic structure of the Kyoto Protocol as it applies to Belarus. Under the Protocol, a number of countries have agreed to physical targets on the level of their emissions (Annex I countries). In meeting these targets they have access to three 'flexibility mechanisms'. These essentially allow a country to buy and sell emission reductions from and to other countries, to undertake emission reduction activities to obtain credits towards meeting its own targets, and to sell extra credit from undertaking emission reduction activities to other countries (joint implementation). In all three cases, activities that reduce carbon emissions will have a value. It is highly uncertain what this value will be, but prices have been estimated in the range of \$10 to \$50 per ton of carbon.

368. Assuming the legal difficulties discussed in Box 9-2 can be resolved, it should be possible to use afforestation as well as preservation of Belarus' wetlands as large scale carbon sequestration sinks, in one or other of the mechanisms that are open to the country under the Kyoto Protocol. If a sequestration element is included in the land reform programs discussed earlier, this might well make the case for a change in land use acceptable. It could also include the creation of long term carbon sinks by foresting areas within the Chernobyl restricted zone (See Chapter VII). External funding for such climate change investment projects is quite likely but some government preparatory action will be needed first.

D. Biodiversity and Wetlands

369. As was noted in Chapter III-C, Belarus has some important ecosystems and species, which it is serious about preserving. Natural landscapes have been well preserved in Belarus compared to neighboring countries: undisturbed natural ecosystems make up some 55 percent of the total national territory. Belarus has joined the convention on biological diversity, and is party to the Pan-European Strategy on Biological and Landscape Diversity designed to implement the treaty by creating a uniform ecological network. Specially protected areas play a major role in the preservation of biological and landscape diversity in Belarus. At present, these territories

370. cover some 1.5 million ha (7 percent of national territory), and the government envisages expanding the protected territories to include some 8.5 percent of total Belarus territory by 2005.

371. Some of the protected natural territories of Belarus have already received world recognition. Berezinsky Zapovednik has been designated as one of the world's network of UNESCO biosphere reserves and has been granted a European diploma. The national

park Belovezhskaya Puscha is included on the List of World Cultural and Natural Heritage, and the biological reserve Sporovsky is entered on the List of Ramsar Forests and Arable Lands.

372. Over the period from 1991 to 1999, Belarus has significantly increased land classified as protected areas. The budgetary allocation for protected areas, however, has not increased in proportion. Table 9-2 provides details for each class of protected area as well as the annual budget in 1999 prices. Compared to 1990, the allocation has fallen in real terms by 38 percent. It fell even more in the intervening years and increased substantially, from a low of 415 billion rubles in 1994 to 749 billion in 1996 and from 867 billion in 1998 to 1,478 billion in 1999. The fact remains, however, that the actual allocations are small and do not allow for many of the interventions necessary to protect or enhance ecosystems or protect individual species. In dollar terms, the 1999 budget amounted to about \$2.3 million⁴. Hence much of the important conservation work is supported by the international community.

373. Internationally supported projects for biodiversity conservation focus on the preservation and management of the country's wetlands. Belarus is unique in having large areas of marshes and floodlands of particular significance for the preservation of Europe's biodiversity. The preservation of these particularly valuable wetlands is important, but complicated by the sheer extent of the water-logged territories, the large diversity of wetland ecosystems and the considerable expansion of economic exploitation already taking place on these lands. Bogs and marshes preserved in their natural condition amount to 2.4 million ha (12 percent of national territory), lakes and artificial water bodies 300,000 ha (1.5 percent), and river valleys 2 million ha (10 percent). The northern part of Belarus (Poozerye) is characterized by a large number of lakes, upland bogs and rivers and the southern part (Polessye) by low lying, transition bogs, and valley rivers with floodlands.

Table 9-2: Changes in Protected Areas and their Budgetary Allocation

	1991 (000 ha)	1999 (000 ha)	Increase (%)
Strict nature reserves	252	269	17
National Parks	88	240	173
Less strictly protected areas: National	570	810	42
Less strictly protected areas: Regional	400	412	3
Total Area	1310	1731	32
Budget in 1999 Prices (Bln. Rubles)	2,396(*)	1,478	-38

Source: Ministry of Statistics (*) The budget allocation was for 1990. Strict nature reserves are called zapovedniks and the less strictly protected areas zakazniks.

374. Concern for the current condition of the wetlands is reflected in the "National Strategy and Action Plan for the Preservation and Sustainable Exploitation of Biodiversity in the Republic of Belarus," which includes tasks for the preservation and rational use of wetlands. Moreover, Belarus joined the Convention on Wetlands (Ramsar Convention) in 1999, an agreement aimed at defining and preserving the most valuable

⁴ Based on year average free market rates.

wetlands in signatory countries, the main form of preservation being the establishment of a specially protected, international network of wetland areas. The Ministry of Natural Resources and Environmental Protection has approved a registry of wetlands in Belarus that conforms to the Ramsar Convention criteria, and the registry will be offered for entry into the List of Wetlands of international significance. The National Academy of Sciences is conducting an inventory of wetlands in Belarus to define potential areas for inclusion in this list. To date, the inventory includes 6 wetland areas to be protected by the state. One of these zakazniks (territories on which exploitation of natural resources is limited), Sporovskoye, is already on the list. The other five – Zvanets, Srednyaya Pripyat, Olmanskiye Bogs, Osveysky and Yelnya (now in critical condition), still need mapping and definition, for which funding is lacking. International sponsors are being sought. A list of the projects currently being undertaken was provided in Table 4-1 in Chapter 4. The last five years have seen an acceleration of Belarus contacts with nature conservation and scientific organizations in Europe and elsewhere, providing expert and financial assistance to Belarus in its efforts to achieve balanced land use, environmental protection, environmentally safe agriculture, economic development and diversity. This has also supported the development of local NGOs with parallel interests, such as the Zoological Society of Belarus, and the National Union for Bird Conservation, which works closely with the Royal Society for the Protection of Birds of Great Britain, the Hunter and Angler Society and a number of others. These organizations assist the Ministry for Natural Resources and Environmental Protection in various environmental management tasks. The Zoological society directly helps the government in meeting its international obligations of reporting on the status of biodiversity in the country and in undertaking some of the projects identified above (e.g. establishing Ramsar sites). The hunter and angler society more or less manages hunting and inland fishing activities. Although they receive payment for some of this work, it is fair to say that, without international links many of these fledgling organizations would not be effective – almost all their funding comes from foreign sources.

375. In addition to mobilizing funds from the international community, Belarus can do more to protect biodiversity by promoting tourism, both local and foreign. The scope for this is recognized, although a detailed assessment has not been made. The policy for most protected areas remains one of restrictions on use and does not look actively at potential benign uses, such as bird watching, hiking, trekking and so on. Any income derived from protected areas goes to the park management at the local level, or to the local community in the case of the zakazniks. This should provide a strong incentive for promoting such activities. In some cases, investment in basic infrastructure is needed, while in others, some capacity building to identify what services need to be provided and how they should be organized is required. This is also an ideal area for involving the private sector, with partnerships between the local community and private investors offering real scope for income generation, employment creation and poverty alleviation. The authorities are taking some tentative steps in these directions, and one of the zakazniks in Minsk Oblast has provided some tourism services and is collecting revenues from visitors. A major effort on this front, however, is warranted, with assistance from the international community. On the government's side, however, changes will be required in its visa policy and in promoting a more tourism-friendly image abroad.

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