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Committee on Environmental Policy

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Preface

The preparatory mission for the Environmental Performance Review of Kyrgyzstan was organized in April 2000. The structure as well as the organizational details of the project were decided on that occasion. The review team for the project was constituted following these decisions and included national experts from Armenia, Belgium, Denmark, Germany, Switzerland and the Russian Federation, together with the ECE secretariat, experts from the International Strategy for Disaster Reduction (ISDR), the United Nations Environment Programme (UNEP) and from the Bilthoven Division of the WHO European Centre for Environment and Health (WHO/ECEH). The costs of the participation of experts from countries in transition, as well as the travel expenses of the ECE secretariat, were covered by extrabudgetary funds that had been made available from Italy and Switzerland. The contributions were essential to the implementation of the project.

The review mission to Kyrgyzstan was undertaken in October 1999. The draft of the EPR report was finalized subsequently and was submitted to Peer Review by the ECE Committee on Environmental Policy at its annual session in Geneva on 25 September 2000. Prior to Peer Review, the EPR Expert Group, together with a high-level delegation from Kyrgyzstan, considered the report and proposed modifications of the EPR recommendations to the Committee. At the end of its deliberations, the Committee approved the recommendations as they are set out in this report.

The review of Kyrgyzstan's environmental performance highlighted the outstanding natural beauty of the country and the efforts and difficulties for environmental management to maintain it under difficult economic circumstances, which call for substantial changes in the economic structure and in production processes. It is hoped that Kyrgyz environmental management will find the methods for effective coordination with other national administrations in order to strengthen its contribution to a future sustainable development of the country.

The ECE Committee on Environmental Policy and the ECE review team wish the Kyrgyz Government success in their important future tasks, including the implementation of the recommendations contained in the present report

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ABBREVIATIONS

ADB	Asian Development Bank
AEWS	Accident emergency warning system
AFI	Agency for Foreign Investment
BaP	Benzo(a)pyrene
BAT	Best available technology
BATNEEC	Best available technology not entailing excessive cost
BOD	Biochemical oxygen demand
BSEC	Black Sea Economic Cooperation
CFC	Chlorofluorocarbon
CHP	Combined heat and power plant
CIS	Commonwealth of Independent States
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CPI	Consumer price index
DDT	Mixture of isomers of dichloro-diphenyl-trichloro ethane
EBRD	European Bank for Reconstruction and Development
EC	European Commission
ECU	European currency unit
EIA	Environmental impact assessment
EMEP	Cooperative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
EPR	Environmental Performance Review
EU	European Union
GDP	Gross domestic product
GEF	Global Environment Facility
GOST	Former USSR standard organization
GTZ	German Agency for Technical Cooperation
HCH	Hexachlorocyclohexane
ICAS	Inter-State Council on the Aral Sea Basin Problems
ICRP	International Commission on Radiological Protection
ISDR	International Strategy for Disaster Reduction
IDRC	International Development Research Centre (Canada)
IFAS	Internal Fund for the Aral Sea
IMF	International Monetary Fund
IUCN	World Conservation Union
KGC	Kumtor Gold Company
MAC	Maximum allowable concentration
MAE	Maximum authorized emission
MAP	Maximum allowable pollution
MARPOL	Convention for the Prevention of Pollution from Ships
MECD	Ministry of Emergencies and Civil Defence
MEP	Ministry of Environmental Protection
MH	Ministry of Health
MoAWR	Ministry of Agriculture and Water Resources
MoI	Ministry of the Interior
MT	Ministry of Transport
MU	Memorandum of Understanding
NEAP	National Environmental Action Plan
NEHAP	National Environmental Health Action Plan
NGO	Non-governmental organization
NRS	Norms of Radiation Safety
OCHA	Office for the Coordination of Humanitarian Assistance
OECD	Organisation for Economic Co-operation and Development
PCB(s)	Polychlorinated biphenyls

PHARE	Assistance for Economic Restructuring in the countries of Central and Eastern Europe
PIP	Public Investment Programme
PM	Particulate matter
POPs	Persistent organic pollutants
REF	Regional Environment Fund
SEF	State Environment Fund
SHD	Sustainable Human Development
SoE	State of the Environment
SPs	Suspended particulates
TACIS	Technical Assistance to the Commonwealth of Independent States
UNDP	United Nations Development Programme
UN/ECE	United Nations Economic Commission for Europe
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund
UNIDO	United Nations Industrial Development Organization
USAID	United States Agency for International Development
VAT	Value-added tax
VOCs	Volatile organic compound
WEC	World Environmental Centre
WHO	World Health Organization

SIGNS AND MEASURES

..	not available
-	nil or negligible
.	decimal point
ha	hectare
t	metric tonne
kt	kilotonne
g	gram
kg	kilogram
mg	milligram
mm	millimetre
cm^2	square centimetre
m^3	cubic metre
km	kilometre
km^2	square kilometre
toe	ton oil equivalent
l	litre
ml	millilitre
min	minute
s	second
m	metre
ºC	degree Celsius
GJ	gigajoule
kW_{el}	kilowatt (electric)
kW_{th}	kilowatt (thermal)
MW_{el}	megawatt (electric)
MW_{th}	megawatt (thermal)
MWh	megawatt-hour
TWh	terawatt-hour
Bq	Becquerel
Ci	Curie
mSv/a	millisievert per year
y	year
cap	capita
eq	equivalent
h	hour
kV	kilovolt
MW	megawatt
Gcal	gigacalorie
Hz	hertz
GWh	gigawatt-hour

Currency

Monetary unit: Som

Exchange rates: The Kyrgyz National Currency, the som, was introduced on 10 May 1993.

Year	1 US$
1993	5.0425
1994	10.8354
1995	10.8240
1996	12.8446
1997	17.3650
1998	20.7668
1999*	39.0245

Source: State Committee on Statistics

Note: Values are period averages
* average for the first nine months of 1999

PART I: THE FRAMEWORK FOR ENVIRONMENTAL POLICY AND MANAGEMENT

Chapter 1

LEGAL INSTRUMENTS, INSTITUTIONAL ARRANGEMENTS AND ENVIRONMENTAL INFORMATION

1.1 The legal framework for environmental protection

General legal system

The legislation of Kyrgyzstan has been entirely renewed since its independence in 1991, as stipulated in the Constitution, which was adopted on 5 May 1993 by the Supreme Soviet (then the highest legislative body in Kyrgyzstan). The Constitution was amended in 1996 and 1998. It places the system of legal acts in the following hierarchy:

- Constitution
- Laws, international treaties and presidential decrees
- Governmental regulations
- Ministerial orders and decrees
- Regulations and regulatory decisions of the local administrations (local *kenesh*).

The Constitution has the highest legal force. No other regulatory document can contradict it. Laws are adopted by the *Jogorku Kenesh* – the legislative body of the country. The President of Kyrgyzstan is entitled to pass regulatory decrees, which have the same force as laws and apply nation-wide. International treaties signed by the President and ratified by Parliament are part of the country's legislation. They do not have precedence over national laws. Governmental regulations are meant to implement laws (including international treaties) and presidential decrees. Ministries and agencies adopt orders and decrees in accordance with their mandates. The President can suspend or cancel governmental and ministerial regulations.

Environmental legislation and its general features

The development of environmental legislation is characterized by the following general features and trends:

- Framework laws prevail, frequently requiring governmental regulations for their application and enforcement
- The new environmental legislation does not necessarily replace the corresponding legal instruments that had been applied during the former Soviet Union, so that new legal instruments may be added to old instruments that continue to be valid
- The new legislation is strongly influenced by the practices of the former Soviet Union republics
- Legislation develops fast, with most of the basic environmental laws adopted in 1999 often being revisions of laws that had first been adopted in the early 90s.

The laws are comprehensive and cover aspects of environmental protection concerning specific natural objects or activities, including ownership, distribution of mandates among State authorities, necessary procedural rules, and liability requirements. Their provisions are further developed in governmental regulations and ministerial acts.

It is a general rule that the State owns natural objects, although communal and private ownership are allowed in certain cases (commonly distributed mineral deposits, forests planted on private land). The use of natural objects requires a State permit, which can be issued to any person, including foreigners, but with certain restrictions in the latter case. As a universal rule, the use of natural resources gives rise to a charge or tax (including emission and effluent charges). Mechanisms such as environmental quality standards, monitoring, the ecological expertise of projects likely to affect the environment are commonly applied. Some laws reflect an ecosystem approach (forests, waters and specially protected areas), i.e. incorporate regulations to safeguard ecosystems in their entirety.

Basic rules on environmental protection and natural resource use are established by the Constitution. Its article 4 provides that land, its subsoil, air, waters, forest plant life and wildlife, and also other natural resources are used as a basis for the life and activities of the Kyrgyz people and are afforded special protection by the State. It also establishes that land can be in public, communal or private ownership. The Constitution establishes as a fundamental right of individuals the right to a favourable and healthy environment and to compensation for the damage caused to health and property by the use of natural resources. The right is balanced by the obligation on each citizen to use the environment, natural resources and historical monuments with care. The Constitution does not grant individuals the right to environmental information, though this is, however, included in the 1999 Law on Environmental Protection and in other specialized legislation.

The general legal framework for comprehensive environmental protection and for the use of natural resources is established by the Law on Environmental Protection. It covers a wide range of issues including environmental standard setting, the legal regime of specially protected areas, rules and procedures for natural resource use, and procedures for dealing with emergencies. Natural resources can be used in accordance with established limits and environmental standards. Environmental standards include, *inter alia*, maximum allowable concentrations of pollutants in air, water, soil and subsoil, maximum allowable effluent discharges, emissions and radiation, rules for the use of chemicals in agriculture, maximum allowable concentrations of chemical and biological substances in consumer goods. The Law forbids the use of toxic chemicals that do not decompose, and the import of radioactive wastes and materials for storage, disposal or transit.

The Law lists the principles of environmental protection that form the conceptual basis for the protection of the constitutional right of individuals to a favourable and healthy environment. These principles give priority to measures aimed at guaranteeing the environmental protection rights of individuals, at respecting the sustainable development principle and at a comprehensive approach to regulating environmental protection and economic activities, transparency of decision-making and the involvement of non-governmental public organizations in environmental activities.

The Law on Wildlife regulates the use and protection of wildlife. In addition, the Law also establishes general framework rules for habitat protection. They oblige the authorities to take requirements for habitat protection into account in decision-making. Furthermore, economic activities are not allowed to damage animal habitats. Provision is also made for listing rare and endangered species in Red Data Books. Endangered species are generally protected, except for selected cases on the basis of a State permit.

Fishing is specifically addressed in the Law on Fisheries. The Law regulates commercial fishing and procedures for allocating water bodies for this purpose. The users are obliged to take fish protection measures, including measures to prevent harm to fish habitats, to keep account of fish resources, and to conduct monitoring. In '*zapovedniks*' (i.e. strictly protected territories), only commercial users are allowed to fish.

The comprehensive Law on Waters regulates the use and protection of waters including reservoirs, canals and other man-made water bodies. It also establishes measures for the prevention of floods and other harmful impacts. Provision is made to ensure that waters are used according to the respective licence, which is allocated on the basis of a concession or lease for specified purposes. Drinking-water or communal water supply purposes have priority. Water bodies are protected against depletion, pollution or littering through such mechanisms as standards, permits for the discharge of effluent and the establishment of water protection zones.

The Law on the Protection of Ambient Air mainly applies historical instruments to air protection and specifies the conditions and methods in which provisions specified in other laws (maximum allowable concentrations, maximum allowable emissions, environmental impact assessment, etc.) are applied to air management.

The Forest Code regulates the protection and use of forest resources, including trees and plant life. It embodies an ecosystem perspective. According to the Forest Code, forests are important in general nature protection and therefore cannot be allocated to commercial timber logging. Only sanitary and forest management logging is allowed and can be performed on the basis of State permits, which are given to individuals for leased forest areas. State

permits are also required for other uses such as grazing, haymaking, hunting, mushroom picking, recreation and the like. The Code provides for forest protection measures to be taken by both the forest management authorities and the users.

An ecosystem approach is also taken in the Laws on Biosphere Territories and on Specially Protected Areas, establishing legal requirements for the protection and use of all natural objects within certain areas. Their legal regime corresponds to the types of protection areas specified in the laws.

The Law on the Subsoil obliges users to ensure the safe exploitation of the subsoil and the rehabilitation of the lands and other natural objects mining operations cease.

The Law on the Radioactive Safety of the Population aims at guaranteeing public safety and the protection of the environment against the harmful effects of radiation. The guarantees include permit procedures, social security measures, the right of individuals to information on the impacts of radiation, and other measures.

Box 1.1: Selected environmental legislation

Law on Environmental Protection (1999)
Law on Specially Protected Areas (1994)
Law on Biosphere Territories (1999)
Law on Drinking Water (1999)
Law on the Protection of Ambient Air (1999)
Law on Waters (1994, amended in 1995)
Forest Code (1999)
Land Code (1999)
Law on the Radioactive Safety of the Population (1999)
Law on Ecological Expertise (1999)
Law on Wildlife (1999)
Law on Fisheries (1997, amended in 1998)
Law on the Subsoil (1997, amended in 1999)

1.2 Policy objectives and implementing institutions

Objectives

The objectives of environmental policy are stated both in legislative acts and in certain 'soft-law' political documents. In particular, the Law on Environmental Protection gives nature and its components a significant role in sustainable development. The Law on the Radioactive Safety of the Population is aimed at protecting people and the environment against the harmful effects of radiation.

The overall objectives of environmental policy are determined in the Strategy for Sustainable Human Development. The Strategy was approved by Presidential Decree in 1996. It targets a national economic growth that is accompanied by a minimum impact on the environment.

Following the Decree, "The Ecological Safety Concept" was prepared. –It is a soft-law document by the Ministry of Environmental Protection that sees sustainable development as a prerequisite for the ecological safety of the nation. In particular, it recognizes that the depletion and pollution of natural resources lead to economic recession in the long term, that a fall in economic activity leads to poverty, and that poverty leads to still greater demands on natural resources. The State policy should therefore be aimed at breaking this vicious circle by ensuring environmental protection and the long-term rational use of natural resources during the promotion of economic activities.

The immediate objectives of environmental policy were set out in the National Environmental Action Plan (NEAP), which was adopted in 1995 for the 1995-97 period. Just how far it has been implemented has not been checked, but it remains a guiding political document, as its objectives demonstrate a long-term perspective. According to the NEAP, Kyrgyzstan's overriding objectives are to ensure sustained economic growth and to reduce poverty. Environmental protection is viewed as both a tool and a condition for achieving the broad goals. The NEAP was prepared with a grant from the World Bank and is administered by a special office created within the structure of the Ministry of Environmental Protection.

The environmental protection objectives specified in the NEAP include an increase in the efficiency of the use of renewable and non-renewable natural resources as well as ensuring sound public health. The following main actions are planned to achieve these objectives:

- To channel investments into the water and sanitation infrastructure and to support rural natural-resource-based enterprises. These actions are taken with a view to achieving socio-economic development and conserving natural resources at the same time.
- To establish and maintain an efficient system of information about the state of the environment, the impacts of economic activities on the environment and public health, as well as the sources of these impacts.
- To raise the efficiency of administrative activities during the current economic, social and political reform.

Priorities

According to the NEAP, the Ecological Safety Concept and the Strategy for Sustainable Human Development, the following priority objectives were identified for environmental protection:

- Reducing urban air pollution
- Using water resources efficiently and economically, and improving waste-water treatment
- Protecting arable lands against degradation
- Establishing a system of sustainable use of plant resources, including forests
- Updating the Red Data Books
- Expanding the system of specially protected areas and of biosphere reserves
- Rehabilitating radioactive dumpsites and ensuring their safe operation
- Controlling the production, treatment, transport and disposal of toxic wastes
- Registering harmful substances
- Improving the environmental monitoring system.

Environmental institutions and their mandates

In Parliament (*Jogorku Kenesh*), the Commission on Agriculture and Environment deals with environmental issues. The Parliament is in charge of:

- defining the overall framework for the nature protection policy
- developing and approving laws and regulations
- approving government proposals on resource charges and taxes.

Some environmental responsibilities are delegated to the President's office. The President has the authority to

- establish specific rules and decide on the use of natural resources
- define and announce the boundaries and the status of ecological emergencies and ecological disaster zones
- approve procedures for the collection and use of environmental protection funds.

The President is also responsible for signing all laws adopted by the *Jogorku Kenesh* and for conducting international negotiations, as well as signing international conventions and treaties and submitting them for ratification to the *Jogorku Kenesh*.

By Government Resolution No. 44 of 26 September 1996 the State Committee on Nature Protection was converted into the *Ministry of Environmental Protection*. The most recent restructuring was adopted on 3 March 1999. The Ministry is the key institution in charge of environmental policy and nature protection regulations. It coordinates the system of environmental management within all sectors of the economy, developing and enforcing all environmental standards and regulations. It also assists the Government in designing and implementing policies and investment programmes for environmental protection.

Environmental data collection, pollution control, the granting of permits for the use of natural resources, the management of protected areas and environmental impact assessment (EIA) are its main operational responsibilities. The Ministry consists of a central office and seven local branches with a total staff of 150. The central office has some 45-50 employees and is composed of nine main units:

- Department of Control and Inspection
- Department of Ecological Expertise
- Department of Economics
- Legal Department
- National Centre for Ecological Strategies and Policy

- Environmental Fund
- Department of Environmental Monitoring
- Biodiversity Conservation Department
- International Relations and Science Division
- Administrative Department.

The State Agency of Hydrometeorology, acting under the Ministry of Environmental Protection, monitors air, water and soil quality. Other institutions with nature protection and environment policy functions include

- The Ministry of International Affairs
- The Sanitary Epidemiological Department
- The State Agency for Geology and Mineral Resources
- The Land Regulation Inspectorate
- The State Forestry Agency
- The State Inspectorate for Industrial and Mining Safety

Environmental data are collected by the State Committee on Statistics. The Ministry of Agricultural and Water Facilities is responsible for water resources management and environmental policy issues concerning soil degradation, the application of agrochemicals and farming.

In the local administrations, environmental protection and management are the responsibility of the six *oblast* and one city Committees on Environmental Protection. Although they are subdivisions of the Ministry and report to the Minister, the local Committees are also accountable to local Governors. The heads of the *oblast* offices are appointed by the Minister, but after consultation with the *oblast* management. One of the Deputy Governors is personally responsible for the performance of the environmental authorities. Much practical work in implementing environmental legislation is assigned to the *oblast* committees rather than to the central office of Ministry of Environmental Protection. Generally, the *oblast* committees are understaffed and restricted in their capacity to perform their duties because of a lack of proper equipment and other means in general.

1.3 Environmental impact assessment

General

For the purpose of preventing the negative impacts of economic and other activities on the environment, a two-stage procedure for decision-making is established. It applies to specified activities that in general can be expected to carry environmental risks. Such activities may be carried out only after

- conducting an environmental impact assessment (EIA), and
- obtaining a positive ecological expertise (EE) report on the project.

EIA requirements are established by the 1997 Regulation of the Ministry of Environmental Protection on Procedures of EIA and the Law on Ecological Expertise. EE is regulated on a piecemeal basis by several acts (like the Laws on Wildlife, on Waters, the Forest Code and others) and comprehensively by the Law on Ecological Expertise adopted in 1999.

EIA procedure

The list of activities and projects that are subject to EIA includes 23 types. Among them are energy facilities, including heating and hydroelectric power stations, oil and gas pipelines, oil and gas storage sites; water reservoirs; oil and gas processing facilities; building materials facilities; forestry and agriculture projects, including agricultural development projects, land allocation projects, water management projects for agricultural purposes, poultry and cattle-breeding farm and land improvement projects, afforestation and logging projects; industrial projects, including mining and quarrying, metal processing, chemical and textile factories, food-processing plant; highways and railroads, airports and ports; storage facilities for toxic, dangerous and radioactive substances, communal and industrial wastes, and some other activities.

EIA aims to determine the impacts on the environment of the project and to decide on its feasibility. EIA is to be conducted by the project developer. For the purpose of conducting EIA, experts are hired. EIA is conducted in 5 stages:

- Submission of the Declaration of Intent regarding the project to the local administration for approval
- Determination of the impacts on the environment
- Assessment of the expected impacts
- Updating of the project
- Preparation of the Statement on Impacts.

The first stage is particularly important, as at that point an interim administrative decision concerning the feasibility of the project is made by the local government concerned. The rules do not clarify whether a possible negative decision blocks the further progress of the project. It envisages only that if the proposed activity is rejected, the developer is entitled to apply to other local governments.

In preparing this documentation the investor may be assisted by external, licensed experts. The Ministry of Architecture and Construction is responsible for the licensing of these experts. The documentation must include:

- A protocol of agreement signed by the investor and the mayor of the municipality where the project is to be located
- An assessment of possible impacts on the environment during construction
- A study of the possible impacts and consequences of the investment's activities on the environment.

While conducting the EIA, the project developer has to meet a number of obligations. Information concerning both the short-term and long-term impacts of the activity on the natural objects in the area is to be collected and analysed. A forecast of cumulative environmental impacts has to be provided. The social and economic impacts of the project have to be analysed, together with alternatives. Public hearings have to be organized. The public and NGOs are invited to take part in the EIA process as well as in the post-construction analysis. Their participation is governed by the Law on Ecological Expertise, which came into force in May 1999.

The Statement of Impacts should contain a summary of the results of the assessment. It should be made available to all interested persons and governmental bodies, and submitted as a package with other technical documentation for EE.

Ecological expertise

EE is the tool for preparing the final governmental decision on the authorization of the project. The Law on Ecological Expertise provides for a separate list of activities for which EE is mandatory. It is not as specific as that for EIA, although it appears to encompass not only every activity subject to EIA, but goes further. For instance, projects for regulatory acts, social and economic programmes or plans for the social and economic development of the country and its regions, projects for international programmes and agreements, technical documentation for new technologies, materials and substances, goods and services, are all subject to EE. It covers also activities requiring governmental licences and permits.

EE has a formally different objective then EIA. EE checks whether the project complies with environmental legal requirements - whereas EIA aims to assess its impacts. However, some overlap is unavoidable, as certain assessments are needed to prepare the final decision on the project.

EE is an entirely administrative procedure. However, the administrative expenses connected with it are to be covered by the project developer. EE is arranged, conducted and administered by the Ministry of Environmental Protection. Since it has the right to adopt a report with either a negative or positive decision that overrides any previous decision, the Ministry has the power to control practically all activities in the country that are subject to EE.

Procedurally, EE is conducted after the project developer has submitted all documentation, including the impact statement resulting from EIA, to the Ministry of Environmental Protection. The Ministry convenes a group of experts on an ad hoc basis for each project. The group is responsible for preparing a final report including a draft decision. The group of experts consists of staff of the Ministry and other experts representing science and organizations competent in the area of environmental protection that is under investigation. It is not clear whether staff of other ministries with some environmental competence, but whose interests are primarily economic, can be members of the group. It is only clearly stated that the representatives of the project itself cannot be included in the group of experts.

EE is to be completed within three months after submission of all necessary project documentation. The report prepared by the experts can suggest either a positive or a negative decision. If the final decision is negative, the project cannot go ahead. Funding, lending, investing for the project can be effected only if the decision is positive. If negative, the developer may introduce changes in the project. This updated project is subject to another EE. The report enters into force after being signed by the Minister of Environmental Protection.

1.4 Environmental information and public participation

Access to environmental information

Basic provisions concerning environmental information are contained in the Law on Environmental Protection. Under article 46, citizens have the right to obtain full and accurate information about the state of the environment and the health of the population, and about construction projects. The Law does not specify who is to provide this information. However, other provisions seem to imply that this information should be provided by governmental agencies rather than by industrial facilities or private organizations. It is further stated that citizens are not allowed to disseminate false (unchecked) environmental information that can have negative political, economic or social consequences.

More specifically, the right to have access to certain types of environmental information is proclaimed in special environmental laws. Under the Law on the Protection of Ambient Air, citizens are granted the right to get correct and timely information on air quality and the measures aimed at protecting it. The Law on Waters and the Land Code have similar provisions. The Law on the Radioactive Safety of the Population establishes rules giving citizens access to information about levels of radiation in residential areas, the dose of radiation citizens risk getting through medical treatment or otherwise.

Provision of environmental information

According to the Law on Environmental Protection, ministries and agencies are mandated to provide environmental information to interested citizens and organizations for a charge that should not exceed the cost of preparing and copying the materials. The information is to be provided upon written application, within 6 weeks. Access to environmental information can be restricted if it can harm international relations, the military interests of the State, the protection of commercial secrets, or the investigation of a criminal case.

The Ministry of Environmental Protection is responsible for the dissemination of ecological information. Public awareness campaigns are regularly carried out. At present, the Ministry, assisted by NGOs, broadcasts a weekly radio and a monthly TV programme. During the programmes, the major environmental issues are presented to the public and debated.

The Ministry is also obliged to inform the public promptly in the event of environmental emergencies. These are defined as a hazardous environmental state which, as a result of either natural causes or human activities, exceeds environmental quality standards. Operators of pollution sources are required to make information on pollution available to the Ministry. Moreover, in the event of accidents implying environmental risks, the corresponding operators must promptly inform both the Ministry of Environmental Protection and the Ministry for Emergency Management and Civil Defence.

The Ministry of Environmental Protection collects environmental data from its own measurements and from monitoring campaigns. It coordinates the monitoring activities of the Kyrgyz Hydrometeorological Institute, and cooperates with other sectoral institutions that are responsible for monitoring specific natural resources. The Kyrgyz State Agency of Hydrometerology from time to time publishes air quality data collected through its own observation network in local newspapers.

The Government is also obliged to publish a quarterly environmental bulletin, and to keep the so-called “cadastres” of natural objects, where information on the state of certain natural objects is stored. Generally, cadastres are open, but administrative procedures and certain restrictions condition access to them. Generally, information on natural objects in commercial use cannot be provided to anyone. In other cases, the request and personal interest in it should be justified. Provision is made for keeping cadastres of wild animals, mineral deposits, water bodies and lands. In practical terms, there are no complete cadastres of natural objects of any type. Environmental monitoring and annual environmental media reports are not published regularly and NGOs complain about general difficulties in accessing information.

The situation is different for industrial facilities and users of natural resources. The only obligation to provide the public with environmental information, and this only for the project activity concerned, is specified in connection with the EIA procedure. In other cases, industrial facilities and natural resources users are obliged to supply data only to the relevant ministries.

In cooperation with the Ministry of Education and the National Academy of Sciences, the Ministry of Environmental Protection is preparing educational programmes on the environment and ecology for schools. One of the critical issues in the introduction of environmental education on a large scale is the lack of adequate training materials.

Monitoring and information systems

The Law on Environmental Protection stipulates that a system of State environmental monitoring should be created. Monitoring is to be performed according to a State programme, and, theoretically, on the basis of standardized methods and norms. Monitoring activities are organized at national, regional and municipal levels. The Hydrometeorological Department of the Ministry of Environmental Protection is responsible for carrying out the monitoring. The Department runs a network of monitoring stations located on water bodies, in cities and in certain critical areas for gathering data on the state of air, water and lands and changes occurring due to pollution or other impacts. The Department also operates a geographical information system and a climate monitoring system. The data necessary to survey and analyse the state of the environment may in principle also come from natural resource users and industrial facilities, who are obliged to set up and operate monitoring systems for their activities and communicate monitoring data to the authorities. The network of the Agency on Hydrometeorology includes 123 hydrological sites, 6 lake sites, 39 meteorological stations, including 4 snow avalanche stations, 1 hydrometeorological station, and 16 control sites for air pollution.

In practical terms, there is a lack of both monitoring experts and technical equipment at the Ministry. Some assistance comes from the World Meteorological Organization (WMO) and foreign donors (Japanese and Finnish Governments). However, it does not cover all the system's maintenance needs. Industrial facilities also lack financial resources and therefore are not able to equip the sources of pollution with appropriate monitoring devices. The equipment that is available is outdated. As a result, monitoring is seriously deficient in practically all areas where it is required.

Air monitoring. In general, there is no on-line monitoring owing to a lack of equipment. Manual sampling is the rule, with irregular sampling frequency and no standard protocols for monitoring or analysis.

The Ministry of Environmental Protection is responsible for monitoring industrial emissions and emissions from mobile sources. All industrial pollution sources are required to report their emission data each year, but lack self-monitoring equipment. Consequently, all data are calculated using emission factors that approximate actual emission data. All this information is used for inspection purposes only. Information is not processed or analysed to describe the pollution load or the environmental situation, nor is it transmitted to the National Statistics Committee for publication.

During the environmental inspection of pollution sources, emission sampling may take place. No standardized protocols for monitoring are adopted. Samples are analysed at the laboratory of the Ministry's Environmental Monitoring Department. The laboratory's instruments and devices for analytical analysis are outdated, so that quality assurance and quality control are not performed. The means to carry out the inspections are scarce, so inspections are erratic.

Each regional office of the Ministry is responsible for monitoring its region. At present, the system is only partly operational (2 regions out of 6). The pollutants being monitored include carbon monoxide, phenol, ammonia, xylene, toluene, benzo(a)pyrene and heavy metals (Pb, Cd, Cu). The monitoring of mobile sources is scarce because of a lack of adequate equipment.

The Hydrometeorological Institute is responsible for ambient air monitoring. Observation stations measure chemical pollution in cities, industrial centres and residential areas. Measurements are conducted manually. Samples are taken and then analysed at the Institute's laboratory according to the methodology of the former Soviet Union based on photometry, mass spectroscopy, chromatography and atomic absorption methods. The list of monitored pollutants includes dust, sulphur dioxide, nitrogen dioxide and carbon monoxide. Other pollutants are analysed if it is suspected that their ambient air quality standards are exceeded.

Monitoring results are not regularly transmitted to the Ministry of Environmental Protection. The Ministry does not control the quality of the monitoring results, nor is there a unified database in use. The air quality monitoring system is considered to be less than satisfactory because of its insufficient geographical coverage.

The Ministry of Health's Sanitary Epidemiological Department is in charge of indoor monitoring. The Department has its own equipment for analysis.

Water monitoring. Water pollution is regularly monitored by: the Ministry of Environmental Protection (water discharges), the State Agency for Geology and Mineral Resources (groundwater), the Hydrometeorological Institute (surface waters) and the Sanitary Epidemiological Department (drinking water).

The Ministry of Environmental Protection's system is decentralized to the regions. At present, the system is in operation at most in 3 regions (out of 6). Water samples are collected during inspections and analysed at the Ministry's laboratory for the presence of microbial and chemical contamination (pesticides, heavy metals, nitrates and PCBs).

For drinking water, nitrate concentrations and microbial contamination are the key parameters analysed. Water samples are collected by the Sanitary Epidemiological Department through regular monitoring and random inspections.

Soil pollution and radioactivity. The state of the soil is monitored by the Ministry of Environmental Protection in the event of an accident. Radioactivity is monitored through three separate networks: the Ministry of Environmental Protection, the Sanitary Epidemiological Department and the State Agency for Geology and Mineral Resources. The networks are not integrated. The Sanitary Epidemiological Department is in charge of monitoring the radioactive contamination of food and water.

A project for strengthening the environmental monitoring capacity of Kyrgyz institutions is under way. The project includes a training programme for operators, the adoption of a monitoring plan, the partial implementation of a pilot scheme, as well as the provision of two mobile monitoring units and data management equipment.

Public participation

Civil society organizations generally and the NGO sector in particular have emerged only since independence. NGOs, although increasing rapidly in number in recent years, have been largely driven by the availability of donor funding. Most environmental NGOs are small, consisting of 5-10 members, and short-lived. Their main orientation is environmental education and public awareness, although some have professional interests and do voluntary work in environmental protection. For instance, "The Tree of Life" NGO was set up by medical doctors in 1996, with the objective of promoting sustainable development and raising the standard of living through environmental protection, health protection and education. One of its recent projects was the monitoring of the Kumtor gold mine after an accidental cyanide spill in 1999.

The main obstacle to the development of a public environmental movement is a lack of finances. In addition, official authorities do not favour environmental NGOs and avoid, whenever possible, their involvement in environmental protection measures. Many NGOs blame the Government for not acknowledging their potential roles and contributions in a general and transparent manner that would provide equal opportunities to all.

1.5 Conclusions and recommendations

Environmental legislation is complex and includes both a comprehensive environmental protection law and natural resources laws. It meets the generally accepted standards of law-making in this area. Most of the laws are of a framework type and depend for enforcement on the development of sometimes numerous governmental regulations. The process of law-making by the executive branch is less transparent and therefore more difficult to influence, but in practical terms more important. A lack of regulations or inadequate ones can seriously weaken the implementation of laws.

Recommendation 1.1:
As most principal environmental and natural resources laws are adopted, activities should concentrate on their implementation, starting with the timely development of all required governmental regulations. See also Recommendations 5.1, 5.2, 7.1 and 9.3.

A system of executive bodies responsible for environmental protection and the regulation of the use of natural resources has been set up in Kyrgyzstan. The solutions adopted for shaping the environmental administrative system are quite adequate, and the Ministry of Environmental Protection exerts key influence on economic activities that are potentially harmful to the environment, through instruments such as environmental expertise, permits for emissions into air, discharges of effluent, monitoring and others. This shifts the emphasis in the direction of the

promotion of sustainable development. Increased focus on this concept might help to increase the clout of the Ministry of Environmental Protection in the governmental system, which in turn may strengthen the capacity of the Ministry to enforce the application of all the instruments at its disposal.

A second impediment to the full enforcement of existing provisions for environmental protection is the lack of funding. This problem's dimension is, of course, international, but it is also national. The readiness of national institutions to make funds available for the implementation of the laws or political programmes that are adopted does not always appear to be commensurate with the priorities verbally given to these laws and programmes.

Thirdly, since transition is accompanied by a certain level of decentralization also in Kyrgyzstan, the problem of capacity-building for environmental management at all levels concerned – national, regional, local, industrial – needs to receive sufficient attention. Here again, increased international cooperation could help master the difficult and time-consuming tasks ahead.

Recommendation 1.2:
The legislative and governmental bodies should see to it that priority policies and management measures receive the necessary funding. Capacity-building measures need to be strengthened, both through training staff at all levels of environmental management and through the upgrading of required equipment. Funding of such measures should primarily be sought from national sources (by adapting the structure of the budget to all policy priorities, including environmental priorities). If funding is sought for training, technical assistance and equipment from international sources, Kyrgyzstan needs to be prepared to better respond to the requirements of foreign partners.. See also Recommendations 4.1 and 6.4.

Public awareness is a significant component in achieving sustainable development – hence the need for mobilizing the cooperation of NGOs with the Ministry of Environmental Protection. The legislation sometimes contains provisions for public participation in environmental protection. However, in such cases, it usually lacks the implementing instruments that are needed to involve the public in practice in decision-making. Wide experience in other countries shows that the public is a strong – if not the strongest – ally of environmental administrations in their struggle for increased social recognition and influence. It is therefore in the interest of the Ministry of Environmental Protection to develop such cooperation as a matter of great urgency.

Recommendation 1.3:
More attention should be paid to ensuring public participation in all aspects of environmental protection, especially by increasing access to policy-making processes at all levels of the legislative, judiciary and executive powers. The Ministry of Environmental Protection should consider strengthening its capacities for developing public awareness and participation. See also Recommendations 5.3 and 5.4.

The procedures followed in EIA will grow into a major instrument of environmental management, once the large-scale economic activity of the country resumes. In the interest of both economic recovery and environmental protection, EIA procedures should not be unnecessarily time-consuming or expensive (for both project developers and environmental authorities), they should be "reasonably applicable" by the environmental inspectors and other managers involved, and they should provide an instrument for effective public participation.

The current procedural scheme does not appear to meet all these requirements. It should be possible to base the final EIA decision on the impact statement without further expertise. All aspects of public participation should be clearly regulated. The training of environmental managers (inspectors) involved in the screening and scoping phases should enable them to apply EIA procedures with ease and should ensure harmonized EIA applications across the country.

Recommendation 1.4:
An early revision and further specification of the procedures followed in environmental impact assessment should be envisaged. Procedures should be streamlined in order to make them less costly and easier to apply. Procedures for public participation should be regulated in the required detail. The training of environmental managers involved in impact assessment should focus on their role in the screening and scoping phases.

Appropriate and functioning environmental monitoring schemes are an indispensable precondition for successful environmental management. The priority of gathering, providing

and analysing reliable monitoring data is beyond doubt. It is therefore highly urgent to ensure that the existing monitoring schemes and plan are such that they can provide at least the necessary minimum service to environmental management. This will require funds.

Recommendation 1.5:
The enforcement of satisfactory environmental monitoring in all areas that depend on reliable monitoring data should be seen as a precondition for environmental management and should, consequently, receive appropriate funding. See Recommendations 2.5, 3.1 and 7.3.

Chapter 2

INSTRUMENTS FOR ENVIRONMENTAL PROTECTION

2.1 Regulatory instruments for environmental protection

Licensing and environmental impact assessment (EIA)

The Law on Environmental Protection was first adopted in April 1991. Its currently valid version follows the revision of 1999. The Law defines the procedures for ecological appraisal and contains specific articles on "licences for the use of natural resources". The following activities related to the environment are licensed: the prospecting and exploitation of mineral resources, the withdrawal of surface and groundwater for irrigation, fishing and hunting. Some activities are licensed but are reserved exclusively for special State enterprises (such as logging, which is licensed exclusively to the State forestry farms).

The Ministry of Environmental Protection is required to prepare an environmental assessment of contracts and agreements related to the use of natural resources. It also assesses the materials presented for a licence application when the licence is to be issued by a State agency (e.g. for prospecting for mineral resources, the withdrawal of water for irrigation, hunting and forestry). Licence fees are paid into the State budget.

The environmental impact assessment regulation of 1997 incorporates the environmental impact assessment principles and procedures. For almost all new investments a set of documents must be prepared and submitted by the developer when applying for a building permit. In the case of large-scale investment projects (23 main types have been identified in the law), the documentation is submitted to the Department of Ecological Expertise at the Ministry of Environmental Protection. See Chapter 1 for a brief description.

For small investments, the investor normally submits a declaration on pollution, which is subject to ecological expertise at *oblast* level.

Post-project analysis and construction control are also carried out. They include:

- An assessment of the consequences and a comparison with the originally assumed circumstances
- Data monitoring and evaluation

Permits and related procedures

The system for issuing permits is not unified. Permits are issued separately for:

- Water abstraction and water use
- Emissions from stationary sources
- Waste generation and management
- Waste-water discharges
- Use of natural resources

The Environmental Inspectorate evaluates the request for a permit – except regarding water abstraction, which is administered by the Ministry of Agriculture and Water Resources. If a positive opinion is given, the regional departments of the Ministry of Environmental Protection issue the permit. Generally, a permit is valid for five years. All the conditions related to emissions – locations, emission thresholds and duration – are specified in each permit. The permit conditions are monitored and enforced by inspectors.

The limits on the use of natural resources are established by the competent State agency after consultation with the Ministry of Environmental Protection. For example, logging takes place in accordance with the resolution of the State Agency for Forestry. The actual volume and methods of cutting are specified in the licences granted to the State forestry farms. Limits on mining are defined by the State Agency for Geology and Mineral Resources.

Data related to emission limits for water, air and waste disposal are recorded in one single document called the "ecological passport". Violating the

conditions laid down in this permit, i.e. violating the methods or the volume of use of natural resources (harvesting, fishing and hunting more, or deviating from harvesting, fishing or hunting rules), or exceeding the emission limits leads to fines.

Environmental inspection

In theory, the national environmental inspectorate inspects enterprises one to three times a year, depending on the degree of hazard associated with the inspected activity. In practice, inspections are less frequent for lack of manpower and technical resources. In general, inspections aim at controlling the conformity of the activity with the granted permit, as well as the emission or discharge information provided by the enterprise.

It is reported that companies report correctly and respect the MAEs in more than 80 per cent of the cases, errors being mostly due to misunderstanding of the methodology to be followed or its implementation. However, there is no table of correlation between the results of the inspection and the values reported by the enterprises. In case of infringement or non-compliance, penalties can be applied to the company manager, or to the company.

Trade and environment

Kyrgyzstan is a member of several international financial and economic institutions including the International Monetary Fund (IMF) (it was the first former Soviet republic to accede to IMF), the World Bank, the European Bank for Reconstruction and Development (EBRD), the Asian Development Bank (it accepted Kyrgyzstan as its 55th member in 1994) and, most notably, in December 1998, Kyrgyzstan became the first newly independent State to join the World Trade Organization (WTO).

So far, the free-trade regime has not aroused the interest of the industrial sector with regard to improving the industry's environmental efficiency or changing pollution patterns. It is hoped that trade liberalization will facilitate access to environmentally friendly technologies and improve the distribution of environmentally friendly products (e.g. by developing eco-labels, environmental management schemes or other instruments).

2.2 Economic instruments for environmental protection

Overview of instruments

The structure of economic instruments for environmental protection in Kyrgyzstan was inherited from the previous Soviet system and has not been significantly modified since then. The present structure includes:

- User charges (payments for services rendered) applied to water supply, (domestic) sewerage, sewage treatment and water management
- Emission charges for air pollution, waste-water generation and waste disposal (landfilling)
- Product charges applied to transport and the use of natural resources
- Road tax
- Deposit-refund schemes for beverage containers (bottles)
- Penalties for excessive pollution or for unlicensed activities (illegal tree felling, fish catch, hunting, or extraction of mineral resources)
- Compensation for environmental damage

The Ministry of Environmental Protection is also considering applying the following economic instruments in the near future:

- Customs duty on cars
- Tax on energy and motor fuel

User charges

They are due for sewage and waste-water treatment as well as for waste management (domestic waste). The system of fees used for water management aims at a rational use of water and the preservation of its quality. Where the necessary infrastructure exists, additional fees are collected for waste-water sewerage and the treatment of waste water in treatment plants. Municipalities control the system of fees for water, the discharge of sewage and the treatment of waste water. Water and waste management are organized in a semi-State system. Municipal enterprises handle waste, treat and supply water. "Vodokanal" companies manage water works, sewerage and waste-water treatment.

Table 2.1: Water-supply and waste-water treatment charges in Bishkek, by type of user

Som/m³

	Domestic users	State enterprises and organizations	Commercial users
Water supply	0.60	0.60	0.60
Water treatment	0.27	0.27	0.27

Source: Vodokanal, Bishkek.

Note:
The national currency, the som, has been convertible since 1995. At the end of 1999, the exchange rate was 100 soms = US$ 2.4.

Typically, service fees are too low to allow water companies to operate on a cost-recovery basis. The service charges collected cover only some costs and priority expenditures, such as salaries and minor urgent repairs. At present, social constraints and the general economic crisis do not allow these prices to be liberalized. This, together with the discontinuation of State investments in the sector, is the main reason for the noticeable reduction in the quality of services. Table 2.1 shows the current fees in Bishkek.

Table 2.2: Unpaid water charges in Bishkek, by debtor category, January 1998-October 1999

	Unpaid water charges	
	Million soms	% of total
State budgetary enterprises	17.5	47
State budgetary organizations	9	24
Domestic users	7	19
Commercial users	4	11

Source: Vodokanal, Bishkek.

The income of the water companies is further depressed by the population's low ability or willingness to pay. Vodokanal in Bishkek has accumulated 37.5 million soms of unpaid charges since January 1998 (see Table 2.2, broken down by debtor category). As a result, subsidies from the municipal budgets are used to cover running costs (wages and minimal repairs). This situation leads to a reduction in the basic maintenance expenditures to often insufficient levels.

Municipal utility companies handle waste collection and disposal. The way charges are levied depends on the type of user of the service. For domestic users living in apartment buildings, the manager of the building (within the municipal department for rental flats) pays a monthly rate to the waste-collection company. The manager of the building in turn charges the occupants according to the number of persons in the household (in Bishkek about 24 soms per person per year.) Occupants of independent dwellings pay directly to the waste-collection services depending on the type of heating system they have. Occupants of dwellings with gas heating pay 16 soms per person per year, others 25 soms.

Table 2.3: Overall waste economy data for Bishkek, 1996-1998

Thousand soms

	1996	1997	1998
Charge revenues	9,033.3	11,522.0	10,300.0
Total operation costs	8,788.2	11,595.2	12,030.0
Balance	245.1	-73.2	-1 730.0
Total volume of collected waste *(Thousand m³)*	567.2	570.8	498.3

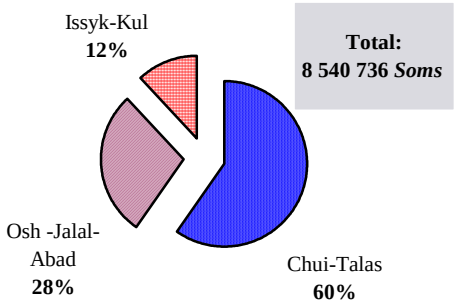
Source: Waste Management Company, Bishkek.

For commercial users, charges are levied per cubic metre of waste produced (approximately 12.5 soms per cubic metre). The quantity is based on the size of the company premises (in square metres), and the number of staff. Table 2.3 gives an impression of the present situation in Bishkek. The current charges do not cover all the expenditures of the waste services and, because there are no State budget contributions, the waste-collection company reduces its activities (volume of collected waste). As a result, the suburbs have been transformed into a source of pollution and environmental degradation.

Emission charges

Kyrgyzstan's environmental policy makes quite extensive use of charges on emissions. They should primarily encourage polluters to change their behaviour. However, they also help to raise considerable revenue. The revenues from emission charges help the State Environmental Fund to finance environmental activities. The charges are levied on the basis of environmental protection acts.

Figure 2.1: Oblast revenues from pollution fees, 1998



Source: Ministry of Environmental Protection.

The emission charge system is inherited from the former Soviet Union. All operators of pollution sources applying for an environmental pollution permit present emission threshold calculations. The threshold is identified for each pollutant emitted based on mathematical models taking into consideration the maximum volume of production. These thresholds are defined as the maximum authorized emission (MAE). Environmental consultants, registered at the Ministry of Justice, may calculate these estimations on behalf of the investor. The inspectors verify the calculations. The pollution charge is calculated per tonne of pollutant.

The charge is levied at the basic rate for pollution not exceeding the threshold and at a reduced rate when the actual emissions are below the threshold. In these cases the charges are paid to the Regional Environmental Funds (REF). The REF will then transfer 25 per cent of the sum to the State Environmental Fund (SEF). The revenues from pollution charges collected by the *oblasts* (regions) during 1998 are given in Figure 2.1.

When emission limits are exceeded, a penalty is applied and the polluter pays an increased rate. According to the Law for Administrative Responsibilities (adopted in October 1998), the entire penalty is paid into the State budget. More recently, a Presidential Decree established that, in the case of penalties, 70 per cent of the fee is to be paid into the State budget and 30 per cent into the State Environmental Fund.

The application of air emission charges is much more widespread in Kyrgyzstan than in EU countries. Air pollution fees are governed by Ministry of Environmental Protection Regulation No. 4 dated 17 September 1999. The Regulation imposes the duty to pay charges on all legal and natural persons that operate large, medium or small sources of air pollution.

The fee is levied at the basic, reduced or increased rate, according to the degree of deviation from the MAE set in the permit, and is applied to all kinds of discharged pollutants. The MAE is the maximum permitted amount of pollutant emitted into the air by a stationary source per time unit that is compatible with the established maximum allowed concentration. The enterprises submit reports to the Ministry of Environmental Protection's regional offices each year. Their reports include (a) the types and quantities of pollutants emitted, (b) the method of measurement (continuously or sample) or estimation of emissions, and (c) information on compliance with emission standards. The manner in which the calculation should be carried out is stipulated in Regulation No. 4/1999. The regional offices base their calculation of the emission charges on the amounts of pollutants reported by the enterprises. At present, no legal instrument exists obliging enterprises to measure emissions continuously, and in practice the surcharges for excess emissions do not act as an incentive to reduce emissions.

Polluters discharging their waste water to surface waters pay waste-water discharge fees. Three types of polluters are distinguished: sewage treatment

Table 2.4: Fees for freshwater abstraction, 1998

Soms per m³

	In general	In particular regions
In vegetation period	0.030	0.015
Outside vegetation period	0.015	0.005

Source: Ministry of Agriculture and Water Resources, 1999.

plants, operated by water companies, municipal sewerage systems, and industries. As with air pollution, the charge is levied at the basic, reduced or increased rate according to the degree of deviation from the MAE set in the permit. The MAE for water pollution is the maximum permitted amount of pollutants discharged into water per time unit that is compatible with the established maximum allowed concentration 500 metres downstream according to former soviet standards.

Product charges

Three types of product charges are used for environmental protection: charges on the withdrawal of surface and groundwater, charges related to transport, and taxes on natural resources. The State Committee for Water, under the Ministry of Agriculture and Water Resources, collects the withdrawal fees from the municipal water companies and industrial and agricultural enterprises abstracting water. The 1998 fee rates are set out in Table 2.4.

Product charges in transport (excise duties, sales taxes, registration and use of motor vehicles) were originally designed and used for the purpose of raising revenue for the general budget. All types of fuels are subject to customs duties. The current excise tax rate is 3,000 soms/tonne for petrol and 1,200 soms/tonne for diesel. Unleaded petrol is currently hardly sold on the Kyrgyz market and no carbon dioxide tax is in place, or even considered at present. The Ministry of Environmental Protection is actually planning to propose introducing motor fuel excise taxes on leaded petrol and diesel fuels in order to make the use of unleaded petrol attractive.

Kyrgyzstan does not manufacture cars; all cars are imported. All road motor vehicles are exempt from customs duties at present. The Ministry of Environmental Protection is considering the adoption of fiscal measures discouraging the import of old polluting vehicles by introducing customs duties for second-hand cars. The rate should depend on the age of the imported vehicle: the older the car, the higher the duty.

The country's natural resources include significant deposits of gold and rare materials such as antimony, mercury, molybdenum and uranium, making mining an important sector for economic development and foreign investment. Regulation No. 198 dated 11 May 1993 "Allocation for the Development and Remuneration of Natural Resources on the Territory of the Kyrgyz Republic" establishes the obligation to pay resource use taxes and prescribes the method for calculating them. Taxes are paid by resource for the quantity extracted and channelled into the State budget.

Table 2.5 shows the tax rate currently applied to the exploitation of selected mineral resources. Official statistics are not available on the relative weight of the taxes on natural resources in the total State revenues. According to official reports, Kyrgyzstan's gold production reached 17 tonnes in 1997, worth US$ 176 million, which is up from 1.5 tonnes in 1996. The jump in the gold production increased Kyrgyzstan's gross domestic product by 14 per cent.

Table 2.5: Mining of selected resources, and respective tax rates, 1997

Resources	Quantity mined in 1997 *(Tonnes)*	Tax rate applied *(%)*
Gold	17	5
Mercury	660	2
Coal	4 *	2

Source: United Nations Economic and Social Commission for Asia and the Pacific, 1999, Ministry of Finance, 1999.

* Million tonnes.

Road tax

Operators in the transport sector pay road taxes for the operation of their commercial vehicles. The tax is paid monthly and varies from 0.8 per cent to 1.5 per cent (for hazardous transport) of the company's revenue. There are no tax exemptions for commercial vehicles with environmentally friendly characteristics. Road taxes are also applied to private cars at a rate of 9 soms per horsepower. Revenues from the road tax are earmarked for the Road Fund.

Deposit-refund schemes

Deposit-refund schemes are limited to glass containers for beverages (beer, milk and alcohol bottles). Apparently, the return rate is very high, which is explained by the low personal income of the population. At the moment, there are no plans to extend the scheme to other materials like plastic bottles, plastic packages, or aluminium.

Penalties and fines

Penalties are applied (a) to pollution beyond permitted limits (see above on reporting obligations of enterprises), or (b) to the pursuit of activities without the required licence (illegal logging, fishing, hunting, extraction of mineral resources).

Inspectors can impose fines if they find evidence of unreported pollution. According to current practice, the polluter is then fined an amount that is 1 to 10 times the minimum monthly salary (in October 1999, this salary was legally fixed at 100 soms). Inspectors also impose fines if they find evidence of pollution exceeding the permitted amounts. The procedure can be summarized as follows:

- Inspections are carried out, partly at the request of the regional offices
- The enterprises' compliance with their permits are checked, visual inspections also take place
- When a breach of law is detected, a penalty may be imposed
- Inspectors deliver a written statement to the enterprise, summarizing their observations
- If the enterprise does not take remedial action, the inspector issues a decision. The decision includes the size of the fine (1 to 50 times the minimum salary) or in some cases the temporary suspension of activities
- The enterprise may appeal against the decision at the Arbitration Court
- If the fine is enforced, it is collected by the Environmental Inspectorate

It appears that the procedure is rather time-consuming. Also, the inspections are carried out by staff of the Inspectorate; they have the technical background but lack adequate equipment. Much of the work turns out to be more of a judicial nature.

Penalties for the illegal (unlicensed) use of natural resources are widely applied. The illegal use of forestry resources, mainly the unauthorized cutting of trees, is a practice that has increased considerably in rural areas over the past 2-3 years. The fine rate is 54 soms for a 4 cm diameter tree and increases with the tree's diameter. The fines are paid into the State budget. Penalties for unlicensed hunting may vary from 2 to 5 times the minimum salary. The fines are also paid into the State budget. 70 per cent of the sanction for illegally shooting game is channelled to the State Agency for Hunting and 30 per cent to the Inspectorate. Illegal fishing is also fined. Table 2.6 shows the imposed and actually collected "environmental penalties".

Table 2.6: Environmental penalties imposed and actually paid, 1998

Soms

Affected resource	Imposed penalties	Actually collected	Payment ratio *(%)*
Total	**350,320**	**230,818**	**65.9**
unlicensed use of resources	158,000	101,250	64.1
Forestry	125,759	78,446	62.4
Hunting	7,261	5,968	82.2
Fishery	24,980	16,836	67.4
Total for excess pollution	192,320	129,568	67.4
Water	52,519	27,242	51.9
Air	80,457	68,713	85.4
Soil	59,344	33,613	56.6

Source: Ministry of Environmental Protection.

Compensation for environmental damage

Legal entities and individuals are liable for the damage they cause to the environment. Compensation for damage resulting from illegal economic activities, the improper use of natural resources or unlicensed activities performed by organizations or individuals is channelled to State Environmental Fund. Kyrgyzstan's Administrative

Code determines both the rates for compensation and the methodology for assessing the damage. The procedure for assessing the magnitude of the damage is based on the costs of restoring the environment to its previous state and the losses occurred.

2.3 Financing environmental expenditures

Environmental expenditures

Environmental expenditures are composed of capital expenditures (investments in equipment and civil constructions) and non-capital expenditures (or current expenditures) that include operational costs, such as personnel, energy, maintenance, chemicals, transport. Table 2.7 gives an overview of investments and current expenditures in the environmental sector in recent years. Officially reported inflation measured in terms of the consumer price index has been going down since 1994: from 278.1 per cent to 53 per cent in 1995, 30.3 per cent in 1996, 26 per cent in 1997 and 18 per cent in 1998. The expected 1999 rate was 12 per cent in October 1999.

Figure 2.2 illustrates that, while current expenditure has grown (doubling over the 1994-1998 period), the share of investments has decreased from 31 per cent in 94 to 23 per cent in 1998.

Table 2.8 gives an overview of the use of limit of investments by sector. During the 1994–1998 period, most of the funds were invested in soil restoration and land protection. The investments in land protection represent 54 per cent of total environmental expenditure in 1994, 63 per cent in 1995, 80 per cent in 1996, 52 per cent in 1997 and 76 per cent in 1998.

It is not completely clear how the National Statistics Committee collects data on environmental expenditures, there is no clear definition of environmental expenditures. A noticeable feature is that the figures published by the National Statistics Committee as "investments" include also expenditures for remedial action undertaken in

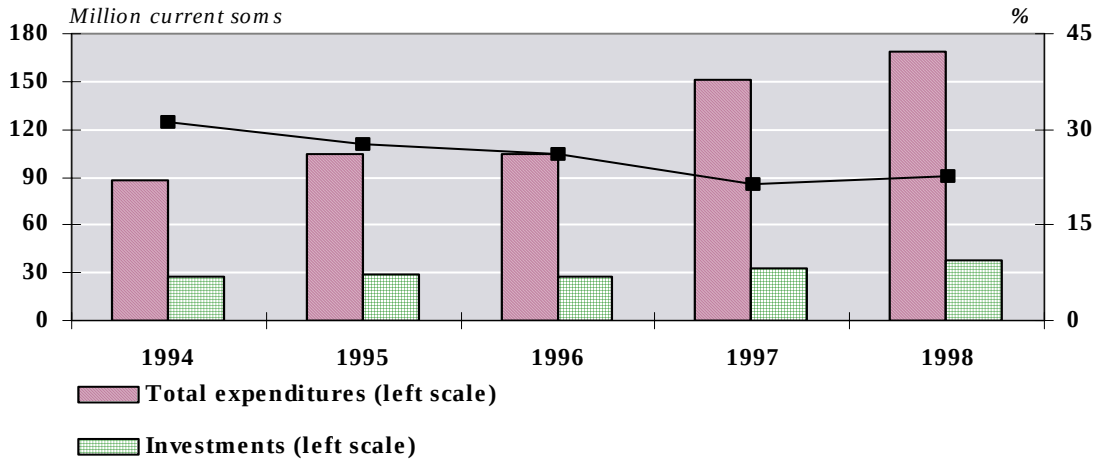
Table 2.7: Environmental expenditures, 1994-1998

Million current soms

	1994	1995	1996	1997	1998
Total	**87.9**	**104.4**	**104.1**	**151.4**	**168.6**
Investments	27.4	28.8	27.1	32.3	38.3
Current expenditure	60.5	75.6	77.0	119.1	130.3

Source: National Statistics Committee.

Figure 2.2: Environmental investments as share of total expenditures, 1994-1998



Source: National Statistics Committee.

Table 2.8: Environmental investment expenditure by sector, 1994-1998

Million current soms

	1994	1995	1996	1997	1998
Total	**27.4**	**28.8**	**27.1**	**32.7**	**38.4**
Water protection	7.9	7.4	4.4	13.0	9.1
Air protection	4.8	3.4	1.0	2.3	0.0
Land protection	14.7	18.0	21.7	16.8	29.3
Others	-	-	-	0.6	-

Table 2.9: Current expenditures, 1994-1998

	1994	1995	1996	1997	1998
Total *(Million current soms)*	**60.5**	**75.6**	**77**	**119.1**	**130.3**
as % of total					
Management expenses	*68.3*	*59.1*	*60.4*	*66.8*	*63.9*
Repairs, maintenance	*11.9*	*23.9*	*17.9*	*19.7*	*21.7*
Protected areas	*7.4*	*6.6*	*9.9*	*4.2*	*7.0*
Forest	*12.4*	*10.3*	*11.8*	*9.3*	*7.4*

Source: National Statistics Committee.

Table 2.10: Ministry of Environmental Protection budget, 1994-1998

Million current soms

	1994	1995	1996	1997	1998
Management expenses	4.01	3.85	4.82	6.10	8.13

Source: Ministry of Finance, 1999.

connection with damage caused by natural disasters or accidents. This may explain the peak in 1998, as a devastating flood and landslide occurred in the Jalal-Abad oblast in that year. Investments may therefore in many cases be repair costs and not investments in new construction or in upgrading existing environmental infrastructure.

Table 2.9 concerns current expenditures for environmental protection. Table 2.10 analyses the Ministry of Environmental Protection's budget over the same period. The Ministry's budget accounts for almost 10 per cent of the environmental sector's management expenses. The Ministry's management is exclusively covered by the State budget.

National sources of finance

Statistical data on sources of finance for environmental expenditure are scarce. Therefore, there is a need to collect more data and make additional assessments to get a more detailed picture of the existing resources.

Many of the problems currently facing the Kyrgyz environmental sector are related to the general situation of the country's economy and public finances. As a result of economic recession following independence (the country was heavily dependent on Soviet subsidies, energy supplies, especially oil and gas, and was closely integrated into the former Soviet Union market), the State budget that is available for the environmental sector is practically limited to covering only management costs. The State has practically ceased to finance new construction or the upgrading of existing environmental infrastructure, but a resumption of such investments is foreseen in 2000 and 2001.

Table 2.11: Investment in infrastructure in the present public investment programme, 1999-2001

Thousand US$

	1999	2000	2001	Total period 1999-2001
Total	**44,511**	**39,043**	**37,533**	**121,087**
Transport	700	7,050	14,000	21,750
Telecommunication	7,734	0	0	7,734
Energy	36,077	29,776	8,716	74,569
Environment	0	650	3,950	4,600
Water supply	0	1,267	9,667	10,934
Housing	0	300	1,200	1,500
Share of the infrastructure related programmes in the PIP (%)	*18*	*14*	*14*	*15*

Source: Ministry of Finance.

Since 1995 the State's national and sectoral investment programmes have been listed in the Public Investment Programme (PIP). The latest PIP covers the 1999 - 2001 period. It includes investment projects to be funded from the State budget, international finance institutions and bilateral donors. Table 2.11 shows the investments in infrastructure projects within the PIP. The plan is to invest over US$ 120 million in public infrastructure in the 1999 - 2001 period.

The infrastructure programme will receive 15 per cent of the total planned PIP. The priority sectors within the infrastructure programme are energy (61.5 per cent of the total budget), transport (17.9 per cent) and the environment (3.7 per cent). The allocation to the environment is intended to finance improvements in sewage systems and waste collection, use and disposal facilities.

State Environmental Fund

The State Environmental Fund was established in 1989. By presidential decree of 1992, the State Fund was reorganized as an independent legal entity. The Fund consists of:

- A National Environmental Protection Fund at the central level
- Regional Environmental Protection Funds at "oblast" level

There are Regional Environmental Protection Funds in Bishkek, Chui, Issyk-Kul, Naryn, Talas, Jalal-Abad and Osh.

The Fund's sources of income are charges on: air pollution, water pollution, waste generation and permits for landfilling. Its income in 1995 stood at 345,000 soms; in 1996 at 957,200 soms; in 1997 at 1,272,600 soms; in 1998 at 2,072,600 soms, according to the Ministry of Finance. Almost 50 per cent of the Fund's budget is used to contribute to the management activity of the Ministry. The remainder is used for projects such as training, education and EIA. No investment projects were financed by the Fund.

Foreign assistance

Overall responsibility for the coordination of foreign assistance lies with the State Commission for Foreign Investments and Economic Development (Goskominvest), chaired by the Prime Minister. The Agency for Foreign Investment (AFI) acts as Goskominvest's executive body and has been given responsibility for the day-to-day coordination of external assistance.

The bulk of international assistance from IMF, the World Bank, the Asian Development Bank and other international financial institutions was directed towards macroeconomic stabilization and structural reforms. Limited support was given to infrastructure developments and the environment. The Ministry of Environmental Protection has long followed a policy of seeking grants for technical assistance, and a number of policy advice and capacity building projects have been carried out and are ongoing in the environmental sector. Since 1992, foreign assistance to the Kyrgyz

environmental sector has amounted to US$ 6,750,000, primarily for technical assistance. A US$ 15 million loan to fund a water supply and sanitation project is being negotiated with the World Bank.

2.4 Conclusions and recommendations

Kyrgyzstan has a long tradition of using economic instruments for environmental protection. Over the past years, their importance and the interest in their further development and increased use has grown. Economic instruments for environmental protection are primarily seen as a means to raise revenue and increase funding for environmental expenditure. Until now economic instruments like tax differentiation and tradable permits have not really been considered.

Regarding the individual instruments in use, it can be said that:

- User charges for sewage, sewage treatment and management of municipal wastes are relatively low and do not cover costs
- Emission charges are complex, especially for air pollution (some 20 substances are affected), but also for waste and water. This should be seen in relation to the ability to monitor and inspect emissions
- Emission charges are too low to provide a real incentive to reduce emissions
- No use is made of product charges such as a CO_2 tax or charge
- The deposit-refund schemes are well developed for bottles
- The State Environmental Fund suffers from a lack of income, and enforcement of payments is too lax.

The current rates for sewage charges and municipal waste management cover the minimal costs of service providers such as salaries and minor urgent repairs. The introduction of higher charge levels should be considered. Where insufficient income is generated through user charges (State subsidies having practically ceased because of the strict austerity measures adopted to tackle the economic crisis), basic maintenance expenditures are slashed, leading to the disintegration of the existing infrastructure.

Recommendation 2.1:
The introduction of higher user charge rates for sewerage, sewage treatment and municipal waste management should be considered. The charge scheme should allow service providers to operate on a cost-recovery basis.

The existing user fee collection system is a source of problems. Enforcement is lax and the current administration of charges sometimes does not constitute an incentive for environmentally friendlier behaviour, nor is it adequate for raising substantial revenues. The current system's inspection capacity is undermined because of a lack of monitoring tools. It is questionable whether the rates applied have an incentive effect on pollution control, and the polluter-pays principle does not seem to be fully in effect. The number of pollutants concerned is large. In EU countries for instance, only a few pollutants are included in the charge scheme. The following options might be considered:

- Simplification of air emission charges by reducing the number of substances charged (possibly keeping the total revenues from the charge system unchanged)
- Introduction of the concept of pollution equivalents for waste and water charges
- Simplification of the administration of emission charges

The analysis of the polluters' compliance with the polluter-pays-principle should be carried out at two levels:

1. Do polluters pay for cleaning their emissions in accordance with emission standards?
2. Do polluters also have to pay for actual emissions?

Recommendation 2.2:
The existing pollution charge system should be improved with regard to the efficiency of the applied rates, a possible reduction of the charge scheme and in general a more systematic application of the polluter-pays principle.

Product charges/taxes are becoming increasingly important in environmental policy. Apart from product charges/taxes in transport, the possibility of introducing a variety of product charges to increase the environmental tax basis should be evaluated. These may include charges on batteries, fertilizers, pesticides, lubricating oils, CFCs, packaging, tyres, coal ash and others.

Recommendation 2.3:
An increased use of products charges for environmental policy should be evaluated. The introduction of tax differentiation to encourage the use of environmentally friendly products should be analysed.

Value-added tax (VAT) represents 50 per cent of State budget income. The normal VAT rate applied is currently 20 per cent. There is no lower rate for "green" products. In order to stimulate the market for environmentally friendly products, the possibility of applying lower rates should be assessed for the following categories of products:

- Products containing at least 70% of recycled paper in terms of weight
- Environmentally friendly fuels (biogas, firewood, wooden chips, etc.)
- Machinery and equipment for environmental protection (solar collectors, small water treatment plants for private houses, catalysers for vehicles, environmental measuring equipment, etc.)

Recommendation 2.4:
A coordinated strategy and a national programme encouraging the introduction of less polluting technologies through modern standards and a revised permitting system as well as economic incentives should be formulated with clear objectives and deadlines, with priority given to environmental hot spots. A strategy to promote cleaner, safer and more sustainable technologies should also be developed and adopted. The role of the State Environmental Fund as a source of finance for related expenditures – as well as for environmental investments in general – should be strengthened. *See also Recommendations 7.6 and 9.4.*

Kyrgyzstan still adheres to the environmental standards used in the former Soviet Union. The approach to emission standards is based on the maximum permitted emission (MPEL). The MPEL is set in the permit. The ability to monitor or inspect emissions is very limited. The application of the current permitting regulations is therefore not effective enough and polluters are not encouraged to clean up their act.

The present permitting system does not limit the pollution per unit of product or process, but merely sets the maximum permitted emissions according to the environmental standards of the area. New standards based on the best available technology not entailing excessive costs (BATNEEC principle) should be adopted in the medium term. Pollution emission limits based on technological criteria and expressed as a quantity of permitted pollution per unit of product should be adopted. For that purpose, cooperation with other ministries (Finance, Economy) should be strengthened. The ministries concerned should fully cooperate in working out the detailed objectives, deadlines, and incentives.

Polluters are not encouraged to implement all appropriate measures against pollution, nor do they have any real interest in polluting less. A legal and tax system that favours the precautionary system and BATNEEC should be introduced. There is not at the moment a corresponding plan that would help achieve more efficiency in environmental protection by encouraging polluters to implement all appropriate measures against pollution and to introduce cleaner technologies.

Recommendation 2.5
An integrated information system strategy should be developed, including the financial aspects of its implementation. The strategy should be explicit on the data collection responsibilities, the data flow organization and the dissemination of data to the public. *See also Recommendation 1.5.*

An environmental monitoring strategy is currently under preparation. The plan emphasizes coordination among national and international sectors, but the present lack of financial resources is limiting the Ministry's ability to develop an integrated monitoring and information system in the short term.

The monitoring data must be used efficiently. The data should be analysed and merged to describe the environmental situation at local and national level and provide accurate information so as to:

- Present a reliable picture of pollution flows
- Investigate the causes of environmental degradation
- Set environmental standards

Special measures to improve the capacity of industries to monitor their own emissions are also required. All data on emissions should be submitted to the Ministry of Environmental Protection and stored in a database. A system of data transmission to the National Statistics Committee should be implemented. Information should be published regularly. Environmental information and its dissemination via the mass media should be systematic in order to increase public awareness of the state of the environment.

Chapter 3

RISK MANAGEMENT OF NATURAL DISASTERS

3.1 Natural hazards

General overview

Kyrgyzstan is a highly disaster-prone country; the territory is exposed to more than 20 different types of natural hazards. The most dangerous, in terms of prevalence, recurrence and damage, are earthquakes, debris flows, flash floods, landslides, rockfalls, avalanches, spring frosts and snowfalls as well as glacial lake outburst floods (GLOFs). Between 1992 and 1999, over 1,210 natural disasters were registered in the country. They took the lives of more than 400 people, and damaged or destroyed more than 50,000 houses, 222 school buildings, 127 health-care facilities, roads, electricity transmission lines, hydro-technological constructions and other important infrastructure. Direct economic damage caused by natural disasters exceeds $20 million in a normal year. Indirect damage and secondary effects, such as ecological damage, epidemics, deterioration of living conditions and decrease in soil fertility, have not been assessed, but are certainly important.

This high vulnerability to natural disasters can be attributed on the one hand to the country's complex geo-climatic conditions and, on the other, to its economic difficulties during the transition period. Kyrgyzstan is situated in one of the most seismically active regions of the world. Its geological conditions are dominated by high mountain systems surrounded by desert plains. High altitudes have predetermined a wide development of glaciation. There are 8,208 glaciers with a total area of 8,100 sq km in Kyrgyzstan. In the mountainous areas, deforestation, ploughing and the impact of cattle grazing on mountain slopes have caused intensive destruction of the soil cover, the formation of mud slides, landslides and avalanches. The absence of appropriate legislation to protect ecosystems has led to the irrational use of limited natural resources. As a result, the environment has deteriorated and become more vulnerable to natural disasters.

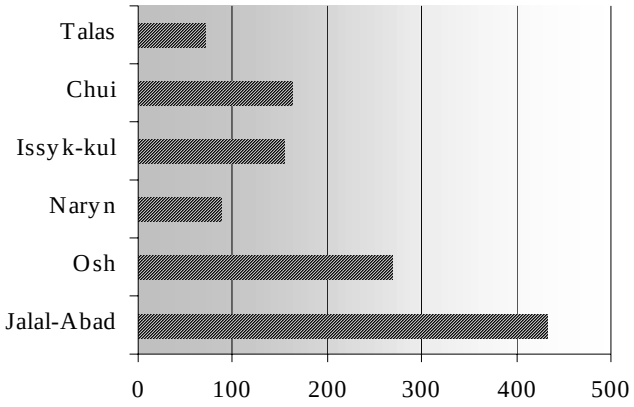
The areas prone to natural disasters are unevenly distributed over the country. The most vulnerable areas, in particular in cases of rapid and disastrous events, such as earthquakes, glacial lake outburst floods and debris avalanches, are valleys where human settlements, transport and other infrastructure are concentrated. In these areas, the potential for loss of life and property is very high, as the settled inter-mountain depressions and valleys are relatively densely populated (90 persons per sq km). (The average population density is 20 persons per sq km, and in high mountain areas it is 2-3 persons per sq km).

The regions most frequently affected by natural disasters are the Jalal-Abad and Osh *oblasts* (see Figure 3.1), followed by the Chui and Issyk-Kul *oblasts*. The administrative districts which have been most affected by natural hazards are: Nookat district in the Osh *oblast*, Nooken district in the Jalal-Abad *oblast*, Ak-Suu district in the Issyk-Kul region and Jail district in the Chu region. Approximately 80 per cent of all the disasters occur between May and August.

The most destructive natural disasters of the past 10 years include:

- torrential rain and an earthquake in Osh and Jalal-Abad in 1992 destroyed 51,440 hectares of agricultural land and affected 20,000 people; direct economic damage was estimated at US$ 31 million
- the Suusamyr earthquake in August 1992 killed 54 people, damaged more than 10,000 residential buildings and made over 60,000 people homeless; economic damage was US$ 130 million
- heavy rainfalls, snowfalls and frosts in spring 1993 caused economic losses estimated at US$ 21 million
- large-scale landslides and mudflows in 1994 in the Osh and Jalal-Abad *oblasts* killed 115 people and made 27,000 homeless; economic damage: US$ 36 million

Figure 3.1: Frequency of natural disasters 1993-1999, by oblast



Source: ISDR

- a glacial lake outburst flood in 1998 killed over 100 people and caused damage over an areas stretching to Uzbekistan
- severe and widespread floods in Jalal Abad in 1998, caused by torrential rains, damaged or destroyed an estimated 1,200 houses and public buildings; direct economic damage was estimated at US$ 240 million

Earthquakes

The entire territory is located in a zone of high tectonic activity with the potential for earthquakes registering 8-9 points on the Richter scale. The area of potential point 9 (Richter scale) earthquakes is 40,000 sq km, and of point 8 earthquakes 150,000 sq km. An estimated 40 per cent of the population lives in the point 9 (Richter scale) zone. Over 3,000 earthquakes are registered in Kyrgyzstan annually and, on average, ten of these are powerful. Annually, several dozens of earthquakes and tremors with a magnitude of 2-3 on the Richter scale are registered. Earthquakes with a magnitude of 4-6 in the epicentre are rather frequent and cause considerable damage to housing and industrial enterprises. According to the prognosis of the Research Institute of Seismology, based on the analysis of past earthquakes, the region is likely to suffer major earthquakes in the coming years.

The areas most prone to earthquakes are the Osh and Jalal Abad *oblasts*. The last strong earthquakes-Suusamyr (1992, 7.3 on the Richter scale), Baicorun (1990, 6.3) and Kochkor-Ata (1992, 6.1)-caused considerable damage to the infrastructure, such as buildings, roads and hydro-technological facilities. According to official data, the Suusamyr earthquake damaged more than 10,000 apartment buildings. The damage would have been more severe if the epicentres of these earthquakes had been in densely populated areas.

Bishkek, the Kyrgyz capital, lies in the northern Tien-Shan seismic zone. According to the seismic zoning map of Kyrgyzstan (1995), the initial intensity for Bishkek is considered to be 9. An estimated 40 per cent of the capital's residents live in buildings that are not sufficiently earthquake-resistant, and more than 90 per cent of the school buildings do not meet the building code requirements. Brick buildings, buildings with flexible ground floors and some frame buildings are most vulnerable to potentially strong earthquakes. Residential buildings with brick walls have a different rate of reliability, which is caused by their different construction designs. Many residential brick buildings are old and were constructed before the development of the main principles of seismic area design. Therefore, many brick buildings do not meet the requirements of present construction codes. Moreover, due to the low quality of construction work, most of the brick buildings constructed under the present construction codes are not sufficiently earthquake-resistant either.

Landslides and rockfalls

The total area exposed to landslides and rockfalls is equal to 50,000 sq km. Rockfalls and landslides

tend to occur mainly in the south, where some areas are affected by as many as 30-40 landslides per sq km. The most vulnerable regions are Osh, Jalal-Abad, Chu, Talas, Issyk-Kul as well as the foothills of the Fergana and Alai Ridges. More than 200 settlements and communication structures are located in landslide-or rockfall-prone zones. About 2,500 landslides have been registered in the south since the mid-1950s. The mining towns of Maili-Suu, Sulukta, Min-Kush and roads have suffered major damage from landslides. In March and April 1994, 115 people died under the deposits of massive landslides in the south.

Debris flows, flash floods and GLOFs

About 50 per cent of the populated territory is prone to debris flows and flash floods. Frequent and heavy rains often cause debris flows and flash floods in the clay soil zones and damage the nearby settlements. Debris flows and flash floods are the most frequent hazards and cause the greatest impact (direct, indirect material and social damage) because of their exceptional prevalence and frequency. Dozens of people suffer annually as a result of debris flows and flash floods. As a rule, settlements are drawn to flood plains and alluvial cones because there are no other flat surfaces available for irrigated land use and settlement. This is typical especially for the south, where habitable land is limited.

Outbursts of high mountain glacier lakes are a typical hazard of mountainous countries. In Kyrgyzstan, there are several lakes with unstable natural dams and there is a permanent threat of outburst. Of more than 1,000 high mountain lakes, 199 have been identified as being dangerous. In 1993, 3 outbursts of high mountain lakes were registered. In 1998, the overflow of a glacier lake in Kyrgyzstan caused widespread damage up to the border with Uzbekistan.

Avalanches, snowfalls and spring frosts

Snow avalanches inflict significant direct material damage, but their indirect effects are also very serious, as important vital communications like electronic power lines and roads are destroyed. Between 1950 and 1990, more than 72,000 snow avalanches were registered in the country. One in every 50 inflicted damage. The main risk of snow avalanches is loss of life. Between 1983 and 1993 snow avalanches killed more people than all the other hazards taken together, including earthquakes. Spring frosts and snowfalls occur mostly in middle and high mountainous areas. Annually, 300,000 hectares of plantations and other farmland are affected by spring frosts.

Interrelations between technological and natural hazards

During Soviet times, environmentally destructive practices were often pursued with little regard for their long-term consequences. As a result, many dangerous, man-made hazards, in particular radioactive (and other hazardous) tailings, lie in areas at very high risk from natural hazards, such as on the banks of flood-prone rivers and at the foothills that are prone to mudslides or earthquakes, thus creating a high risk of secondary technological disasters. Some of the most dangerous sites in this respect are Maili-Suu, Ak Tuz, Sumsar, Kan, Haydarken and Kadamjay.

The disused Maili-Suu uranium ore mine on the border between Uzbekistan and Kyrgyzstan requires special attention as it poses a risk that could have a regional impact. Several radioactive tailings are located on unstable slopes on both banks of the Maili-Suu River, a tributary to the Sir-Darya River, which is one of Central Asia's main riverine arteries, flowing through the Ferghana Valley (home to 8 million people). Tailings are located in a landslide-prone area, in a zone of high tectonic activity with an earthquake potential of 8-9 points on the Richter scale. A landslide triggered by an earthquake could wash the radioactive soil into the waters of the Sir-Darya River, thus contaminating the water supplies of several million people in Kyrgyzstan and in neighbouring countries.

Another cause of great concern is the vulnerability of large hydraulic engineering structures, such as dams, in seismically active zones. For example, the Karakol dam, which retains a huge water reservoir and is both politically and economically strategic for Kyrgyzstan, is located in a zone of high tectonic activity. According to the Institute of Seismology, the dam is not sufficiently earthquake-resistant.

3.2 Policy objectives and programmes

Institutional arrangements

In 1990, the Soviet Government approved the Decision on the Creation of an All-Union State System for the Prevention of and Action in Emergencies. To implement this Decision, the Cabinet of Ministers accepted a decree on the

creation of the State Commission on Emergencies as a permanent Cabinet body. After independence, in May 1993, the State Commission was changed by Presidential Decree into a Kyrgyz State Committee on Emergencies and Civil Defence. In 1996, the State Committee was replaced by the Ministry of Emergencies and Civil Defence, in accordance with the Presidential Decree of 2 December 1996 on the Reorganization of the Structure of Central Executive Power. The Ministry operates in accordance with Government Resolution No. 748 of 18 November 1998, and the Law of 1 March 1992 on Transferring Funds for the Prevention of and Response to Emergencies.

The Ministry of Emergencies and Civil Defence has the main responsibility for developing a unified State policy for the prevention, mitigation and response to natural disasters, as well as for coordinating the activities between other ministries.

According to Government Decree No. 198 of 2 May 1996, the Prime Minister is the Chief of Civil Defence and the Minister for Emergencies and Civil Defence is the First Deputy Chief. The Ministry of Emergencies and Civil Defence is an independent institutional structure responsible for working out measures for the prevention of emergencies, the protection of people and national property, and for increasing the stability of economic objects in the event of a disaster. The Ministry of Emergencies and Civil Defence was also responsible for coordinating and promoting activities within the framework of the International Decade for Natural Disaster Reduction (1990-2000). The Ministry has large requisitionary powers over the personnel and equipment of other government services in emergencies.

The Ministry has specialized civil defence units, which consist of public agencies and institutions (militia, fire brigade, medical services, etc.) and are enlisted to accomplish special tasks in emergencies. At the *oblast* and local levels, the Ministry works through its local units and local State administrations.

The Centre for Emergency Management and Coordination at the Ministry of Emergencies and Civil Defence collects, analyses, processes and disseminates data related to disaster management, thereby serving as a tool for the communication of disaster information and the preparation of disaster forecasts that are used in government decision-making.

The Ministry has the following structure and consists of:

- Central office
- Division of Civil Defence
- Board for dealing with the consequences of disasters
- State reserve fund
- State mining engineering supervision
- local MC&CD units

Besides the Ministry of Emergencies and Civil Defence, there are other organizations whose activities are directly or indirectly connected with natural disaster management. These include:

- The Ministry of Environmental Protection
- The Ministry of Transport
- The Ministry of Health
- The Ministry of External Trade and Industry
- The Kyrgyz Scientific, Research and Design Construction Institute (Ministry of Construction)
- The State Agency for Hydrometeorology (Ministry of Environmental Protection)
- The Institute of Seismology
- The State Agency for Geology and Mineral Resources
- Local Administrations

The observation and monitoring of natural hazards are undertaken mainly by two agencies: the Institute of Seismology of the National Academy of Sciences and the State Agency for Hydrometeorology. Each has its own observation network. Prediction accuracy, however, is not adequate because the stations are rare and their old equipment unreliable. The observation of high mountain lakes was earlier carried out by Hydromet, but is now the responsibility of the Ministry of Emergencies and Civil Defence.

The State Agency for Hydrometeorology is a member of the World Meteorological Organization (WMO) and uses pictures from the satellite system of the United States National Oceanic and Atmospheric Administration (NOAA). According to the underlying agreement for such use, there is a continuous exchange of meteorological

information, including notification about dangerous hydrometeorological events, among the members of the Commonwealth of Independent States (CIS).

Strategies and policy objectives

The National Strategy for Sustainable Human Development, adopted in May 1997, is increasingly seen by the Kyrgyz Government as the appropriate framework for the risk management of natural disasters.

The broad objective of government policy in the risk management of natural disasters is to reduce the vulnerability of the population and the economy to hazardous processes. In this respect, five specific goals have been set:

- to provide timely warning to the population where there is the threat of natural disasters
- to reduce and mitigate human and material losses from natural disasters
- to establish a single monitoring system to ensure the safety of the population
- to improve disaster preparedness by training the population
- to improve preparedness to provide rescue and deal with the consequences of disasters

As of October 1999, there was no approved State-level risk management plan for natural disasters. The State indicative disaster reduction plan, drafted by the Ministry of Emergencies and Civil Defence, which is currently in a draft form, will be the first comprehensive national policy document in the field of natural disaster risk management.

The National Environmental Health Action Plan (NEHAP, 1997) drafted by the Ministries of Health and of Environmental Protection, includes a chapter on natural and industrial disasters. The objectives of the Plan regarding natural disasters are (i) to limit the consequences of natural disasters, to prevent the occurrence and limit the consequences of major industrial and nuclear accidents, and to ensure that effective arrangements in place for emergency preparedness and for response to natural and man-made disasters, nationally and internationally; (ii) to ensure that the appropriate levels of government and the relevant public services, as well as members of the public, are fully informed of the probability and potential risks of industrial and nuclear accidents, so that they can put those risks into perspective and understand the action required of them in an emergency.

In order to achieve these objectives, NEHAP foresees the following actions: (i) restoring the monitoring network for natural and man-made hazards as an integral part of environmental monitoring; (ii) developing and implementing effective measures to prevent and mitigate damage caused by natural calamities and industrial catastrophes; (iii) drawing up a list of and certifying enterprises using technologies pertaining to the use, storage or transport of hazardous substances that present a threat to the environment or public health in the event of natural disasters and industrial accidents.

Programmes and projects

Funds for disaster management are scarce. All enterprises allot 1.5 per cent of their turnover for disaster management. In 1999, this amount totalled 255.4 million soms. At present, as resources are limited, the most vigorous efforts are focused on post-disaster rescue and repairing the consequences of disasters; less than 1 per cent of the disaster management budget of the Ministry of Emergencies and Civil Defence is allocated for preventive measures. However, a number of initiatives have been taken in cooperation with multilateral and bilateral partners to develop expertise in the area of disaster preparedness, mitigation and response. These include a large UNDP project signed in early 1998 called “Strengthening the Capacity of the Government for Disaster Mitigation and Preparedness” – for details see Chapter 4.

Since 1992, several bilateral projects, initiated by the German Committee for the International Decade for Natural Disaster Reduction (IDNDR), 1990-2000, have been carried out to train and strengthen local disaster preparedness organizations within the framework of the decentralization policy. In 1995-1996 the Ministry of Emergencies and Civil Defence, in cooperation with the German Federal Institute of Geosciences and Natural Resources, implemented a project “Creation of a Computer Database on Landslides in Kyrgyzstan”. Three systems to monitor landslide-prone slopes near Maili-Suu were installed within this project. Some other achievements include the production of 10 short films and 10 radio spots on self-protection in the event of an earthquake, a seminar for rescue-dog handlers, and annual seminars on disaster management for local authorities.

Both the Asian Development Bank (ADB) and the World Bank have provided loans for rehabilitation and reconstruction. In 1998, ADB provided a loan of US$ 5 million to rehabilitate roads and bridges, restore power and central heating, water supply and other infrastructure in disaster-stricken areas in the Jalal-Abad and Osh *oblasts*. In 1999, the World Bank approved a US$ 10 million credit for a flood emergency project to support the rehabilitation and reconstruction of river protection and the major irrigation infrastructure in flood-damaged areas of these two *oblasts*. The total project cost is US$ 14.1 million, of which the Kyrgyz Government is contributing US$ 4.1 million. The project will finance the repair and rehabilitation of eroded and damaged river embankments of 5 rivers and 23 protective structures. The rehabilitation and reconstruction of selected flood-damaged irrigation infrastructure both inside and outside the river beds of 16 different locations will also be financed. River gauging stations will be repaired or reconstructed to allow for continued water flow records for future emergencies. A flood-warning system will be established in the Kugart river basin. The project also foresees study tours for the Department of Water Resources, the Ministry of Emergencies and Civil Protection and other relevant agencies.

The International Committee of the Red Cross, the United Nations Office for the Coordination of Humanitarian Affairs (UNOCHA), the United Nations Development Programme (UNDP), the United Nations Children's Fund (UNICEF) as well as the Russian Federation, Kazakhstan, Uzbekistan, China and various NGOs have provided humanitarian assistance to Kyrgyzstan in natural calamities.

3.3 Management instruments

Hazard and risk assessment

A major achievement in risk assessment has been the preparation of hazard and risk maps (scale 1:1,000,000) by the Monitoring and Forecasting Department of the Ministry of Emergencies and Civil Defence in collaboration with other institutes and financial assistance from UNDP. As an example, a map on seismic hazard is presented in Figure 3.2. Maps have been developed for the entire country. They illustrate the geographical area in which different natural hazards occur as well as different categories of risk for earthquakes, landslides, rockfalls, snow avalanches and mudflows.

The risk map of snow avalanches was the first to be completed for the whole of Kyrgyzstan in 1994. The map has been used very effectively not only in designing prospecting works, but also in building protective constructions for roads and objects which were built earlier without consideration of snow avalanche risk. Kyrgyzstan has been divided into four large classes according to the snow avalanche risk level. Preventive measures, including forced throw, are taken in the case of a real snow avalanche risk. If necessary, the population is evacuated.

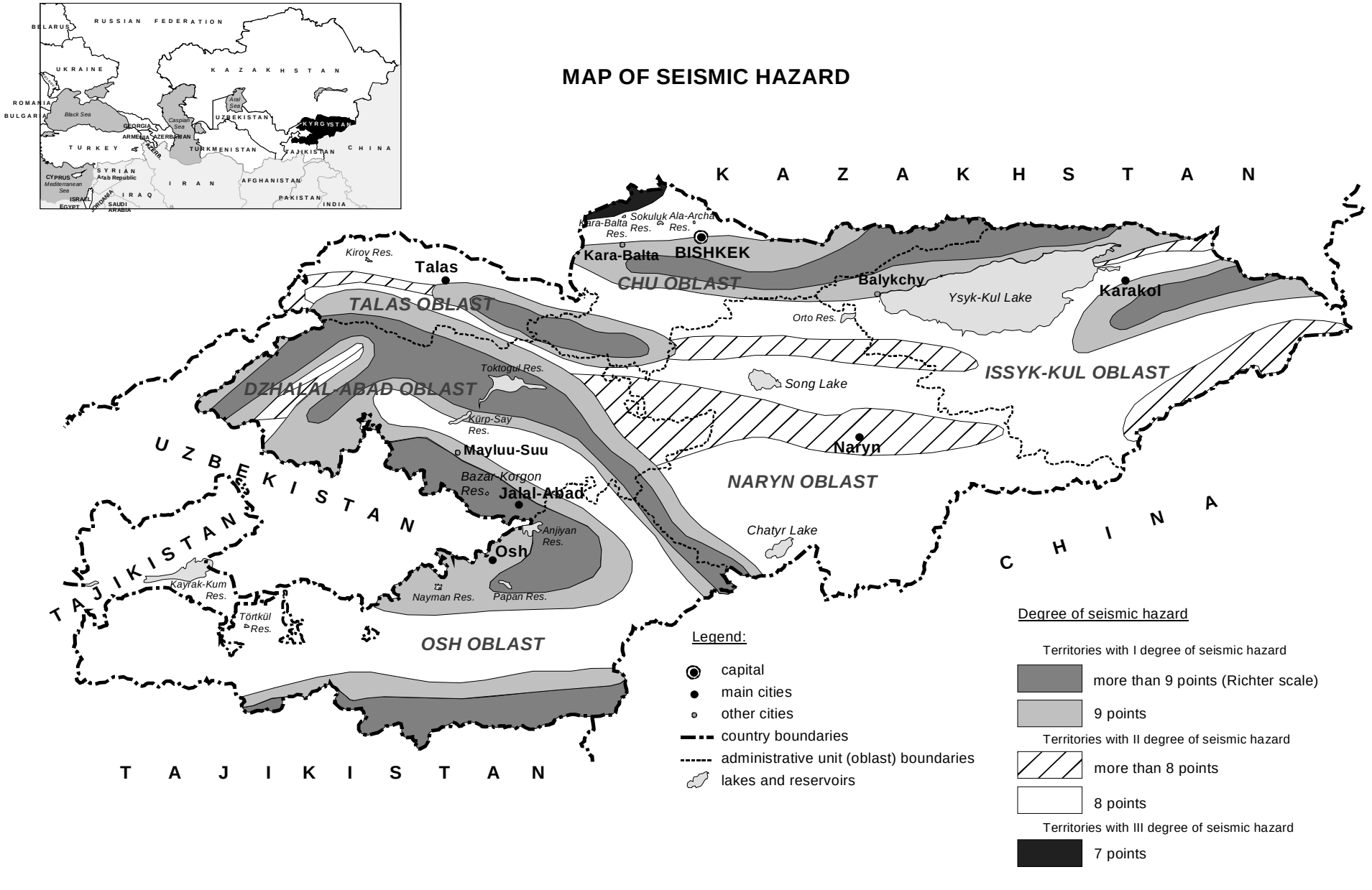
The General Combined Scheme of Engineering to Protect the Territory of Kyrgyzstan from dangerous physical-geological events and processes (debris flows, snow avalanches, landslides, rockfalls and screes) was finished in 1989 for the Jalal-Abad and Osh regions. Its purpose is manifold: revealing hazards; revealing approximate hazard parameters; determining potential losses from hazards; drawing up protective engineering measures for the prevention or reduction of the potentially disastrous consequences of hazards; necessary investments for building protective constructions and suggestions on the organization of building; the economic effectiveness of protective works and the order of priority of building. Similar schemes were drawn up for the Chu and Issyk-Kul regions.

Legal instruments

The laws and regulations governing natural disasters, which Kyrgyzstan inherited from the Soviet period, are gradually being replaced or amended by new laws and regulations. The major problem, however, lies in their implementation. Many regulations have not been fully implemented because of a lack of funds.

The standard documents regulating anti-seismic measures are being worked out by the Institute for Seismic Resistant Construction (Ministry of Architecture and Construction). The Institute is also responsible for the evaluation of the seismic resistance of buildings as well as the engineering inspection of existing buildings. The first step taken by the Ministry of Architecture and Construction to reduce earthquake losses was the development of a set of seismic building codes. The codes have been revised 5 times since the 1960s, and the following

FIGURE 3.2:


MAP OF SEISMIC HAZARD
K A Z A K H S T A N
T A J I K I S T A N
U Z B E K I S T A N
C H I N A
Kara-Balta Res.
Sokuluk Res.
Ala-Archa Res.
Kara-Balta
BISHKEK
CHU OBLAST
Balykchy
Ysyk-Kul Lake
Karakol
Kirov Res.
Talas
TALAS OBLAST
Orto Res.
ISSYK-KUL OBLAST
Toktogul Res.
Song Lake
DZHALAL-ABAD OBLAST
Kürp-Say Res.
Naryn
Mayluu-Suu
Bazar-Korgon Res.
NARYN OBLAST
Jalal-Abad
Chatyr Lake
Anjiyan Res.
Osh
Kayrak-Kum Res.
Nayman Res.
Papan Res.
Törtkül Res.
OSH OBLAST
Legend:
capital
main cities
other cities
country boundaries
administrative unit (oblast) boundaries
lakes and reservoirs
Degree of seismic hazard
Territories with I degree of seismic hazard
more than 9 points (Richter scale)
9 points
Territories with II degree of seismic hazard
more than 8 points
8 points
Territories with III degree of seismic hazard
7 points

building standards and regulations are currently in force:

- *Building in seismic zones,* valid since 1981 (SniP II A. 12-62*)*
- *Building in the zones with seismicity of more than 9 units,* valid as of 1994 (SniP 2.01.02-94 KR)
- *Building in Bishkek taking into account seismic zoning and soil-geological conditions,* valid as of 1993 (Snip 2.01-93 KR)
- *Seismic evaluation of existing buildings,* in force since 1998 (SniP 22-01-98 KR)
- *Re-profiling of existing residential buildings,* adopted 1999 (SniP KR 31-01-99)

The analysis by the Institute for Seismic Resistant Construction of the aftermath of earthquakes which have occurred during the past years in Kyrgyzstan shows that the 85 per cent degree of damage to brick buildings was twice as high as expected given the standards. This is partly due to shoddy building work and the absence of some anti-seismic measures foreseen by the standards. In 1998, the Regulation on Seismic evaluation of existing buildings empowered the Ministry of Architecture and Construction to inspect public buildings and enterprises in order to evaluate their seismic resistance and to make recommendations for their strengthening. In cases of violation, the inspectors can propose to limit or suspend the activities of the enterprise, or to cancel the permits. The Institute for Seismic Resistant Construction is currently drafting a new building code.

All the designing documentation on hydraulic structures and the architecture legislation of the Republic are examined by experts from the State Expertise agencies of the Ministry of Architecture and Construction, in order to check their compliance with the standard documents in force.

In addition, other rules and regulations directly or indirectly related to disaster management in Kyrgyzstan are:

- The Regulation on the engineering protection of territory, buildings and constructions from dangerous geological processes
- The Regulation on the State Committee of Geology and Mineral Resources
- The Regulation on the State Committee on Nature Protection
- The Regulation on the State Committee on Architecture and Technical Control in Building
- The Regulation on the State Agency for Hydrometeorology
- The Regulation on the State Inspection of Safe Conducting Works in Industry and Mining
- The Regulation on State Forestry inspection
- Departmental instructions of the Fire Protection Service,
- Sanitary-Epidemiological Service, Service of Radiation Control, Rescue Teams in mountaineering camps

Currently, a new draft law is being developed on the protection of the population and territories from natural and man-made disasters. Its main features include the prediction of emergencies, the prevention and management of emergencies and obligations in solving these problems.

Early warning and emergency management

In Kyrgyzstan, the early-warning system is based on: (i) an observation network for changes in the environment (seismological stations, hydro posts, landslide stations and mudflow stations); (ii) a visual air inspection and a space monitoring survey to identify possible dangerous zones and forecast their activation; (iii) field trips to identify possible zones of risk; and (iv) the disaster preparedness training of the population and of local administrations.

All the meteorological stations of the State Agency for Hydrometeorology carry out continuous observations for atmospheric events and 8 times a day for meteorological elements. All branches of the Agency observe dangerous hydrometeorological events. The snow avalanche stations are responsible for ensuring snow avalanche safety of traffic on the Bishkek-Osh, Karakol-Inylchek, Kochor-Min-Kush, Alabuka-Janibazar roads by warning of probable snow avalanches drift and their forced throws. Operative hydrometeorological and agro-meteorological information is disseminated to the institutions concerned and the population by different means of communication: TV, radio, telex, telephone, and weather bulletins by post and special delivery.

The activities of the Institute of Seismology, an academic institution, are directed to seismic zoning and forecasting strong earthquakes. The Institute carries out the function of a State seismological service and takes part directly in work connected with mitigating natural disasters. The Institute and

the Methodic Seismological Expedition together have developed a network of 32 seismological, 10 geophysical, 6 hydro-geochemical and 6 hydro-geodynamic stations, which permit continuous measurements and data analysis in commissions responsible for forecasting, in order to evaluate seismic conditions. The Institute of Seismology has 10 stations in the worldwide network of seismic stations of the Incorporated Research Institutions for Seismology (IRIS). There is an exchange of seismic information, including predictions, between CIS and China.

The Scheme for the long-term prediction of strong earthquakes on the territory of Kyrgyzstan (scale 1:1,000,000) is a specific contribution of the Institute of Seismology to protective measures. Local areas are selected where strong earthquakes are expected to occur in the next 6-10 years.

Observation of high mountain lakes is considered an important priority. The Ministry of Emergencies and Civil Defence, together with the State Agency on Geology and Mineral Resources, organizes an annual joint visual survey by helicopter to observe the potential leakages of high mountain lakes. The objectives of these surveys are to identify the level of water and assess the stability of the lake dams, to identify newly created mountain lakes, to assess the risks of the dangerous lakes (both new and existing), as well as to identify the size and border of the zone of impact in case of a leakage. Annually, if the hydrometeorological conditions become bad, high mountain lakes are observed first. Information about the conditions of the high mountain lakes is given to the Ministry of Emergencies and Civil Defence and local administrations, and recommendations are made about draining or strengthening their dams.

During the Soviet period, the State Agency on Geology and Mineral Resources undertook observations for landslides, starting in the mid-1950s. The system for observing landslide includes aerial and field investigation, setting control points for the observation of landslide movements, and the measurements in drills for groundwater. More than 2,500 landslides have been registered by aerial observations in the Osh and Jalal-Abad regions. 1,184 landslides have been examined by field observations. However, because of the lack of funds, most of these activities have stopped. Local Ministry of Emergencies and Civil Defence administrations are informed of landslide activity.

Emergency management

The Ministry of Emergencies and Civil Defence is responsible for the coordination of the organizations participating in rescue and rehabilitation in emergencies. It provides funding for rescue work, organizes and mobilizes the forces and necessary resources to the affected areas.

An unreliable communications system as well as a lack of financial resources have been the major bottlenecks for efficient emergency management. The establishment of the Centre for Emergency Management and Coordination at the Ministry of Emergencies and Civil Defence, with financial assistance from UNDP, has been a major improvement in the system. The new Centre serves as the core mechanism for day-to-day coordination and the management of various emergencies, including both natural and technological disasters. The Centre is equipped with a radio-modem communication system. The Central Office of the Ministry and the local civil defence offices in all 6 *oblasts* have been linked into a radio-modem communication network. The system provides reliable communications, which will remain functional when all other infrastructure is destroyed.

In response to natural disasters, the Ministry of Emergencies and Civil Defence, in cooperation with local authorities, has made the following efforts:

- 70 yurts, 23 shepherd houses, about 8,000 tents, clothes and food were sent to the regions affected by the earthquake in 1992
- in 1997-98, about 30,000 dwellings were repaired, restored or purchased for displaced people and the construction of several thousand homes was started
- 182 schools, 40 public health units, dozens of cultural, public and domestic units have been repaired
- dozens of kilometres of roads and other communications have been repaired
- dozens of kilometres of dykes have been built to protect thousands of dwellings, several schools and farms unis.

Transboundary cooperation in emergencies

Kyrgyzstan is a party to three treaties with other CIS members. First of all, it participates in the

Interstate Council Agreement on Emergencies of a Natural or Technogenic Character. The goals of the Interstate Council are to conduct a coordinated policy in the prevention of and response to emergencies, harmonizing legislation, participating jointly in international programmes, carrying out interstate scientific-technical programmes, providing each other assistance in predicting emergencies, etc. The participants of the Interstate Council have concluded an agreement on cooperation and interaction in earthquake research and seismic risk prediction.

The Agreement between the Governments of Kazakhstan, Kyrgyzstan and Uzbekistan on joint collaboration in the rehabilitation of tailing sites that have a transboundary impact was signed on 6 April 1996. A joint programme of action to rehabilitate tailings on the territories of the countries of the Central Asian Economic Community was prepared and was adopted on 17 June 1999 by the Heads of Government.

The Agreement between the Governments of Kazakhstan, Kyrgyzstan, Tajikistan and Uzbekistan on the joint use of transboundary rivers, water units and hydraulic constructions of 17 March 1998 includes chapters on collaboration to reduce the negative effects of spring waters, mudflows and other natural hazards, such as outbursts of glacial lakes, in emergencies. A joint aerial survey and ground exploration of glacial lakes as well as efforts to predict the mudflows of transboundary rivers have been undertaken.

In accordance with intergovernmental, bilateral and mutual agreements with neighbouring CIS members (Kazakhstan, Tajikistan and Uzbekistan), a coordinating working group has been created. The working group is supposed to meet 2-3 times a year to discuss the impact of transboundary disasters. Kyrgyzstan is represented by the Ministry of Emergencies and Civil Defence and has issued a book on the Forecasting of Natural Disasters.

3.4 Conclusions and recommendations

The Government of Kyrgyzstan and, in particular, its Ministry of Emergencies and Civil Defence have been very active in disaster reduction, in particular within the framework of the International Decade for Natural Disaster Reduction (IDNDR, 1990-2000). The functions and tasks of the Ministry of Emergencies and Civil Defence are entirely in accordance with the aims declared by IDNDR and they are identical with the tasks of the National IDNDR Committees. In 1993, Kyrgyzstan hosted a Regional IDNDR Workshop on Natural Disaster Reduction in the CIS in preparation of the World Conference on Disaster Reduction in Yokohama, Japan, in 1994.

Since its independence, Kyrgyzstan has thus shown a strong political commitment to the risk management of natural disasters. In particular, as a direct consequence of large-scale landslides in 1994 in the Osh and Jalal-Abad *oblasts*, the Security Council of Kyrgyzstan instructed the Government to draw up measures and to take a more proactive approach to preventing the negative impacts of natural disasters. A significant step in disaster management policy was also the conversion of the State Committee on Emergencies to a Ministry of Emergencies and Civil Defence in 1996. While the Government has made much progress in disaster preparedness and response, it is recognized that additional steps need to be taken to reduce the impact of natural disasters. In this respect, there is still a wide discrepancy between policy intentions and ambitions on the one hand, and the realistic possibilities for implementing them on the other.

The Ministry of Emergencies and Civil Defence emphasizes earthquake prediction, particularly in areas where nuclear wastes are in danger of being released. In particular, radioactive tailing sites in Maili-Suu pose a massive threat, which could have regional implications. The Government of Kyrgyzstan is considering transferring some of the waste sites to safer areas, but the decision would require agreement among neighbouring countries. The international community should consider assisting such an initiative financially. In addition, systematic knowledge should be obtained on all critical sites in areas of high seismic activity.

Recommendation 3.1:
Monitoring of critical objects and the drawing-up of preventive measures for critical objects (such as waste tailings and water reservoirs located in disaster-prone areas) should become a priority activity in the monitoring system. Certain indicators and their safety limits have to be developed for that purpose. There is an urgent need to rehabilitate or relocate radioactive and other hazardous tailings that are located in areas of high seismic activity, such as Maili-Suu and Ak-Tuz. An inventory of such "critical objects" and "hot spots" should be made. See also Recommendations 1.5 and 5.3.

There is an urgent need to strengthen inter-departmental coordination in order to reduce the impact of natural disasters. Besides the Ministry of Emergencies and Civil Defence, there are a number of other organizations implementing activities connected with disaster reduction and mitigation. The Ministry of Emergencies and Civil Defence should establish a common approach, including closer working relationships with these organizations, in the prevention of natural disasters. The State Indicative Disaster Reduction Plan (SIDRP) has been drafted by the Ministry in collaboration with UNDP, and is now awaiting Government approval. A rapid adoption and implementation of the State Plan would be a step towards more efficient interdepartmental coordination.

Improved coordination also seems to be required in international cooperation. In particular, coordination in issuing early warning of disasters with potential transboundary effects should be strengthened. In a flood incident in 1998, at least 93 people were killed, and 14,000 people affected in the Ferghana Valley, because of insufficient warning schemes. The flood was caused by the overflowing of a high mountain lake, located close to a glacier in the Allaudin Alaisk mountain range in Kyrgyzstan.

Recommendation 3.2:
The necessary increase in efficiency in the coordination of institutions dealing with natural disasters should start with the swift implementation of the State Indicative Disaster Reduction Plan. Improved coordination is also required in transboundary collaboration on natural and technological disasters in the framework of the relevant transboundary agreements.

The construction of new multi-storey buildings has stopped for economic reasons, a trend that is not expected to change in the near future. The strengthening of existing buildings should therefore be envisaged in order to reduce any potential damage from earthquakes. However, the legislative framework to do so is poor and does not encourage government agencies and private enterprises to undertake the necessary measures. The main obstacles to reinforcing residential buildings therefore are the lack of funds, the absence of adequate regulations, the scant availability of building materials, as well as insufficient experience in strengthening and reconstructing buildings. The vast majority of the buildings in Kyrgyzstan were built during a relatively short period of time, and they vary little in design and method of construction. Their resistance to earthquakes has been demonstrated to be poor during events both in Armenia and Sakhalin.

The recommendations of the Conference on Urban Earthquake Risk Control Strategy for the Central Asian Republics in Almaty in October 1996 require the following steps:

- to draft a new law on earthquake prevention that would encourage the reinforcement of existing buildings
- to improve the normative framework for earthquake-proof construction, including the drafting of norms/codes for reconstruction, as well as the inspection of safety features of existing buildings
- to create a computerized database of the safety characteristics of existing buildings

Recommendation 3.3:
The legal instruments for reinforcing buildings to prepare them better for seismic risks should be revised, as should all technical normative documents applicable to construction. There is also a need for a specific law regulating the response and rehabilitation activities of the different State and non-State organizations in the field of seismic risk.

Funds for disaster management are scarce. So the determination of priorities in allocating them is a crucial problem for the Ministry of Emergencies. These priorities are in disaster relief, only about 1 per cent of the Ministry's budget is spent on preventive measures. The indirect reason for this priority setting is that many agencies responsible for monitoring and prediction receive their funds directly from the State budget.

It is recognized that, in the long term, it would be more effective to allocate funds to the prevention of natural disasters, in order to reduce the need for disaster relief measures. The prevention of building damage in an earthquake is a case in point. The ad hoc measures applied by government agencies and local builders for the strengthening of public buildings after the recent earthquakes have not proved effective. Although the country has solid seismic and engineering knowledge, this knowledge is not properly applied at the local level. Local builders and engineers, unaware of recent technical developments, are not applying designs and construction processes that can contribute to vulnerability reduction at the local level. The result

is a gap between scientific knowledge and practical applications on the ground.

Preventive measures would also require training and awareness raising among the population. In an initial phase, the capacity for such training needs to be extended. Present training programmes should in the beginning focus on disaster-prone municipalities. The creation of a 'disaster prevention culture' should give rise to special efforts in school education, and a long-term effort should be made particularly in the most disaster-prone and vulnerable areas.

Recommendation 3.4:
The development of improved rehabilitation practices should concentrate on low-cost measures that can be applied with local skills. Small contractors active in construction and rehabilitation would benefit from training programmes for the development of their skills. The training capacity in the risk management of natural and technological disasters should be strengthened. Training programmes should be developed and implemented for local authorities in disaster-prone communities. Public awareness programmes should be introduced covering both natural and technological hazards. Risk awareness issues should be included in the primary and secondary school curricula.

Strong earthquakes are among the most threatening natural hazards in Kyrgyzstan and Central Asia at large. A report by Geohazard International states that there is a high (about 40 per cent) probability that, during the next 20 years, a large earthquake near one of the Central Asian capitals will cause human and economic loss even greater than that already experienced in Armenia and Sakhalin-unless preventive action is taken soon.

The activities of the Institute of Seismology are directed to seismic zoning and forecasting strong earthquakes. The Institute, an academic institution, acts as the State seismological service and takes a direct part in works connected to the mitigation of natural disasters. Currently, Kyrgyzstan has a national network of 60 seismological stations. These include 50 old stations, inherited from the Soviet period, 10 of which are not operational due to financial constraints. In addition, there are 10 modern digital stations with radio-telemetric connections. Due to the low density of stations, prediction accuracy is currently not sufficient. The creation of an independent national seismology agency would improve programme delivery, if it were equipped with sufficient resources.

Recommendation 3.5:
An increase in the effectiveness of the activities to reduce losses from earthquakes requires the replacement of all old stations by modern digital automatic seismic stations with radio-telemetric connections, possibly in new institutional arrangements.

At present, restrictions on land use do not exist with regard to natural hazards – there is not even a procedure for specifying them. They will be needed urgently, once significant territorial and regional development gets under way. Instruments to be developed for this purpose include economic instruments like taxes and insurance. The Ministry of Emergencies and Civil Defence and the Ministry responsible for territorial planning should cooperate in creating the foundations for the appropriate policies. Private developers and building owners should be encouraged to build disaster-resistant structures on identified sites, through incentives such as lower insurance premiums for buildings of higher resistance to hazards.

Estimations of earthquake risk that are based exclusively on seismic intensity records are not sufficient to guide public policy and territorial planning. An assessment of the seismic vulnerability of critical structures such as schools, hospitals, government buildings etc. should be undertaken, and their results should be taken into account in urban and territorial planning.

Recommendation 3.6:
Risk management should be introduced as an integral part of territorial planning. A procedure for specifying restrictions on the use of land in areas prone to natural hazards should be developed and implemented. A law on State insurance for natural disasters should be finalized and submitted to Parliament. Development in hazardous areas should be discouraged through taxation, pricing and insurance policies.

Chapter 4

INTERNATIONAL COOPERATION

4.1 General objectives for international cooperation

Since becoming independent in 1991 Kyrgyzstan has been demonstrating its commitment to democratic rule and the market economy. It has stepped along the path of openness to international cooperation within both the regional and global contexts.

The objectives and priorities of its international policy are outlined in several documents, like the Concept of Ecological Security approved by its Security Council on 29 June 1997, the National Environmental Action Plan for 1995-1997, and the draft national programme for environmental protection and the rational use of natural resources for the period up to 2005. According to these documents Kyrgyzstan is committed to widening its international cooperation in environmental protection with the following objectives:

- Accession to basic international environmental conventions and putting them into practice
- Integration of international principles into national legislation
- Attracting international technical and financial assistance to help solve national and global environmental problems
- Development of cooperation with foreign and international organizations and experts to introduce cleaner technologies
- Development of cooperation with neighbouring countries on transboundary environmental problems

The priorities in international cooperation are connected with the country's most urgent environmental problems and include:

- ensuring the safe disposal of nuclear tailings
- strengthening the system of pollution monitoring and control
- combating desertification and land degradation
- improving the regime of water allocation among its neighbouring countries and ensuring efficient water management in the context of the Aral Sea problem

In recent years Kyrgyzstan has signed and ratified a number of global conventions, including the Convention on Biological Diversity, the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) and the Convention to Combat Desertification. On 25 June 1999, Kyrgyzstan signed the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.

Kyrgyzstan has acceded to the United Nations Framework Convention on Climate Change, and has started agreement procedures for accession to the Conventions on Environmental Impact Assessment in a Transboundary Context, on Long-range Transboundary Air Pollution, on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, and on International Trade in Endangered Species of Wild Fauna and Flora.

Kyrgyzstan joined the United Nations on 2 March 1992. Between 1992 and 1994, it also joined some international organizations within and outside the United Nations dealing with environmental matters, including the United Nations Environment Programme (UNEP), the World Meteorological Organization (WMO), the Food and Agriculture Organization of the United Nations (FAO), the World Health Organization (WHO), and the United Nations Educational, Scientific and Cultural Organization (UNESCO). In 1993 it became a member of the World Trade Organization (WTO).

Since December 1991, Kyrgyzstan has been a member of the Commonwealth of Independent States (CIS) – an international union of several former Soviet republics.

Kyrgyzstan is developing cooperation on environmental matters with other countries of Central Asia. An Agreement on a Common Economic Area was signed by Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan on 24 July 1994.

Several executive agencies in the country are responsible for international cooperation in environmental matters, with the Ministry of Environmental Protection playing the leading practical role in promoting international cooperation in environmental protection. The Ministry is the focal point for the Basel and Rotterdam Conventions and provides coordination for other global and regional agreements. It has a mandate to prepare documents required for an administrative agreement of relevant ministries and agencies to accede to international conventions. The Ministry also provides the office for the National Environmental Action Plan (NEAP), which was initially financed by the Government of Switzerland and the World Bank.

Contact with international organizations lies within the competence of the Ministry of Foreign Affairs, which also determines the country's international environmental policy. The development of international relations in the area of transboundary watercourses, including cooperation on protecting the Aral Sea, falls within the competence of the Water Economy Department of the Ministry of Agriculture. The Institute of Irrigation within the same Ministry serves as focal point for the Convention to Combat Desertification.

4.2 Regional cooperation in the framework of UNECE

Conventions

Orientation towards Europe is treated as a general political objective and Kyrgyzstan has signed the UNECE Convention on Long-range Transboundary Air Pollution. The preparatory administrative work on agreement among all relevant ministries on acceding to the *Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention)* is being finalized. However, Kyrgyzstan considers that its neighbours should ratify these conventions simultaneously, as it believes that otherwise the effectiveness of the conventions would suffer. One attempt to cooperate in joint environmental impact assessment (EIA) with Kazakhstan concerning the project of the construction by China of a pulp and paper plant in Kyrgyzstan has collapsed. No claims of transboundary pollution from neighbouring countries have been recorded.

Ratification of the *Convention on the Transboundary Effects of Industrial Accidents* is not on Kyrgyzstan's agenda.

A problem arises regarding the *Convention on the Use and Protection of Transboundary Watercourses and International Lakes.* Disagreement between Kyrgyzstan, Uzbekistan and Kazakhstan over the allocation of water originating in Kyrgyzstan and on responsibility for water pollution control, has become ever more acute since the break-up of the Soviet Union. Disagreements begin with the definition of a "transboundary watercourse" and cover such issues as establishing a joint approach and methodology for determining the natural background concentration of pollutants in watercourses that cross the borders of Kyrgyzstan and for compensation for damage. Another crucial condition for Kyrgyzstan before ratifying the Convention is the readiness of all Central Asian countries to do so simultaneously, as for other transboundary instruments.

The *Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters* is well known both in governmental circles and among NGOs. Both are in favour of its ratification. The legislation in force does not contain any obstacles to compliance with the Convention. In 1997, Kyrgyzstan initiated the adoption of a decision by all CIS members to work out a common position on the Convention. Following this decision, the President on 18 November 1998 issued a decree instructing the competent governmental representatives to sign the Convention.

"Environment for Europe" process

In the draft national programme of environmental protection and the rational use of natural resources up to 2005, integration into the "Environment for Europe" process is ranked as one of the priorities. In particular, the document provides for the country's participation in Pan-European Landscape and Biodiversity Strategy (PELBS), in pan-European environmental programmes, in the phasing out the use of leaded fuels, and in initiatives for energy saving.

4.3 Other regional cooperation

Cooperation within CIS

Kyrgyzstan signed major CIS documents that provide for cooperation on various matters including environmental ones. The Ministry of Environmental Protection is responsible for cooperation in the Inter-State Ecological Council of the CIS. Experts from Kyrgyzstan are involved in the following activities:

- Coordination of environmental cooperation
- Development of legislation and standards for environmental protection
- Environmental monitoring
- Exchange of information

The CIS developed a Convention on Access to Information similar to the Aarhus Convention. However, Kyrgyzstan did not ratify it. Within the CIS in 1998, Kazakhstan, Kyrgyzstan and Uzbekistan signed two environmental cooperation agreements – one on environmental protection and the rational use of nature, and the other on the protection of biodiversity. For the 1998 Ministerial Conference in Aarhus, Kyrgyzstan initiated a resolution on CIS Country Reviews which was approved by the Interstate Ecological Council of the CIS. In practice, financial constraints make it difficult for Kyrgyzstan to cooperate effectively in the CIS.

Cooperation with Central Asian countries

Water problems. Cooperation with Central Asian countries is concentrated mostly on transboundary watercourses and concerns in the first instance the problems of water sharing. On 12 October 1991, the Water Ministers of the 5 basin States jointly declared that the Soviet principles of water allocation would remain in force. Thus, the legal documents adopted at that time are still valid. They include:

- Regulations on the Apportionment of Water in the Basin of the River Chu adopted in 1983
- Regulations on Procedures and Conditions for the Annual Distribution of Water Resources of the River Chu between Kazakhstan and Kyrgyzstan of 1984
- Regulations on the Apportionment of Water of the River Talas of 1983
- The Protocol on the Inter-Regional Distribution of the Water of Small Rivers in the Fergana Valley of 1980
- The Protocol of the Meeting on the Decade-based Apportionment of Water of the Rivers Sokh, Shakhimardan and Isfara between Uzbekistan and Kyrgyzstan of 1981.

Under the Soviet-time agreements, water use was shared approximately equally in each case, the obligations for maintaining the reservoirs and dams being fully assigned to the country on whose territory they were located. Kyrgyzstan is today dissatisfied with these arrangements and the above documents, on the grounds that they do not provide for fair compensation from downstream countries (Uzbekistan and Kazakhstan) for the Kyrgyz expenditures in maintaining Kyrgyz reservoirs and dams that are used for maintaining the water supply.

The above acts are supplemented by several new bilateral and multilateral agreements concerning the use of transboundary watercourses. In 1998, the Governments of Kazakhstan and Kyrgyzstan signed an Agreement on the Use of Water Bodies and Hydro-energy Constructions in Joint Inter-State Use. The Parties confirmed the earlier apportionment of water resources. However, Kyrgyzstan became entitled to compensation for expenses in ensuring the safe and reliable use of water, i.e. for maintaining and constructing reservoirs, dams and other structures in Kyrgyzstan. The Parties also agreed to take measures to ensure a rational use and the protection of waters.

A similar agreement had been concluded in 1996 between Kyrgyzstan, Kazakhstan and Uzbekistan on the Use of Water and Energy Resources of the Syr Daria Basin. It provided for fixed rates of water supply by Kyrgyzstan to the two partner countries in exchange for their supplies of gas and coal to the electric power stations in Bishkek and Osh. Actual water supply rates and other conditions of the agreement are determined annually. Such annual agreements have been signed for 1998 and 1999.

Another agreement concerns the construction of dams and canals on the river Karkara for the purpose of the apportionment of water flowing from Kyrgyzstan to Kazakhstan. However, no such dams or canals have been constructed, and all the water of the river basin flows directly to Kazakhstan without any apportionment.

Further agreements concerning the apportionment of waters and the distribution of expenses between the countries of the region are being negotiated. In Kyrgyzstan, the Ministry of Agriculture and Water Resources is mainly responsible for administering this area of international relations. Kyrgyzstan shares the River Sara Djas with China. There is no agreement with China on the use and protection of transboundary watercourses.

Radioactive wastes. Kyrgyzstan signed an agreement with Uzbekistan on the processing of radioactive wastes from Uzbekistan in Kyrgyzstan. However, this cooperation is currently suspended, as Kyrgyzstan introduced changes in its system of environmental standards and requirements, which the Uzbek wastes do not meet.

Transboundary impacts in emergencies. According to the bilateral and multilateral agreements with the countries of Central Asia (Uzbekistan, Kazakhstan and Tajikistan), Kyrgyzstan participates in intergovernmental working groups that meet 2-3 times a year. This cooperation provides for the exchange of information on forecasts of natural emergencies and disasters and for joint actions to prevent emergencies and eliminate the impacts of natural disasters.

Cooperation on the protection of the Aral Sea. Cooperation of the five countries – Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan-located in the Aral Sea basin started soon after the disintegration of the former Soviet Union. By their Agreement of 26 March 1993, the five countries established regional institutions charged with comprehensive water management. The institutional framework developed as follows:

- The Inter-State Council on the Aral Sea Basin Problems (ICAS) -- a high-level body charged with recommending actions to the 5 Governments for the basin as a whole
- The Executive Committee of ICAS (EC-ICAS)
- The International Fund for the Aral Sea (IFAS) – a body charged with the financing of ICAS
- In February 1997, at the meeting of Heads of State, ICAS and IFAS were merged into IFAS, and the new IFAS became an implementing agency for GEF. Its Executive Committee consists of 5 Deputy Ministers, responsible for agriculture/water/environment. The Executive Committee reports to the Executive Board.

The priorities of the Aral Sea programme are:

- To prepare a general strategy for water distribution, rational water use, and the protection of water resources in the Aral Sea basin
- To draft legislative acts on the basis of this strategy, regulating the use of water and its protection from pollution, and promoting the social and economic development of the region
- To prepare and introduce quotas limiting water use for agricultural and industrial production and other technological needs
- To address water quality and water quantity problems

The World Bank, Tacis, UNDP and UNEP support the implementation of the programme.

The Aral Sea problems are not a high priority for Kyrgyzstan. It is not much involved in the activities stemming from the existing agreements and projects to protect the Aral Sea basin. Neither is it motivated to increase its participation, as it is even dissatisfied with the cooperation. The financial resources allocated to the actions under the international projects are mostly channelled to Uzbekistan and Kazakhstan, and all practical activities are carried out in these two countries. Under the Aral Sea instruments, each of the 5 countries has to spend 1 per cent of its GDP on remedial action. However, Kyrgyzstan argues that not all countries are equally to blame for the Aral disaster. In particular, it argues that Kyrgyz rivers feed Amu-Daria and Syr-Daria without being overused by Kyrgyzstan.

4.4 Global cooperation

Implementation of Agenda 21

Kyrgyzstan participated in the United Nations Conference on Environment and Development and signed the Rio Declaration. A high-ranking Council on Sustainable Development was set up within the Administration of the President. The mandate of the Council is to advise on the development of various sectors of the economy and on social policy, with adequate consideration of environmental protection. The National Strategy for Sustainable Human Development was discussed at the National Forum on Sustainable Development held in Bishkek on 28 May 1997. Scientific experts, governmental representatives and NGOs participated in the Forum, which had been organized with United Nations assistance. It aimed at discussing practical measures to implement sustainable development principles.

Kyrgyzstan participates in promoting the sustainable development principle in the regional context. On 19 July 1994, the Interstate Commission for Socio-Economic Development and Scientific, Technical and Ecological Cooperation was renamed the Sustainable Development Commission. It is composed of the Environment Ministers of the five Central Asian republics and has its headquarters in Tashkent. Kyrgyzstan, like all other Central Asian countries, created its national sustainable development commission, which is charged with the implementation of decisions adopted by the Presidential Council on Sustainable Development.

It is too early to report on the substantive results of these activities. Obstacles arise from the distribution between countries of financial obligations in regional cooperation, and the lack of cooperation routines in current activities between ministries.

Climate change

Kyrgyzstan's accession to the United Nations Framework Convention on Climate Change does not require much legislative action, as the Law on the Protection of Ambient Air (1999) already provides for the obligation of sources to monitor and register greenhouse-gas emissions. Actions having an impact on climate are prohibited, except those based on governmental permits. More specific regulatory measures are still needed, as at the moment national standards do not establish limitations on emissions of CO_2, as this is not considered a pollutant. In the meantime, the country's energy units are to a large extent switching from gas to coal. Without adequate preventive measures, this will contribute to global warming.

Protection of the ozone layer

Kyrgyzstan has neither signed nor acceded to the Vienna Convention or the Montreal Protocol, nor any respective amendment. There is the political will and demand to do so, but the principal obstacle to Kyrgyzstan's becoming a Party to these international instruments is the lack of financial resources to pay the high accession fee. The country does not produce ozone-depleting substances, but its consumption of them is quite high. At present, problems occur with sanctions imposed by the Russian Federation on its exports to Kyrgyzstan of products containing ozone-depleting substances and the illegal trade in fridges, fire-fighting equipment etc. to satisfy local demand.

Convention on Biological Diversity

Kyrgyzstan adopted the Law on Accession to the Convention on Biological Diversity on 26 July 1996. GEF/World Bank provided US$ 108,000 to finance the Biodiversity Strategy and Action Plan. It is currently before Government for approval. The Law on Wildlife provides for implementation measures, including an increase in specially protected areas, licensing for hunting, fishing or capturing animal and plant species for other purposes, as well as the preparation of Red Data Books. The general policy and procedures for setting up specially protected areas are included in the Law on Specially Protected Areas.

The Convention on Biological Diversity gave an impulse to practical biodiversity protection activities. In 1997, two nature reserves (*zapovedniks*) and two national parks were created under the national "Forest" programme for the period 1996-2000, which had been approved by Governmental Decree on 26 November 1996. A special department on biodiversity and specially protected areas within the Ministry of Environmental Protection was mandated to administer the implementation of biodiversity-related laws. Two internationally funded projects are being carried out to ensure better protection of animal species (see below *International Funding*).

The Ministry of Environmental Protection serves as the focal point for the Convention, but its competence is limited to wild animals, wild plants and protected areas. Other agencies involved include the Ministry of Agriculture and the Forestry Agency. Regular contacts between these institutions and the Ministry of Environmental Protection do not yet exist in this area.

Other conventions related to nature protection

The Soviet Union ratified the *Convention on Wetlands of International Importance Especially as Waterfowl Habitat (Ramsar Convention)*, but Kyrgyzstan has not yet acceded to it as a sovereign State. Three years of preparations for ratifying the Convention is coming to an end, during which two wetlands have been designated-lakes Son Kul and Chatyr Kul within the Narynskaya *oblast* in the

Karatal-Dzhaparyksky Zapovednik (natural reserve), affording special protection to wild geese, which are listed in the Red Data Book.

Kyrgyzstan has not yet ratified the *Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)*, but doing so is one of its priorities. It hopes to benefit from the trade in certain species and their derivatives. In the meantime, most export and transit operations are carried out under an agreement with the Russian Federation, providing licensing services. Under the agreement, the Ministry of Environmental Protection of Kyrgyzstan informs the Russian State Committee on Environmental Protection of its consent to the export or transit of a species across the borders and that serves as a legal basis for the issuing of an internationally recognized permit by the Russian State Committee.(see also chapter 8)

The "Central Asian Interstate Ecological Council" has closely followed the CITES and Ramsar Conventions, but as neither Kyrgyzstan nor the other Central Asian republics are Parties, they can do little to influence their activities. Even though Kyrgyzstan has a number of very important habitats for migratory birds, it is not a Party to the Ramsar Convention. Kyrgyzstan is associated to CITES through the Russian Federation without being a CITES Party itself. However, especially as trade from Kyrgyzstan no longer goes exclusively through Moscow the association is not a satisfactory solution.

Kyrgyzstan has been a Party to the *World Heritage Convention (1972)* since 1995. However, at present, only sites of cultural importance are included in the List. The designation of natural sites has not been considered.

The country intends to accede to the *Bonn Convention on the Conservation of Migratory Species of Wild Animals.* Financial constraints are mentioned as having delayed accession so far.

Transboundary movement of hazardous wastes

Kyrgyzstan ratified the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal on 18 January 1996. According to the Governmental Decree dated 14 May 1997, the Ministry of Environmental Protection is responsible for implementing it. The Ministry of Environmental Protection, the State Customs Committee and the State Sanitary and Epidemiological Control Department (Ministry of Health) have been granted supervisory and inspection functions. They are empowered to make regulatory inspections of waste sites, and, jointly with the Customs Committee, to inspect imports and suspend the use of illegally imported wastes.

Kyrgyzstan has been taking legislative and practical measures to meet its obligations under the Basel Convention. The Law on Environmental Protection contains an article requiring a State permit for the export, import, transport and use of wastes, including radioactive wastes. The Law on Licensing requires licences for the transport of hazardous or radioactive wastes. The list of wastes covered by the Basel Convention is reproduced in the Governmental Decree of 29 October 1998 that specifically regulates transboundary movements of wastes and empowers the Ministry of Foreign Trade and Industry, in agreement with the Ministry of Environmental Protection, to issue the required licences. The procedures were established by Governmental Decree dated 6 April 1999 on the State Regulation of the Transboundary Movement of Hazardous and Other Wastes. A comprehensive law on the production and consumption of wastes has been prepared and submitted to the Government for consideration.

In practical terms, one licence for the import of hazardous wastes from the Russian Federation has been issued. No illegal movements have been reported. There are regulatory discrepancies with the transboundary movement of certain wastes listed in the Basel Convention. For example, the import of used tyres falls under the Convention, but national rules regard these wastes as 'second-hand products'. Tyres are now imported from Europe and are qualified as appropriate for further use in the country.

Convention to Combat Desertification

Kyrgyzstan acceded to the Convention to Combat Desertification on 19 September 1997 and ratified it on 18 December 1997. In Kyrgyzstan, desertification is due to erosion, salinization, and natural disasters like landslides. According to official data, 90 per cent of its agricultural land is prone to desertification.

A National Centre to Combat Desertification was set up for the purpose of implementing the Convention and coordinating the respective activities. The Centre functions within the Institute

of Irrigation, which is in turn subordinate to the Ministry of Agriculture and Water Economy. The Centre intends to provide a coordination office for NGOs engaged in land protection, poverty eradication, agricultural development and raising public awareness about these issues. The minimum activities to implement the international obligations are provided for by the National "Land" Programme for the Period up to 2005 (approved by Governmental Decree of 12 August 1998), and Government Regulation "Monitoring of Agricultural Lands", dated 1 March 1999.

Kyrgyzstan has prepared a draft national action plan to combat desertification with the financial support of the Convention's secretariat (US$ 20,000). The draft plan was submitted for discussion to the National Forum on desertification problems in Bishkek in November 1999. The Ministry of Agriculture and Water Resources currently implements several projects directly or indirectly related to land protection, irrigation and the sustainable use of agricultural land.

4.5 Internationally funded projects

Projects implemented by the Ministry of Environmental Protection

The *GEF Central Asia Transboundary Biodiversity Project* aims to ensure the protection of biodiversity in the Western Tian-Shan region. The Project aims at strengthening and widening the network of specially protected transboundary areas, at raising public awareness, and at introducing sustainable types of lifestyles and economic activities. The Project was approved by GEF in 1997 and started in 1999. The project will last 5 years and is co-financed to the tune of about US$ 14 million by GEF, Tacis, Kyrgyzstan, Kazakhstan and Uzbekistan.

The project to create the *"Issyk-Kul" Biosphere Reserve* covers the 1995-2000 period and costs around DM 2 million. The project was initiated by the German "Naturbund" (NABU) and the German Agency for Technical Cooperation (GTZ) and aims at introducing a sustainable development model in the Issyk-Kul region. With DM 400,000 received so far, the experts involved have prepared and submitted for consideration the draft law on biosphere territory and adopted the Concept of Long-term Sustainable Use of Natural Resources in the Issuk-Kul Region.

The *Monitoring and Capacity-building Project* is co-financed by the Asian Development Bank (ADB) and the Finnish Government. Its aims are to assist the establishment of the national monitoring system according to the model in the Chui *oblast*, to create the necessary database, and to train specialists. It will cost US$ 1 million and will end in 2000.

The *Capacity 21* project is financed by UNDP and helps to introduce the principles of sustainable development through data exchange and capacity-building measures. Its total cost amounts to some US$ 650,000. It started in 1997 and will end in 2000.

NABU is implementing the *Protection of the Snow Leopard Population* project. The objective is to protect this endangered species by establishing a highly mobile anti-poaching unit. The project, scheduled for 1999-2001, has led to the creation of an active group of four inspectors. Project costs amount to DM 100,000.

The *Environmental Awareness Raising Programme* implemented by Tacis wants to ensure a greater presence of environmental problems in the public and the media. Under the project, which is scheduled for two years (1998-99), Helsinki University, Ecomedia, BBC and others have assisted in arranging seminars with the deputies of the legislative bodies and the media on environmental protection.

The *Rehabilitation of the Uranium Tailings* project in Mailii Suu is implemented by Tacis, to the tune of ECU 500,000. Its objectives are to establish a monitoring system, to ensure the physical and chemical stabilization of the slopes, to improve safety, and to improve the health of the local population. Groups of experts have so far prepared the project feasibility study.

The *Conservation of Biodiversity of the South Kyrgyzstan Mountains Ecosystem* project is just getting off the ground. It is to be implemented by UNDP, with GEF financing, and seeks biodiversity conservation and sustainable use of nature by local communities.

Other projects

The Ministry of Agriculture and Water Resources administers over 50 internationally funded projects,

mostly relating to water management and drinking-water supply (see Table 6.6), poverty reduction and rural development issues. The principal donors include the Asian Development Bank, the European Bank for Reconstruction and Development, Tacis, the World Bank, and the Governments of Denmark, France, Germany, Switzerland, Japan and the United States. Projects are also financed by the International Fund for Agricultural Development, the Korean Government, the Department for International Development (DFID) of the United Kingdom, and the Government of the Netherlands.

Seven projects have been worked out in accordance with the "Programme of Concrete Measures for the Improvement of the State of the Environment in the Aral Sea Basin". Kyrgyzstan participates in four of them: Regional Water Resources Management Strategy, Hydro-meteorological Studies, Water Quality Management, and Integrated Land/Water Management in the Upper Watersheds. The projects are financed by the World Bank, UNDP, GEF, together with other organizations and donors.

In 1997, the Water and Environment Management in the Aral Sea Basin project was prepared. This is a US$ 72 million project financed by GEF and World Bank. The International Fund for the Aral Sea is the implementing agency. Project duration is 3.5 years. The two components of the project are the development of a strategic action plan and wetland restoration.

The overall objective of the project called "Strengthening the Capacity of the Government for Disaster Mitigation and Preparedness" is to assist the Ministry of Emergencies and Civil Defence in strengthening its capacity for disaster mitigation and preparedness. It thus contributes to the reduction of human casualties and economic losses from natural and man-made disasters. The project is UNDP-funded and was signed in 1998. The essential achievement of this project is the formulation and ratification of a national disaster reduction plan, coordinated by the Ministry of Emergencies and Civil Defence with broad involvement of other governmental and civil society institutions. It is also expected that human resources and local institutions at the national and *oblast* level will have been strengthened in developing regional plans reflecting the Government's commitment to disaster mitigation. One of the major outputs of the project has been the establishment of the Centre for Emergency Management and Coordination at the Ministry of Emergencies and Civil Defence.

The Ministry of Environmental Protection, in cooperation with the World Bank, has drawn up the National Environmental Action Plan (NEAP) and a NEAP office has been opened. The NEAP was discussed and approved at the Consultative Meeting of donor countries, international organizations, the Government of Kyrgyzstan, NGOs, and scientists of Central Asia in Bishkek, on 29 November 1995. Twelve project proposals have been worked out. Donors for concrete projects are being sought.

The European Union renders technical assistance to Central Asian countries within the framework of the WARMAP project, dealing with water and land resources management. The project is supposed to include the development of an information management system (WARMIS), which would facilitate regional planning of the use of water and of land.

On 25 May 1995, the Government of Kyrgyzstan and the Asian Development Bank signed a Memorandum on technical assistance in strengthening environmental institutions and improving procedures for environmental impact assessment in Kyrgyzstan. The project lasted 8 months, starting in April 1996, and cost US$ 400,000.

4.6 Conclusions and recommendations

Cooperation on environmental protection is gradually gaining momentum in Kyrgyzstan. The increased importance can partly be attributed to a growing understanding of interlinkages between economic and environmental interests, a general widening of international contacts, and the influence of generally accepted international principles and models of behaviour.

The overall collapse of the economy and the disruption of links with the former Soviet republics have had a direct impact on Kyrgyzstan's ability to respond to old and new environmental challenges, including its ability to participate adequately in international cooperation. The country lacks even the minimum financial resources for acceding to widely used international legal instruments, especially since their subsequent implementation sometimes requires large investment in economic and social measures, which Kyrgyzstan cannot afford.

For many reasons, the country needs to focus on an active development of international cooperation on environmental protection. International cooperation will give access to information, advanced views, concepts and decisions, and will help obtain financial assistance in solving environmental problems. All the principal donors and international partners are present in the country, including UNDP, Tacis, the World Bank, ADB, and EBRD. Most of the projects are short-term, 1 to 3 years. There are evident successes like the project to establish the Issyk-Kul biosphere conservation territory, or the project providing for the establishment of a special inspection unit to fight poaching. Many ongoing projects also sound potentially efficient. However, much effort in environmental projects seems to be wasted. Often, the end of funding means the end of the activities that were initiated under the project.

The Ministry of Environmental Protection can do much to achieve international cooperation goals. Improvements should start from the recognition that all partners in international cooperation require both stability in their Kyrgyz counterparts and the assurance that the project in which they are cooperating will be ongoing, even after their contribution to it has ceased. If these two crucial conditions cannot be ensured by Kyrgyzstan, it will be difficult to secure the maximum international cooperation.

Foreign partners can support Kyrgyz efforts to improve the situation in this respect. It appears that foreign cooperation projects in the country are more successful, the longer the involvement of the foreign partner, the more this partner participates in the substantive solution of the problems concerned (as opposed to mere financing), and the more the project arrangements include guarantees that the training efforts which are usually part of any project will not be wasted by the spontaneous reassignment of the staff to other functions once they are trained.

Recommendation 4.1:
The Ministry of Environmental Protection should consider developing and publishing guidelines for international cooperation projects, which include safeguards against the unforeseen discontinuation of the national contribution to the projects. Foreign partners should consider insisting on such project arrangements, which increase the long-term benefit of their involvement. See also Recommendation 1.2.

Regional cooperation especially within Central Asian plays an important practical role. Like global international cooperation, it appears to lag behind, failing to respond to some urgent needs, especially with regard to water use and transboundary impacts. The regional agreements on transboundary watercourses are mostly economic and concentrate on the sharing of water resources. There is an evident gap in regulating international relations with respect to the protection of waters, including the regulation of the polluting economic activities in the basins, monitoring, or aspects of joint control over polluting activities. There are no agreements between the neighbouring countries on the protection of transboundary watercourses.

Recommendation 4.2:
Taking into consideration the special significance of water resources for the region and their predominantly transboundary character, it is important to have a legal framework for joint action by Kyrgyzstan and its neighbours to ensure the protection and rational use of these waters. The water protection component of such cooperation ought not to be neglected. See also Recommendation 6.1.

The country is now reforming its economy. Privatization, and the reorientation of economic activities to market economy conditions determine the country's profile. Foreign direct investment into the economy of the country is a new phenomenon, amounting annually to some US$ 100 million. However, the environmental impacts of the big changes originating from economic development have not been adequately studied and therefore do not seem to be taken into account. There is no cooperation between the Ministry of Environmental Protection and the Ministry of Investments responsible for administering foreign investments, and no link or coordination between foreign investment projects and internationally funded environmental projects. Economic and environmental cooperation develop separately. The concept of sustainable development, to which Kyrgyzstan adheres, offers the framework in which economic and environmental cooperation could be better coordinated. Mandatory requirements for environmental friendliness should not only be

specified in theory, but should also be subject to enforcement, possibly with the help of environmental inspections.

Recommendation 4.3:
The Council on Sustainable Development, and the Sustainable Development Commission should, together with the Ministry of Environmental Protection, determine effective mechanisms for coordination between economic and environmental cooperation projects. The main aim of such coordination should be that foreign direct investments should be environmentally friendly, all necessary precautionary measures being recognized in investment projects.

PART II: MANAGEMENT OF POLLUTION AND OF NATURAL RESOURCES

Chapter 5

MANAGEMENT OF RADIOACTIVE AND OTHER WASTES

5.1 Radioactive and chemical wastes from mining operations

Ore mining in Kyrgyzstan

Kyrgyzstan was an essential mineral provider during Soviet times. Geological prospecting and exploitation received high priority from the mid-1940s to the late 1980s and formed a basis for the development of several important metallurgical enterprises. During this period, Kyrgyzstan provided the former Soviet Union with mercury, antimony and uranium amongst other commodities. The country's importance as a mineral supplier was illustrated by the fact that the Haidarkan Combine satisfied about half the Soviet Union's mercury demand and that the Kadamzhai Combine was the sole Soviet antimony producer, although it did rely largely on 'imported' ores from other Soviet republics. One large producer of uranium in the former USSR was the Kyrgyz Mining Complex (KMC) opened in 1951. At first, this complex was tied to the Kyrgyz mines at Mailii-Suu, Kadji-Sai, Shekaftar and Min-Kush. The subsequent expansion of the 'nuclear towns' network subordinated to this complex was prompted by processing requirements for ore from uranium deposits in Kazakhstan.

Ore crushing and the first chemical leaching step were commonly performed in the vicinity of the mines. In the case of uranium, the pre-concentrates so obtained were transported to the largest uranium-processing facility in the Soviet Union, the Hydro-Metallurgical Plant in the town of Kara-Balta, for the production of uranium oxide concentrate. At the end of the 1960s, KMC was confronted with the problem of depleting uranium reserves. The Kyrgyz mining towns were excluded from the complex's network and operations at the Kara-Balta mine were also terminated. In 1975, another large hydro-metallurgical plant was completed in Kara-Balta specifically for the processing of uranium from Kazakhstan. Rare earths, lead, zinc, copper, bismuth, molybdenum, cadmium and gold were also mined and processed in Kyrgyzstan.

Intensive production methods and the almost complete neglect of environmental protection measures during the past decades have led to the accumulation of large amounts of mining waste throughout the country. In most cases the conditions in which those wastes are stored violate even basic environmental protection rules, and they represent a direct threat to the population and the environment. The storage areas do not provide the required level of safety and security, as can be seen from a number of accidents in the past decades. Inadequate extraction techniques mean that the remaining waste still contains high fractions of the minerals, and so high contents of radioactivity and heavy metals including the highly toxic mercury as well as arsenic, fluorides and sulphur-based compounds. The lack of maintenance and reconstruction work has caused an additional decrease in security in the storage of radioactivity and heavy-metal containing wastes. The situation is further worsened by the threat of natural disasters typical of the territory of Kyrgyzstan, e.g. earthquakes, landslides, mudflows or floods, which may destroy waste containments and promote the dispersion of hazardous substances into surface waters and groundwaters as well as into soils and air, affecting large areas of Kyrgyzstan and even neighbouring countries (see also Chapter 3).

Inherited dumps and tailings

During the mining and milling of metal ore and the subsequent ore leaching processes, two physically and chemically different kinds of mining wastes are produced. On the one hand, there is overlay or mining debris, which is rock material of too low a content for further use but of a higher ore content than surface rock. This material has to be mined and transported out of the pit to allow access to the ore that is worth processing. It is not treated chemically, and it is disposed of in so-called waste

rock dumps, or simply in 'dumps', usually close to the entrance to the mine.

On the other hand, waste is produced in the processing of ore-containing rock, when this rock is mechanically crushed and then leached with strong acids or bases to obtain the mineral in a pre-concentrated form. After chemical neutralization, the extremely fine-textured rock slurry is disposed of in ponds behind natural or man-made dams, while the liquid is fed back into the leaching process. The deposits of settled slurry are called 'tailings'. The tailing material is characterized by very special fluidic properties even at low water content – it liquefies when pressure is applied, as, for example, when rock masses from surrounding mountain slopes slide down on the tailing surfaces. The most likely consequence is a dam breach and the release of large amounts of the tailing material. Chemically the tailing components are very reactive, as the natural structures of the minerals have been chemically broken down in the leaching procedure and have been transformed into metal salts. They can easily be dissolved, e.g. by rainwater, and washed out with the drainage water. In the case of uranium mining, tailings also contain considerable amounts of uranium-238 and the daughter products of this natural radioactive series. As in Kyrgyzstan minerals are commonly associated with sulphur, which is also contained in mining and smelting waste. Oxidation and dissolution in water then produces sulphuric acid, which promotes leaching of metals from dumps and tailings.

After the breakdown of the USSR, Kyrgyzstan inherited 49 tailings from previous mining operations scattered over 13 major mining sites. The volume of all tailings is estimated at 75 million m^3. The total volume of mining waste is 620 million m^3 covering an area of 1,950 hectares. At 5 sites, uranium has been mined and processed leaving 29 tailings with uranium and daughter products from the uranium series. Some of the tailings and dumps from heavy-metal and coal mining are radioactive owing to the geological associations of the minerals. The numbers given above are consistently mentioned in official Kyrgyz documents. However, figures referring to individual mining sites may differ by as much as a factor of two depending on the document. Therefore, it must be concluded that there is also a great uncertainty about total waste volumes. The major mining sites established during the Soviet era are listed in Table 5.1 with some additional information on operating periods and number of dumps and tailings.

The 'Hot-Spot' Mailii-Suu

Several critical sites have been identified, and, although limited, some information on the toxic and radioactive contents of wastes is given in official Kyrgyz documents, e.g. the National

Table 5.1: Major inherited mining sites

Town *(Oblast)*	Number of dumps	Number of tailings	Period of operation	Minerals produced
Mailuu-Suu *(Djalal-Abad)*	13	23	1946 – 1968	Uranium
Kadji-Sai *(Issyk-Kul)*	1 equipment dump	1	1949 – 1967	Uranium, (Coal)
Min-Kush *(Naryn)*	4	4	1955 – 1969	Uranium
Shekaftar *(Djalal-Abad)*	8	-	1946 – 1967	Uranium
Kara-Balta *(Chui)*	-	1	1955 – today	Uranium, Molybdenum
Ak-Tyuz *(Chui)*	3	4	1942 – 1978	Rare earths
Sumsar *(Djalal-Abad)*	-	3	1950 – 1978	Heavy metals
Sovetsky *(Osh)*	1	2	1950 – 1971	Heavy metals
Kadamzhai *(Osh)*	2	4	1953 – today	Antimony
Terek-Sai *(Djalal-Abad)*	1	3	1954 – today	Antimony
Haidarkan *(Osh)*	1	1	1967 – today	Mercury
Chaurai *(Osh)*	-	1	1967 – today	Mercury
Makmal *(Naryn)*	1	2	1986 – today	Gold

Sources: Ministry of Environmental Protection, Ministry of Emergencies and Civil Defence.

Environmental Action Plan (NEAP) 1995-1997. Mailii-Suu is presented here as an example of some of the major problems common at most mining and refining locations in the country. At this site, however, the coincidence of tremendous man-made hazards in the form of unsafe dumps and tailings in the middle of a settlement, unsecured mining galleries on top of underground reserves of natural gas and oil, and very high probabilities of various kinds of natural disasters is extremely serious (see also Chapter 3).

As mentioned above, uranium mining has played a special role in Kyrgyzstan. After the first nuclear test explosion in New Mexico at the beginning of 1945, Soviet attempts to construct their own atomic bomb were speeded up. At that time the essential bottleneck was the shortage of uranium (the so-called 'uranium gap'). All possible territories were explored for uranium deposits. Uranium ore was hastily mined at various locations including in the Fergana Valley. For this purpose, the 'closed settlement' Mailii-Suu (till 1991: Maili-Sai) was also established, at the north-eastern end of the Fergana Valley in the Djalal-Abad *oblast*. It is the circumstances of that time which have made it the most peculiar and probably the potentially most dangerous mining waste site.

Mailii-Suu town is situated in the 150 to 200-m wide valley of the Mailii-Suu River. On both sides of the valley, mountains rise up to a height of about 500 m from the river bed with extremely steep and non-vegetated slopes. A geological fault line crossing the valley from east to west divides the town in two. One of the former uranium extraction plants is located at this intersection. It was converted into a factory for electric insulators ('Isolit') after mining actions ceased in 1968. Another extraction plant (Factory No. 7) 500 m upstream has been blasted after mining stopped. 23 tailings and 13 dumps are scattered around the Mailii-Suu valley and in adjacent small side valleys. They are identified by numbers from 1 to 23 and 1 to 13, respectively. The total tailing volume is 1.9 million m^3 and the total dump volume is 0.8 million m^3. Volumes of single tailings range from 1,000 m^3 (Tailing 17) to 1.4 million m^3 (Tailing 7). The smaller ones are located next to the downtown processing facility, most of them in the flood plains of the river. Those are only slightly covered with soil and practically undetectable to the inexperienced eye. On an international scale, the tailings are small to medium size. The world's largest tailings are 20 million m^3 (United States) and 70 million m^3 (eastern Germany). Total radioactivity in Mailii-Suu tailings is estimated at 1.1×10^{15} Bq.

Mining dumps have been established near the mine entrance without any technical precautions whatsoever to prevent dispersion of the dumped material. This careless procedure was also applied to small tailings. The medium-size and larger tailings were constructed according to the following scheme:

- The tailings were located in small side valleys, where the mountain slopes were used as barriers on three sides.
- In most cases, a drainage layer with drainage tubes was installed at the bottom to manage percolation water for a limited duration. There was no base lining to prevent washout into drainage or groundwater.
- Towards the river valley a small starting dam was made from local gravel and soil without any special foundation or anchorage.
- Tailing slurry from leaching was deposited behind the dam, where the suspended particles settled. The excess water was removed and fed back into the leaching process.
- As the deposited volume increased, the dam was raised, partly using tailing material itself. Dam slopes were typically 2:1 (vertical: horizontal).
- Dam tops were covered with pebbles, usually taken from the river bed.
- After completing the filling process, some of the tailings were covered with a pebble and/or a clay layer to reduce resuspension of particles by wind and exhalation of radon.
- Some tailings are equipped with a horseshoe-shaped ditch to collect runoff water from the mountains and to prevent it from penetrating into the tailing body.

Of special concern is the situation of Tailing 3, located across from the 'Isolit' factory. With its 110,000 m^3, it contains a radioactivity amount of 0.65×10^{15} Bq, which is about 60 per cent of the radioactivity deposited in Mailii-Suu. The tailing was produced from the leaching of very high-uranium content ore (> 0.5 per cent) from the former German Democratic Republic, which was transported to Mailii-Suu before leaching facilities were completed by the 'Soviet Stockholding Company SAG Wismut' in the former German Democratic Republic. Poor extraction techniques are responsible for this high-activity waste. On the mountain slope above this tailing, the formation of

a landslide can be observed, representing a rock volume of 150,000 to 200,000 cubic metres. If this rock mass were to slide down on Tailing 3, the tailing material would liquefy, and the dam would break, releasing the waste material into the Mailii-Suu River, which is a tributary of the Sir-Darya River system, and finally into the Fergana Valley and Uzbekistan. The history of this and other sites in the world has shown that a release of considerable amounts of tailings into the environment would lead to an irreversible contamination of the river and downstream areas. The dose to the population would then largely depend on the restrictions imposed on the use of river water and adjacent land over many years or even decades.

Second in the line of potential threats are Tailings 5 and 7 also because of the danger of a landslide. There is a natural narrowness just downstream of those tailings, which could easily be blocked by landslide masses with the effect of damming the river and flooding the upstream tailings. A selection of events documented in the Mailii-Suu chronicle provides an insight into the reality of such disasters:

- 1958: Breach of Tailing 7 dam, loss of 6,000 m^3 of radioactive material, contamination of the river along a 25-km stretch.
- 1992: Earthquake of 9 points on the Richter scale, triggering several landslides.
- 1993: Landslides on slopes of both sides near the 'Isolit' insulator factory, blocking the river and damming the water to a height of 6 to 10 m, drainage through decisive blastings.
- 1994: Reactivation of the landslides by a tectonic event, destruction of Tailing 17, erosion of Tailing 18 by the river.
- 1996: Earthquake of 4.5 points, damage at mine next to Tailing 3.

In 1996, a warning system was installed with the help of the Federal Agency for Geoscience and Natural Resources (BGR), Germany, in the framework of the ECHO project. The installation includes 5 position sensors placed in potential landslide masses threatening Tailings 3 and 9, 17, 5 and 7 and Tailing 8. Evaluations performed with sensor data and precipitation rates have shown that in the case of heavy rainfalls rock masses are notably displaced. The largest displacement within two and a half years has been 4 m on the landslide-prone slope above Tailings 3 and 9 with a total precipitation during that time of about 2000 litres per square metre. Of course, it is anybody's guess how much additional rain may have to fall before the landslide starts to move down the slope all by itself.

The general situation of the remains from uranium mining in Mailii-Suu can be summarized as follows:

- The ore-mining, ore-processing and waste-disposal facilities have been sited and installed without systematic planning and in great haste. There was no assessment of the expected quantities and characteristics of the mining and milling waste. The potential dangers from radioactivity and ionizing radiation have been seriously underestimated.
- Natural disasters like earthquakes, landslides, avalanches or floods, which may cause severe damage to dumps and tailings and trigger the spreading of hazardous substances, have not been taken into consideration.
- Most dams are unstable. Their structural engineering is not adequate for the amount and physical properties of the material stored behind them.
- Most tailings are not equipped with a base lining to prevent the leaching of hazardous substances into the drainage water or groundwater.
- The unsystematic distribution of smaller and medium-size tailings over the valley aggravates the control and supervision of the tailings.
- There are no warning signs or fences. There is free access to all dumps and tailings and to some of the mines.
- There is no original documentation on mining and waste dumping available in Kyrgyzstan at present.
- Percolating water is not regularly analysed for toxic components. There are no provisions for water storage in case of high concentrations.
- There is no regular monitoring whatsoever of environmental media (air, water, foodstuffs) for radioactive substances.

All Mailii-Suu tailings were surface-dry and grass-covered when visited in October 1999. There was no warning sign to keep away from the site nor was there any fencing to avoid the grazing of cattle or goats. The Isolit factory was still in operation, although it is threatened by tailings, floods and

landslides from all sides. The potential danger from the natural disasters alone should be reason enough to abandon this plant.

Environmental problems arising from mining waste

Apart from the natural disasters capable of initiating a tremendous spread of radioactivity and other toxic substances from the dumps and tailings of mining operations, there is also a permanent threat to the health of the population living next to those sites from high radiation levels and radioactivity of environmental media. However, although not hard to obtain, even basic information on the radioactivity of the tailing material is not available, and the State Agency for Hydrometeorology would not have the appropriate measuring equipment for the necessary analyses. There have been some measurements of dose rates at the surface of tailings. On the dam of the critical Tailing 3, they are in the range of 0.2 – 1.0 μSv/h, which is roughly 1 to 5 times the natural level of 0.15 – 0.25 μSv/h in Kyrgyzstan. This dose rate is strongly dependent on the kind and thickness of the sand or clay layer covering the tailings and on the water content, which varies with the season. It is only relevant when staying on or close to the tailings, and it can easily be reduced or avoided by fencing off the sites.

More important in the long run are radiation exposures from inhalation of the radon gas emanating from dumps and tailings and from the open entrances of the mines. Radon concentrations at the entrance to a uranium mine may be high enough to represent a hazard for children playing there for a few hours per day. Radon from dumps and tailings may give rise to critical concentrations in the air of the narrow valleys in summery meteorological situations with slow air exchange. An alarming practice is the use of dump material for building purposes. As a consequence, radon is emanating from walls into the interior of houses.

The water pathway represents another way for toxic or radioactive substances to reach human diet, when rainwater seeps through tailings and drains into the river or into groundwater. This water may be used directly for drinking or for the irrigation of agricultural crops or for watering livestock. As uranium and other heavy metals usually accumulate in river sediments, floods are likely to spread those substances unintentionally across agricultural land. As cattle and goats frequently graze on the tailings and dumps, the animal-meat/milk pathway needs special attention when evaluating human exposure. Where applied, the surface gravel layer on tailings may reduce plant uptake, as there is no capillary rise of contaminated soil water through this coarse material. However, over the years this barrier may be destroyed by the incorporation of fine textured dust and soil.

Since the early 1990s, several national and international teams have studied the potential danger for the population living in the immediate vicinity of tailings and the urgent and long-term action needed to improve the situation created by former uranium and metal ore mining and milling operations. The Mailii-Suu site in particular has been subject to intensive studies, and detailed recommendations, including cost estimations, have been presented. At some locations the simplest measures to improve safety, i.e. putting up warning signs or fencing off dump and tailing areas, have been carried out, but have not lasted long. Because of their steepness and the lack of space, it seems especially difficult to improve the stability of the tailing dams. For the most unstable tailings a transfer to other locations is inevitable in the near future. For long-term considerations it has to be kept in mind that the less dangerous tailings too need frequent maintenance and repair.

Waste generation and storage in contemporary mining

Since the end of the Cold War, markets for traditional mineral products like mercury, antimony and uranium are markedly smaller than before, and consequently the established plants are operating at much reduced capacity. Faced with this and with the need to stimulate economic development in general, the Kyrgyz Government is giving priority to mineral sector development. Unfortunately, mining and smelting practices as well as waste handling techniques are only slowly becoming more efficient and less harmful to man and environment, so that in general the same kind of waste is produced as before. In many cases the old-fashioned, technically inadequate dump and tailing sites are still being filled up. This adds to the dangers, hampers any attempt to store existing waste in a technically appropriate way and makes it practically impossible to reprocess mining waste. Furthermore, most of the mines are located in the middle of or close to settlements, yet no safety zones exist around the mines so that the non-mining population too is exposed to severe health risks.

The following mining and ore-processing facilities are in operation:

- The Kyrgyz Mining and Metallurgical Plant Orlovka extracts and processes rare earths from pre-concentrates from the Russian Federation and Kazakhstan. The tailings contain radioactive thorium-bearing lanthanum and other metals. The integrity of waste confinements is uncertain. An area of 20 km^2 was contaminated by radioactive waste water from Tailing 2 in 1964.
- The Kadamzhai Antimony Combine refines very pure antimony from ore of the nearby Kadamzhai and Terek-Sai mines, but mainly from material imported from Kazakhstan, Tajikistan and the Russian Federation. Little is known about the toxic content of waste deposits except for sulphur and arsenic.
- The Haidarkan Mercury Combine receives pre-products from the Haidarkan and Chaurai mines. There are plans to reprocess waste material to recover residual mercury and to extract selenium, which has recently become more valuable. High-mercury content effluents are migrating to the Chauvay River.
- Top priority is being given to the development of gold deposits. Gold mining at the Makmal skarn-type deposit began in 1986. While open-pit resources are now practically exhausted, reserves remain underground. Of great concern is the use of highly toxic cyanides in the gold extraction process, so that tailings are likely to contain this chemical. In 1996, an American company performed a feasibility study on extracting residual gold from Makmal tailings.
- By far the largest single gold deposit in Kyrgyzstan is the Kumtor deposit, located at an altitude of about 4,000 m in the Central Tien Shan mountains. It was discovered in 1978 during regional exploration. In 1994, the Canadian company Cameco Corporation, also known for its uranium operations, signed an agreement with the Kyrgyz Government covering Kumtor's development. Cameco has a 33 per cent interest in the Kumtor Gold Company (KGC) joint venture with the Government, whose stake has up to now been held by the State mining company Kyrgyzaltyn. The mine was officially opened in December 1996. It is now the eighth-largest gold mine in the world. Development of the ore body required the stripping of both waste rock and ice contained in the overlying Lysyi glacier. The mining rate currently involves the production of 114,000 tonnes/day of ore and waste, with the mill handling 15,000 tonnes/day of ore at a head grade of around 4.2 g/tonne. After ore crushing, milling and flotation, both concentrate and flotation tails are leached in parallel to recover the contained gold. The 'gold bullion' is produced on site, with final refining at the Kara-Balta plant. Tailings are stored in an impoundment lying 8 km from the mill in the Kumtor River valley. A tailings water re-treatment plant was commissioned in May 1999 at a cost of US$ 4.5 million, using the 'Inco' cyanide destruction process to remove any residual cyanide and metals before water is released into the river. The tailing dam itself has been designed to withstand major earthquakes.
- Although the Kumtor mine is environmentally less harmful, its operation is not without risk. This became obvious when on 20 May 1998 a truck with 20 tonnes of sodium cyanide overturned when crossing a bridge near Lake Issyk-Kul. 1.7 tonnes of this extremely toxic substance were spilled into the waters of the River Barscaun, running into the lake, and polluted the surrounding area. Two men died and more than 150 were hospitalized because of poisoning.
- The oldest operating ore-processing facility in Kyrgyzstan is the Kara-Balta Mining Combine. It was established in 1951 as one of the leading Soviet uranium producers with an output of 3,600 tonnes/year of uranium. Input came initially from local ores and then later from Kazakh ores, which also contained molybdenum. So, a molybdenum recovery plant was commissioned in 1967. Kara-Balta's gold-processing plant was opened in 1992. It now has a capacity of 20 tonnes/year of refined gold. The uranium capacity has been reduced to 2,000 tonnes/year and the actual output to 1,000 tonnes/year using feed from in-situ leaching operations in Kazakhstan. It is estimated that 30 million tonnes of tailings have accumulated in Kara-Balta solely from uranium extraction from pre-concentrates. Molybdenum production with an output of some 250 tonnes/year is now carried out in joint venture with a United Kingdom-based company. The joint-venture agreement contains a commitment to rehabilitate the existing plant.

5.2 Other waste generation

Industrial waste

Industrial output has declined by more than 60 per cent since independence. The main industries affected were the mining and metallurgical sectors, mechanical and electronic engineering, light industry, food processing, chemical industry, leather goods and construction materials, all characterized by waste-intensive production processes. The most promising sector became gold mining due to strong international interest. In spite of the decline, there was no relief for waste management.

There is insufficient information on the amounts, chemical compositions and whereabouts of hazardous wastes. Data that have sporadically been reported and collated are inconsistent. Mainly owing to the fact that toxicity standards are either not clear or not observed. As a first approach, the former State Committee on Environmental Protection launched an inquiry into some 100 industrial enterprises in 1994, asking about toxic waste generation rates. On the basis of a 60 per cent response rate, it was estimated that 5,000 tonnes of toxic waste suitable for incineration and 10,000 tonnes of inorganic toxic waste are generated each year. Accumulated masses of toxic waste have been evaluated by the National Statistics Committee (Goskomstat) as shown in Table 5.2. Goskomstat data are based on reports from the industry using standardized reply forms. There have been complaints, however, that the industry is not reporting regularly and is not applying consistent reporting standards. In the National Report on the State of the Environment for 1997 (NRSE '97), the Ministry of Environmental Protection stated that the production of toxic waste in 1996 was 627,298.101 tonnes. Rounded off, this corresponds roughly to the increase in accumulation from 1995 to 1998 in Table 5.2.

Table 5.2: Accumulated hazardous wastes, by region, 1994-1998

Thousand tonnes

	1994	1995	1996	1997	1998
Total	**26,800.2**	**30,479.4**	**31,106.5**	**37,376.6**	**41,809.9**
Jalal-Abad oblast	-	3,120.8	3,385.0	3,775.9	4,137.7
Yssyk-Kul oblast	-	-	-	5,500.0	9,277.0
Osh oblast	-	24,043.4	24,406.3	24,785.5	25,080.1
Chiiy oblast	-	3,314.8	3,314.8	3,314.8	3,314.8
Bishkek City	-	0.5	0.4	0.3	0.4

Sources: National Statistics Committee; Ministry of Environmental Protection.

Generation of hazardous wastes in the Osh *oblast* is presented in Table 5.3

Table 5.3: Generation of hazardous wastes in Osh oblast

Tonnes/year

	Kadamzhay Antimony Combine	Haidarkan Mercury Plant
Sludges	5,576	141,100
Mattes	5,478	
Slags		150
Tailings	52,457	59,600
Wastes of toxicity class I		200,850
Wastes of toxicity class IV	93,661	

Source: Ministry of Environmental Protection.

Industrial hazardous wastes in the Osh *oblast* are generated at the Kadamzhay Antimony Combine and the Haidarkan Mercury Plant (Table 5.3). The Kan lead-zinc combine is shut down.

Apart from the mining and metallurgical sectors, the most polluting industries are cement, electroplating and textile industries together with foundries, tanneries and slaughterhouses. Outdated process technologies are responsible for the relatively high generation of hazardous waste. There are no noticeable attempts to introduce cleaner technologies, or to recover at least some of the reusable components from wastes. According to the state-of-the-environment report of '97, there are 53 industrial facilities using very reactive toxic substances, out of which 18 apply chemicals of the highest degree of toxicity. Among those are 3 mining combines, 7 water purification and distribution facilities and 4 meat-processing plants with their respective chemicals, acids, chlorine and ammonia.

Municipal waste

Table 5.4: Generation of municipal wastes, 1993-1997

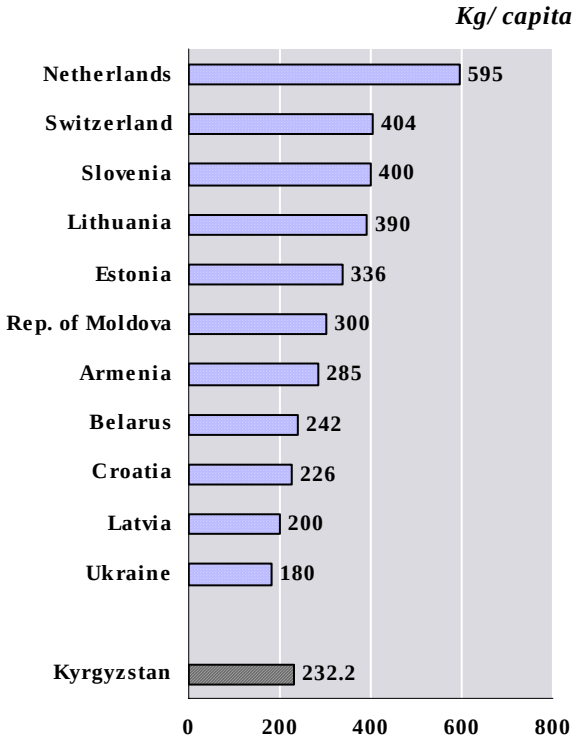
	1993	1994	1995	1996	1997
Kg per capita	278	250	201	237	195

Source: National Human Development Report 1999.

Table 5.4 indicates a somewhat decreasing trend in municipal waste generation. Figure 5.1 compares waste generation rates in Kyrgyzstan and other ECE countries. For Bishkek, the Ministry of Environmental Protection reports a waste generation for 1998 of 1.64 m^3 per capita, which includes rubbish accumulated in streets and by all public facilities. With a mean density of municipal waste of 250 kg/m^3, this would represent a weight of 410 kg. The predicted trend is toward increasing waste volumes, i.e. 1.89 m^3 in 2000 and 2.11 m^3 in 2015. A more detailed picture of the regions is given with the data presented in Table 5.5.
The data do not reveal a reduction in waste generation, as waste disposal was largely reduced for the following reasons:

- Decrease in the number of trucks in operation for waste collection and transport
- Increase in waste disposal at non-authorized sites or in the streets
- Exhausted landfill capacities and lack of new sites

Figure 5.1: Municipal waste generation in selected countries, mid-1990s



Sources: EPR, Slovenia, Lithuania , Rep. of Moldova, Croatia, Latvia, Armenia.

5.3 Waste collection and disposal

Toxic industrial waste

The storage of toxic industrial wastes has largely been unorganized during the previous decades, and only few enterprises maintained storage sites equipped with measures to prevent the spreading of toxic components and their infiltration into soils and groundwaters. In fact, toxic waste, e.g. mercury-containing lamps and thermometers, has been stored in an unprofessional way on industrial sites, such as the Bishkek Engineering Works, the Kyrgyz Truck Assembling Plant, the Osh Machine Building Plant, the Kara-Balta Carpet Factory and others. In many cases, industrial waste is deposited in municipal waste dumps or even in uncontrolled sites. There are no special treatment facilities to decontaminate or break down toxic compounds, nor are there controlled repositories for hazardous waste. Enterprises avoided the proper treatment and storage of the wastes produced.

Repository for radioactive waste

May 1965 saw the establishment of a special section of the Kyrgyz Municipal Services

Table 5.5: Transport and disposal of municipal wastes by region, 1990-1998

Thousand tonnes

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Kyrgyzstan									
Municipal wastes	2,753	3,170	2,918	2,322	1,432	1,712	1,319	1,512	1,194
Liquid wastes	1,983	1,459	1,076	1,022	613	279	289	196	138
Snow and other wastes *(Tonnes)*	18	64	289	170	13,514	71,753	1,803	1,325	2,572
Bishkek									
Municipal wastes	1,122	1,345	1,185	735	500	523	635	624	531
Liquid wastes	126	175	83	58	37	24	22	14	4
Snow and other wastes *(Tonnes)*	-	47	80	93	13,498	71,739	1,770	1,123	2,425
Ycyk-Köl oblast									
Municipal wastes	371	355	212	195	226	87	78	66	56
Liquid wastes	232	192	103	100	229	40	13	8	8
Snow and other wastes *(Tonnes)*	-	-	-	-	-	-	-	-	-
Jalal-Abad oblast									
Municipal wastes	262	262	232	486	225	381	187	373	176
Liquid wastes	149	149	131	253	69	186	70	37	24
Snow and other wastes *(Tonnes)*	-	-	-	-	-	-	-	185	134
Naryn oblast									
Municipal wastes	94	126	126	45	24	5	19	23	10
Liquid wastes	51	51	51	41	41	-	39	39	2
Snow and other wastes *(Tonnes)*	18	17	99	14	16	-	-	-	-
Osh oblast									
Municipal wastes	427	500	503	503	232	195	188	283	267
Liquid wastes	781	264	266	266	62	29	40	36	43
Snow and other wastes *(Tonnes)*	-	-	-	-	-	13	17	17	10
Talas oblast									
Municipal wastes	57	142	50	22	5	3	2	2	2
Liquid wastes	179	127	75	24	4	-	-	-	-
Snow and other wastes *(Tonnes)*	-	-	110	60	-	-	-	-	-
Chüy oblast									
Municipal wastes	420	440	610	336	220	518	210	141	152
Liquid wastes	465	501	367	280	171	-	105	62	57
Snow and other wastes *(Tonnes)*	-	-	-	3	-	1	16	-	3

Sources: National Statistics Committee; Ministry of Environmental Protection.

(Kyrgyzjilkommunsoyuz) which is responsible for the collection, transport and final storage of radioactive waste from hospitals, research institutes and commercial firms. It also offers the delivery of radioactive sources and the cleaning of radioactively contaminated working clothes. Transport is performed by special cars upon request. The transport and storage of radioactive material for enterprises cost 500 soms per haul irrespective of the amount, while it is free for hospitals and institutes (October 1999).

The repository is situated 28 km north-west of Bishkek on the highway to Manas Airport. The whole facility covers an area of 300 ha with a 5 ha strict-control inner zone, a 170 ha sanitary protective zone and a 130 ha supervision zone. The inner zone has a tank for liquid radioactive waste, which is not in operation because of leakage. The near-surface storage facility for solid radioactive waste is a reinforced concrete structure with a total volume of 600 m^3 subdivided into 20 compartments of 30 m^3 each. Up to the end of 1999, about 150 m^3 of solid waste had been deposited with a total activity of 850×10^{12} Bq. It fills 5 of the 20 compartments. Gamma dose rates in the air are measured regularly at fixed locations on the site, and water samples are taken from control wells and analysed for total alpha and total beta activities. On-site workers wear personal dosimeters, which

are evaluated every six months. This is an unusually long term for radiation workers, as exposures to radiation may remain undiscovered for half a year. A monthly, if not daily, dosimeter check would be normal, but this, of course, also depends on the dosimetric technique applied. The analytical and measuring equipment seem to have reached the end of their useful life and need urgent replacement.

Municipal waste

The regular collection of municipal waste in towns and settlements has declined drastically during recent years due to the municipal services' financial difficulties. Only two out of five waste collection trucks were operating in a district municipal service in Balykchy near Lake Issyk-Kul in October 1999. According to the National Environmental Health Action Plan (NEHAP) of 1997, only 39 towns and 95 settlements are provided with municipal rubbish collection services on a regular basis. In 771 settlements this service is performed on request only. Private enterprises in competition with municipal services are an exception in waste handling. It is claimed that from time to time there are large-scale voluntary campaigns to remove rubbish from sporadic, irregular dumps within and near town limits. There is no separation of waste components for potential further recycling or composting. Previous facilities for the separate collection of waste paper, textiles or glass no longer exist, nor do schoolchildren collect metal any more. Table 5.5 gives a more detailed picture by region.

According to NEHAP 1997, there are 155 solid waste disposal sites throughout the country. Only one of them fully meets hygienic safety conditions. Most sites are not equipped with bottom sealing to prevent the pollution of soil and groundwater and there is no collection and control of drainage water. The only waste treatment, if any, is compaction on the disposal site. Constantly accumulating organic rubbish creates favourable conditions for insects and rodents, which may transfer infections and cause epidemic diseases. There are no soil interlayers to initiate the bacterial disintegration of organic components. As a consequence, putrefaction produces methane leading to the spontaneous combustion of waste. Due to the lack of inspection of the delivered waste, hazardous waste, like luminescence devices, mercury lamps, asphalt, oil-contaminated sand, paint, household chemicals, pesticides, can also be found on municipal sites. Even hospital waste, including dressing material and syringes, was dumped at the landfill of the city of Balykchy in October 1999. There was no guard and no fencing, so that children had free access to play on the site.

The regular refuse collection system in Bishkek covers 70 per cent of the rubbish produced. It is undertaken by the self-financing enterprise 'Tazalyk'. Private persons or companies can use Tazalyk's transport services by buying special vouchers. The price is 10 to 25 soms per person per year depending on the distance to the waste dump. It is estimated that this payment covers only about half the actual transport cost, and none of the cost of maintaining the repository itself. Spontaneous dumps within the city limits and street rubbish are removed by the municipal services. Those dumps occur where the public rubbish containers, which are placed at different locations around the city, overflow. It has been estimated that 16,000 such containers would be needed in Bishkek, but only a third of that number is actually available.

The main solid waste dump for Bishkek is a former quarry located close to the Ala-Archa water reservoir, about 25 km away from the city and extending over 20 ha, which is also a tourist area in the summer. It started operating 25 years ago and was planned for a period of 10 years. Because of ongoing dumping a waste heap is piling up with no means of preventing dispersion by rain and wind. There is no waste separation or control of incoming trucks. Only weights are registered.

The City of Osh maintains a landfill occupying 15 ha without any control or monitoring. The capacity of the landfill is exhausted and a new area has been allotted for the construction of a municipal waste repository. As there is no special installation for hospital waste, it is also disposed of on the municipal landfill.

5.4 Framework for waste policy and programmes

Legal basis

The legislative details that directly or indirectly affect the management of waste are established in the following laws:

- The Law on Environmental Protection in its new version of 16 June 1999 (No. 53) defines waste "as the remainder of raw materials, of materials, of semi-finished products, of other products and of products produced during economic activities" (art. 2). As measures for

environmental protection it lays down standards of payment for the use of natural resources, for discharges of polluting substances, for physical and other harmful impacts and for the storage of waste in the environment (art. 6). It also establishes State support for the introduction of non-waste and low-waste technologies. Article 20 describes the "ecological requirements for operations with radioactive and chemical substances", i.e. the need for licences for such actions, while the legal specifications for the storage and burial of industrial and domestic waste are given in article 23. According to articles 37 and 38 listing five categories of 'ecological danger (non-safety)' zones, most tailing sites would have to be classified as 'ecological emergency zones', which could easily turn into 'ecological disaster zones', the highest category.

- The Law on the Subsoil, which was passed by the Zhogorku Kenesh (Supreme Soviet) on 24 June 1997, is the second Kyrgyz mining code, replacing the Law of 1992. It specifies that all subsoil resources are the property of the State, managed through a 'State Fund' by Parliament. Parliament controls the implementation and enforcement of the Law and collects and reviews periodical government reports. Licensing and supervision of mineral users are vested in the Government, which may delegate authority to ministries and State agencies. Local administrative authorities are responsible for the issuance of land allotment certificates and may also supervise operations to ensure compliance with environmental norms during mining operations. Very importantly, mineral rights may be terminated when there is a "direct threat to the life or health of people working or residing in the area affected by the works" or "irreparable damage to the surrounding environment". The Law requires the prevention of wasteful or harmful extraction practices. It is silent, however, on the duty of mine operators to make provision for the orderly shutdown and rehabilitation of mined-out areas, which would at least take care of dumps and tailings from modern mining operations.

  The Radiation Safety Norms (NRS-96) valid in Kyrgyzstan were prepared by the Russian Federation's State Committee of Sanitary-Epidemiological Supervision and issued in Moscow in 1996. They define the term 'radioactive waste' as radioactive substances in any state of matter which are not subject to subsequent use and which contain radioactivity exceeding levels established by normative acts. The basic dose limits (effective equivalent dose as defined by the International Commission on Radiological Protection, ICRP) established in this norm are in agreement with ICRP Publication 60 of 1990 and Directive 96/29/EURATOM of 1996 of the Council of the European Union: 1 mSv/year for members of the public and 20 mSv/year for radiation workers.

- The Law on the Radioactive Safety of the Population, signed by the President on 17 June 1999, specifies the legal provisions in the field of radiation safety and the protection of the environment from the harmful impact of sources of ionizing radiation and the principles, the responsible State bodies, and the rights and duties of citizens concerning radiation safety.

- The Law on Ecological Expertise of 16 June 1999 applies to: the construction and operation of slag and ash dumps, of deposits for toxic and radioactive substances, of deposits for industrial and domestic wastes, as well as the processing and recycling of industrial and domestic wastes including hazardous and toxic substances.

- The Law on the Protection of Ambient Air of 12 June 1999 refers in article 31 to the requirements for the intermediate or final storage of industrial and domestic wastes, taking account of the fact that those facilities may be sources of air pollution.

- An urgently needed special law on the dumps and tailings of mining operations is in preparation. An equally needed law on industrial and municipal waste management is being prepared by the Ministry of Environmental Protection in the framework of a TACIS project. The present draft defines the competencies of the various executive levels, the rights and duties of industrial and private waste producers and those in charge of any kind of waste treatment. It also states the requirements for waste transport and disposal facilities including environmental monitoring. Finally, it includes international agreements concerning waste management (Basel Convention, Rotterdam Convention).

Institutional responsibilities

The list of institutions involved in the different aspects of interaction between waste and environment is unusually long. The Ministry of Environmental Protection is clearly a key institution. Among its assignments, the approval of EIAs includes the construction and operation of any waste handling and storage facilities as well as landfills, according to the Law on Environmental Expertise of June 1999 and the Instructions for Performing EIA of June 1997. See Chapter 1 for further explanations.

The regional departments of the Ministry of Environmental Protection associated with the six *oblast* administrations are responsible, for instance, for regulating the construction of buildings, the use of land and the inspection of waste dumps and deposits, including those maintained by industry. Such inspections are scheduled once or twice a year per enterprise. It is also the environmental sections of the *oblast* and *rayon* administrations which are responsible for developing waste reduction, handling and recycling strategies.

Since the adoption of Resolution No. 161 of 23 March 1999 on the Reassignment of Tailings and Dumps Produced by Mining Companies, to the *Ministry of Emergencies and Civil Defence* and on Measures for their Rehabilitation, the priority tasks of this Ministry include the maintenance, control and rehabilitation of tailings and dumps of the uranium and metallurgical operations of the former USSR (budget 1999: 5 million soms) and finally their conversion into an ecologically safe condition. The resolution transfers responsibility for 36 tailings and 25 dumps of the closed-down mines from the Joint-stock Company 'Kara-Balta Mining Combine' to the Ministry of Emergencies and Civil Defence (see Table 5.1). As it is now in the hands of the Ministry, which should be best equipped to handle those legacies and the possible consequences of an accident, it is hoped that this will put an end to the series of responsibility transfers. Like the Ministry of Environmental Protection, the Ministry of Emergencies and Civil Defence has departments in the *oblast* administrations.

The *Ministry of Health* controls the standards for radiation protection and for concentrations of toxic substances in air, water and food and the protection of the population against the adverse effects of radiation and toxins from waste handling and storage. The Department of State Sanitary-Epidemiological Surveillance of the Ministry of Health was founded by Government Ordinance No. 229 of 29 May 1997. Its main task is to control the performance of sanitary, hygiene and anti-epidemic measures aimed at preventing and eliminating environmental contamination, improving working conditions, everyday life and recreation of the population, preventing morbidity and reducing morbidity rates.

Until January 1993, the *State Agency on Energy* was responsible for all mining and metallurgical enterprises, including the inherited dumps and tailings. It now oversees coal mining as well as the burning of coal. Both activities produce waste that may contain radioactivity due to uranium mineral association. The State Agency is also responsible for health and environmental protection matters related to mining, for which it depends on expert technical advice from other institutions.

The *Ministry of the Interior* executes the State's policies on environmental protection. It supervises compliance with safety standards in the transport of wastes.

The *State Agency for Geology and Mineral Resources* (formerly: the Ministry of Geology, then: the State Committee on Geology) is responsible for implementing the Government's mineral sector policies. Its key functions include acting as the national geological survey, administering and monitoring the minerals sector, issuing licences for exploration and mining and ensuring that the country' resources are protected. In this context it has been surveying the levels of natural radioactivity in soil and groundwater. The Agency also holds the national archive of mineral data. Unfortunately, the archive does not include past uranium mining data, which are still in Moscow.

The *State Agency for Hydrometeorology* acts under the Ministry of Environmental Protection. Its main task, besides meteorological service, is the monitoring the chemical and radioactive pollution of air, water and soil. Since 1965, the Agency has been trying to maintain daily monitoring of the deposition of radioactive substances at 7 meteorological stations.

The *State Agency for Registration of Immovable Property* protects and controls the rational use of land. This includes the recultivation of land previously used for mining and production operations.

The *National Statistics Committee* collects all environmental monitoring data obtained from the State Agency for Hydrometeorology. Once a year, it distributes questionnaires to industry on the generation of waste. The accuracy of the information provided is not verified. The generation of toxic waste has been registered statistically since 1994. The contents and concentrations of toxins are unknown.

The *Academy of Sciences* is responsible for basic geological research and theory. It complements the State Agency for Geology and Mineral Resources. In 1992, the Academy's Institute of Geology started a survey of heavy-metal deposits in order to develop a map of natural and man-made long-term ground pollution. The study assesses natural and anthropogenic sources of mercury, arsenic, lead and beryllium carried to irrigated fields by erosion. However, the geological and geophysical staff has declined drastically during recent years due to the lack of funding, retirement and general social conditions.

The *State concern 'Kyrgyzaltyn'* was formed by Presidential Decree of 15 October 1992 ("Creating State Concern 'Kyrgyzaltyn"). The main tasks of Kyrgyzaltyn were defined as follows: (i) to increase gold production ("Decision of the State to Improve the Output of Gold" of 31 December 1992); (ii) to develop a basis for a national economy of minerals; (iii) to introduce new technologies in mining and processing; (iv) to develop a social infrastructure for the employees of the enterprises; (v) to establish the environmental protection and safekeeping of tailings and dumps from the mining and milling operations which were closed down before 1990. This includes their rehabilitation. All mining and metallurgical enterprises (except coal), which were formerly under the State Agency on Energy, were placed under Kyrgyzaltyn (Decree of 18 January 1993 "Organization of Kyrgyzaltyn"). They include: the Kara-Balta Combine (uranium oxide, molybdenum), the Makmalzolto Combine (gold), the Kyrgyz Mining and Metallurgical Combine (rare earths), the Kadamzhai Combine (antimony), the Haidarkan Combine (mercury), the Sary-Dzhaz Combine (tin, tungsten) and the Tash-Kumir Semi-Conductor Plant.

Since then, Kyrgyzaltyn has risen and then fallen because of a number of privatization decrees, so that all mining enterprises still in operation were transferred to other State organizations or were spun off as individual joint-stock companies. Finally, Resolution No. 630 of 27 October 1997 on the Reassignment of Tailings and Dumps to the Joint-Stock Company 'Kara-Balta Mining Combine' took away this responsibility, leaving Kyrgyzaltyn to concentrate on Makmal and the various joint-venture holdings in gold exploration projects with foreign partners.

Because of the prominence of the present and future condition of the dumps and tailings from former uranium and heavy-metal mining and processing, it is worth tracing responsibility for those sites during the past decade:

- Till August 1991 (Independence): USSR Ministries of Middle Machine Building and Non-Ferrous Metallurgy
- August 1991 – January 1993: Kyrgyz State Agency on Energy
- January 1993 – October 1997: State Concern Kyrgyzaltyn
- October 1997 – March 1999: Joint-Stock Company 'Kara-Balta Mining Combine'
- March 1999 – present: Ministry of Emergencies and Civil Defence.

Resolution No. 161 of 23 March 1999 requires the search for foreign assistance and funding for the rehabilitation of the sites to be intensified. The frequent changing of responsibility has certainly made it more difficult to find international project financing.

Waste management programmes

The Government has launched four major undertakings for the improvement of waste management:

- The National Environmental Action Plan (NEAP)
- The National Environmental Health Action Plan (NEHAP) with local spin-offs as Local Environmental Health Action Plan (LEHAP), e.g. for the City of Bishkek
- The State Programme on the Protection of the Environment and on the Rational Use of Natural Resources till 2005.
- There is also the Programme of Measures for the Rehabilitation of Tailings and Dumps Produced by Mining Companies.

The NEAP is a continuous endeavour to identify the most critical environmental issues, to endorse the Action Plan, to mobilize external assistance and to periodically update priorities. The NEAP process was initiated by the Kyrgyz Government in March 1994, with the assistance of the World Bank, by establishing a steering committee under the chairmanship of the State Committee on Environmental Protection, and with the participation of various governmental institutions, scientific institutions and non-governmental organizations. In 1995, Kyrgyzstan became the first Central Asian country to complete its NEAP. It identifies five major areas of concern, one of which refers to the rehabilitation of dumps and tailings from former mining operations, focusing on two priority sites: Kadji-Sai and Mailii-Suu. The list of actions also foresees the evaluation of the new gold mines and the systematic assessment of mining waste dump and dam safety.

The NEAP edition for priority actions 1995 – 1997 contains lists of defined measures, the respective responsible institutions, the schedules and cost estimates. The following waste management actions were identified:

- Developing appropriate and enforceable regulations governing the treatment and disposal of hazardous materials, including storage of banned pesticides
- Assuring the proper monitoring of all tailings and closed mines
- Completing studies of potential health hazards from mining wastes at Haidarkan, Kadamzhai and Ak-Tyuz sites
- Performing studies to identify the use and clean-up of mining wastes at Kara-Balta.

Not explicitly listed as a NEAP action but mentioned in the accompanying text is the issue of environmental liability for past pollution, which certainly applies to dumps, tailings and closed-down mines and which is of great importance in privatization processes. NEAP suggests three options: (i) sell assets off cheaply and transfer full liability to the new owner; (ii) sell assets at their full price and assume liability using some of the proceeds for cleaning up; or (iii) negotiate a combination of those options with clear decision rules.

At the Second European Conference on Environment and Health in Helsinki, June 1994, Kyrgyzstan committed itself to developing an environmental health action plan by the end of 1997. The document was drawn up with the broad cooperation of the Ministries of Environmental Protection and of Health and a great number of other interested ministries, departments and working groups. It complements, but it also overlaps the NEAP, and it follows the format of the WHO Environmental Health Action Plan for Europe.

NEHAP specifies the following waste management actions:

- The development of programmes and schemes for the disposal of municipal and industrial wastes, taking into account modern techniques in construction and recycling, cost-efficiency and local requirements
- The construction of waste repositories in Bishkek, Osh, Djalal-Abad and Issyk-Kul recreation zone
- The construction of controlled disposal sites for toxic industrial waste in the north and south of the country
- The launching of a nation-wide campaign to remove, dispose and recycle municipal wastes
- The development of laws on ‘radiation safety’ and on the ‘disposal of radioactive waste’
- The establishment of a standardized system of radiation monitoring
- The performance of a gamma survey to reveal man-made pollution by radioactive substances
- The conduct of a radon emanation survey to identify locations with high radon contents in soil and air near uranium deposits and the consideration of the problem in civil and industrial construction
- The strengthening of the personnel and technical capacity of institutions responsible for the operation and maintenance of dumps and tailings of mining waste
- The development of a programme to prevent the negative effect of ionizing radiation on public health in areas of high radiation
- The supply of modern radio-analytical equipment for mobile application to the radiological laboratories of the Sanitary and Epidemiological Services at national and *oblast* levels
- Providing the population with comprehensive information on the radiation situation in the different parts of the country and with instructions for avoiding radiation effects
- The licensing and supervision of sources of non-ionizing radiation

- The construction of a special plant to dispose of mercury-containing wastes
- The construction of a repository for toxic industrial waste.

The list of actions in the 1997 edition is identical to that in the 1999 draft of the NEHAP, which is a clear indication of how difficult it is to achieve progress.

The State Programme on Environmental Protection and the Rational Use of Natural Resources till 2005 has been developed by the Ministry of Environmental Protection together with 12 other ministries, 9 State agencies and 7 *oblast* authorities and institutions in compliance with Security Council Decision No. 3 of 4 August 1997 on the State, Conceptual Projects and Measures for the Ecological Safety of the Kyrgyz Republic. The Programme's objective as far as waste is concerned is the maximum use of cleaner technologies, combined with the recycling of wastes into the production process. The list of measures attached to the 1998 edition of the Programme distinguishes between short-term (in 1998), medium-term (1998-2000) and long-term (2001-2005) actions. Altogether, there are 32 waste-relevant measures, which include remediation projects for tailings from the closed-down mines, the construction of waste treatment and recycling facilities for all kinds of waste, from municipal to toxic industrial, and the construction of a number of landfills and repositories for hazardous waste. For each measure, cost estimates and sources of funding as well as the main actors and other participants are given.

Finally, there is a programme especially for waste from past mining operations: Resolution No. 161 of 23 March 1999 on the Reassignment of Tailings and Dumps, Produced by Mining Companies, to the Ministry of Emergencies and Civil Defence and on Measures for their Rehabilitation stipulates that the Ministries of Emergencies and Civil Defence and of Environmental Protection should develop a programme of priority measures. The resulting "Programme of Measures for the Rehabilitation of Tailings and Dumps Produced by the Mining Companies of the Kyrgyz Republic" (draft 1999) lists a total of 34 urgent (1999-2000) and medium-term (2000-2005) measures for the tailings and dumps of Mailii-Suu, Min-Kush, Tuja-Mujun, Kadji-Sai, Kysyl-Djar, Shekaftar, Ak-Tuz, Sovetsky and Sumsar (see Table 5.1). They range from monitoring landslide threats and putting up warning signs and fences, to reburying and conserving (smaller) waste sites. Because of a lack of funds most of the proposed measures have not been carried out.

Apart from these four national programmes, there are a number of bilateral and multilateral international projects and agreements specifically aimed at investigating and improving the situation of the mining waste sites. In 1991 shortly after independence, Kyrgyzstan and the Russian Federation signed an agreement on compensation for uranium mining on Kyrgyz territory. So far, this agreement has not been implemented. In April 1996, the Governments of Kazakhstan, Uzbekistan and Kyrgyzstan signed an agreement on collaboration in the rehabilitation of tailing sites with a transboundary effect. On 29 August 1996, the Uzbek Committee for Environmental Protection informed its Kyrgyz counterpart that it was willing to financially support actions to remove mining waste from the Mailii-Suu site. There is no information on real transactions.

Several projects on site investigations have been funded by TACIS and governmental institutions in individual countries (e.g. Germany, Finland) and various proposals have been presented including schedules of action and cost estimates.

Whatever the focus and the detail of presentation, all programmes agree on the needs with respect to waste management: legislation and detailed regulations governing the handling, recycling and disposal of industrial and municipal waste and of waste from past, present and future mining operations. They also agree on the need for practical action – first of all, to reduce the threat of radioactive dumps and tailings to the environment and to the health of the population.

5.5 Conclusions and recommendations

There is a growing awareness of environmental concerns among both the public and the State authorities. The country has inherited-and produced-a number of 'hot spots', especially of radioactivity and heavy-metal-containing waste sites. Some of those sites are subject to a combination of considerable natural hazards and substantial quantities of highly dangerous waste dumped with little visible environmental concern, and have generated extremely high-risk areas in vulnerable surroundings.

Coping with such a legacy would be an arduous task under any circumstances. The economic

depression in which the country finds itself obliges Kyrgyzstan to advance slowly, at the risk of major ecological disasters – the arrival of substantial foreign assistance being the only apparent remedy that would be likely to reduce the existing environmental risks in a large number of 'hot spots'. Nevertheless, not all possible measures are costly.

Among them are organizational issues that merit urgent attention. Legislative and executive processes for adopting environmental policies, laws and standards as well as organizing, staffing and equipping governmental institutions to supervise compliance and execute approved principles are slow. The monitoring system for tracing the dispersion of hazardous substances in the environment from all sorts of official and illegal waste dumps has almost totally collapsed. Waste deposits are not controlled according to generally accepted international standards. State control over polluting operations and over the transport of hazardous substances has diminished to an alarming extent.

A total of five ministries and six State agencies are involved in waste management. It also seems that responsibilities are not clearly defined and delineated. This inevitably leads to a duplication of work, which is especially unacceptable when budgets are tight. The different undertakings for identifying priority measures to improve environmental protection and health are an example of duplication. The tremendous tasks to be performed in this field in the near future can only be accomplished under the strict observation of cost-efficiency principles.

Recommendation 5.1:
Legal, economic and regulatory instruments for the management of industrial and municipal waste including hygienic and technical norms in accordance with international standards should be completed to pave the way for new technologies in waste reduction, recycling and disposal. They should be in line with the polluter-pays principle. Responsibilities for the adequate treatment and disposal of waste need to be clarified. The adoption of the law on industrial and municipal waste should be accelerated. See also Recommendation 1.1.

It is neither appropriate nor possible to store all kinds of radioactive wastes in repositories and to completely exempt all affected areas from any further use. Therefore, decontamination techniques have to be applied to reduce the volumes of material to be stored and to minimize the surfaces of land for restricted use only. For this purpose, limits for the activity concentrations of products of all kinds and levels for restrictions on land use have to be defined on a scientific basis and transformed into national radiation protection norms.
The continuation of wasteful ore-processing methods and filling with tailings known not to meet modern technical standards is the result of the non-application of ecological expertise to activities on sites that started operation before the law was in force. The expected law on tailings and dumps should clarify how environmental impact assessments can be applied to such activities.

Recommendation 5.2:
Radiological protection principles for the safeguard, use or release of contaminated materials, buildings, areas, dumps and tailings from uranium and heavy-metal mining have to be formulated. The Law on the Subsoil should be amended to include regulations on responsibilities for rehabilitation after the closing of mining and ore-processing operations. The adoption of the law on tailings and dumps should be accelerated and should include provisions for environmental audits of old, high-risk tailing sites. See also Recommendation 1.1.

The mining industry is the greatest potential industrial threat to Kyrgyzstan's environment. Mining dumps and tailings are badly maintained. As a consequence, radionuclides, heavy metals and other toxins are leaking into rivers and other watercourses. Some of the most dangerous spots are the nearly 50 uranium tailing sites inherited from the Soviet Union, and especially the Mailii-Suu uranium mine. Earthquakes, mudslides or floods might release radioactive waste into the downstream river system in Kyrgyzstan and Uzbekistan. The Isolit factory, although situated literally in the 'epicentre' of all possible natural and man-made disasters, is still in operation.

Analyses of the most critical sites of past uranium and heavy-metal mining and milling operations have been performed in recent years in a number of international projects. They revealed the potential threats and have identified the most urgent actions required to reduce health risks in those areas. International funds will have to be found, possibly through negotiations with neighbouring countries, to support those measures before more harm can occur. It is likely that fund raising has been complicated by the fact that the authority responsible for contract negotiations has changed

four times over the past decade. Much less expensive than the relocation of tailings and a first step towards more safety for the population is the installation of a monitoring system. It should be coupled to the early warning system of natural disasters under the responsibility of the Ministry of Emergencies and Civil Defence.

Recommendation 5.3:
An appropriate share of the State budget should be allocated to urgent remedial measures for the dumps and tailings of closed-down mines, and complementary international funding possibilities should be analysed and applied. A system of regular monitoring of radon in air and uranium-238, radium-226 and lead-210 in river water and sediment as well as in foodstuffs in the affected areas should be set up urgently. The public should be kept informed about any monitoring and remedial action. See also Recommendations 1.3 and 3.1.

Past failings in the practical management of municipal and industrial waste have led to an unmanageable situation of waste flows, waste mixing and waste dumping. The development of proper laws, regulations and norms is also lagging far behind. The database on trends in the generation of waste volumes and their material composition is highly erroneous or at least misleading and thus inappropriate for the development of a waste-treatment system with modern technical components. With a growing population and economy, waste generation will increase. There is also evidence that privatization in some industrial activities is resulting in a decline in environmental controls. Remediation should be sought through the gradual development of a modern toolkit for waste management.

Recommendation 5.4:
A series of landfills for non-toxic waste and repositories for hazardous waste have to be constructed in various parts of the country. Construction should follow internationally accepted practices. A public information campaign should be envisaged in cooperation with NGOs to increase awareness of the potential for waste recycling and reuse. Charges for waste collection should cover the total cost of handling and disposal, and fines for violations of environmental laws should be adapted to the cost of remediation. See also Recommendation 1.3.

Chapter 6

WATER MANAGEMENT

6.1 State of water resources

The regional context

The high and large mountains of Kyrgyzstan are the source of important volumes of headwaters that feed a large number of transboundary streams and drain into other Central Asian countries. This is namely the case of the Syr Darya and the Amu Daria rivers, two key rivers draining into the Aral Sea and replenishing it. There are a number of disagreements about annual water allocations among the Central Asian countries.

More than 3,500 rivers that rise on Kyrgyz territory further run through neighbouring countries, such as Kazakhstan, Uzbekistan, Tajikistan and China. The water allocation schemes that were developed under the Soviet regime between the republics concerned are still in force (for further details, see Chapter 4, International Cooperation). At that time, reservoirs and dams had been developed chiefly to serve agricultural irrigation. Today, the water allocated to Kyrgyzstan is 24 per cent of the available resources. The allocated water quantity is calculated every year, depending on the existing flows (see Table 6.1). On average, it represents 11.6 billion m^3 per year. In the early 1990s, Kyrgyzstan fully consumed the water that was allocated to it, while in 1998, because of the reduction in agriculture, it abstracted less than 9 billion m^3.

Inside the country, this sharing imposes specific constraints (Figure 6.1). In the north, the water of the Issyk-Kul basin is fully used internally by the country. In the Chu region, the water is shared with Kazakhstan (52 per cent Kyrgyzstan/48 per cent Kazakhstan). The water of the Talas basin is also shared with Kazakhstan (50 per cent/50 per cent). In the south, waters from the Fergana Valley and Osh *oblast* drain into the Naryn, a tributary of the Syr Daria, whose waters are shared with Uzbekistan and Kazakhstan. The Axon river drains into the Amou Daria. All the rivers of the south ultimately feed the Aral Sea. Along their course, they are subject to important water uptakes for the intensive cotton agriculture developed along their banks. Kyrgyzstan is no exception, as the south of the country is the most agriculture-intensive region, and irrigation there is a necessity.

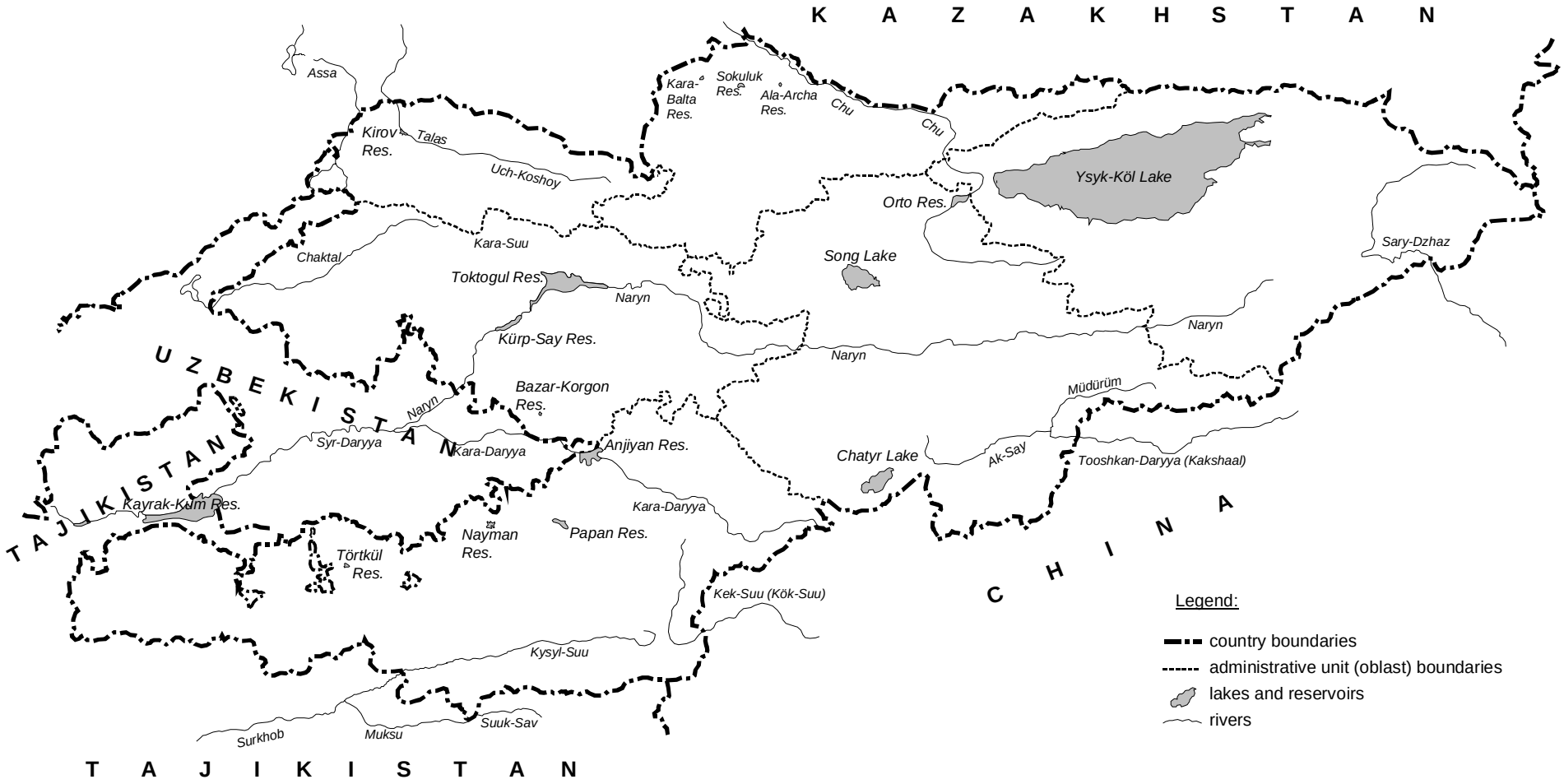
Table 6.1: Main river basins in Kyrgyzstan

River basin	Main tributaries on Kyrgyz territory	Watershed area (km^2)	Average flowrate (Billion m^3/year)
Total		**168,791**	**44.46**
Chu	Chu	14,154	3.73
Talas	Talas	7,640	1.35
Assy		454	0.19
Syr Darya	Naryn, Kara-Darya	99,458	27.42
Amu Darya		7,700	1.25
Issyk-Kul Lake		15,738	3.33
Ili		997	0.36
Tarim		22,650	6.15

Source: NEAP, 1995.

FIGURE 6.1:

MAP OF KYRGYZSTAN



In practice, water is shared through important infrastructure works. Reservoirs make it possible to accumulate the water that will be released at given times of the growing season to neighbouring countries. These reservoirs are also a means of measuring the quantity of water released. Due calculations and accounting are made of water releases. A few examples are the Kyrov reservoir on the Talas river, the Kara-Balta, Sokuluk and Ala-Archa reservoirs on the Chu river, the Toktogul reservoir on the Naryn river, etc. These artificial reservoirs with dams are classically accompanied by hydropower stations. In addition, a system of canals also helps in dividing water and measuring flow rates. Each year, Kyrgyzstan calculates how much water it is authorized to use and then manages the delivery of what is left to the neighbouring countries (see the hotly debated system of compensation described in Chapter 4).

This sharing system, which had been set up in Soviet times in a very different political and economic context, implies a certain number of constraints and conflicts of interest affecting the country's water policy and management:

- The neighbouring countries need water for irrigation during the vegetation period. Their highest demand for water releases from the reservoirs is in summer. Kyrgyzstan, on the other hand, is poor in energy resources and wants to release water to produce electricity in winter, when its demand for energy is the highest.
- In the south, the water quotas left to Kyrgyzstan are too small to allow for the expansion of agriculture. In fact, there are 2.8 million km^2 of arable land that need to be irrigated. Today, 1.2 million km^2 are actually irrigated. The plan is to increase the irrigated area to 1.5 million km^2.
- Finally, all the water infrastructure for the storing and sharing of waters (reservoirs, dams and channels) is located on Kyrgyz territory, and therefore maintained and restored exclusively at Kyrgyzstan's expense.

Climatic factors and water availability

The climate is continental, characterized by cold winters and hot summers. Average temperatures in the valleys fluctuate from minus 18°C in January to 28°C in July. The average annual precipitation is about 533 mm, with over 1,000 mm in the mountains and 150 mm in the plains (Fergana valley). Precipitation occurs between October and April. The primary source of water is snowfall as the average altitude is high. Water flows originate in the melting of snow, permanent snowfields and glaciers.

Kyrgyzstan has huge reserves of groundwater and surface water. There are 10.3 billion m^3 of potential proven annual reserves of groundwaters, and the annual drain of surface waters is 44.5 billion m^3 per year. 650 billion m^3 of ice are stored in glaciers and 1,745 billion m^3 of surface water in lakes and natural reservoirs, 84 per cent of which are located at altitudes above 3,000-4,000 m. Water is also stored in 13 artificial reservoirs with a total capacity of 23.4 billion m^3.

The trends in climatic conditions over the past 20 years show that temperatures are rising. In parallel, droughts are more frequent, water evaporation is more intense, in particular for lakes, and the surface covered by glaciers is diminishing. It is forecast that the surface of ice accretion will reduce by 30-40 per cent by 2025, resulting in a 25-35 per cent decrease in water volume production.

85 per cent of the territory benefits from a positive water balance (water flows). On the remaining 15 per cent the balance is negative, with water lost through recharging underground aquifers, irrigation, and evaporation. This concerns the Chu Valley, the periphery of the Fergana Valley, plains around lakes and the foothills and alluvial plains of other valleys.

Surface water

Rivers: There are six main catchment basins (see Table 6.1):

- Syr-Darya (525 km long, called Naryn river upstream from the Fergana valley), flowing to Tajikistan and Uzbekistan; major Kyrgyz tributaries are the Kara-Suu and the Kara-Darya rivers; and also the Chatkal river flowing west to Uzbekistan;
- Chu (221 km), the Talas and Assa river basin flowing to Kazakhstan;
- the south-eastern small catchment areas of Aksay, Sary Dzhaz and Kek Suu draining to China;
- Lake Issyk-Kul interior basin, which has no outlet (inflows are balanced by evaporation and water uses);

- Kyzyl Suu, which is a Kyrgyz tributary of the Amu Darya River basin in the south-west;
- upstream of the Ili river catchment area, which is a tributary of the Balkhash basin in Kazakhstan.

The Naryn watershed covers 59,000 km^2, i.e. 30 per cent of Kyrgyzstan, and generates 31 per cent of its total water volume. The second largest river in Kyrgyzstan, the Kara Darya, has a watershed of 31,000 km^2, and generates 10 per cent of the country's water flow. Both of them cross over agricultural regions, where water is mainly used for irrigation (see Figure 6.1). Their flows are regulated by a series of dams and reservoirs (in particular, the 19.5 km^3 Toktogul reservoir) which are the country's most important source of hydroelectric power. The watershed of the Chu River, in the north, is home to major urban and industrial centres and is also one of the most important irrigated areas. This watershed of 38,000 km^2 is half in Kazakhstan and half in Kyrgyzstan. The upper Chu river flow is regulated by the Orto-Tokoy reservoir (volume of about 47 km^3).

Lakes: There are 1,923 lakes in Kyrgyzstan, totalling a water surface of 6,836 km^2 (total watershed area 15,738 km^2). The largest are lakes Issyk-Kul (6,236 km^2), Son-Kul (270 km^2) and Chatir-Kul (175 km^2). Most of them are situated at high altitudes between 2,000 m and 3,500 m (see Table 6.2). The total storage capacity of the lakes (excluding Issyk-kul) is only 10 per cent of the total run-off (i.e. about 4.5 billion m^3), which means that lakes do not play an important role in the regulation of water flow over the year. Wetlands occupy 0.5 per cent of the territory in the alluvial valleys and along the banks of Lake Issyk-Kul.

Lake Issyk-kul has a high recreational value and is exceptionally clear. More than 80 rivers from the Terskey and Kungey-Alatoo Mountains flow into the Lake. The Lake has no outlet. Therefore, it is sensitive to all pollution inflows, mineral salt inflows (the salinity of the Lake is on the increase), water uptakes and evaporation, as all these factors threaten its ecological equilibrium.

Reservoirs: Artificial reservoirs have been created to regulate the water flows from the melting of snow and glaciers in spring and store it till the vegetation period in summer (Table 6.2). Fifteen major reservoirs with a total capacity of 15.6 billion m^3 have been built to regulate the fluctuating river flows. 24 smaller ones have capacities ranging from 1 to 10 million m^3. There is a significant loss of storage capacity in these 15 major and 24 smaller reservoirs due to the

Table 6.2: Major natural and artificial reservoirs

	Area (km^2)	Altitude (m)	Volume (Million m^3)	River basin
Lakes				
Issyk-Kul	6,236	1,606	1,738,000	Issyk-Kul
Sonk-Kul	270	3,013	2,640	Naryn
Chatyr Kul	154	3,530	610	Naryn
Sary Chelek	4.9	1,873	483	Naryn
Cheul-Suu	4.5	3,514	338	Ak Sail
Kara-Suu	4.2	2,022	223	Naryn
Mertbachir	4.5	3,304	129	Sary Dzhaz
Kullun	3.3	2,856	118	Kara-Darya
Reservoirs				
Toktogul	284		19,500	Naryn
Andizhan	-		1,750	Kara-Darya
Kirov	26.5		550	Talas
Orto Tokoi	25		470	Chui
Kocksai	12		370	Naryn
Papan	7.1		260	Ak-Buura
Tashkumyr	-		250	Naryn
Tjurtkul	6.6		90	Isafa

Source: NEAP, 1995.

sedimentation of suspended solids brought in with the influent waters. This is an important problem as spare water capacities are vital for agriculture (irrigation) and hydropower production. Equally important is the maintenance of dams, which has been inadequate for a few years now, some of them present a real danger of bursting (See Chapter 3).

The biggest storage capacity is in the Syr Darya basin, in particular with the huge Toktogul reservoir (19.5 billion m^3) on the Naryn River. It is a multi-purpose reservoir for irrigation, hydropower production and protection against floods. Situated close to the Uzbek border, its irrigation and flood functions mostly concern the Uzbek territory.

Hydropower plays a key role in Kyrgyzstan. It provides 90 per cent of domestic electricity needs, with an estimated 3,000 MW of installed capacity (compared to an economically feasible potential of 6,200 MW). As said above, there is a conflict of interest between the production of electricity, for which demand peaks in winter, and the irrigation water requirements, which peak in the summer cropping season. The water demands for irrigation come mostly from abroad.

Quality of surface waters: It is difficult to have a clear picture of the quality of surface water, as monitoring is scarce and increasingly unreliable (see below the section on monitoring). In general it is said that the water bodies suffer only low levels of pollution. All river basins have an adequate water oxygen content (5-6 mg/l) and low organic and nutrient substance content (BOD5 down to 2-3 mg/l, nitrates below 1 mg/l). River water is particularly pure in the upper stretches (e.g. Naryn, Amu-Darya, and other mountain rivers).

However in the vicinity of urban, agricultural and industrial centres, the quality of river water deteriorates. Pollution hot spots are found in the populated Chu river basin, the lower section of Kara-Darya and Naryn tributaries in the Osh and Djalal-Abad *oblasts*, and the Tyup rivers flowing into Lake Issyk-Kul. In these places, high concentrations of nitrates (above 3 mg/l), nitrites (0.7 mg/l), oil and grease (0.5 mg/l), phenols (above 0.001 mg/l) and pesticides (DDT and HCH group) have been detected. Pollution by mine tailing dumps also occur in several places in the country, such as radioactive contamination of the Mailuu-Su River, cadmium contamination of the Sumsar River (320 times higher than the concentration limit) and other heavy metals (copper, zinc and lead) in the Djalal-Abad *oblast*.

In order to protect water supply sources, a number of designated areas and watersheds have restricted access and limited land-use conditions. As much as 172,260 ha are thus protected, including 18,900 ha encompassing the vulnerable Lake Issik Kul. But the enforcement of protection measures is uneven.

Groundwater

3.4 billion m^3/year of groundwater resources were available for abstraction in the early 1990s, a figure which has probably decreased, as no investments have been made since then and some pumping systems have been abandoned because of a lack of maintenance. At that time, 2.0 billion m^3/year in the Chu river basin, 0.8 in the Syr Darya basin and 0.8 in the Issyk-Kul catchment area were potentially extractable (Table 6.3). The volume of groundwater is sufficient to meet present and future needs, save perhaps the aquifer

Table 6.3: Groundwater reserves

	Estimated reserves		Aquifers	Proven reserves		Wells
	Billion m^3/year	*Thousand m^3/day*	*Number*	*Billion m^3/year*	*Thousand m^3/day*	*Number*
Total	**10.71**	**29,348**		**3.76**	**10,289**	**5,900**
Chuisk	2.80	7,648	13	2.03	5,553	2,207
Tals	0.82	2,250	4	0.11	306	245
Issyk-Kul	2.11	5,803	7	0.76	2,083	1,078
Naryn	3.34	9,154	3	0.01	41	459
Osh	0.95	2,595	13	0.41	1,131	1,105
Djalal-Abad	0.69	1,898	2	0.43	1,175	806

Source: NEAP, 1995.

serving Bishkek, where present abstraction seems close to its maximum (other underground sources or surface water might be sought in the future if demand for drinking water continues to increase). Aquifers are recharged both by precipitation and by river water infiltration.

Monitoring shows that in some places the water quality of the aquifer's upper layers is deteriorating. Where there is infiltration from irrigation canals and from irrigated areas, groundwater is threatened by contamination. Because of infiltration, the water quality in the upper layers is threatened by the poor protection from sanitary perimeters around the water uptakes (wells), the improper development of irrigation methods, untreated waste-water discharges, and inefficient water drainage. There is also the improper storage (illegal dumping) of waste, in particular tailings containing radioactive substances, heavy metal salts, cyanogen-containing substances, which are deposited in troughs and hollows.

Here are some examples of groundwater pollution:

- In the Orto-Alysh region, from where 60 per cent of the drinking water for Bishkek city is extracted, groundwater is polluted by nitrates (concentration exceeding the norm for drinking water) to a depth of 150 metres; pollution is from domestic activities at the surface;
- In the south-west of Kara-Balta city, groundwater is polluted by nitrate and manganese from tailing storage from a hydro-metallurgical factory;
- Infiltration from beneath the tailing ponds of the Kara-Balta mining complex causes the infiltration of chromium compound in groundwaters; the State Agency that performs systematic investigations at this site has also shown high contents of sulphate, manganese (up to 15 mg/l), molybdenum (up to 7.0 mg/l) and uranium (0.03 mg/l);
- The whole region of Kara-Balta suffers severe pollution of groundwater beneath industrial premises; 15 wells are no longer used because the groundwater is unfit for human consumption;
- In the region of the Makmalzoloto gold-extracting factory, abnormal mineralization of groundwater is on the increase as is the chlorate and sulphate content;
- In the southern regions (Osh), groundwaters are polluted by pesticides and fertilizers (e.g. Tuia, Kerki-Dong, Suzak, Kutarma, Kyzyl-Bulak, Karavan villages).

6.2 Water uses and anthropogenic pressures

General

In the early 1990s, Kyrgyzstan consumed its entire water allotment. Since 1991, the volume of water abstracted has shrunk by more than 20 per cent to 8.5 billion m^3 in 1997 and 8.8 billion m^3 in 1998 (Table 6.4). Most of the water is extracted from the surface; groundwater uptake is only about 6-7 per cent of total uptake. As the main water distribution networks suffer from bad maintenance, leaks have increased and represent above 25 per cent of the total uptake. In particular, 90 per cent of the losses occur in the obsolete irrigation network (Chu and Osh Oblasts). This problem has been increasing since 1990 and affects all distribution networks. Abstracted groundwater volumes have halved over the same period, as many pumping stations are no longer operational.

Until 1993-1994, allotted water quotas were completely used in all water basins except the Amu Darya River basin. In 1993-1994, the areas draining to the Aral Sea basin of Naryn, Chatkal and Kara-Darya, and Kyzyl Suu consumed between them 45 per cent of the water allotted to the whole country. These are areas of highly intensive and water-consuming agriculture where cotton is grown. Kyrgyz projects to expand irrigation are also situated mainly in this region. It is questionable whether under the existing water-sharing agreements, there is still much room for new uses, such as expanding irrigation, unless water use for other purposes is lastingly cut.

Traditionally, the bulk of water has always been used for irrigation in Kyrgyzstan, a trend which is still true today (Figure 6.3). In 1995 irrigation used 89 per cent and industry came second with 7 per cent. In 1998 irrigation consumed 91 per cent of water and domestic uses 5 per cent. Since 1991, water use has decreased by 29 per cent overall, or specifically by about 80 per cent for industry, 40 per cent for agriculture excluding irrigation, 25 per cent for irrigation; but it has increased by 25 per cent for domestic consumption (Figure 6.4). Total industrial output declined by 65 per cent between 1991 and 1995 and agriculture activities fell by 45 per cent in the same time. Pollution pressure has decreased accordingly.

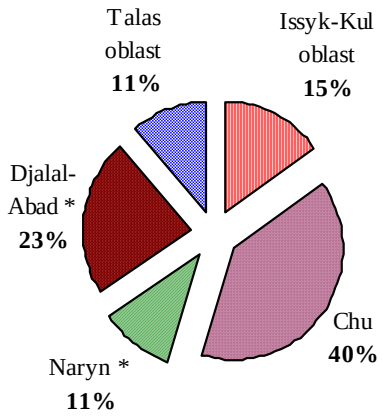
Table 6.4: Water abstraction and uses in the different oblasts (administrative regions), 1997

	Abstraction		Water use						Total used/total abstracted	Losses
	Surface water	Under-ground water	Total	Domestic uses	Industry	Irrigation	Agriculture (excluding irrigation)	Other		
	Million m³								*%*	
Total	**7,877.6**	**575.8**	**6,177.8**	**316.1**	**141.8**	**5,597.4**	**111.5**	**11.0**	**73.1**	**26.9**
Issyk-Kul	920.5	28.0	757.5	9.0	5.0	735.0	7.5	1.0	79.9	20.1
Naryn*	644.0	16.0	545.9	10.0	2.0	526.9	6.0	1.0	82.7	17.3
Chu	2,435.0	256.0	1,493.0	225.4 **	87.8	1,151.8	21.0	7.0	55.5	44.5
Djalal-Abad*	1,017.0	135.0	1,046.9	19.0	18.0	970.9	38.0	1.0	90.9	9.1
Osh*	2,199.0	140.8	1,756.1	51.7	25.0	1,650.4	29.0	0.0	75.1	24.9
Talas	662.1	14.0	578.4	1.0	4.0	562.4	10.0	1.0	85.5	14.5

Source: Ministry of Agriculture and Water Resources.

Note:
* Oblasts of which river flows are tributaries of the Aral Sea basin;
** Of which 205 million m3 for Bishkek.

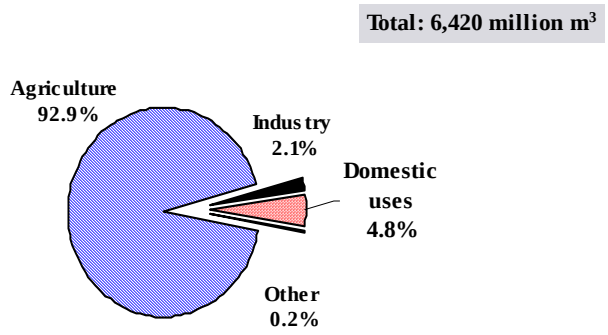
Figure 6.2: Use of water in the different oblasts, 1998



Source: Ministry of Environmental Protection, 1999 State of the Environment Report.

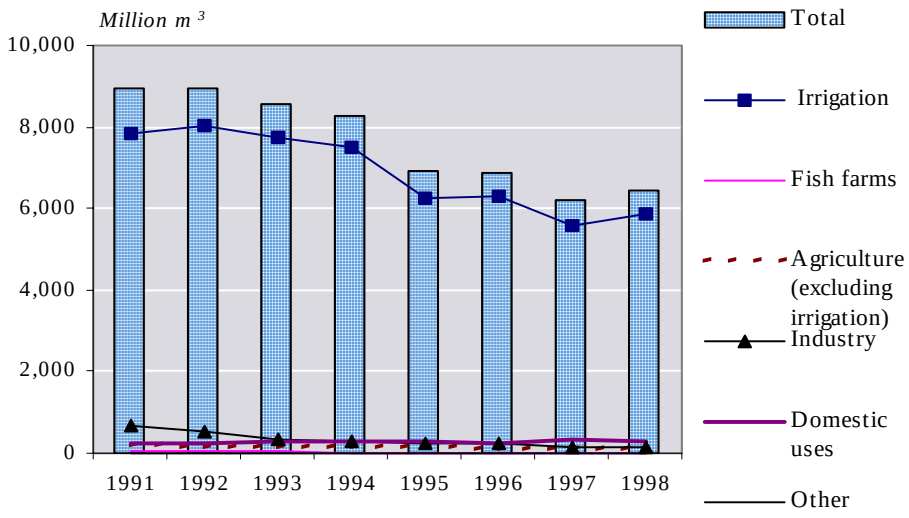
Note:
* Oblasts of which river flows are tributaries of the Aral Sea basin.

Figure 6.3: Water uses, 1998



Source: Ministry of Agriculture and Water Resources.

Figure 6.4: Water uses, 1991-1998



Source: Ministry of Agriculture and Water Resources.

At *oblast* level, the use pattern depends on the predominant sector of activity (Figure 6.2 and Table 6.4). The Chu *oblast*, which is the most densely populated (it includes the city of Bishkek) and the most industrialized, uses comparatively also much water for domestic and industrial use: irrigation 77 per cent, domestic use 15 per cent and industry 6 per cent. In all other *oblasts*, irrigation uses more than 90 per cent. Also in all *oblasts* abstraction rates are about 10 to 27 per cent higher than used volumes depending on the place, which shows the importance of losses in the main distribution systems.

Agriculture and irrigation

The agricultural sector is heavily dependent on irrigation. It seems that among the primary reasons for the current low harvest yields are the inefficient management and maintenance of irrigation systems, irrational use of water resources and lack of modern irrigation technology (see Chapter 9).

In 1999, irrigated areas covered 1.06 million ha, out of a total potential of 2.25 million ha. Irrigation is most widespread in the Syr-Darya River basin (42 per cent), the Talas and Chu River basins (41 per cent) and around Lake Issyk-Kul. There is a wide variation in the use of water for irrigation, ranging from 3,800 m^3/ha/year in the Chu basin to 11,200 m^3/ha/year in the Syr-Darya basin, the country's average being 9,000 m^3/ha/year.

Water is supplied mainly through river diversion. The irrigation infrastructure includes pumping stations, diversion works, reservoir facilities, distribution canals and water control structures. The network is made up of about 13,000 km of canals, most of them unlined. The reservoirs and main canals constitute the inter-farm network, whilst secondary distribution networks inside the former kolkhozes and sovkhozes constitute the in-farm network. Although the main network has been well designed, the secondary distribution system is in general poorly designed, built and maintained, and an increasing length of it is no longer operational. In the former system, this entire infrastructure, including its development, operation and maintenance, was the State's responsibility. Nowadays, the responsibility of the main network is still with the Ministry of Agriculture and Water Resources but the responsibility for the in-farm network has been shifted to farmers. Farmers are strongly encouraged to create water users' associations (WUAs) at village level. For more details, see Chapter 9.

Since the beginning of the 90s, the maintenance of the irrigation infrastructure has been increasingly neglected, as the expenditures on operation and maintenance have regularly shrunk. In 1991 expenditures were only 56 per cent of estimated requirements, in 1992 they were 9 per cent, and in 1993 a mere 5 per cent. Today, the losses along the distribution system are high, the reservoirs need to be cleaned and the dams repaired.

Domestic water supply

About 90 per cent of drinking water comes from underground. It is extracted from some 5,900 wells

with a total discharge of 1.6 million m^3/day (Tables 6.3 and 6.4).

The urban population (i.e. 40 per cent of the total population) is supplied mostly good-quality groundwater through water supply networks (Table 6.5). A quite important part of the urban population is supplied from standpipes in streets and yards. There are also a few towns that rely on surface water for their supply. There, the quality of the water is uneven. For instance, one of the principal water sources for Osh city is the Ak-Buura River. This river, which is located in a basin with much livestock and large farms, rarely endowed with sanitation facilities, is subject to sudden floods. These floods wash out the soils with all their pollutants and so contaminate the water supply. Another city, Kara-Kul, also relies on surface water from the Kara-Kul and Kashka-Su rivers for 60 per cent of its population. In general, areas with low-quality drinking water are the populated areas of the Chu river basin, Osh and Djalal-Abad *oblasts*, and the rivers flowing into Lake Issyk-Kul. For instance, Karakol city, close to Lake Issyk-Kul, is supplied with low-quality drinking water. The water is neither filtered nor disinfected and causes numerous infectious diseases.

In rural areas, there has been a programme under way for many years to expand the piped water supply. About 70 per cent of the 2.5 million rural population is now served by a small piped water supply system. Usually the water comes from underground, except for about 634 villages, 92 per cent of them in the south-west, that are supplied from open water reservoirs and irrigation canals. At present, many groundwater intakes from wells are out of order (because not repaired) and not controlled by the local authorities.

The remaining 30 per cent of the rural population is supplied by individual wells without disinfecting equipment. The distribution system is highly dispersed: 97 per cent of the rural piped service is supplied from 770 groundwater wells that feed 662 water mains supplying 26,814 street hydrants and standpipes. In some places, street and yard standpipes are the predominant means of water distribution.

Built in the 1970s, 70 per cent of the current water supply network is said to be in poor condition and needs rehabilitation. Often, there are no fences around sanitary protection zones of water intakes, and cattle come to pasture and drink water there. The water is rarely treated before distribution. About 48 per cent of the supply facilities have no disinfectant installations. In the main towns, disinfecting treatment facilities exist but disinfection is not performed. The risk of contamination occurs along the often badly maintained pipe system. Funds are available only for emergency repairs and cannot cover disinfection equipment or even chemical disinfectant for existing units. The lack of funds since 1991 has resulted in a reduction in experienced staff, and consequently in bad operation and maintenance and poor water quality monitoring. In particular in the rural areas, the staff of Kyrgyzselremstroy, the State water supply enterprise, is about ten per cent of what it was in the 1990s.

The problem of inadequate drinking-water quality and its impact on human health is described in detail in Chapter 10.

Industry

Water consumption by industry has fallen from 674 million m^3 in 1991 to 138 million m^3 in 1998. More than 60 per cent of this quantity is used in the Chu *oblast*, which is the most industrialized area in the country, the rest is used in the Osh and Djalal-Abad *oblasts*, where important mining and textile (cotton retting) industries are located.

Waste-water discharges and pollution

There are no data about waste-water discharges either because monitoring is no longer performed or because data are not available to the authorities. The Report on the State of the Environment in Kyrgyzstan published in 1998 reports that annually 900 to 1,150 million m^3 of waste water is discharged into natural receiving bodies. Only 300 to 635 million m^3 undergo waste-water treatment, be it mechanical, biological or physico-chemical. 1.42 to 0.75 million m^3 of toxic or dangerous waste water is discharged without any treatment. Based on the situation in 1990s, waste-water treatment units (WWTU) represent a capacity of 300 million m^3/year. Industrial waste water is generally treated in municipal waste-water facilities, possibly after a detoxifying or primary treatment. The monitoring of municipal waste-water treatment plant outflow is the responsibility of the State enterprise operating the plant (see further below).

Table 6. 5: Water supply systems and sewage systems, 1991-1998

	1991	1992	1993	1994	1995	1996	1997	1998
Water supply systems								
Number of main cities equipped	21	21	20	20	20	20	20	20
Number of small towns	29	29	29	29	29	29	29	29
Number of rural areas and smaller villages	946	956	999	999	999	1,018	1,018	878
Water sewage systems								
Number of main cities equipped	18	18	17	17	17	17	17	17
Number of small towns	15	14	14	15	15	15	15	15
Number of rural areas and smaller villages	54	54	56	56	56	56	56	56

Source: Ministry of Environmental Protection, State of the Environment Report, 1999.

However, the above-mentioned figures are theoretical, as they assume that (i) waste water collection capacity in towns equals about 70 per cent of the water supply capacity, (ii) existing WWTU are functioning at their nominal capacity and (iii) biological treatment is functioning. This was true in the early 1990s. Today, the quantity of waste water discharged has dropped to 400-450 million m^3/year. 40 per cent of the 350 WWTU do not operate at all, and 30 per cent do not meet government standards, as they have not received any funds for maintenance or repair since 1991. In 1997, out of 24 sewage plants in the Osh *oblast* only two just met sanitary requirements, as did one out of 34 in the Djalal-Abad *oblast* and 6 in the Naryn *oblast*. Most of those that are operating have only the mechanical stage functioning. The treatment plants in Karakol, Cholpon-Ata, Balykchy, Djalal-Abad, Osh, Tokmok, Mayluu-suu, Naryn and other cities are in a critical condition and need reconstruction.

Pollution removal performance is largely unknown as only the Naryn *oblast* continues to report on water discharge; the other *oblasts* are no longer transmitting data. As for the capital, at the moment the WWTP of Bishkek city is working, but 35 per cent of Bishkek city is not connected to any sewage system. In the Issyk-Kul *oblast*, out of the 78 treatment plants, only 4 are more or less operating (i.e. only the primary treatment stage might work); their removal rates are in any case unknown. In Osh, where two waste-water treatment plants operate and have been subject to some repair over the past year, the performance on BOD is 17 per cent and on suspended solids 67 per cent. In rural areas, more than 90 per cent of settlement have no sewage systems and no individual installations to treat waste waters (septic tanks, absorbing pits or other means, see Table 6.5).

There is no quantified information on the pollution discharge by agriculture, be it point pollution (manure from cattle breeding) or diffuse (fertilizers and pesticides impacting river water quality). But untreated manure containing sewage and livestock wastes is perceived as one of the most dangerous sources of water pollution at present.

Information on industrial pollution discharge has been lacking since 1996, and figures after 1995 are mere prognoses (See the State of the Environment report of 1998 on components such as ammonium, nitrites and nitrates, petroleum and oil products, toxic substances (DDT and HCH) and heavy metals (copper, chromium and zinc). Also, it seems that contamination from radioactive refuse from past mining activities also occurs but is not measured. According to the NEAP prognosis, toxic pollution has increased since 1995. Due to the recession, the preliminary treatment facilities at industrial plants are rarely operated. In the Bishkek region, they function at 5 to 10 per cent of their capacities, if at all. In general, they are outdated, obsolete and require overhauling.

6.3 Water management

Policies and strategies

For the time being there is no national strategy for the use of water resources or their protection. In Soviet times, planification of the use of water resources for 5-year periods was the rule. Kyrgyzstan and the other four Aral Sea countries have decided on their water priorities at regional level (see details in Chapter 4). In short, they are to prepare a regional strategy on water management and, on the basis of this strategy, complete the necessary legal framework, limit water consumption by introducing quotas and address

water quality as well as water quantity. Today, Kyrgyzstan is following these guidelines internally under the guidance of international programmes and international financial institutions, as can be seen by the projects currently implemented throughout the country. Table 6.6 summarizes the main water projects.

The Aral Sea problem has attracted much international assistance in water management to the Central Asian countries concerned. Two objectives of the Aral Sea Programme are of direct concern to Kyrgyzstan: developing joint management of transboundary waters and building regional institutions to achieve these goals. The Programme is funded jointly by the 5 affected countries and external foreign financing. The Programme also aims at assisting the riparian States in adopting macroeconomic and sectoral policies that support water resource development. The first phase focuses on important elements for Kyrgyzstan, such as the preparation of a regional water resource management strategy, the development of a regional environment monitoring system to track water availability and consumption, and the implementation of an integrated water and land management in the upper watersheds. All of these objectives directly affect the country's water management policy and have been taken into account in the NEAP.

The new NEAP, which is in preparation, mainly consists of a long list of projects. Many concern water management. They integrate sectoral energy and agriculture concerns, mostly irrigation infrastructure; they also encompass public water supply needs and infrastructure as well as pollution protection works (sewerage and WWTP). The projects are listed for each *oblast*. Corresponding investments and funding sources are given. Priorities are also set. Short-term (i.e. 1998), medium-term (1999-2000) and long-term (2005) actions are defined. The total investment estimates allot 8.9 billion soms to the short-term, 2.1 billion soms to the medium-term and 6.9 billion soms to the long-term actions. In the present economic situation this does not appear realistic (total expenditures on water for 1997 were about 9 million soms). Moreover, the short- and medium-term deadlines are almost past.

A Clean Water and Health Programme has been developed since 1998. Coordination is ensured by the Kyrgyz-Russian (Slavonic) University. The Programme is ambitious and has numerous aims and components. It consists of projects of varying quality and importance. It is not clear how the Programme relates to the NEAP and NEHAP (see Chapter 10). The financing is not clear either. The Programme focuses mostly on technical problems, but does not integrate the managerial, institutional and financial aspects.

A national irrigation rehabilitation strategy and action plan (NIRAP) should start to be developed in late 1999, with the financing of the EU. It will serve as an important input in the design of future irrigation projects.

The lack of a national strategy has led to an absence of cooperation, coordination and strategic views at territorial level. There are no management plans for water allocation or water protection. Management is made on the spot, separately in the different *oblasts*, by local offices of the Ministry of Agriculture and Water Resources and the Ministry of Environmental Protection. They have no concerted actions. However, as far as water allocations are concerned, each *oblast* knows how much water it can distribute, as quotas for each *oblast* are set by the Ministry of Agriculture and Water Resources. In other areas of water management, the *oblasts* are not working together to develop common strategies or synergies.

Legal framework

The 1994 Water Law strengthens the legal basis for water management and the regulation of both water quality and water use (see Chapter 1). There are provisions to introduce economic elements including infrastructure operation, maintenance and construction. This applies to agriculture, industry and households.

The Water Law introduced specific provisions for the management of water infrastructures and the establishment of water users' associations (WUAs) (Article 18). However, the Law does not provide for clear water rights (e.g. the ownership of main irrigation and secondary irrigation infrastructure and the legal status of WUAs), which creates difficulties in particular in rural areas and in irrigation infrastructure. The main water infrastructure is still the responsibility of the Ministry of Agriculture and Water Resources. Where they exist, WUAs are responsible for the maintenance of the secondary irrigation network. They should store and distribute water amongst their members in accordance with the water abstraction licences. They should also handle

in-farm water infrastructure, manage water use and take water protection measures.

Kyrgyzstan was the first Central Asian country to introduce charges on irrigation water (Law of 1995, see the section on economic instruments below). Currently, a decree is in preparation for fixing charges for water abstraction for all users.

The Law on Drinking Water was adopted in 1999. Standards for drinking-water quality are being worked out (see Chapter 10 for more details).

Institutional framework

The Ministry of Agriculture and Water Resources is responsible for water allocation, water accounting and for regulating and issuing permits for water use. Together with the local authorities (*oblasts* and *rayons*) it is also responsible for the construction and maintenance of infrastructure for irrigation water, including reservoirs with their dams and main canals, and for delivering irrigation water. With the privatization of farms, the in-farm water distribution has increasingly shifted into the hands of water users' associations. The Ministry of Agriculture and Water Resources monitors ground and surface water quantity and quality in irrigated areas. It negotiates water allocations with the neighbouring countries, and delivers and keeps records of the agreed water quantities. The Ministry's inspectors verify that the actual water uptakes comply with the permits. Also, the Ministry decides on the level of the charges on water resources use for irrigation and other activities, and collects them.

The Ministry of Environmental Protection is in charge of protecting water quality; regulating the discharge of pollutants into water bodies and collecting fines and fees for such discharges. It delivers emission permits to enterprises and other polluters. Polluters are responsible for monitoring water quality within 500 metres of the point of discharge. The Ministry of Environmental Protection with its inspectorate and Water Monitoring Department supervises and checks the monitoring system and controls permit compliance. The Ministry has regional offices in each *oblast*. They control compliance and levy fees and fines on polluters for violations; they can decide to close industrial activities when the law is infringed. In the Issyk-Kul *oblast*, four facilities were closed for such reasons in 1998 and two in 1999. However, in this period of economic difficulties, inspectors are more inclined to negotiate than to impose sanctions.

At territorial level, water is managed by the *oblast* administrative units. Related tasks are performed for water allocation by the local office of the Ministry of Agriculture and Water Resources and at the same time by the local office of the Ministry of Environmental Protection for water protection. The concept of management by hydrographic basin (or catchment basin) is not put into practice.

The supply of domestic, municipal and industrial water is the responsibility of three organizations. In Bishkek (38 per cent of the urban population), a water enterprise (Bishkek Vodokanal) is responsible under the city council for water supply and waste-water collection and treatment. In smaller cities, similar responsibilities are under the Kyrgyzjylkommunsoyuz State enterprise (KJKS). In each *oblast*, the KJKS operates water management through local vodokanals that are responsible of water supply, sewers and wastewater treatment. These local units carry out projects, and operate and maintain facilities. They should cover all their expenses with the charges they collect from users for their services. As other water users, they apply for a licence for abstracting water to the MAWR. In rural areas, where 60 per cent of the population lives, it is the MAWR that is responsible for water supply and wastewater treatment, through its state rural water enterprise (Kyrgyzselremstroy). It manages piped water supply and sewage when they exist (See Table 6.5). A major difference with the vodokanals is that the operation and maintenance of infrastructure is budgeted directly by the Ministry of Agriculture and Water Resources.

Irrigation water infrastructure is still mostly under the control of the Ministry of Agriculture and Water Resources except where WUAs have been set up. WUAs are only in their infancy but should become important local institutions. Flood infrastructure is the responsibility of the Ministry of Emergencies and Civil Defence (see Chapter 4).
The Ministry of Health, with its inspectorate and SANEPID (i.e. sanitary and epidemiology) institute, controls the quality of tap water and that of water discharged from water-treatment facilities.

6.4 Management tools

Monitoring

Water monitoring is spread over different State agencies/institutions:

- The State Agency for Meteorology (Hydromet) of the Ministry of Environmental Protection

monitors surface water quantity and quality. In 1991, Hydromet had a routine monitoring network of about 180 stations located on rivers, lakes and reservoirs. Samples were taken by car to one of its two laboratories in Osh and Bishkek. There, the global basic parameters of water quality, plus a few specific elements as heavy metals and some organic pollutants (oils, pesticides, phenols, etc.), were determined. The methodology used was traditional wet chemistry. The results were published in an annual report in which they were compared to the then prevailing quality standards and maximum allowable concentration (MAC). They were also compared to the results of the previous year. During the past ten years, the monitoring capacity of Hydromet has deteriorated for economic reasons. Today, it monitors only on the Chu River. The Osh laboratory no longer performs water analysis. The monitoring of Lake Issyk-Kul has been interrupted since 1992, with an exception in 1998 when a few monitoring points were checked following an accidental discharge of cyanides in the vicinity of the Lake. In the area which is still monitored, sampling frequency is twice a year (winter and spring) instead of once a month in the 1990s. Hydromet functions on a State budget which hardly covers the salaries of the 700 staff still working there (1,500 staff before 1992).

- The State Committee for Geology and Mineral Resources of the Ministry of Environmental Protection monitors groundwater quality and quantity. This Committee explores, maps and tests the aquifers. It operates a network of 800 observation points. Because of the lack of funds, only 75 per cent of these points were monitored in 1995, a situation that has likely deteriorated since then. This Committee also gives the authorization for abstracting groundwater (water passports) which should then be submitted to the Ministry of Agriculture and Water Resources to receive a water abstraction permit.
- The Environmental Monitoring Department of the Ministry of Environmental Protection monitors the purification performances of municipal waste-water treatment plants and of the major industrial enterprises. There is one such department and laboratory per *oblast*. They all coordinate their action with the Ministry's inspection services and the local *oblast* administration. Out of the 1,200 water standards, the laboratories of the Department are able to verify about 20. The Department also has a data and analysis section, which is working on an inventory of data for the past 5 years. It has collected data from Hydromet about the water quality of the Chu river and from the Ministry of Agriculture and Water Resources on pesticide use. The Monitoring Department does not transmit its data to the statistical office. So far the data are only used as information for the Ministry of Environmental Protection's inspections. They are not processed at all.
- The monitoring of emissions discharges is the task of the emitters. The results of self-monitoring are to be checked regularly by the central inspection laboratory of the Ministry of Environmental Protection, a procedure which seems to have been interrupted because of a lack of funds.
- The Ministry of Agriculture and Water Resources monitors the pesticides, fertilizers, and mineral content of the irrigation waters.
- The Ministry of Health monitors the quality of drinking water.

Box 6.1: The Pilot Environmental Monitoring and Management Capacity Building Project

The objective of the Environmental Monitoring and Management Capacity Building Project of the Asian Development Bank and Finland is to strengthen the capacity of Kyrgyz institutions to effectively carry out environmental monitoring and data management. It includes a training-of-trainers programme in environmental monitoring and data management; pilot-scale monitoring and data management on case studies; providing two mobile monitoring units and data management equipment for the training; drafting plans for environmental monitoring and data management; preparing guidelines and manuals. The Project started in 1998 and will be ended in spring 2000. It is now in the implementation phase of pilot studies. The Project is sited in the Chu region (Chu river valley), which is densely populated (includes Bishkek city) and where most of the industrial activities are located. The Project applies in particular to water. All monitoring institutions for water (Monitoring Department of the Ministry of Environmental Protection, Hydromet, Ministry of Health, State Committee of Geology and Mineral Resources, Academy of Science, Statistical Office) are involved. Staff members went to Finland for training; they are also trained on the computers that have been installed in the MEP.

Currently, a pilot project of the Asian Development Bank (ADB) and Finland (see Box 6.1) aims at improving cooperation between the different monitoring agencies, and at developing the use of data as a decision-making instrument, in particular in shaping strategies and action plans. The US$ 1.2 million project is financed 11 per cent by Kyrgyzstan, 36 per cent by Finland and 53 per cent by ADB. In a concerted manner, the German Association for Technical Cooperation (GTZ) is also developing a pilot programme for water quality monitoring in the Chu valley.

International agreements

International agreements on water allocation are putting strict constraints on water management with concrete quotas. For instance, the agreement between Kyrgyzstan, Kazakhstan, Uzbekistan on the use of transboundary water resources of the Naryn and Syr-Darya reservoirs fixes the daily quantity of water and the schedule of releases that Kyrgyzstan should deliver during the 1999 vegetation period from the Toktogul reservoir. The daily quotas differ from month to month:

Jun:	Mar:	Sep:
500 m^3/day	400 m^3/day	190 m^3/day
Jul:	Apr:	
650 m^3/day	300 m^3/day	
Aug:	May:	
600 m^3/day	230 m^3/day	

Similarly, water quotas are set by other international commissions for the release of water from other reservoirs. These obligations prevail over domestic priorities. Therefore, they influence water use and allocation down to local level. This has a knock-on effect on the management of water: Kyrgyzstan must release water in summer although it would prefer to release it in winter, when domestic electricity demand is high. Unfortunately, that is the period of reservoir refilling. Kyrgyzstan's reservoirs have a capacity that its own uses do not justify. Kyrgyzstan has to operate, maintain and rehabilitate reservoirs, dams, principal channels for transboundary irrigation water as they are on its territory. This puts a huge financial burden on the country and restricts other action in water management.

Two international river basin agencies (the water management associations BVOs) were established in 1996 for the Amu Darya and the Syr Darya rivers. They operate hydraulic structures and installations on rivers. With the Interstate Council for Water Coordination (ICWC) they are responsible for ensuring compliance with water withdrawal limits and guaranteeing the annual water supplies.

Regulatory instruments

There are two kinds of permits/licences for water:

- A water abstraction permit that defines water quantities and that all users, private as well as public, should obtain from the Ministry of Agriculture and Water Resources. These permits are delivered at the oblast level and should be in line with the quota available for the oblast (each oblast has its own water quota).
- A water discharge permit delivered by the Ministry of Environmental Protection. It is a single permit based on the maximum allowable concentration (MAC) and quality standards of the receiving water body, as in the former Soviet system. MACs are calculated for each enterprise and for 25 major pollutants. There are 1,243 quality standards, which are in line with the Russian standards of 1998. They are more restrictive than before, in particular for toxics (for instance for cyanides, 0.1 mg/l before 1998 and 0.035 mg/l since). The permit includes a daily self-monitoring and yearly reporting obligation to the Ministry's inspectorate.

Three different inspectorates are involved in checking compliance with water legislation: the inspectorate of the Ministry of Agriculture and Water Resources for water abstraction, the inspectorate of the Ministry of Environmental Protection for the discharge permit and the inspectorate of the Ministry of Health for drinking-water quality. A compulsory reporting system for all water users and dischargers (public and private enterprises) was introduced in 1998. A form has been proposed for the first time in 1999. It covers the quantities of water abstracted/used each month; as well as the characteristics of the water discharged (quantities and a few pollutants such as BOD_5, COD, SS, dry matters, SO_4^-, Cl^- and oil products) and the type of treatment; information on the permit limits and on the treatment facilities is also mentioned. Inspections by the Ministry of Environmental Protection of permit compliance have shown that 60-65 per cent of nature protection facilities in enterprises are working unsatisfactorily, leading to the pollution of water resources.

Table 6.6: Ongoing projects in water management or with a water component

Title/issue	Donor	Project period	Cost/financing (million US$)	Comments/purpose
Strategy on Water Management	IFAC/GEF	1999-2000		The project is under the Aral Sea Programme. The National Commission on Environment under the President entrusted in 1999 with drawing up a strategy; work will start in end 1999
National Irrigation Rehabilitation Action Plan (NIRAP)	TACIS/EU	1999	**0.2** mln / grant	Development of strategies and priorities for the rehabilitation, modernization and development of sustainable irrigation infrastructure
Irrigation Rehabilitation Project	World Bank/IFAD	1998-2004	Total cost **46.8** mln / of which **35** mln IDA loan	Rehabilitation of primary and secondary canals (serving up to 345000 ha) and major (12) dams; institutional development; O&M transfer to private sector; capacity building of the Water Resources Department.
On-farm Irrigation Pilot Project	FAO	late 1999	**0.4** mln / grant	Development of on-farm irrigation and improvement to enhance productivity/pilot approach for the on-farm irrigation projects of the World Bank and Asian Development Bank
Agricultural Area Development Project	Asian Development Bank	1999-2005	Total cost **50** mln / of which **20** mln only for rehabilitating irrigation / grants and loans	Irrigation component coordinated with the World Bank on farm-irrigation project: rehabilitation of on-farm drainage and irrigation in Chui Oblast ; capacity building in rayon irrigation administrations
On-farm Irrigation Project	World Bank/IFAD	2000-2005	Total cost **25** mln / of which **20** mln IDA loan	Rehabilitation of on-farm irrigation (168000ha) and drainage infrastructure; development of WUAs and irrigation advisory services
Development of WUAs	Asian Development Bank	1996-1997 completed	**0.9** mln / grant	Established legal framework for WUAs; support services; 3 pilot WUAs in Issyk-kul Oblast
Rural Infrastructure Services Project	Asian Development Bank	2000-2006	Total cost **44** mln / of which **35** mln loan	Institutional strengthening and rehabilitation of water supply in 500 villages and 5-10 small cities; sanitation. Will cover Chui, Djala-Abad and Osh oblasts

Table 6.7: Investments for the protection and use of water resources, 1991-1998

	1991	1992	1993	1994	1995	1996	1997	1998
Total* *(Million soms)*	0.04	0.3	2.8	7.9	7.4	4.4	13.1	9.1
as share of total environmental investment (%)	*63*	*82*	*48*	*29*	*26*	*16*	*40*	*24*
- of which:								
for sewage systems *(th. soms)*	0.02	0.2	1.17	1.15	0.58	3.76	9.36	6.6
" " *(as % of total)*	*34*	*77*	*42*	*14*	*8*	*85*	*72*	*73*
- of which:								
mechanical treatment *(th. soms)*	0.02	0.09	0.215	1.134	0.575	3.76	9.35	6.6
biological treatment *(th. soms)*	-	0.1	0.944	0.016	-	-	1.6	-

Source: Ministry of Environment, State of the Environment Report, 1999.

* Investment for protection and use of water resources meaning current expenditures for operating the plants, as no investments have been made since 1991, and very few rehabilitation works carried out.

Projects under way

A series of projects are being developed that concern the improvement of irrigation water management and of the water supply and sanitation infrastructure. They are summarized in Table 6.6. More details are given in Chapter 4 as most of these projects are sustained with international financing.

Economic instruments

Saving water is an essential objective at regional level. So far only Kazakhstan and Kyrgyzstan have introduced water charges as an incentive towards this goal. Kyrgyzstan has put water charges on abstracted water, including for public supply, industrial and irrigation use. Water savings are mainly to be achieved in irrigation water. The Ministry of Agriculture and Water Resources regularly reduces water allocation to promote savings and satisfy the demand of new users. It has introduced a system of water tariffs, which is designed to be an incentive to reduce consumption. The price of water is far higher in the irrigation season (0.03 som/m^3) than out of the irrigation season (0.015 soms/m^3).

Industry and the public also pay for the water they use (Chapter 2, Table 2.1). For households, the water charges are included in a global user charge paid for municipal services to the local communal department or municipal services. Household tariffs for water and sewerage services are established by local authorities. They are based on the accounts of the local Urban Municipal Services units, which are regulated by the State Committee on Prices. The prices are deliberately kept down as it is commonly accepted that most people could not afford higher prices. In addition, the local authorities do not allow the maintenance cost of existing facilities to be reflected in the charge rate. The underpayment by domestic and municipal consumers is compensated by higher tariffs for industrial enterprises. In 1998, most of the unpaid water charges in Bishkek were from State enterprises or State organizations (Table 2.2 and section 2.1 in Chapter 2).

Kyrgyzstan has tried to install water meters in pilot residential buildings with the money collected from household and enterprise water charges. However, it seems that it has not been successful as people simply destroyed the water meters. The reason is that in the absence of a water meter, charges arecalculated as a function of the number of registered inhabitants in a flat. In fact the predominant situation is that flats are occupied by a large number of people but that only one inhabitant is officially registered, which grossly underestimates the presently calculated consumption and hence the charges.

Expenditures for managing water

Since 1991, no investments have been made either in irrigation infrastructures, or in water supply or water sewage and treatment facilities. Details on investments for the protection and use of water resources and treatment of sewage are given in Table 6.7. The table clearly shows that very little investment has been spent on water over the past decade, and in an uneven manner. The bulk of

investment over the past three years is on waste-water treatment rather than on water supply, and almost all concentrated on the operation of mechanical treatment. In 1998, 9.1 million soms (i.e. US$ 0.2 million) were invested on water supply and treatment, of which about 70 per cent devoted to mechanical waste-water treatment.

6.5 Conclusions and recommendations

At present, in Kyrgyzstan, there is no national strategy for the management of water resources, or for their protection or for drinking-water management. The only document that gives directions and priorities about water is the NEAP of 1995, worked out with the assistance of the World Bank. This absence of strategic views undoubtedly makes it difficult for the many local stakeholders (several authorities involved in water management and the water users) to coordinate their respective actions and for potential foreign donors to decide on what issue they should concentrate their assistance. International funding institutions follow the NEAP priorities. Whether the priorities defined 5 years ago by foreign experts still fit the present situation and the expectations of the Kyrgyz people for the future is a point that also needs to be clarified. The water issue is of key importance in the short, medium and long term as it has many political, social and economic repercussions (human health, sectoral activities and international relations).

Recommendation 6.1:
The development of a consistent national water strategy, in cooperation with all the public administrations and non-governmental sectors concerned, should be seen as an urgent requirement. All concerned ministries and institutions should align their own relevant policies and practices on the national water strategy. The national water strategy should focus on the sustainable use of water resources, and should cover the protection of water quality, water supply, water pollution control and protection against floods, as well as the priority investments in the water sector. The national strategy should integrate the needs of sectoral activities, the needs of the population and the water-sharing arrangements with neighbouring countries. See also Recommendation 4.2.

Reconsidering the actual administrative managerial structure for water is essential. The current structure is still adapted to the previous organization of the Soviet system. Responsibilities and tasks are spread over different administrative bodies at different levels, governed by different ministries and financed according to differing criteria/rules and different channels. To coordinate this complex task sharing, it seems that there is no national body that could balance decisions and financing, grant priority to actions and decide on national or local management plans. For instance, each *oblast* deals strictly with its part of the territory. Therefore, hydrographic basins are managed in separate trunks. There is no forum for working out the common problems of a hydrographic basin. In these conditions, the country can hardly see where its most demanding priorities lie. Shifting towards a hydrographic basin management would be premature at present. However, steps should be taken to better integrate water supply and waste-water treatment problems and to improve the cooperation between the major actors.

Recommendation 6.2:
A national council or committee should be created to give direction to the implementation (i.e. not necessarily involving supervisory functions like monitoring) of water policies at national level, harmonize the conditions for water supply (irrigation and public supply) and waste-water treatment, and integrate actions at river basin level.
Water strategies developed at local (oblast) level, where water problems are especially acute and specific, could also be useful. In particular, water saving and conservation strategies should be worked out in the southern oblasts. There, irrigation is the main consumer. There are conflicts with neighbouring countries over water allocation as well as problems with the pollution of surface water, impairing the quality of drinking-water supply and food.

Recommendation 6.3:
Oblasts should be encouraged to develop coordinated water management plans in catchment areas by agreeing on concerted priorities and objectives when they share common water resources. See also Recommendation 10.3.

The NEAP is being updated by the Centre for Strategies and Policies on the Environment of the Ministry of Environmental Protection, with the cooperation of other ministries and stakeholders. It embraces water use and protection. It lists the different actions and investments necessary for remedying the water management and protection situation. The list includes investments in

rehabilitating the irrigation infrastructure including dam maintenance, main channels and in-farm network repair and maintenance. All works necessary to rehabilitate and improve water supply have also been estimated. The rehabilitation and construction of waste-water treatment units are also covered. The document presents a cost estimate at State level or at oblast level of the different works mentioned above, with their priority ranking: short term (1998), medium term (1999-2000) and long term (2005). Apart from the fact that the short-term and medium-term periods are already over and implementation of the plan has not started, the sums at stake are huge (about 9 billion soms for 1998, 2 billion soms for 1999-2000 and 7 billion soms for 2005). Kyrgyzstan will ask for foreign financing. But this will not free the country from the financial burden of consequent future debts. Compared to the real expenditure made by the country over the past years, which peaked at 13.1 million soms in 1997, and bearing in mind the country's current economic potential, the plan and schedule do not seem realistic.

Recommendation 6.4:
The projects included in the upcoming National Environmental Action Plan should be reviewed in order to arrive at a realistic schedule and priority programme. Such a programme for water investments seems to be a precondition for obtaining any foreign financing. See also Recommendation 1.2.

Supplying safe drinking water and protecting people's health from any contamination due to the mismanagement of water is priority number one. Chapter 10 extensively covers this issue, including in Recommendations 10.1, 10.2 and 10.3.

Important irrigation projects are conducted under the umbrella of the World Bank and the Asian Development Bank. However, funding alone would not be sufficient to ensure the success of the projects. Infrastructure is not the only element at stake. User-acceptability is of key importance. Therefore relations between the local administration for agriculture and water resources management and the farmers are to be improved. As for WUAs, it is possible that complementary legislation may be needed to clarify their status and make them fully operational. They need a legal status, to be independent of government, able to collect taxes from their members, borrow funds, take action to maintain and upgrade the part of the irrigation infrastructure under their responsibility.

Recommendation 6.5:
The legal status of water users' associations should be clarified in order to make them fully operational and responsible, as they are key players in any water-saving strategy.

It is important that farmers see the advantage of water users' associations and not only the constraints imposed by the new system. Concrete messages by agriculture and irrigation experts (i.e. extension services for farmers; see Recommendation 9.1 in Chapter 9) should be adapted to each specific region. For this, projects that are in direct contact with the farmers, as is UNDP/Capacity 21, are important. Money and training should be introduced at grassroots level in order to have a direct and concrete impact. Awareness campaigns are another important tool as carried out by the GEF International Fund for Saving the Aral Sea. These kinds of actions in the field should be more numerous and should be preferred to the traditional way of injecting finance at ministry level, which often results in dilution of funds before they reach their targets. So far, UNDP/capacity 21 and the GEF programme do not apply to the whole territory. The other *oblasts* would also greatly benefit from similar actions.

Recommendation 6.6:
Actions to involve people at the local level in day-to-day water management, protection and saving should be developed and extended to the whole country along the lines of UNDP/Capacity 21 and the GEF awareness campaign, starting in the Chu and Issyk-kul oblasts. Ways should be found to ensure that more international funds are spent at the grassroots level closer to those concretely involved in the management, operation and maintenance of the water distribution systems.

Supplying safe drinking water to the public is a difficult endeavour at present in Kyrgyzstan. Most of the infrastructures in cities are obsolete and do not guarantee a satisfactory water quality. In the countryside, since the disappearance of the sovkhozes and kolkhozes that were in charge of managing water supply, the practice of individual uptakes of water, in canals and surface water bodies is growing. In most cases, and especially in some very populated rural *oblasts*, such as Osh and Djalal-Abad, this water is not potable. Improving the infrastructure is certainly a necessity (see the projects currently in the pipeline). Applying the user-pays and polluter-pays principles in a fair and affordable manner is another considerable problem,

but certainly points in the right direction. See Recommendation 2.1.

Controlling water pollution is the next objective that the Ministry of Environmental Protection should pursue as this issue is directly within its competence. This longer-term objective should nevertheless be envisaged as soon as possible, as it means drastic moves in the way water pollution permits are designed. Therefore, it will require particular efforts from and training of the inspectors to adjust to a modern way of controlling pollution release. At present, the system, which is still identical to the Soviet one, does not encourage polluters to reduce their pollution. There is no internal strategy within the Ministry of Environmental Protection to rationalize pollution management. The data on discharged pollution that are generated by enterprises and by the Ministry's Monitoring Department and produced to the inspectorate, are not used as a decision-making tool. It is at present impossible to obtain a clear picture of the main polluters, by enterprise or sector of activity. Nor it is possible to have a clear idea of the major pollution hot spots throughout the country and along the water bodies. This information should exist and be used by the Ministry of Environmental Protection in order to work out common strategies with the sector ministries or to agree upon specific goals to reduce pollution emissions. See Recommendation 2.5.

Drawing up a water strategy means that preliminary information on water quality and water use should be available and as comprehensive as possible. The monitoring of water is spread over a number of different institutions. There are apparently no major problems of overlapping. However, the processing of data, the transmission and exchange of information between institutions, cooperation between monitoring institutions, the use of data as a tool for decision-making are practically non-existent. Moreover, serious financing problems make it difficult to carry out monitoring programmes properly, making monitoring data scarce and unreliable. It is problematic when the lack of data affects the monitoring of the quality of groundwater used for drinking purposes.

At the present time of dire financial straits, it is important to refocus the monitoring strategy. It should be oriented towards an integrated monitoring system *(see Chapter 2 and Recommendation 2.6)*. If full systematic monitoring is not possible, methods should be reconsidered in order to build a more result-oriented system. Efforts should concentrate on a few selected methodologies and parameters that describe specific local problems and produce data for decision-making.
This problem is of considerable importance and deserves having foreign assistance continue to recommend well adapted and/or new monitoring technologies, finance equipment and train local people, following the pilot project on Environmental Monitoring and Management Capacity Building that Finland and ADB are implementing at the Ministry of Environmental Protection. Extending this Project to the whole country as initially planned is an endeavour that deserves to be kept high on the agenda.

Recommendation 6.7:
Aquifers whose waters are used for human consumption should be monitored regularly and extensively.

Finally, no improvement in water management can be achieved without a competent and professional managerial and operational staff. The key water management institutions have been seriously weakened over the past decade. Too much competence has drained out of the ministries and other levels of administration. It is important to find ways to keep highly trained and competent people at all levels of administration. See Recommendation 1.2.

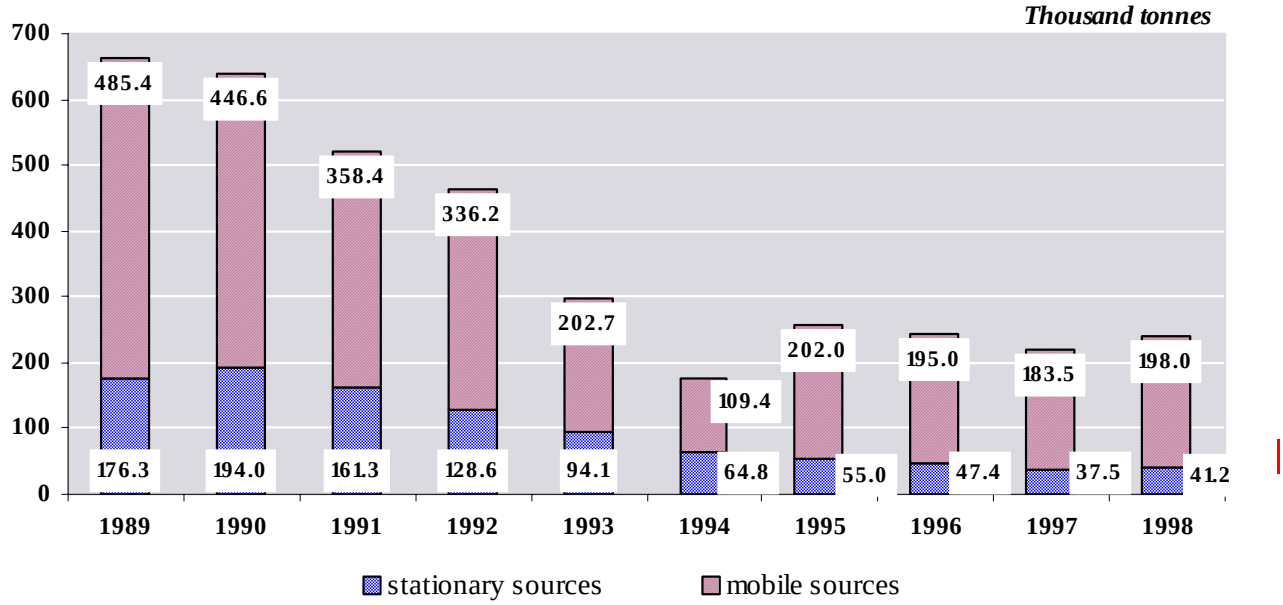
Chapter 7

AIR MANAGEMENT

7.1 Air emissions

Total emissions decreased from 662,000 tonnes in 1989 to 239,000 in 1998 with a record low of 220,000 in 1997 (Figure 7.1). The average emissions per capita were some 51 kg in 1998, all pollutants included. For comparison, the OECD average was 80 kg in 1996 for SO_x and NO_x alone. The share of mobile sources was 73 per cent in 1989 and went up to 83 per cent in 1998. Emissions are calculated with the help of emission factors and models designed in the former Soviet Union, which may no longer adequately represent present conditions.

Figure 7.1: Air emissions, 1989-1998



Source: State of the Environment in 1998 - draft report, Ministry of Environmental Protection, 1999.

Table 7.1: Air emissions from stationary sources in Bishkek, 1991-1998

Thousand tonnes

	1991	1992	1993	1994	1995	1996	1997	1998
Total	161.3	128.6	94.1	64.8	55.0	47.4	37.5	41.2
Bishkek	60.0	47.9	37.3	24.5	20.9	17.0	13.0	14.3
Bishkek *as % of total*	*37.2*	*37.2*	*39.6*	*37.8*	*38.0*	*35.9*	*34.7*	*34.7*

Source: National Statistics Committee.

Table 7.2: Air emissions from stationary sources by pollutant, 1989-1998

Thousand tonnes

	1991	1992	1993	1994	1995	1996	1997	1998	1998/1991 %
Total	**161.3**	**128.5**	**94.1**	**64.8**	**55.0**	**47.4**	**37.6**	**41.2**	**25.5**
Dust	53.7	48.6	38.0	27.9	25.1	21.6	17.0	18.8	35.0
SO_2	52.1	40.8	31.6	21.0	15.7	14.0	9.9	10.8	20.7
NO_x	20.0	8.9	6.5	3.3	3.4	3.5	3.5	3.4	17.0
CO	26.2	21.3	13.2	9.5	7.5	5.5	4.6	5.0	19.1
HC	8.0	6.9	4.0	2.5	2.8	2.4	2.4	2.7	33.8
Others	1.3	2.0	0.8	0.6	0.5	0.4	0.2	0.5	38.5

Source: State of the Environment in 1998 - draft report, Ministry of Environmental Protection, 1999.

Stationary sources

Many of the major industrial sources of air pollution have closed down for economic and technological reasons. This has drastically cut air emissions, from a maximum of 194,000 tonnes in 1990 to 41,200 tonnes in 1997, with a minimum of 37,500 in 1995. Emissions have decreased in all *oblasts*. The values for Bishkek, accounting for around 35 per cent of total emissions from stationary sources, show a similar trend (Table 7.1).

This substantial decrease is observed for all pollutants, but with some variation in intensity. Reduction factors between 1991 and 1998 range from 2.9 for dust to 5.9 for NO_x, with an average of 3.9 for total emissions (Table 7.2).

Mobile sources

Emissions from mobile sources peaked in 1989 with 485,000 tonnes and reached a record low in 1994 with 109,000 (Figure 7.1). Since then, the values have ranged from 183,000 to 202,000 tonnes, without showing a significant trend.

7.2 Air quality

Monitoring network and stations

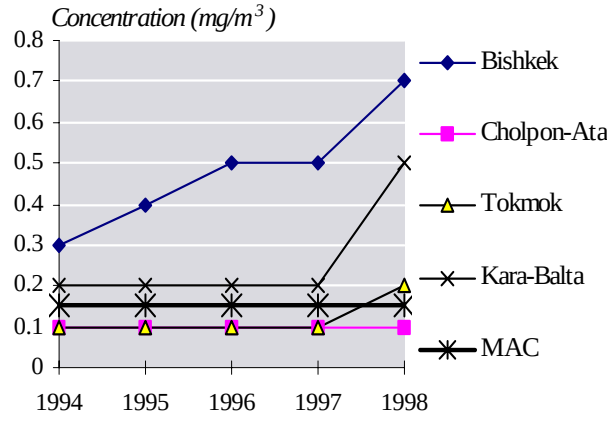
Air quality monitoring is the responsibility of Hydromet of the Ministry of Environmental Protection. The national network has 16 monitoring stations: seven are located in Bishkek, two in each of the towns of Tokmok, Kara-Balta and Cholpon-Ata and three in Osh. Pollutants are measured three times a day (at 6 a.m., 12 noon and 6 p.m.) with a sampling time of 20 minutes. Daily average concentrations are computed from these three measurements.

Measurements are done manually in regional laboratories according to methods used in the former Soviet Union. Dust (by gravimetry), SO_2, CO and NO_2 are measured at all stations. Additional pollutants (NO, NH_3 and formaldehyde) are measured at some stations. Benzo(a)pyrene (BaP) is monitored in three stations by the Ministry of Health. VOCs and ozone are not measured. Rainfall acidity was measured in the past.

The main criterion followed in locating the stations was to cover the maximum population, considering that each station is representative within a radius of 5 km. The type of zone is also taken into consideration but in a very basic way; for example, in Bishkek, two stations are traffic-oriented, one is located in a residential area, three in industrial zones and the last one near the power station.

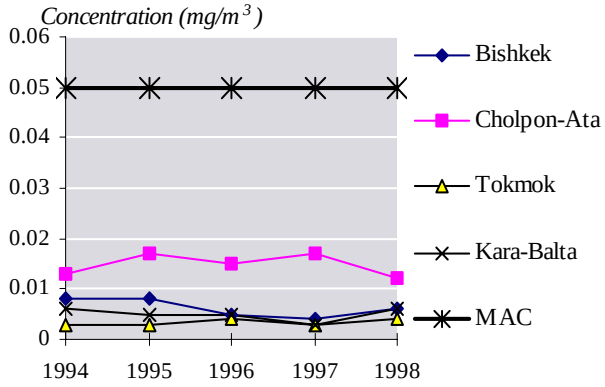
Monitoring results

Figure 7.2: Annual average concentration of dust in selected cities, 1994-1998



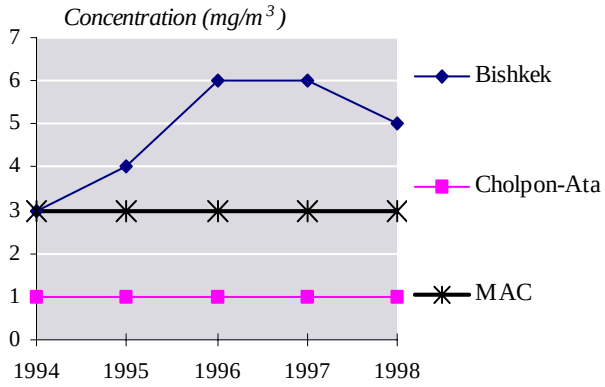
Source: State of the Environment in 1998 - draft report, Ministry of Environmental Protection, 1999.

Figure 7.3: Annual average concentration of SO_2 in selected cities, 1994-1998



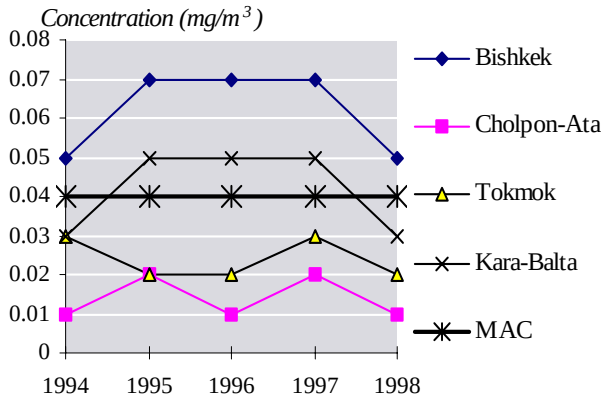
Source: State of the Environment in 1998 - draft report, Ministry of Environmental Protection, 1999.

Figure 7.4: Annual average concentration of CO in selected cities, 1994-1998



Source: State of the Environment in 1998 - draft report, Ministry of Environmental Protection, 1999.

Figure 7.5: Annual average concentration of NO_2 in selected cities, 1994-1998



Source: State of the Environment in 1998 - draft report, Ministry of Environmental Protection, 1999.

Figures 7.2 to 7.5 present the annual mean concentrations of dust, SO_2, CO, NO_2 for Bishkek, Cholpon-Ata, Tokmok and Kara-Balta from 1994 to 1998. The validity and reliability of these values are, however, doubtful not only because the representativeness of the stations is uncertain but also because they are computed from very few observations (for example, the average value for particles in Cholpon-Ata in 1998 was computed from 232 measurements) and combine data obtained from stations with different environments.

Of the five cities where air quality is monitored, the most polluted are Bishkek and Osh. Bishkek's climate, geographical position and meteorological conditions slow the dispersion of atmospheric pollutants. Located in a basin near the head of the Chui valley, it is subjected to local winds (mountain-valley circulation) and atmospheric inversions, accumulating pollutants in the lower layers of the atmosphere.

Table 7.3: Range of annual average concentrations in selected countries, 1998

mg/m³

	Dust	SO_2	NO_2
Kyrgyzstan	<0.1 - 1.1	0.004 - 0.009	0.01 - 0.07
Ukraine	0.15 - 0.35	0.082 -0.092	0.04 - 0.12
Lithuania (1996)	0.10	..	0.02 - 0.03
United Kingdom*	not appl.	0.005 - 0.040	0.013 - 0.082

Sources: - Ambient air pollution in Kyrgyz cities, Hydromet, 1999 - State of the Environment in Ukraine, GRID - State of the Environment - Lithuania - The air quality strategy for England, Scotland, Wales and Northern Ireland, 2000.

Note:

* Excluding rural stations.

In 1998, the annual average concentration for dust was 0.7 mg/m^3 or 4.7 times the MAC (MACs are not really comparable with international standards such as WHO Guidelines, as the averaging times and the statistics are different). The average values for the stations taken individually range from 0.2 to 1.1 mg/m^3 in the centre of Bishkek. SO_2 average concentrations have not exceeded the MAC, individual values ranging from 0.004 to 0.009 mg/m^3 with an overall average of 0.006 mg/m^3. For NO_2, the standard has been slightly exceeded overall at 1.5 times the MAC, individual average concentrations varying from 0.03 to 0.07 mg/m^3. Pollution by CO was a 5 mg/m^3 overall average or 1.7 times the MAC with individual values ranging from 3 to 9 mg/m^3. It is also reported that high levels of BaP exceeding 25 times the MAC have been observed (values not available).

As in past years, the most polluted part of Bishkek is the centre of the city (traffic zone), where exceedances are observed for all pollutants except SO_2. Data for Osh are only partially available, exceedance for NO_2 being observed with up to 0.11 mg/m^3-2.75 times the MAC. Compared with Bishkek and Osh, the pollution levels in the other cities, Kara-Balta, Tokmok and Cholpon-Ata, are mostly low. In Kara-Balta and Tokmok, annual average concentrations of dust have exceeded the MAC with, respectively, 0.5 mg/m^3-3.3 times the MAC-and 0.2 mg/m^3-1.3 times the MAC. For the other pollutants, the annual standards have not been exceeded, except for occasional monthly values.

Trend analysis seems to indicate that concentrations of CO, dust, NO, formaldehyde and BaP have increased between 1994 and 1998, but the uncertainty factors attached to the results appear to be important. Compared with other countries, dust values are very high, NO_2 is in the same range, while SO_2 levels are lower (Table 7.3).

Table 7.4: Energy production and consumption, 1994 and 1998

	1994		1998	
	Production	**Consumption**	**Production**	**Consumption**
Electricity *(GWh)*	13,500	..	11,570 *	9,105 *
Coal *(Thousand tonnes)*	800	1,600	550	1,350
Oil *(Thousand tonnes)*	110	900 - 1 800	78	800
Gas *(Million m^3)*	30	1,300 **	18	1,080

Sources: for 1993, 1994: National action plan - background papers, 1995;
for 1996: Oxford analytica East Europe daily brief, 1999;
for 1998: Institute of Energy.

Notes:
* electricity data for 1996.
** gas consumption data for 1993.

Although ozone is not monitored, all the meteorological and chemical conditions present suggest significant concentrations of this secondary pollutant. Furthermore, leaf damage to crops and skin irritations have been observed in some areas and indicate possible episodes of ozone pollution or high rainfall acidity.

7.3 Sectoral pressures

Energy use

Energy supply is a critical issue in Kyrgyzstan. Although the country has coal, some oil and natural gas reserves and a significant hydropower capacity, it remains dependent on foreign sources of supply, which are costly in terms of hard currency. Increasing prices for fuel could modify consumption patterns resulting in increased air emissions. Table 7.4 presents the national production and consumption of coal, gas, oil and electricity in 1994 and 1998.

Table 7.5: Major power stations, type and capacity, 2000

	Type	**Capacity** *(MW)*
Total		3,460
Bishkek	TPS	600
Osh	TPS	50
Toktogul	HPS	1,200
Uch-Kuugan	HPS	80
Kuep-Sai	HPS	800
At-Bashi	HPS	40
Shamaldy-Say	HPS	240
Tash-Kumyn	HPS	450

Source: Institute of Energy.

Coal production in 1998 represented 41 per cent of needs against 50 per cent in 1994. Residential consumption of coal could decrease in the future, as the use of electricity is promoted by the authorities. However, overall consumption will probably increase for power and heat generation if imports of oil and gas continue to be unreliable. Increased coal consumption for energy production will increase

emission of particles, SO_2 and greenhouse gases, as well as quantities of ashes as compared to using natural gas.

Most of the country's coal is mined in the south, when most of the coal is consumed in the north. Exploitation of a new promising mine of coal has started in Kara-Keche. The sulphur content of this coal is higher than that of the coal imported from Kazakhstan. This implies a need to modify and adapt the power plants burning it. It was also proposed to build a new thermal power station on the mining site, but this project is facing financial difficulties.

National production of gas and oil satisfied respectively 2 per cent and 10 per cent of needs in 1998. Exploration in this sector is low due to a lack of financial resources, equipment and spare parts.

The country is self-sufficient in electricity with production representing 11,570 GWh or 127 per cent of internal consumption, the surplus being exported to neighbouring countries. The capacity and the type of some major electric power generating units are presented in Table 7.5. The transmission network consists of nearly 6,000 km of transmission lines and 64,000 km of distribution lines. Losses in distribution have reached 40 per cent.

Table 7.6: Number of private motor vehicles

Thousand

	Total	Cars	Trucks	Buses	2-wheelers	Other
Republic (1998)	236	179	16	5	25	11
Bishkek (1997)	80	69	7	..	5	..

Sources: Republic: National Statistics Committee;
Bishkek: DEP - Chui oblast.

Although 75 per cent of electricity generation capacity is provided by hydropower stations, it is estimated that only 15 per cent of the hydro sources are harnessed. The authorities intend to increase the exploitation of the hydropower potential with the development of small units.

The Institute of Energy has drawn up a national development programme for the 2000-2005 period. This programme has not been released yet, but it is confirmed that it will emphasize the need for environmental assessment. There is no direct or formalized coordination between the Institute and the Ministry of Environmental Protection.

Transport

Transport infrastructure consists of about 34,000 km of roads and 450 km of railways. In 1998, the total number of private motor vehicles was estimated at 236,000 for the whole country, with around 30 per cent operating in Bishkek (Table 7.6). The bulk of the vehicle fleet of the Ministry of Transport has been privatized (sometimes with shares kept by the Ministry), or transferred to the municipalities. In 1992, this fleet amounted to about 33,000 vehicles (all types, including 7,000 buses), compared to 2,000 in 1999.

The public transport companies are officially under the control of the Ministry of Transport for the coordination and attribution of lines, as well as for organizing purchases.

Although figures provided are not always consistent, the number of motor vehicles is said to have considerably increased over the past years and to be steadily continuing to do so. Traffic density has become very high, generating frequent traffic jams. The situation is worsened by the poor road condition, as well as by the increase in the number of commuters. Fuel quality is an important factor contributing to air emissions, despite existing fuel standards. For example, it is unofficially reported that imported unleaded petrol is leaded within the country.

As can be seen from Table 7.7, motor vehicles are the major means for both freight (65 per cent 1998) and passenger (81 per cent) transport. Rail is second for freight (30 per cent) with one line in the northern part of the country and a second in the south. It is planned to build a new railway linking Osh to Lake Issyk-Kul through Kara-Keche (coal mine). For passengers, the second mode of transport is air transport, with a share of 13 per cent.

Table 7.7: Freight and passenger transport by mode, 1998

	Freight transport	Passenger transport
	10^6 tonne-km	*10^6 passenger-km*
Road	1,015	3,699
Railroad	466	59
Water	6	604
Air	87	216

Source: Kyrgyz Republic - Concise statistical handbook, National Statistics Committee, 09/1999.

Industrial enterprises

Most of the industrial enterprises still active are using out-of-date technologies and processing equipment, which in addition has been or is poorly maintained due to a lack of funds. Air emissions are correspondingly very high, and probably in many cases above the maximum allowable emissions (MAEs). Inspections have shown that up to 65 per cent of environmental protection facilities in enterprises are working unsatisfactorily. Moreover, many enterprises including thermal power stations and combined heat-and-power plants (CHP), and also private dwellers, have reverted to using solid fuels of local origin with low calorific value, high ashes and sulphur content. This shift in fuel use obviously dominates the emissions from stationary sources at present.

In 1995, the CHP plant of Bishkek alone was reported to produce 30-40 per cent of point source pollution in the city. At national level, the energy sector (thermal power plants and CHPs) was responsible for 60 per cent of total air emissions from stationary sources. Mining activities and ore processing are probably other major sources of dust, heavy metal and other emissions, but few data seem to be available on the subject.

7.4 Priorities and instruments for air management

Legal provisions

The improvement of air quality has become a national priority as concern is growing about environmental health in the transition period. National air quality management is mainly based on the Law on the Protection of Ambient Air of June 1999. It derives from the old Soviet law of 1981 and concerns both emission and immission of atmospheric pollutants, but without fixing standards or limit values. In addition to this framework law, national, regional or local authorities may adopt specific measures through decrees or normative texts, such as the decree in Chui prohibiting the use of leaded petrol.

The Law of 1999 prescribes that:

- maximum allowable concentrations (MACs) for the different pollutants in the air have to be respected
- maximum allowable emissions (MAEs) shall be defined for all sources (both mobile and stationary), taking into consideration
- the MAC according to mathematical calculation and models
- their toxicological and environmental effects, and
- the local background.

The Law lays down that an ecological expertise is required before operating a company (see Chapter 1 for a description of EIA and EE procedures). Emission limit values are set on the basis of a simplified model that was also applied in the former Soviet Union within the ecological evaluation procedure. Stationary sources are allowed to emit pollutants only when existing standards are met and the State has issued a permit for operation. In practice, temporary emission limits can also be fixed in addition to the MAEs, corresponding to the real situation of the emitting source. These values can be either lower than the MAEs, when e.g. the level of activity is lower than initially proposed, or higher, for example to give time to install pollution control devices. Licences for operation are then granted to the company. Officially, only very few enterprises take the risk of operating without it, although some companies start operating before getting the permit.

MAEs are also fixed for mobile sources and vehicles, including private cars, taking into consideration their type and age. Vehicle fleets of transport companies are submitted to a licensing procedure. The Ministry of Internal Affairs is in charge of tracking emissions from vehicles and enforcing standards and regulations.

Polluting enterprises must ensure that:

- the required controls are effective
- pollution control devices are kept in good operating order
- emissions are monitored and reported to the competent authorities on a routine basis

- additional steps are taken to further reduce air emissions.

The Law foresees State assistance for the use of cleaner technologies or resource-saving technologies through information campaigns and financial assistance, but so far these measures have remained without any practical effect.

Institutions and monitoring

The most important agencies, institutes or departments interacting in air pollution monitoring and control are:

- the Ministry of Environmental Protection through, among others, its State Committee for Hydrometeorology (Hydromet), which is in charge of measuring the concentration of pollutants in the atmosphere, its Monitoring Department in charge of controlling industrial emissions, and its regional departments for environmental protection
- the Ministry of Internal Affairs in charge of controlling mobile sources of air pollutants
- the Statistics Committee, in charge of collecting and compiling information from the industries in annual reports
- the Institute of Energy
- the Ministry of Transport, and
- the Ministry of Health.

Companies monitor their emissions themselves (see also Chapter 1). According to the law, enterprises are obliged to communicate their emission values every year to the Statistics Committee. However the companies usually have no equipment to monitor their emissions and air-source sampling is almost non-existent. Emission data are in most cases computed using emission factors based on energy and material inputs. Only an approximate indication of emission levels can be expected through this approach.

Reports on air pollution are produced annually by Hydromet and by the Statistics Committee. The national reporting system on emissions from stationary sources covers only those with one or more chimneys.

Environmental inspection

Inspection by the national authorities is limited by resource constraints (see also Chapter 2). For example, there are only 8 inspectors to control 800 point sources in Bishkek, with an average of 40 controls per month. Two types of control are performed. The routine inspection is a visual control of the equipment and the administrative documents, performed by inspectors from the local office of environmental protection. As these offices are not adequately equipped to ensure complete control, the inspectors rely mainly on emission assessments based on production and energy consumption data. In cases of doubt, a 'complex' control is performed, including sampling and measurements, with the help of the laboratories of the Monitoring Department of the Ministry of Environmental Protection or the Ministry of Health.

Emission controls performed between 1991 and 1996 shows that more than 25 per cent of road vehicles exceeded the toxicity and smoke emission standards. The percentage is probably much higher now, being estimated at 40 per cent. This is due to inadequate maintenance as well as to the age of the fleet. It is estimated that 90 per cent of the vehicles are more than 10 years old .

The technical inspection of vehicles is fixed in a normative text. It is performed by private companies authorized by the authorities and under the responsibility of the police. Buses are controlled twice a year, trucks and passenger cars once. Inspection includes CO and smoke (for diesel) measurement. Spot checks are also performed. For example, four inspection posts exist at the entry of the Chui *oblast* for the ecological control of buses and lorries.

7.5 Conclusions and recommendations

Air emissions have significantly decreased since the beginning of the nineties. This phenomenon is primarily due to the economic and financial context that has caused a sharp reduction in industrial activities. Air pollution continues, however, to be a major concern in the cities of Bishkek and Osh, which account for about 25 per cent of the national population. This situation could worsen, once the economy and industry recover from the financial

crisis-unless an appropriate strategy is defined and implemented.

The 1999 Law on the Protection of Ambient Air provides guidance on the principles and goals of air quality management. The Law is based on the 1981 Law on Clean Air. It is not fully adapted to the requirements specific to privatization and a market economy in terms of both substance and management procedures. For instance, it does not include economic mechanisms such as a system of environmental taxation or the polluter-pays principle.

Legal foundations seem also to be insufficient or inadequate in specific areas, such as measures against air pollution due to emissions from motor vehicles and fuel quality. Also, procedures and controls applicable to the mining and metallurgical sectors should be clarified and strengthened.

Coordination and communication between the different key institutions in air quality management have to be developed and formalized, and the roles and mandates of the regional authorities and the municipalities need to be clearly spelled out. The possibility of associating the public, NGOs and industry in the development of proposals and decision-making processes should also be investigated.

Recommendation 7.1:
Strengthening the legal foundations of air quality management is of prime importance. Special attention should be paid to all matters of enforcement, including managerial and organizational aspects. In particular, communication and coordination between the key partners in air management should be clarified in the interest of an efficient application of the legal instruments. See also Recommendation 1.1.

Many officers and experts involved in air quality management at different levels of responsibility (monitoring, inspection, etc.) understandably seem to be demoralized. Their main objective appears to be to try to maintain the existing situation. It is clear indeed that additional funds and financial means are unlikely to be allocated to their tasks considering the country's economic difficulties. However, some simple and low-cost measures could sometimes improve the present situation. Alternative ways of air quality management and control could be usefully anticipating the time when the economy will take off again. Preparation for such a situation by investigating the adequacy, feasibility, costs and benefits of modified management practices is advisable. The NEAP would be the adequate place to reflect these requirements.

Recommendation 7.2:
The National Environmental Action Plan should concentrate on the implementation of low-cost management measures in the short term, and the development of new routines for air management in the medium term, when the economy will have recovered.

Air quality standards, and the related emission limits, still derive from standards and methodologies used in the former Soviet Union and are in many cases not really comparable with internationally adopted guidelines and limit values. As these standards are not fixed in the law, they could be swiftly adapted to new requirements. See Recommendation 10.4.

Ambient air quality monitoring is disintegrating. As it stands at present, it could not be integrated in international or regional programmes. The reliability and accuracy of air quality information is questionable in many respects:

- The criteria used to locate the stations are very elementary. They need to be revised and extended in order to ensure an optimal representativeness in terms of, among other things, area and population covered, type of pollution and type of sources, including mines, ore-processing units, dumps of ashes from thermal stations and background, all of which are not, or only partly, covered at present.
- Sampling and measurement techniques as well as calibration procedures should be assessed against the international reference methods. They probably need to be upgraded if they are to provide compatible results.
- The quality assurance/quality control procedures used to validate individual data as well as the criteria for aggregating them and computing statistics should be evaluated.
- The list of pollutants monitored needs to be revised, and ozone as well as heavy metals (mainly from ore processing) should also be measured.
- Recourse to alternate monitoring methods such as mobile stations, optical techniques, diffusion tubes or bio-indicators should be envisaged. The use of mathematical models could also be

considered provided the necessary input data (meteorological, climatological and geomorphological data, emission inventory) are available and reliable. Besides giving indications of pollution levels, such techniques could also help optimize the network of fixed stations.

Recommendation 7.3:
Ambient air quality monitoring needs to be reinforced and upgraded in particular with respect to the representativeness of stations, the coverage of the network, data accuracy and reliability. Alternate methods of air pollution monitoring should be assessed and their use envisaged. See also Recommendation 1.5.

The inspection and control of both stationary and mobile sources obviously suffer from a lack of technical and financial resources as well as from an insufficient number of inspectors. Before taking any practical measures, it would appear necessary to critically review the global functioning of the services involved and the sharing of the responsibilities between them.

Recommendation 7.4:
An internal audit of the services involved in inspection and control should be organized in order to evaluate the exact needs and to design adequate measures. Fuel quality control should also be covered in this audit.

The number of motor vehicles has significantly increased over the past year and will probably continue to do so in the coming years. Road transport remains by far the most important transport mode for both passengers and freight. Traffic density in Bishkek is on the increase, the trend being amplified by the rise in transit traffic and the number of commuters.

Motor vehicles are the main sources of air pollutants. A relative reduction in emissions requires a number of measures at the municipal, regional or national levels, mainly in the areas of spatial planning and the development of new instruments. Possible measures could include:

- control of traffic flows
- maintenance of roads and highways
- promoting public transport and improving its efficiency
- development and use of economic instruments to encourage cleaner fuels and vehicles (petrol pricing, differentiated annual vehicle taxes and import duties), and
- setting stricter vehicle and fuel standards.

Recommendation 7.5:
Traffic reduction should be sought through a better integration of transport policy and traffic management with territorial planning. Economic instruments such as differentiated taxes and duties should be developed.

Most of the industries still active are using out-of-date technologies and processing equipment, which have been and are poorly maintained. Most of the time pollution control devices are absent or ineffective. Furthermore, only very few companies monitor their air emissions. The new Law on the Protection of Ambient Air contains provisions promoting the use of cleaner or resource-saving technologies through State assistance. For the time being, the application of these provisions is unsatisfactory. Measures to introduce cleaner technologies more widely in anticipation of economic recovery could be usefully complemented by increasing the level of pollution fees for enterprises, in order to encourage them to switch to the best available technologies (not entailing excessive cost) at the earliest possible time.

Recommendation 7.6:
The scope of State assistance for the introduction of cleaner technologies should be extended to ambient air quality and air emissions monitoring. Special attention should be given to thermal power units firing coal in the introduction of cleaner technologies. See also Recommendation 2.4.

Most electricity is produced from hydropower stations, and only two stations are thermal, but CHP plants are also operated (around 110 including some small units in Bishkek). The air emissions from these thermal units are high, mainly because

- they burn low–quality fuel
- they either lack pollution control devices or maintain them poorly.

The present policy is to harness hydropower capacity by installing primarily small production units. The country seems also endowed with

renewable energy resources such as solar, wind and geo-thermal power.

Recommendation 7.7:
The present hydropower policy should be continued. Power generation alternatives such as wind, solar and geothermal energy should be investigated and their viability assessed on both local and larger scales. Population exposure to air emissions from stationary sources – like power stations - should be reduced in particular in Bishkek and other large human settlements.

Chapter 8

BIODIVERSITY AND FOREST MANAGEMENT

8.1 Current state of nature

Habitats

Kyrgyzstan contains a great variety of natural zones, particularly within the alpine habitats. 94 per cent of Kyrgyzstan is mountainous and 40 per cent of the area is over 3,000 m high. The central Tien Shan (meaning "Heavenly Blue" in Chinese) in the east is the highest part: it is an immense knot of ranges, with dozens of summits over 5,000 m, culminating in Pik Pobedy on the Kyrgyz-Chinese border (7,439 m). Alpine meadows and alpine tundra represent the main vegetation zones of the region (Table 8.1).

Due to its high elevation, only 7 per cent of the total land area is suitable for agricultural crops and many parts need irrigation and/or drainage. Agriculture is concentrated on the low areas, of which the Issyk-Kul is the most notable. The valley runs for 250 km from east to west, is almost 100 km wide, bordered on both the north and the south by mountains towering over 5,000 m. The Fergana valley in the south constitutes the boundary between the Tien Shan and the Pamir mountain ranges and is an agricultural and cotton-growing centre. Finally, the Chuy valley is located in the capital region of Bishkek.

In the hilly areas between the alpine and lowland regions, deserts, semi-savannahs and savannahs represent the main vegetation zones. Until recently, about 45 per cent of the land area was used for extensive sheep and cattle raising. Hilly areas are used as summer pastures by the semi-nomadic herders, stock being moved into higher alpine pastures from around June to September.

Currently forests cover only 4.2 per cent of Kyrgyzstan, making it a forest-deficient country. Most forests are at high altitudes between 1,300 and 2,800 m, and their appearance is determined by the amount of precipitation. Juniperus forests (Artcha) grow up to 3,200 m in extremely dry conditions. Characteristic trees of the northern Kyrgyzstan forests are fir, poplar and willow. In the southern part, where the climate is drier and protected from northern winds, mixed forests prevail with walnut, maple, apple, cherry plum, crataegus and almond trees.

Table 8.1: Selected ecosystems of Kyrgyzstan

Ecosystem	Share of the territory %
Cryophilic meadows	14
Cryophilic steppes	11
Mid-mountain steppes	9
Glacier and subglaciers	6
Cultivated land	6
Lakes and wetlands	4
Foothill deserts	4
Mid-mountain meadows	4
Savannah	3
Others	39

Source: Fact Finding and Project Identification Mission Forestry Sector of Kyrgyzstan, April, 15th, to May, 8th, 1994.

Of the five Central Asian republics, Kyrgyzstan is the richest in water, with its numerous lakes, rivers and streams. Lake Issuk-Kul – the world's second-largest alpine lake, at an altitude of 1,600 m-is basically a huge dent filled with water in the Alatau ranges that form the northern arm of the Tien Shan. The name means „warm lake". A combination of great depth, thermal activity and mild salinity means that the lake never freezes. Its moderating effect on climate, plus abundant rainfall, have made it something of an oasis throughout the centuries. The longest river is the Chuy, which crosses 1,030 km, beginning at the glaciers of the inner Tien Shan mountains, and flowing into the Chuy valley in the north.

Species diversity

Despite its relatively small land area, Kyrgyzstan is wealthy in terms of highland plant and animal species that are representative of Himalayan biotypes. Mountain wildlife includes the snow leopard, the Manul cat, the Turkestan lynx, the badger, the weasel and the otter, the Tien Shan brown bear, the ibex and other mountain goats, the Marco Polo sheep, the wild boar and the Menzibeiri marmot. Raptors from the sparrow hawk to the vultures and the golden eagle, as well as wild geese, ducks, egrets and other waders, pheasants, partridges and wild turkeys have their habitats in Kyrgyzstan. The name of the Karkara valley east of Lake Issuk-Kul means "Black Crane", for the graceful migratory birds that stop here and at Chatyr-Köl near the Torugart pass. Many subspecies of fish, reptiles, birds and mammals are endemic in Kyrgyzstan. Little is known about the state of invertebrates, they are not included in the Central Asian red-listing process, and there is little awareness of the ecological functions of invertebrates in maintaining natural processes.

Box 8.1: Kyrgyz biodiversity in a nutshell

Despite its size, Kyrgyzstan is highly rich in species, hosting nearly 1 per cent of all known species on just 0.13 per cent of the world's land mass. Recently, a decline in the population of many species has become evident, and 9.5 per cent of bird species and 18.1 per cent of mammal species are currently considered to be at risk of extinction. A number of rare and valuable ecosystems have nearly disappeared, and forest cover has more than halved in the past 50 years.

Source: Fact Finding and Project Identification Mission Forestry Sector of Kyrgyzstan, April, 15th, to May, 8th, 1994.

Central Asia is a global biodiversity hotspot (i.e. an area with a high density of particularly endemic species) for certain groups of nuts and fruits, and high-quality timber species. Walnut forests growing on the northern slopes of west Tien Shan are unique and extremely rich in biodiversity. They are considered to be the source of domestic nut and fruit trees all over the world. Spruce forests, also containing the famous and unique blue Tien Shan spruce, grow mainly in the north of Kyrgyzstan, near Lake Issyk-Kul and in the *oblast* of Naryn. Juniper forms slow-growing forests, the so-called Artcha forests, in the highlands of the south-west. There are also riverside forests, relict fir forests, including the unique Semenov fir, and plantations in all ecological regions. The largest forest is Arslanbob, measuring over 600,000 ha (its name means "king of forests" in Kyrgyz). Up to 1,500 tonnes of walnuts are harvested each year in the Arslanbob valley, in addition to 500 tonnes of pistachios, apples, cherries and plums.

Development of forest

Forest cover has halved during the past 50 years. The main felling periods were in the years between 1930 and 1950. Protection and afforestation only started after the creation of the State forestry enterprises, responsible for forest management, protection and development (leskhozes) in 1947. Between the 50s and 90s, overgrazing added to the slow disappearance of forests (Table 8.2). Since 1982, all fellings in natural forests have been banned, except 'sanitary' cuttings. There have been no fellings at all in mountain forest since then, resulting in the decreased protective function of these forests.

High energy prices, together with spreading poverty, have made illegal cutting a danger for forests in more recent times. It is estimated that a family in rural areas needs 3-4 m^3 of wood per year for heating and cooking. Due to the economic crisis, the rural population today cannot afford any other fuel. The results are highly visible in many Kyrgyz regions: alleys, parks and forests close to settlements are heavily cleared, and only the stumps are left of many trees. After dusk, numerous donkey and horse yokes drag home the daily wood supply.

The very high number of grazing livestock added pressure on forests, hindering afforestation efforts or natural regrowth, particularly during the times of the former Soviet Union. Since then, the previous large-scale transport of livestock to mountainous areas for grazing purposes has been progressively reduced, partly as energy costs rose and such transport could no longer be afforded. Today, a sharp decrease in livestock numbers-the number of sheep has been reduced from about 13 million to about 3 million in the past few years – and an increase in areas covered with forest can be observed in mountainous regions, but pressure on forests close to settlements has even increased.

As forest cover has disappeared from many mountain areas, floods and mudslides have become common phenomena, killing dozens of people every year and further accelerating erosion. Decreasing the forest area has also harmed

Kyrgyzstan's extraordinarily rich ecosystem diversity. Because of the lack of scientific preparation and financial possibilities, there is almost no prevention of deforestation so far.

Non-wood products, like nuts, fruits and others, play an important income-generating role in the nut and fruit tree zone. The harvest depends heavily on the prevailing climate. For example, a late frost in May 1999 destroyed almost all nut and fruit blossom in higher altitudes, and nuts and fruits could be harvested only at lower altitudes. Medicinal plants and burls are also collected in the Kyrgyz forests. There are virtually no reliable indications of collection intensities and, consequently, of their possible pressures on the forests. Ongoing research projects aim at collecting these data, e. g. within the Kyrgyz-Swiss Forestry Sector Support Programme (KIRFOR).

The leskhozes have suffered from drastic national budget cuts. Financial support by the State Agency for Forestry (Gostleagenstsvo) decreases every year, forcing the leskhozes to generate income for themselves and for their members – a situation that is most probably further increasing pressure on the forests. As the trade in burls is rather lucrative (the Ortok leskhoz of about 1,000 members earned US$ 10,000 in 1999 selling burls, and had earned even more in earlier years), corresponding pressure on the walnut forest has to be supposed.

Table 8.2: Development of forest area by type, 1930 and 1978

Forest type	1930	1978	Change
	Thousand ha		*%*
Total	**1,396**	**624**	**-55**
Coniferous	219	89	-59
Artcha	536	213	-60
Walnut	45	28	-38
Other deciduous	219	89	-59
Bush	377	205	-46

Source: Ueli Müller, KIRFOR Programme leader, Bishkek, Kyrgyzstan.

Development of aquatic habitats

New fish species have been introduced in almost all Kyrgyz lakes (Table 8.3). They have thoroughly changed or even destroyed the natural lake biodiversities. Predatory fish-such as trout from Lake Sevan in Armenia introduced into Lake Issyk-Kul decades ago-have thrived in the absence of natural predators in their new habitat, now endangering the Lake's endemic fish species. Moreover, Lake Issyk-Kul is at present probably overfished, possibly causing unknown further impacts on its ecological balance.

The Nizhnenarynskiy kaskad is a series of five dams down the lower gorge of the Naryn river. This cascade, topmost in the series, was completed in 1976 after 14 years of work. More and bigger ones are under construction or in planning. The gorge of the lower Naryn river is surely one of Central Asia's most impressive passages, with sheer walls and towering pillars of red sandstone, and a little road clinging to the side. Looking down there is no longer a river, but a series of narrow, still lakes behind the dams of the Nizhnenarynskiy kaskad. The country has a considerable hydroelectric potential, making it a net exporter of peak electrical energy, and posing at the same time a potential threat to aquatic habitats and biodiversity.

Table 8.3: Origin of fish species

	Number	
Native species	14	
Endemic species	12	86 % of natives
Artificially introduced species	12	46 % of all fish species

Source: Fact Finding and Project Identification Mission Forestry Sector of Kyrgyzstan, April, 15th, to May, 8th, 1994.

Pressures due to agriculture

45 per cent of Kyrgyzstan's land is pasture. Overgrazing by cattle and sheep in Soviet times – they were herded during the summer all over the Kyrgyz mountains and transported even to the most distant valleys-has resulted in a fall of pasture productivity in the past 25 to 30 years by a factor of 4. Weeds and poisonous vegetation are overgrowing, and different kinds of erosion are taking place. Since the 1970s, the area of wild pasturage has declined by 20 to 30 per cent, as wild grasses lose out to flora of poorer quality when domestic herds migrate to higher elevations. Due to a sharp decrease in livestock, a natural restoration of remote pastures is beginning to take place, whereas grazing close to settlements might even have increased, as fuel for transport is not easily

affordable any longer. Practically all vegetation communities have changed due to long-term overgrazing and overherding.

Hunting and poaching

Since Kyrgyzstan opened its borders to international visitors and trade, poaching has seriously increased. Reports on poaching are numerous. They mention illegal shooting of deer (maral), and the illegal shooting of two bears by villagers from the north of Jalal-Abad. The population of snow leopard has shrunk, in the past few years, from a few thousand to only a few hundred, paralleled by a flourishing trade in furs and bones for medicinal use, as well as in livids to international zoos. With western hunters paying several thousand dollars for a Marco Polo sheep trophy, and local poachers boosting their income by selling Marco Polo sheep meat, far more Marco Polo sheep are killed every year than hunting licences are issued by the CITES Secretariat. Different species of falcons in the Red Book are endangered by hawking. It would seem that foreign hawkers enter Kyrgyzstan with their old falcons and leave the country with a young Kyrgyz falcon. Not only does this practice reduce the number of rare Kyrgyz falcons, but it also generates risks by the introduction of species not local to Kyrgyzstan.

Table 8.4: Status of species

	Species	Threatened
	Number	*% of number*
Lower plants	3,676	unknown
Higher plants	3,786	2
Annelid worms	1,282	0.5
Molluscs	168	1
Insects	10,290	0.5
Fish	75	8
Amphibians	4	75
Reptiles	33	15
Birds	368	10
Mammals	83	18

Source: Fact Finding and Project Identification Mission Forestry Sector of Kyrgyzstan, April, 15th, to May, 8th, 1994.

As a result of the mentioned pressures, Kyrgyz biodiversity has considerably suffered in the past decades (see Table 8.4). The Kyrgyz Red Book of endangered species, published in 1985, but based on even older data (red lists of plants date back to 1953), includes 71 species of plants, 32 species of birds, 3 species of reptiles, 2 species of fish, 19 species of insects and 13 species of mammals. Since 1985, 10 species of plants, 1 species of fish, 11 species of birds, 4 species of mammals and 13 species of insects have been added to it. Besides snow leopard and Marco Polo sheep, the rare or threatened fauna include the markhor, the ibex, Menzbier's marmot, the bareheaded goose, the lammergeier and the ibisbill. 300 species of wild plants are considered to be rare and in danger of extinction. Of these, 125 are endemic and 200 are important medicinal plants. Even though the Kyrgyz Red Book has not been updated systematically since 1985, it is evidence of the ongoing reduction in biodiversity.

8.2 Policy priorities and management

Objectives, priorities and strategies

Biodiversity and forest protection are mentioned in a number of the Kyrgyz Government's strategy papers:

- The National Environmental Action Plan (NEAP) identified land degradation due to overgrazing, overexploitation of fragile forest resources and the threat of irreversible loss of biodiversity among the five major areas of concern. It recommended "establishing a national biodiversity strategy", "joining the Biodiversity, CITES and Ramsar Conventions", "establishing networks of protected areas", "establishing a reliable monitoring of hunted and endangered species and carefully observing the possible negative trends of international hunting", "cooperative management with local communities and individuals", "public participation" and "public education".
- The "National Programme for Environmental Protection and the Rational Use of Natural Resources in the Kyrgyz Republic until 2005", a follow-up to the NEAP, covers biodiversity and hunting.
- The "Concept of Ecological Security", published in 1998 by the National Centre for Environmental Strategy and Policy mentions "the preservation of biological diversity – the foundation of the biosphere itself, the source of the biological basis of life, and the reservoir of the genetic material for the animal and plant worlds" as "the permanent goal and task of the Government".

- The State Agency for Forestry (Gostleagenstsvo), in line with the environmental and socio-economic objectives of the "Programme for Sustainable Human Development", defined five policy goals in 1999: (1) "to ensure the sustainable management of forests", i.e. to use and protect forests at the same time, (2) "to improve the management of the leskhozes" by increasing their economic independence, (3) "to associate local population and stakeholders with forestry development" e.g. by leasing parts of State forests to local tenants, (4) "to develop the link of private activities with forestry" also to overcome the lack of wood by additional industrial plantings, and (5) "to redefine the role of the State in the forestry sector".
- One of the central objectives of Kyrgyzstan now, besides the protection of the existing forest, is the increase of the forest area. The long-term goal is to reach a forest cover of 8 per cent and to satisfy at least 10 per cent of the national need for wood (especially with poplar plantations).

Protected area and other core legislation

Kyrgyzstan has a Law on Specially Protected Areas (see Figure 8.1). These areas cover only 3.9 per cent of the Republic, which is short of the global average of about 6 per cent and also not considered sufficient by the Kyrgyz National Centre of Environmental Strategy and Policy. To preserve biodiversity, six nature reserves (zapavedniki, under the responsibility of the Ministry of Environmental Protection), 70 nature preserves (zakazniki) and nature memorial parks grouped into forest, botanical, hunting and complex parks, one national park and five nature parks were created. The zakazniki and the national park are under the responsibility of the State Agency for Forestry. The zapavedniki fall in IUCN category I, the national park in IUCN category II, the zakazniki in category III and the nature memorial parks in category IV.

The 32 forest and botanical zakazniki, although perhaps adequately protecting individual plant clusters or localized botanical associations, are in general too small to be of importance for regional ecosystems, and certainly too small to protect many of the more widespread species of the Tien Shan fauna. There is no network of the protected areas that would take migration into consideration. More than half of the 19 vegetation zones of Kyrgyzstan are inadequately or very inadequately represented within the protected areas. Only about 15 of the zakazniki are sufficiently large (greater than 5,000 ha) to be considered as significant multi-habitat nature reserves, assuming that they are still in reasonably pristine condition after years of active use by hunters.

A major contribution of the Law on Environmental Protection has been the assignment of implementation responsibilities to the national government, the provincial government and the specialized environmental protection authorities.

Kyrgyzstan's most recent Red Data Book, published in 1985, is based on even older data, is a part of the national legislation, and a part of national biodiversity policy. Red Data Books also play a role in education and are used in various ways in efforts to increase public awareness. Current practice in establishing or updating the Red Data Book has tended to be based on subjective criteria, relying primarily on the accumulated knowledge of experts.

Based on the "Issyk-Kul Biosphere Reserve" international cooperation project a new Law on Biosphere Territories was adopted in 1999, giving a legal basis to the implementation of sustainable development concepts for a whole region. Former decrees on fauna and flora protection were replaced (Law on Wildlife, adopted in 1999) or are intended to be replaced (Law on the Protection of Flora, in preparation) by laws.

The Kyrgyz Forest Code was updated in 1999, based on KIRFOR, the Swiss bilateral cooperation project. Newly structured, it faces up to the main forestry problems and opens the way to sustainable and decentralized forestry activities. It is planned that the State Agency for Forestry's Kyrgyz Forestry Concept 1999 will shortly be continued in the preparation of a new forestry law and related by-laws.

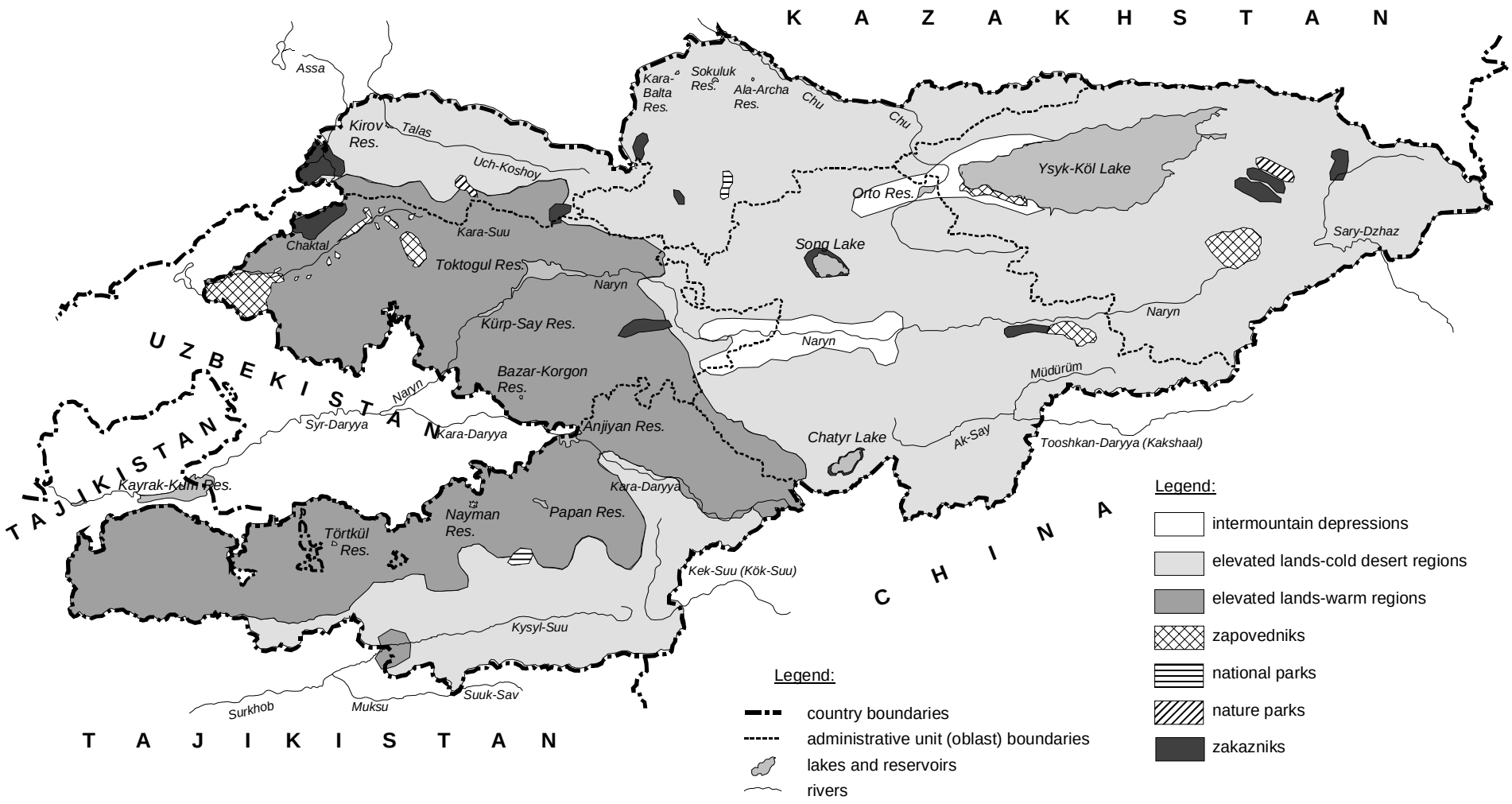
Even though the ongoing international hunting activities in Kyrgyzstan would partly demand a national EIA, so far no existing or newly created hunting reserve has been subject to a national ecological expertise/environmental impact assessment.

Monitoring and inspection

The traditional role of the Ministry of Environmental Protection in the field of

FIGURE 8.1

MAP OF MAJOR ECOSYSTEMS AND PROTECTED AREAS OF KYRGYZSTAN



biodiversity is inspection, monitoring and sanctions for non-compliance with legal instruments. Incentives for biodiversity protection are almost completely lacking.

The Ministry's biodiversity monitoring activities have been drastically reduced in recent years. Inspectors visit habitats only once or twice a year and concentrate on so-called hot spots. This practice does not provide a database sufficient to monitor populations, nor to develop sustainable protection or hunting strategies.

Hunting is allowed in 75 per cent of the country. A number of hunting reserves are co-owned by the Kyrgyz State and the Hunting and Fishing Union of Kyrgyzstan. In addition, private hunting reserves have been established. Population numbers for game species are used to determine annually licensed hunting bags. The population numbers are obtained from the owners of the hunting reserves. None of the databases of the involved parties is reliable, and the Ministry of Environmental Protection bases the hunting authorizations issued (i.e. the number of hunting licences) on the average number of game indicated by hunting reserve owners. This practice does not ensure sustainable hunting management.

Permits, fees, licences and leasing

The only economic instruments applied to protect biodiversity are licences and fees. For hunting, different systems are applied to local hunters and foreign hunters, of whom between 150 and 400 visit Kyrgyzstan each year, mainly in order to shoot Marco Polo sheep and goats.

Local hunters buy a licence costing a few dollars for every wild animal they intend to hunt. Most local hunters hunt without a licence, owing to the breakdown of sheep breeding in rural areas and to ignorance of the legislation. If they are caught, most of them do not have enough money to pay the fine composed of an administrative fine and a so-called damage repair fine ("Iska"). Hunting by local people therefore is dominated by poaching and generates almost no income, apart from the occasional sale of the hunted meat. Marmots, lynxes, snow leopards and bears seem to be poached most often, illegal hunting is estimated to be 10 times greater than legal hunting. 30 per cent of any damage repair fine collected would go to the income of wildlife inspectors. Since few poachers are in a position to pay up, there is little incentive for a wildlife inspector to sanction poaching.

The system works differently for international hunters. For every wild animal, a "trophy charge" of several thousand dollars is due. For instance, the trophy charge for a Marco Polo sheep amounts to US$ 7,000 (October 1999). According to the law, 30 per cent of trophy income goes directly into Kyrgyzstan's State budget, 25 per cent into the *oblast* or *rayon* budget, and 45 per cent stays in the Hunting Department within the State Agency for Forestry. The Hunting Department reinvests 60 to 70 per cent of this amount in the Hunting Reserves (staff accommodation, transport and means of communication), the rest is used for advertisement, participation in international hunting exhibitions and other activities. None of the trophy income seems to go to the Ministry of Environmental Protection, to perform wildlife monitoring, for example.

The State Agency for Forestry is testing leasing as a forest management instrument within the KIRFOR project. Forest areas are leased to local, qualified tenants. To implement the sustainable use principle the permit for use of the forest resources is linked to the obligation to take clearly defined protection and regeneration measures.

Institutional arrangements

The Department of Biodiversity and Protected Areas within the Ministry of Environmental Protection is responsible for biodiversity protection in the Kyrgyz administration. It concentrates its efforts on the administration of the nature reserves (zapavedniki). The environmental protection administrations at the level of the seven *oblasts* represent subdivisions of the Ministry and are at the same time are responsible to the Governor of the *oblast*. The tasks of the Ministry's offices in the field of biodiversity are concentrated on inspection.

The State Agency for Forestry was until recently a part of the Ministry of Environmental Protection. Then it became independent and is headed by a minister. It controls 90 per cent of all woods and about 14 per cent of the country's surface, as are the nature reserves (zakazniki) and the national parks.

The present financial capacity does not allow forestry or biodiversity protection objectives to be achieved. The available funds are not enough to maintain a minimal infrastructure, or even to pay the salaries in the leskhozes. These conditions certainly affect staff morale, even though the staff in the forestry sector is usually highly qualified.

The forest structure is decentralized, and the foresters are aware of the need to protect and improve their forest.

Part of the land is now privatized, 25 per cent belongs to the municipalities (Aiyl Okmotw) and may be privatized later on, 15 per cent including the forest territories belong to the Goslesfund of Gosleagenststvo, and, finally, high mountain pastures and glaciers belong to the Goszemzapaz, a State-owned land fund which can lease land for short periods. The privatization of arable land is currently going on, whereas other land-use categories (land for biodiversity protection, sensitive areas such as forests, river- and lakesides, swamps, etc.) still remain State property. There do not seem to be any strategies for protecting biodiversity in the privatization process, except in the forestry sector.

Research

In general, research is in a very difficult situation in Kyrgyzstan. Many (mainly young) researchers have left the country, salaries are extremely low, and the current tax situation prevents researchers from doing contract work (income tax rate for such contracts is about 90 per cent).

Until 1991, Kyrgyz foresters were trained in universities of other Soviet republics, where the special needs for education and research connected with the Kyrgyz forests were not sufficiently taken into account. Efforts to establish an adequate research base are part of KIRFOR, the Kyrgyz-Swiss Forestry Sector Support Programme, and forest faculties were created in a number of Kyrgyz universities. Besides the lack of finances, forest education suffers from a lack of teachers. Well established contacts between forest education conducted under the Ministry of Education on the one hand and the forest service and the forest research institutes on the other are so far non-existent.

Forestry research is undertaken mainly by the Institute on Forest and Walnut. Another institute related to forest research is the newly created Institute for Biosphere in Osh. Both institutes are under the umbrella of the Academy of Sciences. Their research is mainly biological and ecological, not research into forestry techniques.

The lack of research capacities prevails also in biodiversity protection, especially in applied biodiversity research. Access to international literature and opportunities for exchange are very limited, making it difficult to pursue this complex and developing research subject.

Public participation

The Kyrgyz NGO community is developing and stronger than in most neighbouring countries, but most NGOs concentrate their activities on environmental education. Internationally active NGOs especially engaged in biodiversity protection, for instance in the form of wildlife monitoring and protection such as “Bird Life” do not seem to be active in Kyrgyzstan yet. Relations between NGOs and the Ministry of Environmental Protection are poor in the field of biodiversity protection, and the NGOs’ influence is rather weak. NGOs do not feel that their opinions have been systematically elicited nor taken into account in either the biodiversity or the forestry protection decisions of the Ministry in recent times.

Selected international cooperation projects

International cooperation in the context of international conventions is covered in detail in Chapter 4, where also major projects in this area are reported. The projects included below deal with both biodiversity protection and economic development.

In 2000 the Issyk-Kul area was registered as a biosphere reserve. In a project financed by the German Agency for Technical Cooperation from 1997 until 1999 (US$ 830,000), guidelines for environmentally sound development planning in the Issyk-Kul area have been published. Sustainable concepts of protection, use and development are being introduced. The reserve, covering 25 per cent of the country, represents the second biggest biosphere reserve of the world after its registration by UNESCO (in the Man & Biosphere programme).

The Kyrgyz-Swiss Forestry Sector Support Programme (KIRFOR) (US$ 1 million/year, financed by Switzerland) concentrated in its first phase on the north of the country. Since 1997, it has been extended to the south as well. The Minister for Environmental Protection as well as the Minister of the State Agency for Forestry are represented in the Steering Committee. The programme has three components: national forest development, the conservation of biodiversity in the walnut fruit forests, and the processing of timber products. Its main aims are in capacity building, so that the

different actors in the forest sector can ensure the conservation of forests, the increase of the forest cover and the sustainable use of forest resources. Leasing of parts of State forests to local tenants is being tested (see above), enabling a stronger association of local populations and authorities with forestry development and biodiversity protection.

The UNDP project financed by GEF and carried out by the Ministry of Environmental Protection for the "Conservation of biodiversity of the Southern Kyrgyzstan mountain ecosystems as the basis for sustainable use and an alternative source of income for local communities" contains a few concepts parallel to the KIRFOR programme. See also Chapter 4.

There are also two international projects relevant to biodiversity issues even though biodiversity protection is not their main aim. The Ministry of Environmental Protection does not seem to be involved in either of these projects to any substantial degree. They are:

- The World Bank IFAD Sheep Development Project (see also Table 9.5) in the Ministry of Agriculture and Water Resources aiming mainly at improving breeding methods and market access. Environmentally safe carrying capacities for grazing livestock on different kinds of pastures are also calculated, and models to implement them are being tested.
- The National Irrigation and Drainage Rehabilitation Programme (see also Table 9.5), which is also located in the Ministry of Agriculture and Water Resources and financed by the World Bank. It aims at renovating agricultural irrigation systems. About 75 per cent of Kyrgyzstan's arable land used to be or still is irrigated. The reconstruction of many irrigation systems will not be economical, and so will offer a chance to enrich biodiversity and re-establish swampy habitats.

8.3 Conclusions and recommendations

Kyrgyzstan has succeeded in laying the foundations for modern biodiversity and forest management. Most of the recommendations of the National Environmental Action Plan (NEAP) in biodiversity protection and forest management are still valid, proving the success of the document's approach. Kyrgyzstan has ratified the Convention on Biological Diversity, established a Biodiversity Strategy and Action Plan, and started biodiversity-relevant reforms in the forestry sector. Other NEAP recommendations remain to be implemented. The relevant policy documents stress biodiversity and forest protection, and some, primarily internationally financed, projects are currently under way.

Nevertheless, some reorientation of current biodiversity policy and management would improve the chances of bringing the efforts already undertaken to full fruition. The tendency of the Ministry of Environmental Protection to focus, in the field of biodiversity, on critically endangered species one at a time has to be overcome. While species-specific protection measures are certainly required, biodiversity protection as a whole has to be based on a broad ecosystem approach. The concentration of protection on the limited area of a few zapavedniki is not sufficient for biodiversity nor for forest protection, and has therefore to be complemented with other measures. The principle of sustainability ought to be given greater prominence, as it would permit use of natural resources, and at the same time allow for their regeneration.

Efficient biodiversity and forest protection demand a transsectoral approach. The Department of Biodiversity and Protected Areas within the Ministry of Environmental Protection should lead biodiversity protection, which has to be seen as an effort concerning many parts of the national administration. The Department should therefore be technically and personally strengthened.

Recommendation 8.1:
The existing individual objectives and strategies for biodiversity protection together with protection measures for endangered species should be based on an ecosystem approach and integrated into sectoral policies and plans. The adoption of the existing draft "Strategy and Action Plan on Biodiversity Conservation" should be accelerated.

The legal basis for biodiversity and forest protection is continuously developing, whereas the enforcement of these laws is quite slow. The update of the forest code as well as the draft biosphere law have been drawn up in international cooperation. Current activities in the field prove the country's interest in modernizing its legislation on biodiversity and forest protection. Great efforts will have to be made to enforce all biodiversity and forest protection laws, such as the new Law on Wildlife and the new Forest Code.

The new Law on Biosphere Territories gives a framework for the sustainable development of a region. Decisions on the administration of the Biosphere Reserve should be taken as soon as possible. Kyrgyzstan should strengthen its efforts for bilateral or multilateral financial support to implement further projects within the Issyk-Kul Biosphere Reserve framework, illustrating principles of sustainability. The potential of Kyrgyzstan to create other biosphere reserves does not seem to be exhausted.

The west Tien Shan region, where the Central Asian Transboundary Biodiversity project (see Chapter 4) is implemented, should especially be encouraged to investigate this possibility. Additionally, the establishment of a unit for large protected areas should be considered. It could possibly also be independent from all ministries and directly responsible to the Cabinet for implementing the Law on Biosphere Territories, serve as a national focal point for actual and potential future Biosphere Territories in Kyrgyzstan or transboundary reserves and enforce the concept of sustainable use across all ministries.

Biodiversity conservation is severely constrained by a very small and fragmented network of protected areas. In border areas, biodiversity should be managed in cooperation with the neighbouring countries, as is actually intended by the west Tien Shan GEF project. The Interstate Council of Kyrgyzstan, Kazakhstan and Uzbekistan should quickly fulfil its commitments to start implementing the GEF project.

Area protection will have to face new challenges in relation to land privatization. The Ministry of Environmental Protection should take initiatives that would ensure successful biodiversity protection management as the privatization of arable land is continuing and may be followed by the privatization of other land-use categories. As land once privatized is unlikely to be purchased back by the State for protection purposes, areas that are especially important for biodiversity protection (i.e. forests, wetlands, lake coasts, riversides) should either not be privatized at all, or should be privatized under suitably restrictive conditions. New management practices – such as leasing in forest management – should be evaluated also from the point of view of their benefit to biodiversity and forest protection.

Recommendation 8.2:
The loss of habitats and endangered species in all main vegetation zones of Kyrgyzstan should be halted through the establishment of a long-term master plan for the development of protected territories. The protected areas would need to be enlarged and integrated as core zones in sustainably managed regions. They should also be connected through corridors. Provision should be envisaged for successful protection in connection with land privatization..

Measures to protect biodiversity and the forest also have to be taken outside protected areas. In the past, overgrazing has represented one of the biggest pressures on natural vegetation. Forest and steppe vegetation have been destroyed or strongly modified. Due to a considerable reduction in cattle in recent years, pressure on biodiversity has, at least temporarily, been reduced, and the opportunity should be grasped to avoid a repetition of past problems with overgrazing. In collaboration with the local leskhozes and farmers, grazing cadastres should be prepared and implemented. Certain forest and steppe areas especially vulnerable to grazing damage should be excluded from grazing.

There is hardly any afforestation going on in the regions outside the leskhozes, even though many of them are heavily affected by mudslides. Such activities appear to fall in between the responsibilities of the Ministry of Environmental Protection and the State Agency for Forestry. Thus, initiatives are needed to improve cooperation. It is supposed that about 10 per cent of Kyrgyz territory may be reforested (in areas where forests had grown but were destroyed by agriculture, fires, etc. in recent years) or afforested (in areas where forests may grow, but have not done so in the past several hundred years). The Ministry of Environmental Protection should actively participate in the preparation of the forest plans 2001-2005 and support the biodiversity protection efforts of Goslesagentstvo.

The planting of fast growing forest cultures (as being discussed within the KIRFOR project) could contribute to the energy supply, as could small-scale hydropower stations. The Ministry of Environmental Protection should encourage the State Agency on Energy to draw up a project proposal for sustainable energy supply for funding by international financial institutions.

The National Irrigation and Drainage Rehabilitation Programme offers the prospect of re-establishing swampy and aquatic habitats. The Ministry of Environmental Protection should be involved in its implementation. The construction of fish passages through dams could be another practical measure to protect biodiversity.

Recommendation 8.3:
The Ministry of Environmental Protection should actively coordinate its work with the State Agency for Forestry as well as with the Ministry of Agriculture and Water Resources to draw up regulations for effective use of pasture land. Despite the heavy pressure from grazing animals, more efforts should be made to afforest sensitive areas outside leskhozes. To reduce pressure on Kyrgyz forests and wood stands in general, favourable conditions for the introduction of alternative energy resources should be created.

Environmental protection depends on the results of applied research. The concept of sustainability as well as its practical implementation should systematically be taught in universities and to the public. Poverty represents one of the most important threats to biodiversity and forests. The more pronounced participation of the NGO community and the public at large in environmental decision-making should be seen as a chance to convince large parts of the population of the need for successful biodiversity and forest management.

Public interest in environmental issues, decisions and management can be raised through the dissemination of adequate information. The absence of wildlife monitoring as well as the general lack of reliable environmental data impede environmental management, as can be seen in the issuing of hunting licences to national and international hunters, possibly leading to unsustainable hunting quotas. The development of sustainable hunting concepts and the calculation of sustainable hunting quotas presuppose a greatly improved monitoring of wildlife and the identification of all endangered species. Monitoring requires funds. The addition of a monitoring tax to trophy licences might be a way of financing such badly needed monitoring, if the revenues from such a tax could be effectively earmarked. Monitoring would have to be applied across all game habitats. Until reliable monitoring data on game exist, no additional hunting or trophy licences should be sold and no additional hunting reserves created.

The absence of reliable data also hinders research, policy monitoring and public participation. Information on the status of species is in a special condition. The Kyrgyz Red Data Book for fauna was published in 1985 and has not been systematically updated, although habitats and pressures on fauna and flora have changed drastically. Red listing of plants dates back to 1953. All species included in the Red Data Books are protected by law, so providing an outdated basis for the protection of endangered species and for international cooperation. The updating of Red Data Books is therefore required. As the existing books are fairly old, updating them will be time-consuming and expensive and will therefore demand international financial and technical support.

Recommendation 8.4:
The Ministry of Environmental Protection should actively support the development of applied research in the field of biodiversity and forest protection and the sustainable use and management of nature. The participation of the local population and non-governmental organizations in planning and implementing protection measures ought to be improved. The Red Data Books should be updated according to internationally accepted criteria. Funds for a biodiversity inventory and biodiversity monitoring could perhaps be obtained from the income from trophy licences, hunting licences and poaching fines.

The provisions for trade in endangered species are particularly important. Kyrgyzstan hosts 63 CITES-annex species (including 8 Annex I species: the hunting leopard, the tiger, the snow leopard, the otter, the red bear, the peregrine falcon, the houbara bustard and the varanus griseus lizard), some of them being very vulnerable to poaching and illegal trade. It also harbours a number of very important habitats for migratory species, particularly wetlands. Direct membership in the CITES Convention is likely to increase transparency in an internationally sensitive area such as the hunting of big game. Only as a full member can Kyrgyzstan join the Conference of the Parties and take part in CITES training programmes, supporting capacity building in Kyrgyzstan in species protection. CITES membership fees could possibly be sponsored, at least during an initial period, perhaps through an international cooperation project in biodiversity protection.

Ratifying the *Washington Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)* is one of Kyrgyzstan's priorities (for details see Chapter 4). While considerable interests appear to be vested in trade in certain species and their derivatives, most export and transit operations are carried out under an agreement with the Russian Federation, providing licensing services. The matter is economically sensitive, but the country would certainly gain substantially from rendering the related activities more transparent.

The creation of a special unit to combat poaching of the endangered snow leopard appears to have been successful (for details see Chapter 4). It therefore constitutes an example that might be followed. The Ministry of Environmental Protection should strengthen its cooperation with the Ministry for Internal Affairs, accelerate the acceptance of the NABU-financed unit at *oblast* level, and search for further bilateral or international funds to create additional anti-poaching units.

Recommendation 8.5:
Kyrgyzstan should sign and ratify the Convention on International Trade in Endangered Species (CITES). Experience gained with the special protection unit for the control of poaching of the snow leopard should be evaluated with a view to its extension.

PART III: SECTORAL INTEGRATION

Chapter 9

SOIL CONSERVATION AND ENVIRONMENTAL CONCERNS IN AGRICULTURE

9.1 Natural conditions and agricultural activities

Climate

The climate in Kyrgyzstan is continental, with hot summers and cold, snowy winters. The frost-free period per year is 185 days in the Chui valley and 240 days in the Fergana valley. Average temperatures in the valleys vary from -18^{0}C in January to +28^{0}C in July. Extreme temperatures range between -54^{0}C in winter and +43^{0}C in summer.

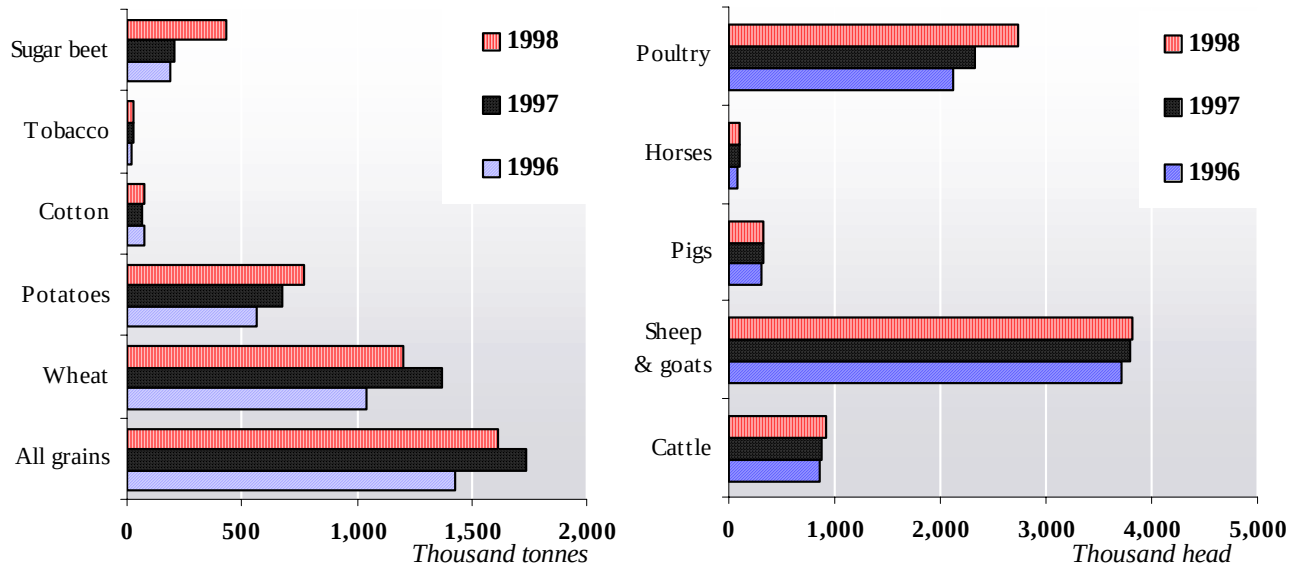
The average precipitation is estimated at 533 mm (from 150 mm in the plains to over 1,000 mm in the mountains). Climate conditions limit double cropping therefore to vegetables, and irrigation agriculture is very limited. Snowfall constitutes an important part of total precipitation. About 10 per cent of the territory is classified as arid.

General information on agriculture

Kyrgyzstan is a landlocked, mountainous country with a total area of 19,994,000 ha, with the Tien Shan mountains in the west and the Pamir-Alay in the south-west. The country is divided into six administrative and agricultural regions (*oblasts*). *Oblasts* are divided into *rayons* and *rayons* into *aijil-okmotus*. The main agricultural regions are Osh and Djalal-Abad in the Fergana valley, the Chui and Talas valleys, and the Issyk-Kul hollow. The share of agriculture in total GDP normally amounted to around 50 per cent. Employment in agriculture accounted for nearly 50 per cent of the total population.

Livestock breeding (sheep, horses, cattle) generates 60 per cent of gross agricultural income (GAI), and crop production (grains, cotton, tobacco, fruits, sugar beet) 40 per cent. The recent development of livestock numbers and of harvests of main crops is shown in Figure 9.1.

Figure 9.1: Livestock numbers and harvests of main crops, 1996-1998



Source: Ministry of Agriculture and Water Resources, 1999.

In 1998 agricultural production grew by 4.1 per cent, while overall GDP only rose by about 1.8 per cent, and agriculture is considered the basis of the country's economy. The Agricultural Reform Programme for 1999 adopted by the Government aimed at achieving 10 per cent growth in agricultural production in 1999.

Regional agricultural activities

The Chui *oblast*. The contribution of agriculture to regional GDP was 53.5 per cent in 1995, 51.8 per cent in 1996, and 51.7 per cent in 1997. There are 7 *rayons* and 109 *aijil-okmotus* in the *oblast*. Natural climatic conditions and geographic location, combined with the region's proximity to large markets, are most favourable for agriculture and explain the *oblast*'s leading position among regions in terms of agricultural production. Its natural environment has also been the most detrimentally affected by human activities. The recent decrease in industrial production, however, and the lack of chemicals used for agricultural production, have slightly eased the ecological problems.

The Issyk-Kul *oblast*. The share of agriculture in the *oblast*'s GDP was 41.4 per cent in 1995, 62.1 per cent in 1996, and, in 1997, 46.0 per cent. The Issyk-Kul *oblast* includes 5 *rayons* and 63 *aijil-okmotus*. Climatic conditions are most favourable for agricultural activities in the eastern part. Several successful processing plants are located in this fertile region, where the bulk of the *oblast*'s agricultural output is produced. The western part of the Issyk-Kul basin has less favourable conditions for agriculture and, thus, a higher share of poorer districts.

The Naryn *oblast*. Agriculture contributed 73.3 per cent to regional GDP in 1995, 78.3 per cent in 1996, and 76.6 per cent in 1997. The Naryn *oblast* is composed of 5 *rayons* and 56 *aijil-okmotus*, and is one of the mountainous regions of the country, with 95 per cent of the territory more than 1000 metres above sea level. It is located in the centre of the Tien Shan massif. Climatic conditions are not suitable for crop cultivation. Animal husbandry plays the biggest role in the *oblast*'s agro-business sector. The improvement of living standards in the *oblast* depends to a large degree on reforms in agriculture. One of the most important factors influencing development involves the rational use of pastures, following privatization. The availability of commercial credits and micro credits for farming and other agricultural activities needs to be improved.

The Talas *oblast*. In 1995 the share of agriculture in the *oblast*'s GDP was 71.2 per cent, in 1996; 76.9 per cent, and in 1997; 77.6 per cent. The *oblast* consists of 4 *rayons* and 36 *aijil-okmotus*. The *oblast* is relatively small and covers only 6 per cent of Kyrgyzstan. Economically isolated, the *oblast* has traditionally pursued agrarian activities. Because of favourable natural conditions and highly fertile soil, it is the second *oblast* in per capita agricultural production after Chui Oblast. Agricultural output is primarily produced in small processing enterprises. The main agricultural export markets are the nearby border regions of Kazakhstan, and the Chui *oblast*. From an ecological perspective, the Talas *oblast* is overall in a favourable situation.

The Djalal-Abad *oblast*. The contribution of agriculture to regional GDP was 50.4 per cent in 1995, 44.5 per cent in 1996 and 42.3 per cent in 1997. The oblast consists of 8 *rayons* and 75 *aijil-okmotus*. It belongs to the rich Fergana region, with ancient traditions of efficient agriculture. Insufficient land resources have led to increased poverty among the rural population and migration to Djalal-Abad city and to the Chui *oblast*. The *oblast* faces serious ecological problems with frequent natural disasters (floods and landslides, etc.). There is a growing need to protect large groves of rare alpine forests, which have suffered from over-pasturing by livestock.

The Osh *oblast*. The share of agriculture in the *oblast*'s GDP was 46.6 per cent in 1995, 55.4 per cent in 1996 and 56.3 per cent in 1997. The *oblast* consists of 10 *rayons* and 115 *aijil-okmotus*. The Osh *oblast* is part of the Fergana valley, has good climatic conditions for growing cotton, early fruits and vegetables. There are rural migration problems. The *oblast* is isolated from major export markets due to poorly developed or non-existing transport routes, and its industrial sector is undeveloped.

Land reform and production by farm type

The first stage of agrarian land reform began in 1991, with the adoption of the Land Code, establishing the long-term lease of land for 49 years (later prolonged to 99 years). Land could be leased from collective and State farms, which are State property.

Table 9.1: Number of farms by type, 1992-1999

Number

	Kolkhozes	State enterprises	Agricultural cooperatives	Agricultural associations	Joint-stock companies	Individual farmers
1992	195	323	-	-	-	4,567
1993	179	258	125	45	-	8,695
1994	212	193	160	79	-	18,269
1995	119	128	152	116	72	21,264
1996	37	49	608	227	74	23,180
1997	16	38	631	125	61	31,078
1998	8	35	318	154	41	38,724
1999	4	35	336	261	45	49,277

Source: Data of Ministry of Agriculture, 1992-1999.

The second stage of agrarian land reform began on 30 April 1999, when the new Land Code was enacted. It established the right to private ownership of land. The Law on Cooperation (1999) enables private landowners to associate in cooperative societies. The Law on Agricultural Farms (1999) establishes a legal basis for the creation of country farms, whose development rights are equal to those of other forms of farm management (Table 9.1).

At the beginning of 1999, total farmland covered 10,620,000 ha. The 49,277 private farms covered 974,700 ha. Overall crop areas totalled 1,175,600 ha. In 1998, the share of private farmers in the overall output of grain grew to 53 per cent, from 48 per cent in 1997, of cotton to 64 per cent from 50 per cent, of sugar beet to 53 per cent from 36 per cent. Private farms produced 25.4 per cent of all meat, 25.7 per cent of milk, and 28.6 per cent of wool.

9.2 Environmental concerns with soil and agriculture

Soils and soil degradation

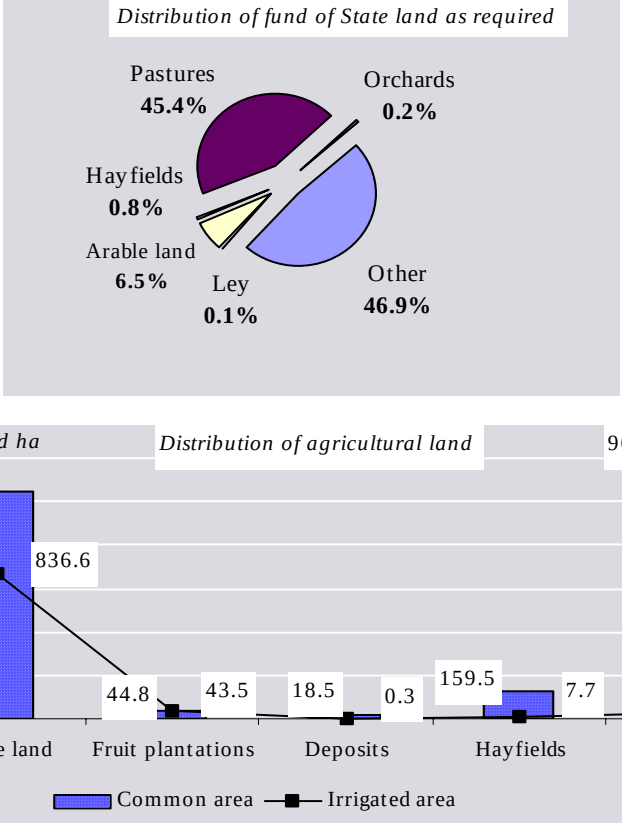
Agricultural land, including all rangeland, is estimated at 10,613,900 ha, i.e. 53.1 per cent of the country. Other land-use categories extend over 9,380,100 ha. Arable land amounts to 1,308,900 ha, and is partly irrigated. Perennial cultures cover 44,800 ha, hayfields 159,500 ha, pastures 9,082,200 ha and leys 18,500 ha. Figure 9.2 shows the distribution of land categories.

The reduction in cultivated land per capita between 1975 and 1995 is the subject of Table 9.2. It is attributed to the following factors:

- soil erosion, which affected 5,599,900 ha of farmland, 968,000 ha of cropland (erosion caused by irrigation affected 74,200 ha), 4,544,800 ha of pastureland, and 87,100 ha of hayfield
- destruction of soil cover, mudslides, landslides, avalanches in mountainous areas caused by deforestation, intensive ploughing, overgrazing, etc.
- the surface of salinized soils increased between 1985 and 1990 from 666,300 ha to 1,170,300 ha
- waterlogged areas increased from 28,900 ha to 89,200 ha
- areas covered by rocky soils grew from 2,397,400 ha to 3,808,800 ha, due to insufficient implementation of agro-technical rules, poor design and construction of irrigation systems, over-watering of irrigated land, irrational irrigation
- loss of humus for loss of topsoil during erosion and a deficit of organic fertilizers. Plants take up 20-45 per cent of humus at the surface. Humus content in the ground does not exceed 2.5 per cent
- overgrowing by weeds, poisonous plants and bushes on 60-90 per cent of meadow and meadow-steppe zones, 14.4 per cent of pastures, and 1.4 per cent of hayfields.

The factors impacting soil cover are not only cattle herding and agricultural production, but also urbanization, construction of roads, of hydro-engineering structures and of (mining) enterprises. Deterioration also results from inadequate irrigation processes. All kinds of soil erosion types (from pasture, wind, water, irrigation, ravine) can be found. As a result of erosion

Figure 9.2: Land distribution



Sources: State of the Environment of Kyrgyzstan, 1998; Document from GRID Arendal, 1998.

Table 9.2: Agricultural land per capita

ha/capita

	1975	1980	1985	1990	1995
Farmland	3.11	2.94	2.60	2.46	2.35
Arable and perennial land	0.41	0.39	0.35	0.32	0.30
of which: Irrigated	0.27	0.26	0.23	0.21	0.19

Source: "Activities of the Ministry of Environmental Protection in 1998", 1999.

processes and humus losses, the productivity of agricultural cultures directly depends on the amount of mineral fertilizers that is applied.

The overgrazing of pastures has resulted in a gradual reduction in their productivity over the past 25-30 years. The average reduction amounts to 75 per cent. There is also overgrowing by weed and poisonous vegetation. Large regional variations exist in the degree of pasture degradation. The recent sharp decrease in the number of livestock has started to bring about some natural restoration of remote pastures.

Irrigation and drainage

About 1.06 million ha of the cultivable area are irrigated. In Table 9.2, irrigated land is less than 10 per cent of farmland. In 1990, there were 1,346 large irrigation systems, installed on 60 per cent of the irrigated area and providing water mainly to kolkhozes or sovkhozes. The distribution network within the kolkhozes and sovkhozes is generally poorly designed and built, with an estimated efficiency of around 55 per cent.

In 1943, an estimated area of 0.43 million ha was irrigated. The main irrigation technique is surface

irrigation. Sprinkler irrigation was used on 141,000 ha in 1990. Since then, sprinkler irrigation has decreased-to only 37,000 ha in 1994. The agrarian reform led to an increase in the number of small farms, a decrease in the size of plots, and a deterioration of water distribution in irrigation systems. Major irrigated crops are fodder crops and cereals, mainly wheat. The yields on irrigated land are generally about two to five times higher than yields on non-irrigated land.

It is estimated that only 149,000 ha are equipped for drainage, while 750,000 ha of irrigated land would need it. Due to the existing financial situation it is unlikely that the drainage systems will soon be effectively improved. So, salinity and drainage problems are likely to worsen in the near future.

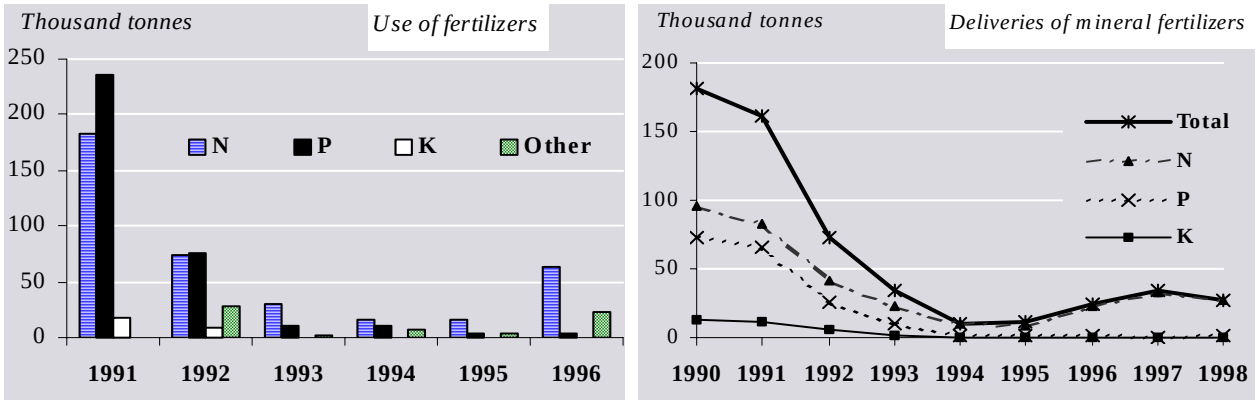
Use of fertilizers and pesticides

The use of chemicals in agricultural production has currently been sharply reduced. On the one hand, this influences the environment positively. On the other, the fertility of the soil cover is so critical that, without the application of mineral and organic fertilizers, even its preservation is impossible. Furthermore, effective and rationally managed agriculture requires the application of plant protection measures.

Figure 9.3 shows the development of fertilizer use during the 1990s. The average use of fertilizers in Kyrgyzstan is currently down to 140 kg/ha. The use of pesticides has declined from 5.2 kg/ha in 1980 to 1.4 kg/ha in 1994, which resulted in a dramatic reduction in yield.

The problems due to the lack of chemicals are less damaging than the inefficiency of watering systems, handling practices, and soil erosion, which contribute to the pollution of water resources through chemicals running off fields. Table 9.3 illustrates the current development of nitrate and nitrite concentrations in two rivers, which seems to

Figure 9.3: Deliveries and use of mineral fertilizers, 1990-1998



Source: Department of Chemicalization of Agriculture and Plant Protection.

Table 9.3: Content of nitrates and nitrites in waters of Chu and Naryn Rivers

mg/l

	1997		1998	
	Average	Maximum	Average	Maximum
Chu River				
Nitrate	1.43-1.96	3.19	1.23-1.91	2.8
Nitrite	0.004	0.009-0.013	0.002-0.0026	0.01
Naryn River				
Nitrate	1.67-1.71	2.55	1.61-1.75	2.47
Nitrite	0.019-0.077	0.148	0.017-0.227	0.71

Source: Hydromet.

indicate a slight improvement in the Chu River, flowing in the most important agricultural *oblast*.

Kyrgyzstan does not produce fertilizers or pesticides. The suppliers of mineral fertilizers are:

- Uzbekistan and the Russian Federation for nitrogenous fertilizers
- Uzbekistan and Kazakhstan for phosphoric fertilizers
- The Russian Federation for potash fertilizers

According to a report prepared by the Department of Sanitary-Epidemiological Control (Gossanepidnadzor) of the Ministry of Health in 1999, there is a decrease in pesticide concentrations in food (0.6 per cent) and environmental objects (0.5 per cent). This is the result of the decrease in the quantities of chemicals applied: 1,017 tonnes in 1997, 888 tonnes in 1998. The average quantity of pesticides per hectare in 1997 and in 1998 amounted to 0.3 kg.

9.3 Policies and management of environmental concerns in agriculture

Policy objectives

The *"State Land Programme" for the period till 2005* includes a description of the existing situation of agriculture, including an analysis of the changes that can be expected from the implementation of the measures foreseen in the Programme. The Programme envisages:

- Water management measures at a level of 229.97 million soms
- Measures against salinization and salinity, for protection against erosion, for an increased use of organic fertilizers, and for the recultivation of soils are planned at a level of 636.468 million soms
- Land consolidation activities (including the preparation of a land registry, the land reform of State forests, the monitoring of pastures and soils, the completion of the land cadastre and State registration of land use, etc.) would cost 295.084 million soms
- The Irrigation Rehabilitation Project (with World Bank credit) requires 456 million soms
- The repair of sprinkling and drainage systems is planned to the tune of 330 million soms

The *Concept of Ecological Security* identifies factors leading to soil degradation as one of the vital aspects of ecological safety.

According to official data, agricultural production started to increase in the years 1996-1998. The *"Integrated principles of development of Kyrgyzstan's agriculture in the period 2000-2010"* were prepared by the Ministry of Agriculture and Water Resources for the purpose of ensuring and maintaining the country's food security. The programme plans to increase crop productivity from 46.3 per cent in 1998 to 55.8 per cent in 2010. The annual growth of Gross Agricultural Product is intended to increase from 4 per cent to 22.4 per cent.

The main objectives of the programme are:

- To increase the cultivation and processing of sugar beet (to 22,000 ha), corn (to 55,000 ha), cotton (to 34,000 ha), fodder crops (lucerne, esparcet, root crops, roughage, etc., to 370,000 ha in comparison with 286,000 ha in 1997), tobacco (remaining at the existing level, but speeding up construction of new tobacco factories), pistachio, almond and other arid crops on non-irrigated soils for commercial requirements, and from a point of view of rational soil management,
- To supply farmers with high-quality seeds, fertilizers and other agrochemicals, fuel and lubricating materials, and with agricultural machinery services
- To increase meat production by improving cattle and poultry selection by farmers
- To create efficient marketing and auctioning systems, as applicable
- To establish rural credit associations and a legal basis for corporate management by agricultural enterprises.

In addition, by 2010 the programme wants to

- reduce the area of grain cultivation from 668,000 ha to 620,000 ha (down to 500,000 ha thereafter), in order to promote the rational management of soils
- establish a biotechnological centre for the cultivation of virus-resistant potatoes
- achieve a balanced number of livestock by fully using the potential of the "Sheep Development Project" for recovering sheep numbers (in its

framework, 200 store rams and 400 Australian sheep were already purchased)
- create associations of cattle farmers, sheep farmers and private cooperative farms with the purpose of achieving greater efficiency in animal industries
- issue soft loans and allocate more land to farmers for cattle breeding
- create a centre for horse breeding
- promote joint ventures with foreign investors.

In general, the programme envisions a common agricultural market with the countries of Central Asia, with the Russian Federation and with Belarus. The aims of land reform and agrarian reform are to create favourable conditions for the further creation and development of private farms and the stimulation of new forms of cooperation on a voluntary basis.

Agricultural policy stipulates that in the long term, along with an increased application of biological methods of pest and plant disease control and organic soil nutrition, the use of chemical means is necessary. Government decree No. 345 of 10 June 1997 on urgent measures to preserve soil fertility thus recommended increasing the use of organic and mineral fertilizers from 810,000 tonnes in 1997 to 1,530,000 tonnes in 2000.

One part of the NEHAP refers to the impact of agriculture on the environment. The objectives of NEHAP in this part were:

- to study the professional level of people employed in agriculture, veterinary and human health services and in their cooperation
- to study protection issues for farmers and consumers
- to study the consequences of the use of pesticides and fertilizers on surface and groundwater
- to study possibilities for reusing livestock manure in order to prevent general contamination of groundwater, especially by nitrate
- to evaluate irrigation aspects from the point of view of minimizing negative impacts on the soil (salinization, etc.)

NEHAP concludes that, under the conditions of privatization and development of a market economy, it is not sufficient to control and test the quality of imported pesticides and fertilizers in order to prevent environmental and health damage from their application. Training of farmers is also required, as the majority is not trained in the effective and safe use of agrochemicals.

A report prepared by the Department of Sanitary-Epidemiological Control (Gossanepidnadzor) of the Ministry of Health in 1999 made a number of recommendations on the risks of pesticide contamination, including strengthening monitoring by Gossanepidnadzor, the control of pesticides and pesticide applications and general environmental conditions.

Institutional responsibilities in land management

Several institutions are responsible for different aspects of land and soils management. The *State Agency on Registration of the Rights on Real Estate* (up to 22 February 1999 State Agency on Land Consolidation, Geodesy and Cartography) has the following tasks:

- Supervising a uniform State register, covering rights on land and real estate, land cadastre, soil characteristics, agrochemical applications and other issues related to land and soil.
- Managing the cadastre, developing all regulations pertaining to land management, the land market, and the monitoring of soils, and supervising the enforcement of land legislation and land use
- Participating in the implementation of the land reform
- Implementing research, cartography, and a geo-referenced information system on soils
- Participating in the development of measures to improve and protect soils, as well as in actual protection measures and remediation measures for damaged land

In the absence of an entity responsible for soil conservation in the *Ministry of Environmental Protection*, the *Main Ecological Inspectorate* controls the respect of environmental requirements and norms as specified at the time of the distribution of land. It aims at preventing soil contamination, the illegal cutting of wood and generally contributes to the enforcement of land legislation.

The *Environmental Monitoring Department* of the Ministry of Environmental Protection monitors the environment, in particular the state of soils. Soil samples should be taken from almost all major

Table 9.4: Major international cooperation projects

Title / Period	Goals
1. Sheep Development Project (World Bank,1996-2001)	1. Private sheep enterprise development 2. Development of a lamb and wool marketing system 3. Introduction of advisory and veterinary services 4. Pasture/fodder improvement
2. Agricultural Support Services (World Bank,1998-2002)	Alleviate rural poverty, improve incomes and develop a productive, competitive farming sector. Components-land and agrarian reform, advisory services and adaptive research, seed industry development, plant quarantine/plant protection services
3. Irrigation and Drainage Rehabilitation Project (World Bank,1998-2004)	Rehabilitation of primary and secondary canals and major dams, institutional development
4. Land and Real Estate Registration Project (World Bank,1999-2004)	Establishing of national immovable property registration system, local registration offices, procedural framework, registration maps, data collection, trainings
4. Rural Financial Institutions Project (Germany, 1997-2003)	Developing sustainable rural financial institutions. Establishing credit unions at village level and a national credit union
5. Community Based Rural Infrastructure Services Project (Asian Development Bank, 2000-2006)	Institutional strengthening and rehabilitation of village and small urban potable water supplies: sanitation, micro-hydropower, village roads, flood control
6. Review of Agricultural Legislation (FAO, 1997-1999)	Reviewing legislation, assisting in establishment of database, identifying priorities for revision, preparing programme, supporting the revision of priority items
7. Pilot Project on Farm Irrigation (FAO,1999)	Support for the development of farm irrigation and other improvements to enhance productivity
8. Private Veterinary Services Development (France, 1996-1998)	Support to the establishment of private veterinary services in Osh oblast
9. Support for Private Farmers (Germany, 1996-2002)	Support of private farmers including advisory services, community development, etc.

Source: Ministry of Agriculture and Water Resources

industrial enterprises and from agricultural land. In monitoring agricultural land, the Department should be able to identify contamination by pesticides, radionuclides, heavy metals, etc. However, all soil monitoring in the country is currently suspended for lack of finance and equipment.

The Ministry of Health, through the Department of Sanitary-Epidemiological Control, controls compliance with sanitary legislation and aims at preventing soil contamination by activators of parasitic and infectious diseases.

Internationally financed projects

Table 9.4 includes an overview of major cooperation projects involving Kyrgyzstan, selected bilateral or multilateral partners and international financing institutions.

9.4 Conclusions and recommendations

Agriculture is one of the most important economic branches in the country, if not the most important. After the economic collapse in the former USSR countries, and during the period of transition to a

market economy, the reform of Kyrgyz agriculture began. The step-by-step reforms started in 1991 with the adoption of the Land Code, which introduced leasing of land. The second stage began in 1999, when the revised Land Code enabled private ownership of land.

Problems related to the economic situation of the country, disregard for the environmental impacts of agricultural activities, and careless exploitation of natural resources, in particular land, have resulted in a need for special efforts to restore natural balances. Such efforts require first of all training and information for farmers. The advisory and information services are least developed in agricultural administrations, in spite of the fact that some projects financed by external donors provide for the creation of such services in the Ministry of Agriculture and Water Resources and its local bodies.

Recommendation 9.1:
The Ministry of Agriculture and Water Resources should take urgent measures for the creation of advisory services for farmers, including for training with regard to the reduction of undesirable environmental consequences of farming.

The Ministry of Environmental Protection is responsible for the protection of the environment and nature. Nevertheless, its structure does not reflect a role for this department in the administration of questions concerning the protection of soils. The Ministry has only limited authority over the supervision of some aspects of land use.

Recommendation 9.2:
The Ministry of Environmental Protection should be given more competences in the national soil protection. The necessary cooperation with the Ministry of Agriculture and Water Resources might require the creation of a special administrative unit in the Ministry of Environmental Protection.

Private landownership became legal in Kyrgyzstan after a referendum held on 17 October 1998. However, a five-year moratorium on the sale of land was also imposed, in order to leave time for the administration of the new property provisions. From May 1999, the revised Land Code set a new stage of agrarian land reform. Land registration and the documentation of the rights of landowners started. Land belonging to collective farms (kolkhozes) and State farms (sovkhozes) had been distributed in plots of equal size to villagers during the first stage of reform.

The full enforcement of the revised Land Code depends on the development and approval of the related by-laws and regulations. For instance, in 1999 the Government started to modernize or draw up about 30 by-laws related to the creation of a land market, the relations between landlords and tenants, and the use of the land reserve fund, which is currently the property of the State. To the extent that substantial changes in agricultural policy will follow on the completion of the privatization process, it is important that the related processes should be accelerated as much as possible.

Recommendation 9.3:
The approval of all by-laws and regulations necessary for the full enforcement of the Land Code should be seen as a priority. Equally urgent for the reform of agricultural policies and management is the completion of the relevant land and other privatization processes, including the required registrations. See also Recommendation 1.1 .

1999 was a key year for the implementation of the agrarian reform, not only because of the adoption of a number of important laws, but also because important strategic documents were successfully discussed and approved, such as the "State Land Programme " and the “Integrated principles of development of Kyrgyzstan’s agriculture in the period 2000 – 2010”. The "State Land Programme " analyses the situation of land resources in the country, including problems of melioration, etc. It also includes a plan of necessary actions together with their funding requirements. The “Integrated principles of development of Kyrgyzstan’s agriculture in the period 2000–2010” concern general trends in agricultural production and are of a more declamatory character, requiring financial substantiation. The joint development of these two key programmes could be particularly helpful for agricultural policy and management, if it succeeded in integrating the specification of overall principles with a fully costed action programme, and the identification of sufficient sources of funding.

The harmonization of agricultural policies and action programmes could provide an occasion for laying the basis for a sustainable agriculture. The recognition of the respective principles should give rise to measures to promote ecologically cleaner agricultural production. The country’s potential for eco-tourism suggests also that some place should

be found in the future agricultural policy for the development of agro-tourism.

Recommendation 9.4:
The further development of the successful foundations of agricultural policies in Kyrgyzstan should be sought through (a) the implementation of the "State Land Programme ", (b) the translation of the "Integrated principles of development of Kyrgyzstan's agriculture in the period 2000 – 2010" into fully costed projects and programmes, (c) the introduction of sustainability principles into the next updating process of the two programmes, and (d) the full reflection of cleaner agricultural production techniques and schemes for the development of agro-tourism. See also Recommendation 2.4.

Of particular interest is the future development of the use of fertilizers and pesticides in agriculture. The inadequate application of fertilizers for economic reasons has resulted in the attrition of natural resources (soils, pastures). On the other hand, the reduced use of agrochemicals has had beneficial effects, in particular on the pollution of soils, surface and groundwater. In the future, there seems to be a substantial potential in Kyrgyzstan to replace agrochemicals by biological pest control. In the former Soviet Union, Kyrgyzstan had accumulated special experience in this area, which recently led to the export of biological pest control products to Germany. There were biological laboratories in different parts of the country and an industrial enterprise in Bishkek, which produced organisms and micro-organisms that were used for pest control on agricultural crops. In 1999, according to statistical reports, Kyrgyzstan produced biological means sufficient for pest control on about 70,000 ha of agricultural plantations.

Recommendation 9.5:
Special measures should be taken to strengthen Kyrgyzstan's capacity to produce bio-organisms for the control of agricultural crop pests and diseases.

The sharp decrease in livestock numbers, together with the lack of funds for transport, has led to some natural regeneration on remote pastures, although the problems are far from being solved. At the same time, pastures close to settlements continue to deteriorate. The ecological risk is that mountainous soils are renewed very slowly, and eroded soil is especially difficult to restore. Thus, ongoing degradation might endanger food security in the long run. It is therefore advisable to prepare a gradual disappearance of the factors of relief for mountainous pastures by adequate measures.

Recommendation 9.6:
A programme for the rational use of pastures should be developed, including pasture rotation schemes and the introduction of measures supporting livestock breeding in remote areas.

Chapter 10

HUMAN HEALTH AND THE ENVIRONMENT

10.1 Demographic and health characteristics of the population

Population dynamics

The population of Kyrgyzstan reached 4.8 million people in 1999, 3.8 per cent more than in 1998 and 9.5 per cent more than in 1991, the year it became an independent republic. This overall growth has occurred in spite of the out-migration, which caused a temporary decrease in the number of residents in 1993-1994. The fertility rate (22.2 per 1,000 population in 1997) remains twice as high as the European average. Its level and trend are very close to the Central Asian average, and the rates are declining (by 7 per cent compared to 1996 and 25 per cent compared to 1991). Its average population density (22.8 per km^2) is 71 per cent of the Central Asian average and 20 per cent of the European average.

Kyrgyzstan's population is young, with 37 per cent below 15 years of age (2.1 times the European mean) and 5.6 per cent 65 years of age or older (0.4 times the European mean). There is a slightly declining trend in the proportion of young people and a slightly increasing proportion in the older group. The above proportions and their trends are very close to the Central Asian average.

About 35 per cent of the population lives in cities (1999 census), which is 17 per cent lower than the Central Asian average and 48 per cent lower than the European average. According to the census, 788,000 people live in Bishkek (16 per cent of the total population), 183,000 more than the number estimated for January 1997. The increase, besides the difference in the source of the data, results from the significant migration of the rural population to the city in the mid-1990s. A 1997 report of the Ministry of Health estimated this uncontrolled migration to Bishkek at some 0.5 million people. The difference between that estimate and the census data may be a result of the different methods of estimation, but may also reflect some reverse in the migration trend in recent years. Whatever its precise magnitude and changes in time, the additional population creates an increased stress on Bishkek's urban infrastructure.

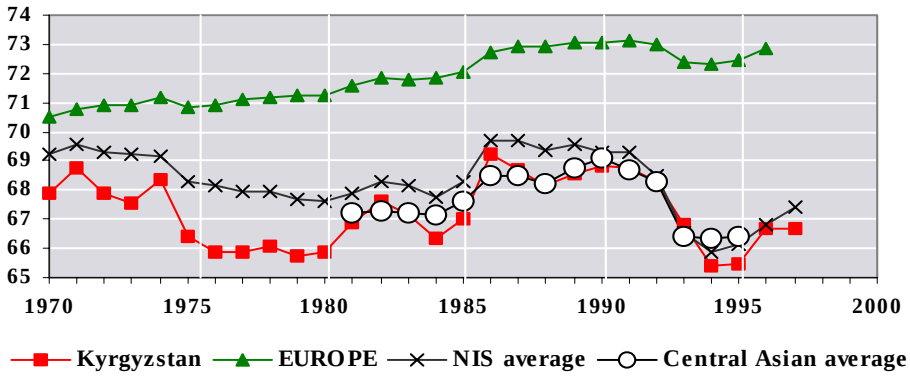
Mortality

Life expectancy in Kyrgyzstan was 67.1 in 1998, i.e. lower than the Central Asian average and six years below the average for the WHO European Region. Similarly to the average trend in the newly independent States (NIS), life expectancy markedly declined between 1991 and 1995 (Figure 10.1). Since then, a slow increase has been observed. The most significant impact on the decline in life expectancy was the increased mortality in the older groups of the population.

Infant mortality (26.1 per 1,000 live births in 1998) is 5 per cent below the Central Asian average but more than twice the European average. It has declined by 13 per cent since 1991, though the trend is not uniform and there was an increase in infant mortality in 1992-93. Post-neonatal mortality, which is related to hygienic conditions, decreased from 19.8 to 17.4 per 1,000 live births from 1994 to 1998. That level was more than five times the European average.

Infant mortality varies considerably within the country, and the most intriguing thing is the difference between the rates reported for the regions and for the major cities located in those regions (Table 10.1). A pattern similar to that in 1998 had been seen in the two previous years. The higher rates in most of the cities might indicate a greater adverse impact of unsatisfactory hygienic conditions in the cities than in the rural areas. However, what is more likely is the influence of the poorer reporting of live born infants dying in the first days of life and not registered by the vital statistics system in the rural areas. This would reflect slower implementation of the WHO definition of infant mortality in the rural regions of Kyrgyzstan, artificially diminishing the real infant

Figure 10.1: Life expectancy at birth, 1970-1997



Source: WHO-HFA

mortality rate both in the regions and in the country overall. The pattern observed warrants further study.

Table 10.1: Infant mortality by region and in selected towns, 1998

Region	Town in the region	Infant mortality *(per 1000 live births)*
Chui		20.1
	Bishkek	*29*
Issyk-Kul		21.8
	Balykchi	*22*
	Kara-Kol	*36.5*
Talas		19.2
	Talas	*44.5*
Naryn		21.2
	Naryn	*42.5*
Osh		32.2
	Osh	*33.7*
Jalal-Abad		21.3
	Jalal-Abad	*14.8*

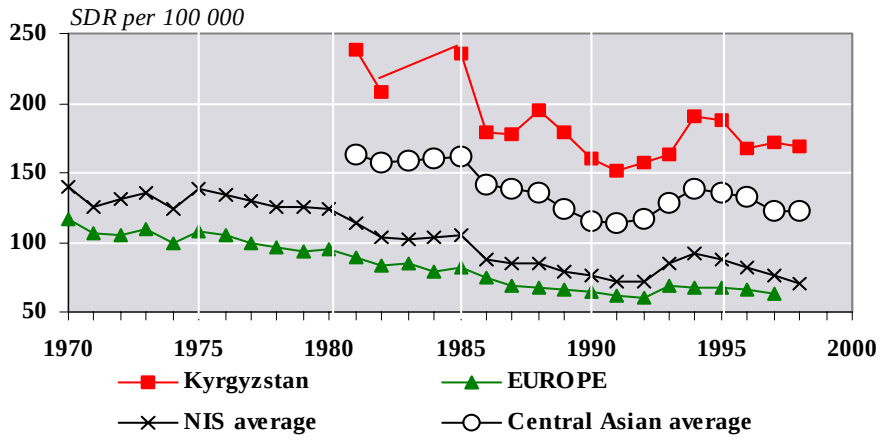
Source: Republican Centre of Medical Information, Bishkek.

Causes of death and morbidity

The most common causes of death in Kyrgyzstan are diseases of the circulatory system. They are reported in 47 per cent of deaths, which is lower than the average frequency in all the Central Asian republics (56 per cent) or in all of Europe (49 per cent). Neoplasms are also responsible for a smaller proportion of all deaths (8.8 per cent) than in Central Asia (9.5 per cent) or all of Europe (18.6 per cent). Second most common causes of death are diseases of the respiratory system, recorded in 13 per cent of cases. This is twice the European average. Diseases of the digestive system cause a higher mortality rate than in Europe (5.6 per cent in Kyrgyzstan vs. Europe's average of 3.4 per cent). This is also true of infectious diseases (3.2 per cent and 1.3 per cent, respectively). External causes of death are registered in 7.8 per cent of deaths, which is higher than the Central Asian average (6.7 per cent) but lower than the European average (9.2 per cent). For as much as 10 per cent of mortality, the cause of death is classified as an "ill-defined condition" (compared to a 3.5 per cent average in Central Asia or Europe). That may influence a more detailed analysis of mortality by cause of death.

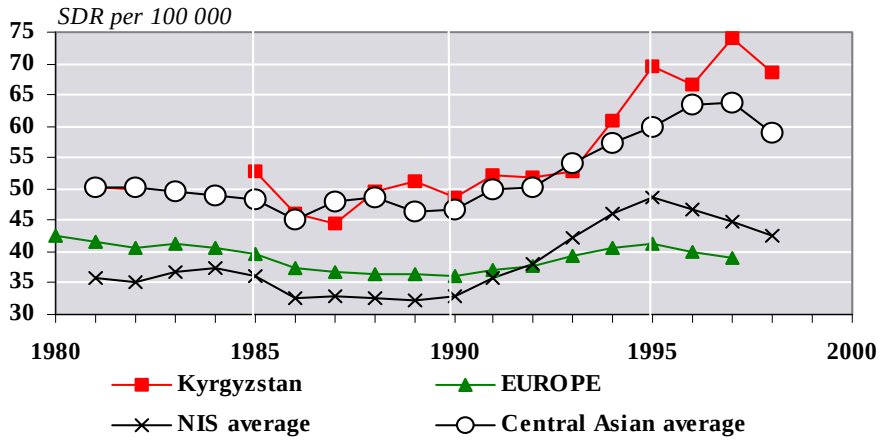
Overall mortality due to diseases of the respiratory system was more than twice the European average and 25 per cent higher than the Central Asian average (Figure 10.2). A relatively high proportion of those deaths was attributed to chronic obstructive respiratory diseases (50 per cent in Kyrgyzstan and 37 per cent in Europe), the group of diseases which caused 30-50 per cent more deaths in the mid-1990s than in the mid-1980s. Mortality due to all the most common causes showed similar trends in the 1990s, with a peak in 1994-95 and a gradual decrease in more recent years. However, the trends in mortality due to diseases of the digestive system and infectious diseases increased throughout most of the 1990s (Figures 10.3 and 10.4). This relatively high and increasing mortality may be associated with poor sanitary conditions and the deteriorating quality of drinking water and food. The level and trends of respiratory diseases mortality may also be related to the adverse impact of environmental conditions,

Figure 10.2: Mortality due to diseases of the respiratory system, 1970-1998



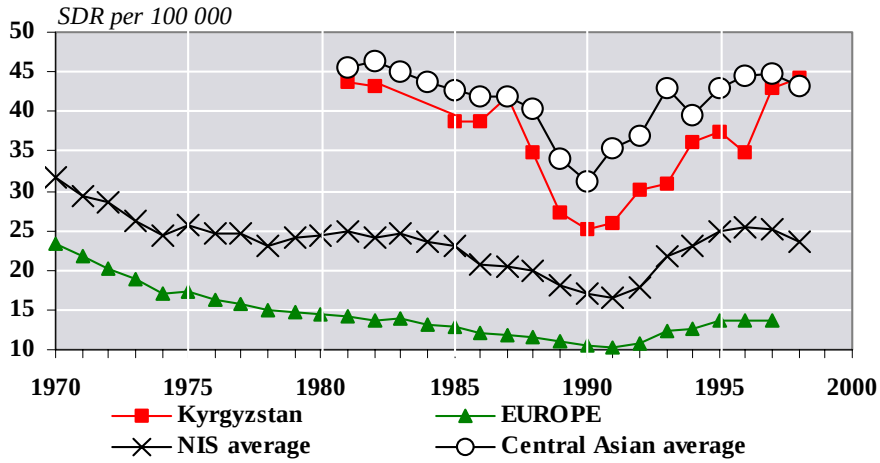
Source: WHO-HFA.

Figure 10.3: Mortality due to digestive system diseases, 1980-1998



Source: WHO-HFA.

Figure 10.4: Mortality due to infectious diseases, 1970-1998



Source: WHO-HFA.

especially to air pollution. Tobacco smoking, the other major cause of obstructive respiratory diseases, is less common in Kyrgyzstan than in other parts of Europe.

The most common causes of morbidity, as reported by the outpatient clinics, are respiratory system diseases (Table 10.2). A comparison of the structure of visits to a doctor throughout the country and in Bishkek suggests a relatively higher incidence of infectious and digestive system diseases outside the capital and a higher relative incidence of respiratory diseases in children living in Bishkek. This may be due to poor sanitary conditions in rural areas and high air pollution in Bishkek. However, the difference in the frequency of recourse to the medical services in and outside Bishkek may also influence the structure of registered causes of morbidity (visits by adults were 14 per cent more common in Bishkek than country-wide; visits by children were 98 per cent more common in Bishkek).

The incidence of infectious diseases of the gastrointestinal system, possibly related to the microbial contamination of drinking water or food, and registered by the sanitary-epidemiological system has not changed substantially over the past five years (Figure 10.5). In all, over 37,000 cases of such diseases were registered in 1998. The incidence of viral hepatitis in Kyrgyzstan was more than 6 times the European average. Since 1995, the number of typhoid cases has increased (from 114 cases in 1995 to 355 in 1997 and 1,333 in 1998). The large number in 1998 was due to a major outbreak of typhoid registered in the Osh region, with 1,254 cases. The outbreak was related to the contamination of water in an irrigation canal (by effluents from sewage treatment installations), which was used as a source of drinking water. Independently of that outbreak, the incidence of all acute gastrointestinal infections was over twice as high in the Osh region than in Bishkek (with the lowest incidence) in both 1997 and 1998. The Talas *oblast* is second worst in that respect, with an incidence 60 per cent higher than in Bishkek.

10.2 Health risks related to environmental factors

Drinking water supply and quality

Piped water supply is available to some 85 per cent of the population of Kyrgyzstan. Underground reservoirs, located deep below the surface (more than 100 m) provide 90 per cent of the water to the distribution systems. On the one hand, such a deep location of water resources facilitates maintenance of the quality of the source water; on the other, it makes recovery difficult. However, even those deep reservoirs can be contaminated, as can be seen in several locations, e.g. in Bishkek. The pollutants detected include nitrates and petroleum products. Most of the water distribution systems use electricity to pump the water.

Almost 600 villages, with more than 700,000 inhabitants (22 per cent of the rural population), have no access to piped water. More than 300 villages without piped water are located in the Osh region. Since there are no shallow underground sources allowing the drilling of simple wells that do not require pumping, this population uses surface water, including that from irrigation canals. There is no quality control for that water. This source of drinking water poses significant risks to health. An

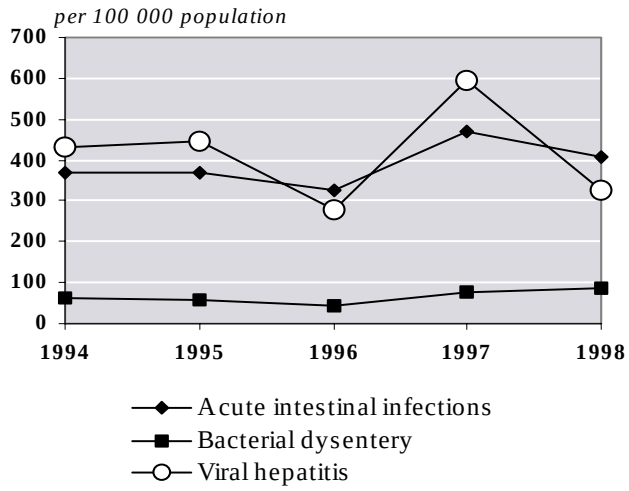
Table 10.2: Main causes of registered morbidity in Kyrgyzstan and in Bishkek, 1998

%

	Adults		<14 years	
	Kyrgyzstan	Bishkek	Kyrgyzstan	Bishkek
Total	**100.0**	**100.0**	**100.0**	**100.0**
Infectious	6.9	3.1	11.3	8.1
Respiratory	16.4	16.2	36.9	42.3
Digestive	13.4	11.8	8.7	6.4
Injuries	7.6	12.6	3.9	5.7
Other diseases	55.7	56.3	39.2	37.5
Total morbidity (per 100 000)	*49,376*	*56,126*	*45,089*	*89,287*

Source: Republican Centre of Medical Information, Bishkek.

Figure 10.5: Registered incidence of infectious diseases, 1994-1998



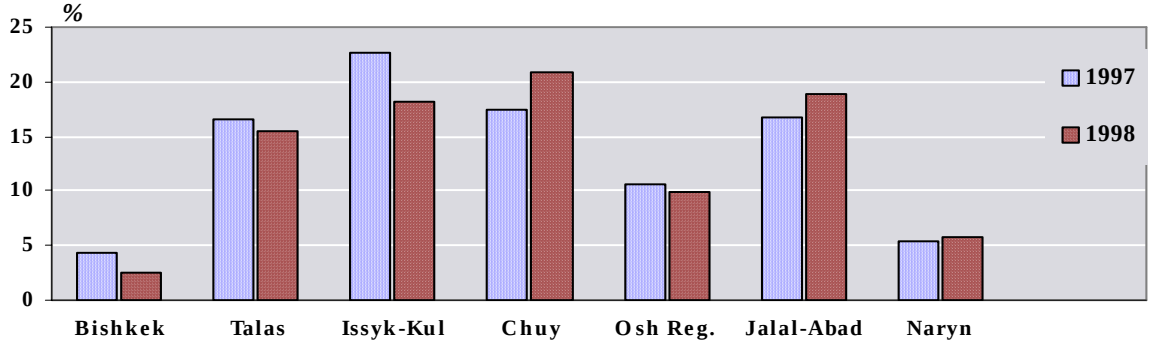
Source: Department of the State Sanitary-Epidemiological Surveillance, Ministry of Health.

illustration of the risk was the outbreak of typhoid, registered in the Osh region in 1998, which was caused by the use of contaminated water from an irrigation canal, as mentioned in the previous section.

The technical condition of water distribution systems is very poor, resulting in leakage and the risk of water contamination, especially since disinfection of the water is nil or insufficient. The level of chlorine in the distribution system is not properly monitored and may often be insufficient. In the systems using UV radiation for disinfection, chlorine is not added to the distributed water, therefore the common leakages of the distribution systems create health risks. Only a few, small systems have been built in the past ten years. In Bishkek, with more than 1,100 km of the piping network, some 200 km need replacement. Currently, only 4 km of pipes are replaced per year. The number of breakdowns is about 0.7 per year per kilometre of pipe, which is twice the frequency of other European cities. With the sewage system in a similarly bad condition, this may lead to secondary contamination of drinking water in the system. However, the fraction of drinking water samples not meeting national standards is lower in Bishkek than in other parts of the country (Figure 10.6).

Another potential risk factor in some distribution systems occurs when switching the supply from groundwater to surface water. This is done due to a lack of electricity for pumping the water from deep

Figure 10.6: Microbiological contamination of drinking water samples in 1997 and 1998, by region



Source: Department of the State Sanitary-Epidemiological Surveillance, Ministry of Health.

sources, and can create risks if there is no appropriate protection of the catchment area for the surface reservoir and no adequate treatment of the surface water entering the system.

The quality of water distributed by the centralized systems is systematically controlled by the State sanitary-epidemiological service. The samples are collected at the sources of drinking water, at points where water from various sources is mixed and at taps, mostly in public places (schools, kindergartens and food-processing facilities). The samples are evaluated according to the 1982 GOST 2,274 standard. However, only a limited number of water quality parameters are considered at each sample. A full set of parameters for larger water supply systems is controlled once a year.

In 1998, 1,008 distribution systems were evaluated, and 340 systems were assessed as "not fulfilling sanitary conditions". In most cases the reason for the negative assessment was the lack of a sanitary protection zone at the source (36 per cent), or the lack of disinfecting facilities (66 per cent). Microbial contamination exceeding the national standard was found in 15 per cent of 18,512 analysed samples. A similar frequency of microbial contamination was reported in 1997. These results were higher than in the 1994-96 period, when 10.8 per cent to 12.7 per cent of samples were contaminated. The substantial differences between the regions in the microbiological quality of drinking water are stable in time, indicating that the local conditions responsible for the risk of contamination do not change (Figure 10.6). However, there was no correlation between the percentage of water samples from water supply networks with detected microbial contamination and the incidence of acute gastrointestinal infections at the regional level. The highest rates of infection were in the (Osh and Jalal-Abad) regions with the largest number of villages without access to piped water supply systems.

An important factor in preventing an even higher incidence of water-related gastrointestinal infection is the fact that people avoid drinking unboiled water and the custom of drinking tea. New options provide locally designed and produced tap water filters, highly effective in removing bacterial and viral contaminants from the water. However, their shelf price (around 200 soms) is considered high for the less affluent, and this method cannot be recommended as a solution to the drinking water supply problem.

Physico-chemical parameters exceeded the standards in 3.8 per cent of 16,149 drinking water samples, with the highest frequency of rejected samples (6.6 per cent) reported from the Osh region. However, in most samples, only organoleptic properties and sediments are assessed, without any analysis for nitrates or heavy metals. The potential of the contamination of drinking water with heavy metals exists in several locations in the country, mainly due to the accumulation of wastes from mining (tailings) and the leaching from wastes to surface water.

Waste water and solid wastes

The discharge of untreated water to surface water bodies amounts to 0.4-0.7 million m^3 per year. Out of 350 waste-water treatment plants only 30 per cent meet sanitary standards. Even some health-care facilities, such as the hospital for infectious diseases in Bishkek, have no local waste treatment facilities. Therefore, the discharge of waste water constitutes a significant burden on the environment and poses a health risk to the Kyrgyz population. A large proportion of the population does not have access to collective sewage collection systems (Table 10.3). Even in Bishkek, the communal sewage collection system covers only 63 per cent of the population. Sanitary installations are often lacking in schools and other public buildings. Overall, 78 per cent of schools and 44 per cent of kindergartens have no sewage collection systems. Combined with the common lack of piped water supply (22 per cent schools and 2 per cent of kindergartens), such conditions create a high risk of the spread of infectious and parasitic diseases. However, it is difficult to quantify the contribution of those poor sanitary conditions to the high registered incidence of infectious diseases, such as viral hepatitis.

Solid wastes, both uncollected and dumped in unprepared landfills, pose a risk to health through people's direct contacts with hazardous materials, through the possibility of diseases being spread by insects and rodents, through the possible contamination of ground and surface water, and drinking water supply systems. There are no data on such contamination and, therefore, any assessment of the risk to the Kyrgyz population is difficult. Of special concern are accumulated mining wastes. The contaminants can be spread through the wind-blown dust from the tailings and through the seeping of the water from the tailing ponds to the rivers (see Chapter 5 for details). The

local population, living in the vicinity of the tailings and using the contaminated water for drinking, may be at risk. Also, the possible use of the material from the tailings for building construction poses a risk to health. Again, the lack of data on the extent and characteristics of the possible contamination of the environmental media and the population exposure around the tailings makes more precise risk assessment impossible.

Ambient air quality

Although the total emissions of dusts and gases to the atmosphere have decreased in recent years, pollution of urban air often and substantially exceeds standards – see Chapter 7. Existing data on air quality, even taking account of the recognized limitations of the monitoring system, show that ambient air pollution constitutes a significant risk to the health of the urban population. In 1998, the annual mean concentrations of suspended particulate matter in the most polluted part of Bishkek exceeded 1.1 mg/m^3 (see Chapter 7), twice what it was a few years before. In less polluted parts of the capital, the annual mean concentration of suspended particulate matter is 0.2 mg/m^3. The assessment presented in the National Environmental Action Plan calls Bishkek an ecological disaster area due to the observed air pollution. In other cities the reported annual mean concentration of suspended particulate matter was also higher than in most cities in Europe. Reported nitrogen dioxide levels were not very high in most cities (30-60 µg/m^3 in Bishkek, and 10-30 µg/m^3 in Kara-Bata and Tokmok), however the values reported from Osh were much higher (95-110 µg/m^3 annual average).

The currently applied methods of monitoring suspended particulate matter are inadequate to assess the content of the respirable fraction of the pollution (PM_{10} or $PM_{2.5}$), the most relevant from the health perspective. The moderate levels of NO_2, in most locations, might indicate that the contribution of internal combustion (car engines) to particulate pollution is not the predominant risk factor for most city areas. Emissions from energy production facilities and from communal sources contribute significantly to suspended particulate levels in urban areas, which are also due to common atmospheric inversion. The result is that population exposure to particulate pollution is high and may lead to increased incidence of acute respiratory infections, especially in children. It may also contribute to the aggravation of chronic cardio-respiratory diseases and increase mortality. A study conducted in Bishkek has, indeed, reported a higher prevalence of respiratory symptoms among children residing in more polluted parts of the town. Using very rough assumptions, it can be estimated that as many as a thousand people may die prematurely in Bishkek each year as a result of air pollution. The pollution would also increase the incidence of acute respiratory infections and infant mortality. However, a more precise, quantitative assessment of the effects would require information on the concentration of the respirable fraction of particulate matter.

The contribution of road traffic to air pollution is significant. The highest annual average concentration of suspended particulate matter in Bishkek has been measured in the vicinity of the main bus station. Also air quality measurements at the traffic-oriented air quality monitoring stations at the main crossroads of the city show a high concentration of particulates and other traffic-related pollutants. The annual mean concentration of lead in the air was 0.5 – 0.75 µg/m^3 in, respectively, the eastern and western parts of the city in 1996. That was higher than WHO Air Quality Guidelines level and more than in most European cities. Exposure of young children to such lead levels may adversely influence their neurobehavioural development.

The concentration of polycyclic aromatic hydrocarbons (PAH), indicated by benzo-a-pyrene (BaP), was between 31 and 44 ng/m^3 in traffic-oriented monitoring stations, and 6 ng/m^3 in the residential area of Bishkek in 1997. The levels in traffic locations were 2-3 times higher than in 1993; the BaP concentration in the residential area increased by 60 per cent in that period. These results indicate that the concentration of carcinogenic pollutants in the ambient air of Bishkek is high and contributes significantly to the risk of cancer. According to WHO Air Quality Guidelines, the unit risk for BaP is 8.7 per 100,000 per 1 ng/m^3 of lifetime exposure.

Food contamination

Due to the decreasing use of agrochemicals, chemical contamination of food is not common in Kyrgyzstan. According to the food monitoring system, pesticides were found in 0.6 per cent of samples tested in 1998. However, in the Osh region, contamination was more common, with pesticide residues found in 2.6 per cent of the samples (reaching 6.6 per cent of meat, 4.9 per cent of milk products, 6.9 per cent of vegetable oil).

Chloro-organic and phosphoro-organic contamination is the most frequent. Heavy metals contamination exceeding the standard levels has been detected in less than one per thousand samples.

Bacterial contamination was found in 11.5 per cent of tested food products in 1998, which is close to the 1997 level. In some locations, the reported proportion of contaminated products reached 46 per cent. Bacterial contamination was found in 20.9 per cent of tested milk samples (16.6 per cent in 1997), and this includes 93 per cent of contaminated samples from Bishkek.

In 1998, 163 outbreaks of food-related poisoning were registered, with 175 cases (none fatal). This is more than in the previous years (59 outbreaks with 119 cases, 2 deaths). In October 1999, mushrooms caused more than 150 cases of poisoning, including 12 fatal ones.

The national programmes to prevent iron deficiency and to eradicate iodine deficiency, established in 1994 and 1995 are not widely implemented due to the lack of funds. Therefore, generally poor nutrition is combined with deficiencies of those essential microelements in food.

Workplace conditions

Over 30,000 people in Kyrgyzstan work in places that fail to meet health standards. This includes 11,000 people working in highly polluted air and 9,000 in loud noise. Overall, 13 per cent of the workplaces controlled have air polluted with dust breaking the standard and 10 per cent with gaseous air pollutants exceeding the standards. Though the sensitivity of the screening examinations is assessed as poor, as many as 2 per cent of workers examined are diagnosed as having occupational diseases. This rate reaches 9 per cent in the Issyk-Kul region.

10.3 Policy and management related to environmental impacts on public health

Legal instruments and action programmes

The Kyrgyz Constitution states that the "*Citizens of the Kyrgyz Republic shall have the right to an environment favourable to their life and health*". Several specific laws, addressing various environmental media, also consider human health as the target of protection. In 1999, a new Law on Drinking Water and a Law on the Radioactive Safety of the Population were introduced. A food safety law is being drafted. Public health is the focus of the Law on the Sanitary-Epidemiological Well-being of the Population of 2 March 1993. Kyrgyzstan has not signed the Protocol on Water and Health to the 1992 Convention on the Protection and Use of Transboundary Watercourses and International Lakes.

The National Environmental Health Action Plan (NEHAP) was developed in 1996. Since then, it has been through a process of review and updating by all ministries. In October 1999, the document was submitted for approval to the Cabinet of Ministers. The document provides a comprehensive review of a wide range of environmental health issues. Based on that review, the plan recommends a long list of actions to protect the population from health risks related to individual environmental hazards. The plan identifies State agencies (ministries or enterprises) responsible for the implementation of the recommended actions. However, it does not set target dates and does not specify a budget or a schedule for the actions, which must be implemented gradually. The NEHAP, when approved by the Government, will have the official status of a governmental decision. To allow an assessment of the extent to which this decision is implemented, the programme needs to be accompanied by an implementation schedule.

Several actions recommended by NEHAP refer to the upgrading of legislation, such as air quality or water quality standards. The present approach is based on the old legislation of the Soviet Union and will certainly need revision.

Preparation of the local environmental health action plan (LEHAP) for the city of Bishkek was initiated in the summer of 1999. The process gathered specialists from various sectors and has the potential to prepare a programme for the improvement of environmental conditions affecting health in Bishkek.

A national food safety plan was prepared in the summer of 1999 and presented to the Government. The plan contains proposals for changes in legislation and for health promotion.

Institutional responsibilities

Government ordinance No. 299 of 29 May 1997, linked with ordinance No. 328 of May 1994, established the Department of the State Sanitary-Epidemiological Surveillance (San-Epid)

of the Ministry of Health. It is responsible for State control over the performance of sanitary, hygiene and anti-epidemic measures to prevent and eliminate environmental contamination and reduce the risk to the health of the population presented by environmental contamination. The main element of the San-Epid structure relevant for environmental health is the network of 6 regional (*oblast*), 10 town and 48 local (*rayon*) offices. Its staff totals almost 3,000 people, including 710 with university-level education (mainly "sanitary physician"). This constitutes a strong organizational and professional basis for the implementation of public health actions.

The continuing education system in San-Epid allows the personnel to upgrade its professional qualifications. However, there is no system of university-level training for environmental health specialists in the country. Access to worldwide expertise is also limited due to the scarcity of international contacts and the weak research background. The Ministry of Health promotes a system of accreditation of the San-Epid analytical laboratories. However, the technical and material basis of the San-Epid service is very poor. Due to a lack of resources and materials, the range of laboratory analysis is reduced to a few basic tests. In some regions (Issyk-Kul, Naryn, Talas, Jalal-Abad), there is no analysis of food contamination with heavy metals. In the Jalal-Abad region, the tests for the microbiological contamination of surface water are not carried out. The plan for the laboratory analysis of environmental samples was only 70 per cent fulfilled in 1998. In the Naryn region 50 per cent and in Talas region only 27 per cent of the scheduled tests have been performed. One of the reasons is the insufficiency of transport facilities, restricting the mobility of San-Epid staff.

The annual report of the Department of State Sanitary-Epidemiological Surveillance assesses the validity and precision of laboratory analysis as poor. Bacteriological laboratories are able to identify pathogens in a small percentage of tested samples, and this is attributed to the low qualifications of the laboratory personnel and insufficient resources to implement programmes for quality assessment and control. Virology laboratories do not have enough qualified personnel either. In some respects, the tests performed are not relevant to the existing environmental situation. This is the case with the tests for pesticide residues, which do not always take into account the changing types of pesticides used in the country.

The research basis for environmental health assessment and risk management is very poor. The Research Institute of Prophylaxis and Medical Ecology, employing 37 research workers, has no funds for materials and equipment, or for conducting field studies. It is involved in few internationally supported activities. Its access to foreign scientific literature and expertise is very limited. If reliable internal mechanisms for basic financing were established, the Institute could provide a valuable basis for the development of national capacities. Such capacities will certainly be needed, e.g. when national water and air quality standards are reviewed, as planned by the NEHAP and NEAP. The Institute could also conduct the assessment of risk to health of pollution hot spots (as tailings).

Monitoring and reporting of environmental health

Control of drinking water and food quality, assessment of hygiene conditions at the workplace as well as the registration of infectious diseases conducted by the San-Epid system provide baseline information on population exposure to environmental hazards. Information on ambient air quality is collected by the State Agency for Hydrometeorology. The Republican Centre of Medical Information collects and processes data on mortality and morbidity.

The Department of Sanitary-Epidemiological Surveillance produces monthly bulletins containing current information on the incidence of infectious diseases as well as the analysis of selected sanitary and health issues. The annual "Analysis of the hygienic situation and of activities of the San-Epid system" also provides summary results of the monitoring and analysis of the health conditions in the country as well as a critical assessment of the ability of the San-Epid system to assess and manage health risks. These are good professional publications and constitute a valuable source of information.

Information within the regions is processed manually and is submitted to the national level in an aggregated form. Though it is, in principle, possible to trace the information back to its original source, quick retrieval of source information and its analysis is very difficult. The system is also prone to error and inconsistency.

Most of the available information on health indicators (mortality and registered morbidity) is

processed (electronically) and published by the Republican Centre of Medical Information in a yearbook "The Health of the population and the activity of health services in the Kyrgyz Republic".

The NEHAP and NEAP documents provide a good overview of the environmental health situation in Kyrgyzstan, and the draft LEHAP document gives a detailed overview of the situation in Bishkek. Those documents synthesize the information from all available sources and provide a brief interpretation of the data on environmental health risks. Interestingly, the action plans do not address the issue of environmental health monitoring, reporting and communication.

The reports and source information are available to the relatively narrow circle of professionals. Exchange of these reports between sectors is poor, and difficult access to the primary information limits the applicability of the data. In particular, access to information for local assessment is difficult and requires gathering data from different agencies. Public access to the information is hampered by both its limited accessibility and a format not suitable for laymen.

10.4 Conclusions and recommendations

The health status of the Kyrgyz population is, according to a number of indicators, poorer than in most other countries of the WHO European Region. Its trends in the 1990s have been similar to those of other Central Asian countries. Exposure to environmental contamination contributes to this poor health status. The relatively high mortality and morbidity due to infectious and digestive system diseases might be related to microbial contamination of food and drinking water. The high rates of respiratory system diseases might be related to high levels of air pollution. The high infant mortality might be linked to poor hygiene. The available information allows a general assessment of the situation. The limited access to the source data and insufficient specificity and precision of the information restrict the possibility of a detailed analysis. However, the general information available allows conclusions and recommendations to be drawn up on those environmental issues most clearly related to the health of the Kyrgyz population.

The common use of untreated surface water for drinking, especially from sources with an unprotected catchment area, such as irrigation canals, constitutes a significant health risk for a large part of the Kyrgyz population, especially in rural areas. It results in outbreaks of gastrointestinal infections or in an endemically high incidence of digestive system diseases. While the target of long-term action should be a supply of safe water to the entire population, the short-term objective should be the prevention of contamination of the open waters by the rural population. Improved sanitation in the villages, combined with the promotion of the hygiene and training of communities, should reduce the spread of gastrointestinal infections.

Recommendation 10.1:
Programmes to improve hygiene and sanitary conditions in villages should be developed and/or implemented, especially in those villages where there is no piped water supply and that use surface water as a source of drinking water. The contamination of surface water by sewage aggravates the problems and should be addressed in special water protection programmes.

Water treatment and distribution systems do not ensure the safety of the drinking water delivered to a large part of population. Both insufficient disinfection and secondary contamination in the poorly maintained distribution system are the causes of risk. The huge demand for the modernization and maintenance of the water distribution systems will require careful planning to ensure maximum health benefits with the use of limited resources.

Recommendation 10.2:
National water quality standards should be revised according to WHO Guidelines. The modernization of water treatment and distribution systems with the help of adequate investments into both should be governed by the principle of maximum reduction of health risks from microbiological contamination of drinking water.

Sanitary conditions are bad in the country and increase the risk of communicable diseases. A large number of public buildings, such as schools, have no basic sewage collection facilities. Some hospitals do not even have sewage treatment facilities effectively preventing the transmission of diseases. The condition of existing sewage collection and processing systems in the cities is poor and creates the risk of secondary contamination of drinking water and soil. Many cities, and most villages, do not have sewage collection systems.

Recommendation 10.3:
A comprehensive programme for the sanitary disposal of sewage, preventing human exposure to pathogens and protecting drinking water sources should be established. It should include the sanitary education of the public and should propose simple, cost-effective measures that can easily be implemented by local communities as they help to mitigate social consequences of rising water prices. Public buildings should be considered as a priority for action and be designated as pilot projects for demonstration. See also Recommendation 6.3.

The exposure of the population to air pollution, especially to suspended particulate matter, is very high and leads to significant health effects in the large cities in Kyrgyzstan. Though the precise magnitude of the effects cannot be estimated due to the lack of appropriate data from air quality monitoring and health statistics, a substantial increase in infant and adult mortality, and an increased incidence of acute respiratory infections and chronic respiratory system diseases can be expected. The emission of pollutants from stationary sources, especially heat and electricity generating plants, communal combustion and road traffic contribute to the pollution. The situation in Bishkek is the most alarming, due to both the level of pollution and the size of the highly exposed population.

Recommendation 10.4:
The effective reduction of population exposure to respirable particulate matter must be a leading criterion in actions to reduce air pollution in the cities. The reduction of emissions from large point sources located in urban areas should be considered as the most feasible way first to improve air quality and subsequently to decrease health impacts. National air quality standards should be reviewed according to the revised WHO guidelines. The monitoring of the respirable fraction of particulate matter (PM_{10}) should be introduced.

The concentration of transport-related air pollutants is high in the cities, and may lead to both acute and chronic health effects. Increasing traffic, the poor technical quality of the vehicles, the poor quality of fuels and inefficient emission control are responsible for the present situation. Most cars are old and use leaded petrol. The present plans of actions mainly propose more controls of emissions from individual vehicles and re-routing the main traffic flows away from the city centres. The long-term transport development strategy should focus on more sustainable actions, including a reduced demand for car traffic in the cities through better urban planning, the development of public transport or the promotion of cycling.

Recommendation 10.5:
The health impacts of traffic-related air pollution, and the economic benefits related to the reduction of population exposure to this pollution, ought to be included in the transport development strategies. Technical improvements in the vehicle fleet, the use of cleaner fuels, and alternatives to predominant transport by cars must be looked for as the future sustainable solution for transport problems.

Several national action plans relevant to the prevention of adverse impacts of environmental factors on health have been prepared in the past few years. They contain long lists of recommended actions or programmes. However, the feasibility of implementation of the actions is not certain, partially due to the lack of clearly formulated priorities, to implementation projects, to the specification of methods for project implementation, and to the costs and sources of financing.

Recommendation 10.6:
The implementation of the national and local action plans should start urgently, aiming at the most cost-effective way of achieving health benefits. General action plans should be supplemented with detailed technical project proposals. Investments in the technical infrastructure by national and local authorities, as well as by energy production, transport and other industries, should be combined with public education and health promotion campaigns.

The professional capacities of San-Epid provide a good basis for the definition of priorities and for monitoring actions. See also Recommendation 1.5. Maintaining this basis and upgrading it, however, require improved access to internationally available information, continuous education and a radical improvement in the technical, and laboratory, capacities. Staff education, the development of methodologies, the risk assessment of the emerging environmental issues and professional support for new regulations and procedures require that a necessary minimum of scientific capacities should be available in the country. This can be achieved only if the local capacities are created and if an international exchange of information is facilitated, via all existing means.

Recommendation 10.7:
The assessment of health risks and benefits should be an integral part of all development projects. This will require substantial strengthening of the technical and scientific basis for risk assessment, including exposure and health assessment. Quality assurance systems should be implemented to ensure the validity of the information. International collaboration and the exchange of information should be facilitated.

The gathering, processing and reporting of information on the population's health status has improved significantly in the past few years. However, a large proportion of mortality with no defined cause of death and possible under-reporting of infant mortality may bias the more detailed assessment of health and of the health impacts of the environment. Also, the laboratory basis for the identification of environmental hazards, both microbiological and chemical, limits the possibility of a quick, specific response to the emerging risks.

Recommendation 10.8:
The validity and specificity of health data (e.g. the cause of death diagnosis and registration, infant mortality reporting) should be improved, and laboratory capacities should be reviewed to increase the reliability of health status analysis and the assessment of environmental impacts on health.

ANNEXES

Annex I

SELECTED ECONOMIC AND ENVIRONMENTAL DATA

Selected economic data

	Kyrgyzstan
TOTAL AREA (1 000 km^2)	199.9
POPULATION	
Total population, 1998 *(100 000 inh.)*	47.00
- % change (1993-1998)	6.82
Population density, 1998 *(inh./km^2)*	23.51
GROSS DOMESTIC PRODUCT	
GDP, 1998 *(US$ billion)*	1.60
- % change (1993-1998)	84.76
per capita, 1998 *(US$ per capita)*	347.80
INDUSTRY	
Value added in industry, 1998 *(% of GDP)*	17.7
Industrial output - % change (1993-1998)	-99.8
AGRICULTURE	
Value added in agriculture, 1998 *(% of GDP)*	39.2
Agricultural output - % change (1993-1998)	-73.5
ENERGY SUPPLY	
Total supply, 1997 *(Mtoe)*	2.79
Energy intensity 1997 *(toe/ US$ 1 000)*	1.58
Structure of energy supply, 1997 *(%)*	
- Coal	32.6
- Oil and oil products	17
- Gas	17.4
- Others	32.9
ROAD TRANSPORT	
Road traffic volumes, 1998	
- million veh.-km	2216 a/
- % change (1994-1998)	20.66
- per capita *(1 000 veh.-km/inh.)*	0.47
Road vehicle stock, 1998	
- 1000 vehicles	195
- % change (1993-1998)	-1.57
- private cars per capita *(veh./1 000 inh.)* 1998	39.94

Sources: Kyrgyzstan and UNECE, IEA.

Notes:

* National Human Development Report 1999

a/ Motor vehicle movements on national territory, vehicles registered in the country

Selected environmental data

	Kyrgyzstan
LAND	
Total area *(1 000 km²)*	199.9
Protected areas *(% of total area)* 1999	3.89
Nitrogenous fertilizer use, 1996 *(tonne/km² arable land)*	4.8
FOREST	
Forest area *(% of land area)* 1997	4.2
THREATENED SPECIES	
Mammals *(% of known species)*	18
Birds *(% of known species)*	10
Freshwater Fish *(% of known species)*	8
WATER	
Water withdrawal *(% of gross annual availability)* 1997	6.81
AIR	
Emissions of sulphur oxides, 1998 *(kg/inh.)*	2.30
Emissions of sulphur oxides, 1998 *(kg/US$ 1 000 GDP)*	6.75
Emissions of nitrogen oxides, 1998 *(kg/inh.)*	0.72
Emissions of nitrogen oxides, 1998 *(kg/US$ 1 000 GDP)*	2.13
Emissions of carbon monoxide, 1998 *(kg/inh.)*	1.06
Emissions of carbon mpnoxide, 1998 *(kg/US$ 1 000 GDP)*	3.13
WASTE GENERATED	
Industrial waste *(kg/US$ 1 000 GDP)* 1998	26.13
Municipal waste *(kg/inh./day)* 1997	0.534

Sources: Kyrgyzstan and UNECE, IEA.

Annex II

SELECTED BILATERAL AND MULTILATERAL AGREEMENTS

Selected multilateral agreements			
	Worldwide agreements		**Kyrgyzstan**
	As of 1 July 2000		
1949	(GENEVA) Convention on Road Traffic	**y**	
1957	(BRUSSELS) Int. Conv. Relating to Limitation of Liability of Owners of Sea-going Ships	**y**	
1958	(GENEVA) Conv. Fishing and Conserv. Living Resources of High Seas	**y**	
1969	(BRUSSELS) Intern. Convention on Civil Liability for Oil Pollution Damage	**y**	
	1976 (LONDON) Protocol	**y**	
1969	(BRUSSELS) Conv. Intervention on the High Seas in Case of Oil Pollution Casualties	**y**	
1971	(RAMSAR) Conv. Wetlands of International Importance, especially as waterfowl habitat	**y**	
	1982 (PARIS) Amendment	**y**	
	1987 (REGINA) Amendments	**y**	
1971	(GENEVA) Conv. on Protection against Hazards from Benzene (ILO 136)	**y**	
1971	(BRUSSELS) Conv. Establishment of an International Fund for Compensation of Oil Pollution Damage	**y**	
1972	(PARIS) Conv. Protection of the World Cultural and Natural Heritage	**y**	**R**
1972	(LONDON) Conv. On the Prevention of Marine Poll. By Dumping of Wastes and Other Matter	**y**	
	1978 Amendments to Annexes (incineration at sea)	**Y**	
	1980 Amendments to Annexes (list of sustances)	**Y**	
1972	(GENEVA) Conv. Safe Container (CSC)	**Y**	
1973	(WASHINGTON) Conv. International Trade Endangered Species of Wild Fauna and Flora	**y**	
	1983 (GABORONE) Amendment	**y**	
1973	(LONDON) Internat. Conv. for the Prevention of Pollution from Ships (MARPOL)	**y**	
	1978 (LONDON) Protocol (segregated balast)	**y**	
	1978 (LONDON) Annex III on Hazardous Substances	**y**	
	1978 (LONDON) Annex IV on Sewage		
	1978 (LONDON) Annex V on Garbage	**y**	
1974	(GENEVA) Conv. on Prot. against Hazards from Carcinogenic Subst. (ILO 139)	**y**	
1977	(GENEVA) Conv. on Prot. against Hazards from Air Poll., Noise and Vibration (ILO 148)	**y**	
1979	(BONN) Conv. Conservation Migratory Species of Wild Animals	**y**	
	1991(LONDON) Agr. Conservation of Bats in Europe	**y**	
	Agreement on the Consevation of African-Euroasian Migratory Waterbirds (AEWA)	**Y**	
	1992 (NEW YORK) Agreement ASCOBANS	**y**	
1982	(MONTEGO BAY) United Nations Conv. on the Law of the Sea	**y**	

Source: UNECE and Ministry of Environment of Kyrgyzstan.

y = in force; **S** = signed; **R** = ratified, acceded, approved

Worldwide agreements *(continued)*

	1994 New York Agreement. Related the Implementation of Part XI of the Convention	**Y**	
	1994 New York Agreem. Implementation of the Provisions the Convention and management of stradding fish stocks and highly migratory fish stock		
1985	(VIENNA) Vienna Conv. for the Protection of the Ozone Layer	**y**	
	1987 (MONTREAL) Montreal Prot. Subst. that Deplete the Ozone Layer	**y**	
	1990 (LONDON) Amendment to Protocol	**y**	
	1992 (COPENHAGEN) Amendment to Protocol	**y**	
1960	(Geneva) Conv. Concerning the Protection of Workers Against Ionizing Radiation	**Y**	
1963	(VIENNA) Conv. Civil Liability for Nuclear Damage	**Y**	
	Protocol on Amendments to the Convention	**Y**	
1963	(MOSCOW) Treaty banning nuclear Weapons Tests in the Atmosphere, in Outer Space and under Water	**Y**	
1986	(VIENNA) Conv. on Early Notification of Nuclear Accidents	**Y**	
1986	(VIENNA) Conv. on Assistance in the Case of Nuclear Accident or Radiological Emergency	**Y**	
1971	(LONDON, MOSCOW, WASHINGTON) Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Seabed and the Ocean Floor and in Subsoil Thereof	**Y**	
1989	(BASEL) Conv. Control of Transbound. Movts of Hazard. Wastes	**Y**	**R**
1990	(LONDON) Conv. Oil Pollution Preparedness, Response and Cooperation	**Y**	
1992	(RIO) Conv. Biological Diversity	**Y**	**R**
1992	(NEW YORK) United Nations Framework Conv. Climate Change	**Y**	
	1998 KYOTO Protocol to FCCC		
1994	(VIENNA) International Nuclear Safety Convention	**Y**	
1997	(VIENNA) Conv. Management of Radioactive Wastes and spent nuclear fuel		
1997	(VIENNA) Conv. Supplementary Compensation for Nuclear Damage		
1994	(PARIS) Convention to Combat Desertification		**R**

Source: UNECE and Ministry of Environment of Kyrgyzstan.

y = in force; **S** = signed; **R** = ratified, acceded, approved

	Regional and subregional agreements		Kyrgyzstan
	As of 1 July 2000		
1950	(PARIS) Intern. Conv. for the Protection of Birds	y	
1957	(GENEVA) European Agreement-Intern. Carriage Dangerous Goods by Road (ADR)	y	
1958	(GENEVA) Agreem. Adoption Uniform Cond. of Approval and Recognition for Motor Vehicles Equipment and Parts	y	
1968	(PARIS) European Conv. Protection of Animals during Intern. Transport	y	
	1979 (STRASBOURG) Additional Protocol	y	
1969	(LONDON) European Conv. Protection of Archeological Heritage	y	
1978	(OTTAWA) Convention on Multilateral Cooperation in North-West Atlantic Fisheries	y	
1979	(BERN) Conv. Conservation European Wildlife & Natural Habitats	y	
1979	(GENEVA) Conv. Long-range Transboundary Air Pollution	y	
	1984 (GENEVA) Prot. Financing of Coop Programme (EMEP)	y	
	1985 (HELSINKI) Prot. Reduction of Sulphur Emissions by 30%	y	
	1988 (SOFIA) Prot. Control of Emissions of Nitrogen Oxides	y	
	1991 (GENEVA) Prot. Volatile Organic Compounds	y	
	1994 (OSLO) Prot. Further Reduction of Sulphur Emissions	y	
	1998 (AARHUS) Protocol on Persistent Organic Pollutants		
	1998 (AARHUS) Protocol on Heavy Metals		
1992	(BUCHAREST) Conv. Protection Black Sea Against Pollution	y	
	1992 (BUCHAREST) Protocol (combatting pollution by oil and other harmful substances in emergency stuation	Y	
	1992 (BUCHAREST) Protocol (protection of the Black Sea marine environment against pollution from dumping)	Y	
	1992 (BUCHAREST) Protocol (protection of the Black Sea marine environment against pollution from land-based sources)	Y	
1991	(ESPOO) Conv. on Env. Impact Ass. in a Transboundary Context	y	
1992	(HELSINKI) Conv. on the Protection and Use of Transboundary Watercourses and International Lakes	y	
1992	(HELSINKI) Conv. Transboundary Effects of Industrial Accidents	y	
1998	(AARHUS) Conv. Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters		
1992	(PARIS) Conv. Protection Marine Env. North-East Atlantic		
1993	(LUGANO) Conv. Civil Liability for Damage from Activities Dangerous for the Environment		
1994	(LISBON) Energy Charter Treaty		
	1994 (LISBON) Prot. on Energy Efficiency and Related Aspects		

Source: UNECE and Ministry of Environment of Kyrgyzstan.

y = in force; S = signed; R = ratified, acceded, approved

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