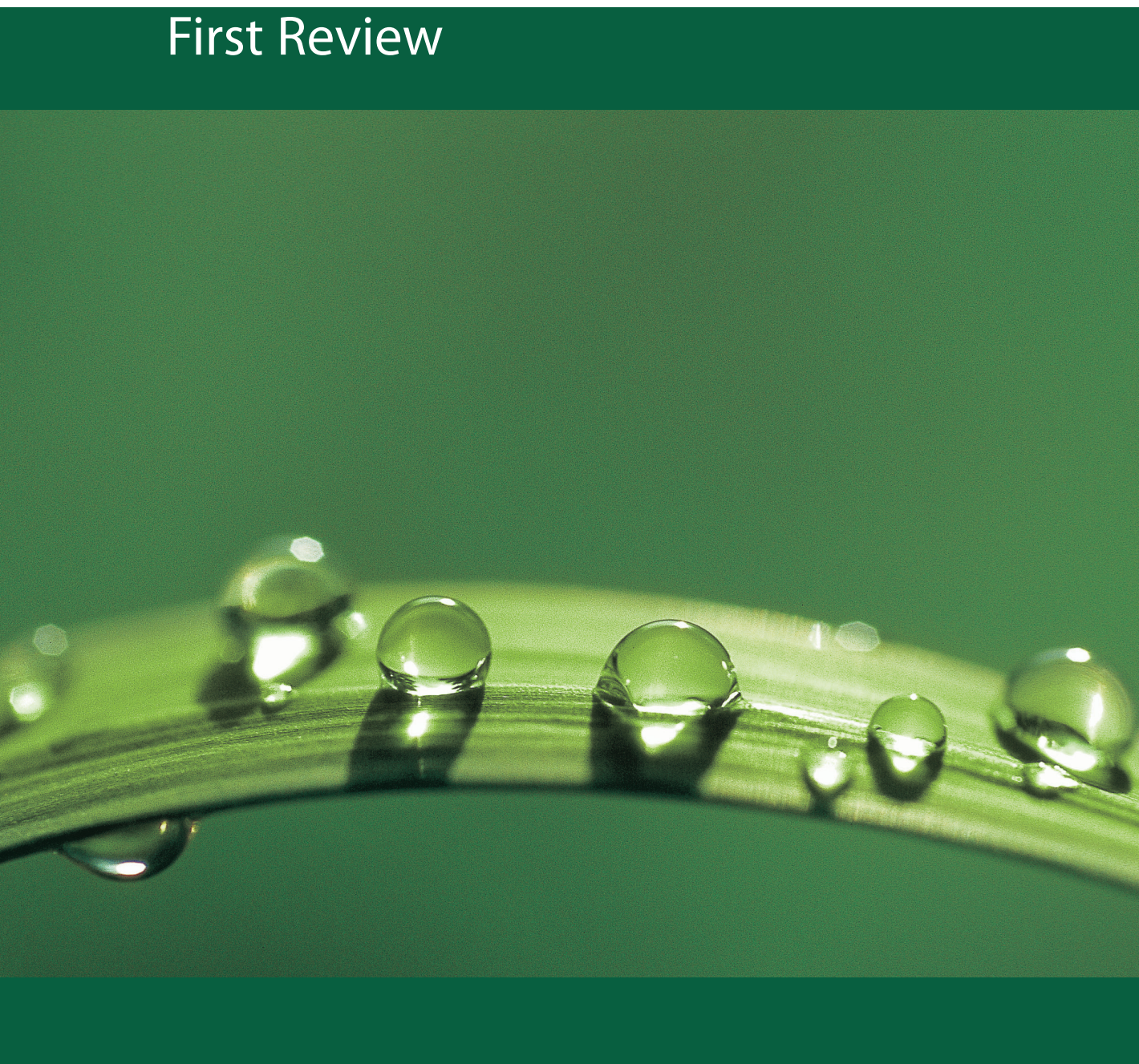


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First Review



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Foreword

In 1993, Environmental Performance Reviews (EPRs) of the United Nations Economic Commission for Europe (ECE) were initiated at the second Environment for Europe Ministerial Conference, in Lucerne, Switzerland. They were intended to cover the ECE States which are not members of the Organisation for Economic Co-operation and Development (OECD). Subsequently, the ECE Committee on Environmental Policy decided to make them part of its regular programme.

At the fifth Environment for Europe Ministerial Conference (Kiev, 2003), the Ministers affirmed their support for the EPR Programme, and decided that the Programme should continue with a second cycle of reviews. This second cycle, while assessing the progress made since the first review process, puts particular emphasis on implementation, integration, financing and the socioeconomic interface with the environment. The seventh Environment for Europe Ministerial Conference (Astana, 2011) formally endorsed the third cycle of reviews. In response to new global and regional concerns, the Ministers decided that integrating green economy into the third cycle of the EPR Programme would add value to this work, due to the relevance and importance of the green economy concept to the countries under review, and the potential to enhance cooperation with the community of donors and investors.

Through the peer review process, EPRs also promote dialogue among ECE member States and contribute to the harmonization of environmental conditions and policies throughout the region. As a voluntary exercise, EPRs are undertaken only at the request of the countries concerned.

The studies are carried out by international teams of experts from the ECE region, working closely with national experts from the reviewed country. The teams also benefit from close cooperation with other organizations in the United Nations system, for instance the United Nations Development Programme (UNDP) and other organizations.

I hope that this review will be useful to all countries in the region, to intergovernmental and non-governmental organizations (NGOs) alike and, especially, to Turkmenistan, its Government and its people.



Sven Alkalaj
Executive Secretary
Economic Commission for Europe

Preface

The Review of Turkmenistan began in November 2010 with the preparatory mission, during which the final structure of the report was established. Thereafter, the review team of international experts was constituted. It included experts from Bulgaria, the Czech Republic, Estonia, Germany, Kazakhstan, Portugal, the Russian Federation, Slovakia, Switzerland and Ukraine, together with experts from the secretariat of the United Nations Economic Commission for Europe (ECE).

The review mission took place from 21 February to 3 March 2011. The draft EPR report was submitted to Turkmenistan for comment and to the Expert Group on Environmental Performance Reviews for consideration. During its meeting on 13-15 March 2012 held in Ashgabat, Turkmenistan, the Expert Group discussed the report with expert representatives of the Government of Turkmenistan, focusing in particular on the conclusions and recommendations made by the international experts.

The EPR report, with suggested amendments from the Expert Group, was then submitted for peer review to the ECE Committee on Environmental Policy on 18 April 2012. A delegation from the Government of Turkmenistan participated in the peer review. The Committee adopted the recommendations as set out in this report.

The report covers major issues for Turkmenistan, divided into three sections, including the framework for environmental policy and management, management of natural resources and pollution, and economic and sectoral integration. Among the issues receiving special attention during the reviews were the policy, legal and institutional framework; public participation in decision-making and access to information; air pollution; water resources management and Caspian Sea issues; land management; forestry; biodiversity; management of waste; climate change and environmental concerns in the energy sector.

The ECE Committee on Environmental Policy and the ECE review team would like to thank both the Government of Turkmenistan and the many excellent national experts who worked with the international experts and contributed with their knowledge and assistance. ECE wishes the Government of Turkmenistan further success in carrying out the tasks before it to meet its environmental objectives and implement the recommendations of this review.

ECE would also like to express its deep appreciation to the Governments of the Netherlands, Norway and Switzerland for their financial contributions; to the Governments of Portugal and Switzerland for having delegated their experts for the review; and to UNDP Turkmenistan for its support of the EPR Programme and this review.



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LIST OF KEY ABBREVIATIONS

ADB	Asian Development Bank
AEWA	Agreement on the Conservation of African-Eurasian Migratory Waterbirds (African-Eurasian Waterbird Agreement)
AJSC	agricultural joint stock company
APG	associated petroleum gas
BAT	best available technique(s)
BSAP	Biodiversity Strategy and Action Plan for Turkmenistan for the Period 2001-2010
CACILM	Central Asian Countries Initiative for Land Management
CBD	Convention on Biological Diversity
CDM	Clean Development Mechanism
CEP	Caspian Environmental Programme
CIS	Commonwealth of Independent States
CITES	Convention on International Trade in Endangered Species of Wild Fauna and Flora
CLRTAP	Convention on Environmental Impact Assessment in a Transboundary Context
CMS	Convention on the Conservation of Migratory Species of Wild Animals
CPAP	Country Programme Action Plan
DNP	Department of Nature Protection (MoNP)
EBRD	European Bank for Regional Development
EC	European Community
ECE	United Nations Economic Commission for Europe
EIA	environmental impact assessment
EIU	Economist Intelligence Unit
ELV	emission limit value
EMEP	Co-operative Programme for Monitoring and Evaluation of the Long-range Transmission of Air Pollutants in Europe
ESD	education for sustainable development
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FRA	Global Forest Resources Assessment (FAO)
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GIZ	German Agency for International Cooperation – Deutsche Gesellschaft für Internationale Zusammenarbeit
GHG	greenhouse gas
GMO	genetically modified organism
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit (now Deutsche Gesellschaft für Internationale Zusammenarbeit, GIZ)
IBA	Important Bird Area
ICSD	Interstate Commission for Sustainable Development
IEA	International Energy Agency
IFAS	International Fund for Saving the Aral Sea
IMF	International Monetary Fund
IMO	International Maritime Organization
INCD	Intergovernmental Negotiating Conference on Desertification
IPPC	integrated pollution prevention and control
ISDB	Islamic Development Bank
ITCP	Integrated Technical Cooperation Programme
IUCN	International Union for Conservation of Nature
IWRM	integrated water resources management
LMO	living modified organism
MAC	maximum allowable concentration
MAE	maximum allowable emission
MEA	multilateral environmental agreement

MoA	Ministry of Agriculture
MoHMI	Ministry of Health and Medical Industry
MoNP	Ministry of Nature Protection
MoWE	Ministry of Water Economy
MSW	municipal solid waste
NAPCD	National Action Plan to Combat Desertification
NCAP	National Caspian Action Plan
NEAP	National Environmental Action Plan of the President of Turkmenistan
NGO	non-governmental organization
NIDFF	National Institute of Deserts, Flora and Fauna
NIS	Newly Independent States
NPF	National Programme Framework
ODA	official development assistance
ODP	ozone-depleting potential
ODS	ozone-depleting substance
OECD/DAC	Organisation of Economic Co-operation and Development, Development Assistance Committee
OWL	other wooded land
PA	protected area
PCA	partnership and cooperation agreement
POP	persistent organic pollutant
PSA	production-sharing agreement
RPCEM	Research and Production Centre on Environmental Monitoring
SCS	State Committee on Statistics
SEE	State ecological expertise
SES	Sanitary and Epidemiological Service
SFF	State Forest Fund
SOE	State-owned enterprise
SSFI	State Service Foreign Investments
TACIS	Technical Assistance to the Commonwealth of Independent States (European Commission)
TSP	total suspended particulates
UNCCD	United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
VOC	volatile organic compounds
WHC	Convention Concerning the Protection of the World Cultural and Natural Heritage
WHO	World Health Organization
WMO	World Meteorological Organization
WWF	World Wide Fund for Nature (also known as World Wildlife Fund)

SIGNS AND MEASURES

..	not available
-	nil or negligible
° C	degrees Celcius
\$	dollar
Ci	Curie
GWh	gigawatt-hour
ha	hectare
kg	kilogram
kJ	kilojoule
km	kilometre
km ²	square kilometre
km ³	cubic kilometre
kgoe	kilogram of oil equivalent
ktoe	kiloton of oil equivalent
kV	kilovolt
kW	kilowatt
kWh	kilowatt-hour
l	litre
m	metre
m ²	square metre
m ³	cubic metre
MW	megawatt
PJ	petajoule
ppm	parts per million
s	second
t	ton
TJ	Terajoule
toe	ton of oil equivalent
tofe	ton of fuel equivalent
TWh	terawatt-hour

CURRENCY CONVERSION TABLE

Year	Manat /US\$	Manat /EUR
2000	1.04	0.96
2001	1.04	0.93
2002	1.04	0.98
2003	1.04	1.18
2004	1.04	1.29
2005	1.04	1.29
2006	1.04	1.31
2007	1.04	1.43
2008	2.32	3.41
2009	2.85	3.98
2010	2.85	3.78
2011	2.85	3.97
2012 May	2.85	3.64

Source: ECE common database (accessed August 2012).

Notes: Monetary unit: manat

The Turkmen manat (TMM) replaced the Soviet rouble at 1:500 in 1993 and after January 2009 the new manat (TMN) replaced the old currency at 1:5000. All data are expressed in the latest currency units.

Executive summary

The Environmental Performance Review (EPR) of Turkmenistan began in November 2010. It analyses the progress made in Turkmenistan from 2000 on environmental protection, and proposes recommendations on how the country can improve its environmental management and address upcoming environmental challenges.

Turkmenistan is a landlocked country in Central Asia, with a continental climate and an insufficient constant surface water flow. The harsh climatic conditions and the transboundary nature of its water resources make the country vulnerable to climate change impacts and water-related pollution threats.

Turkmenistan's budgetary performance remains strong. However, the non-continuous budget data seem to represent only a part of overall government expenditure. The country's gross domestic product (GDP) has been growing since 2005. It is not possible to assess the level of inflation due to the lack of available consumer price index (CPI) and producer price index (PPI) data.

Decision-making for environmental protection

Since its independence, Turkmenistan has been facing rapid economic development which has not been followed by the commensurate development of environmental legislation. Although the system of government is very centralized, the frequent changes in the titles, structure and functions of State bodies create confusion regarding their legal status.

There is no legal definition of the term "sustainable development" and the terms "socioeconomic development" or "economic, political and cultural development" are used instead. The President's 2003 National Strategy of Economic, Political and Cultural Development of Turkmenistan for the Period until 2020 (Strategy 2020) was the main policy document on sustainable development and it is now succeeded by the 2010 National Strategy of Economic, Political and Cultural Development of Turkmenistan for 2011-2030 (Strategy 2030). The economy and nature use are treated as a single unit by Strategy 2030 and State policy is oriented around the following tasks: protection of air quality and development of green belts; water protection; protection and exploitation of land and forest resources; and conservation of biodiversity.

The year 2000 was the starting point for the development of Turkmenistan's environment-related programmes and plans. The National Environmental Action Plan (NEAP), which covered the period 2002-2010, was the main instrument assisting the implementation of environmental strategies. However, NEAP had a limited role and it failed to integrate environmental concerns into all sectors of the economy. The Biodiversity Strategy and Action Plan (BSAP), which has never been formally adopted, and the National Caspian Action Plan (NCAP) aim to implement the State's environmental policies in their respective areas.

Environmental legislation consists of key legal acts regulating the use of natural resources and their protection. These acts are not fully comprehensive and are frequently ineffective in protecting the environment and regulating the rational use of natural resources. For this reason, in March 2011, the Ministry of Nature Protection (MoNP) created a working group on improving national environmental legislation in order to complement existing legislation and improve environmental management in Turkmenistan.

Regulatory instruments for environmental protection

Turkmenistan has no clearly defined procedures for conducting inspections, detecting administrative offences and reporting on such offences. Provisions regulating non-compliance with environmental requirements are outdated and many of the environmental regulations are either not available or not easily accessible for the general public.

The main mechanisms for monitoring compliance with environmental regulations are scheduled inspections and patrolling of natural sites. However, these are done irregularly, without strict criteria for deciding which enterprises are to be inspected, and the results are kept for internal use only. Furthermore, inspections conducted by MoNP are ineffective since they are based mainly on comparison with previous reporting periods.

The Code on Administrative Offences and the Civil Code provide a range of enforcement tools – mainly administrative fines and compensation for environmental harm – while criminal sanctions are rarely applied. Moreover, when cases of non-compliance are detected, the environmental inspectorates do not have enough flexibility to deal with them in a way that is tailored to the specific nature of the offence. The current system does not contain effective sanctions to deter further non-compliance and there is an obvious lack of proportionality between the level of offences and the level of the fines set by the Code on Administrative Offences (which is currently under review).

As of 2000, environmental impact assessment (EIA) has been part of the national legislation and quite a broad range of activities are subject to EIA. However, in most cases, EIA is carried out without application of the public participation procedures. Strategic environmental assessment is not applied at present, and the environmental audit procedure is not included in the current legislation.

Economic instruments and financing of environmental protection

Turkmenistan has experienced strong economic expansion over the past decade. This has been mainly State led although there has been a gradually increasing role played by the private sector. The protection and rational use of natural resources is considered a fundamental principle of Government policy which, as of 2003, also identifies the welfare of the population and the raising of living standards as priority areas.

Fees charged as a feature of the economic instruments introduced to help prevent pollution are much too low to provide incentives for polluters to engage in pollution abatement. Charge rates for the pollution of air and water have not been adjusted for cumulative inflation over the last decade, and their effectiveness cannot be assessed due to the lack of available data. However, the level of revenues appears to be largely insufficient for the task of financing environmental expenditures.

The generous subsidies for the use of electricity, gas, petrol and water create perverse incentives for consumers, which leads to excess consumption and a wasteful use of resources. Due to a lack of metering, there is no effective control over the population's water use; hence, the setting of an upper limit is hard to observe. Despite the 2008 increase in petrol prices, gasoline and diesel are still heavily subsidized.

Administrative fines are imposed in cases of infringement of environmental regulations. However, the fines are set at levels that correspond to only a small fraction of the minimum wage and, hence, are an ineffective instrument for changing the behaviour of those who do not abide by the law.

The State budget is the main source of environmental expenditure financing, but there is a very limited amount of published information on actual expenditure levels. There has been relatively little international assistance given to the country over the past decade, and moderate reliance on international financial institutions, special mechanisms and bilateral assistance.

International cooperation

Turkmenistan is currently a party to 11 international environmental treaties and is making efforts to bring its legislation in line with its international obligations. However, the roles of MoNP and of the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes are not clearly defined. In light of the expiration of NEAP, MoNP is developing a draft national environmental programme for the period 2012-2016.

There has been a significant level of involvement by Turkmenistan with the international environmental community in activities related to biodiversity, nature conservation and desertification. On the other hand, the level of Turkmenistan's commitment to United Nations Economic Commission for Europe (ECE) conventions is low, and the country still has not acceded to other important environmental agreements such as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the Bonn Convention on the Conservation of Migratory Species of Wild Animals (CMS).

Non-compliance with the multilateral environmental agreements (MEAs) to which it is a party remains an issue for Turkmenistan, especially regarding its obligations under the Convention on Access to Information, Public

Participation in Decision-making and Access to Justice in Environmental Matters (Aarhus Convention). Further implementation measures need to be taken in order to increase compliance with the Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Basel Convention) and the Cartagena Protocol on Biosafety to the Convention on Biological Diversity (CBD).

Water management deserves a special focus in Turkmenistan's policies, and the country's bilateral and regional cooperation with other Central Asian countries needs to be reinforced. The transboundary nature of the water system and the great strain that has been placed on the water resources of the Central Asian region by intense economic expansion show the need for Turkmenistan to engage in productive dialogue with neighbouring countries.

Environmental monitoring, information, public participation and education

After gaining its independence, Turkmenistan managed to maintain its environmental monitoring through a minimal monitoring observation network. However, there are still several issues which need to be addressed, such as obsolete equipment and a lack of publicly available data.

Air quality monitoring is conducted manually and the equipment is obsolete. While a high concentration of dust is observed, the current monitoring system does not distinguish between dust coming from natural and anthropogenic sources. Airborne concentrations of pollutants harmful to human health and the environment, such as PM_{2.5} and PM₁₀ and ground-level ozone, are not measured.

Water monitoring is scattered and uncoordinated. Only two of 16 reservoirs are monitored, while drainage collectors and heavy metals are not monitored (except at the Caspian Sea). Furthermore, information is not being exchanged among the various monitoring institutions. Monitoring of the Caspian Sea, however, is being done quite effectively by the Caspian Ecological Service (CaspEcoControl).

There has been no qualitative assessment of lands in Turkmenistan since the State Committee for Land Use, Land Management and Land Reform under the Cabinet of Ministers was abolished in 1998. Geographic Information System (GIS) technologies are not applied, remote sensing data are not used in cadastre preparation and equipment is obsolete and outdated.

Turkmenistan is making little effort to ensure that environmental information is accessible to the public. Most of the monitoring results and reports are not publicly available and the information that can be found on the various ministry websites is not comprehensive, not regularly updated and often not available in the Turkmen language.

Turkmenistan does not publish state-of-environment reports. This is contrary to the country's obligations under the Aarhus Convention, to which Turkmenistan is a party. Moreover, MoNP has established neither a legal nor an institutional framework for producing regular environmental assessment reports.

Currently, registered public associations are the only means by which citizens can participate in environmental matters and actions. Furthermore, the laws containing provisions on access to justice are vague and it is unlikely that they are used by citizens extensively, if at all.

The right to environmental education is established in the 1991 Law on Nature Protection. Elements of environmental education are included in all levels of education and there have been considerable investments in new buildings and resources for teaching and research. Sustainable development principles do not appear to be integrated into school curricula. The country has not yet developed an action plan for the implementation of the ECE Strategy on Education for Sustainable Development (ESD).

Air quality management

Air quality assessment and management is amongst the priorities of the country's environmental policy. Although certain practical measures have been taken to reduce emissions from stationary and mobile sources, the existing air quality and emission standards do not allow for proper monitoring and assessment.

Permitting procedures are based on obsolete practices and integrated pollution prevention and control (IPPC) has not been introduced. Furthermore, best available techniques (BAT) have not been defined and, therefore, they are not taken into account during the permit-issuing procedure. The role of EIA is not clearly defined.

The current air quality management system is being developed and implemented separately from mitigation of climate change, and potential synergies cannot be exploited. There is no coordinated approach between these two targets, and measures aiming at energy efficiency or the use of renewable energy sources are not being supported.

Water management and protection of the Caspian Sea environment

Water management is one of the key issues for Turkmenistan, since almost 90 per cent of its water resources go to irrigation. The inefficient and wasteful irrigation system is one of the most acute water management problems. In addition to the water losses, the extensive use of old, traditional irrigation technology, which uses increasing amounts of water, has salinized more than 60 per cent of agricultural land.

Turkmenistan still lacks a national integrated water resources plan. Currently, there are no instruments to help economize on water use and there are no flexible financial mechanisms or incentives to stimulate the introduction of modern water-saving technologies and practices.

Access by the population to safe drinking water is officially declared to be a priority of State policy. Considerable steps have been taken to reformulate the existing legislative and regulatory framework in this regard, in particular through the recently adopted 2010 Law on Drinking Water. Still, water quality monitoring is rather scattered, uncoordinated and geared towards concrete sectoral interests.

The Caspian Sea plays an important role for Turkmenistan, since the main oil and gas industry is concentrated in the coastal zone. The most important forms of pollution in the Caspian Sea are oil spills caused by oil-related activities, and eutrophication caused by chemical nutrients originating primarily from sewage and agricultural run-off. The Government has made efforts to tackle these pollution sources by implementing the Caspian Sea Environmental Programme, Oil Spill Prevention and National Response Plan, which has resulted in pollution having generally diminished along Turkmenistan's Caspian Sea coast in recent years.

Land management

Agriculture plays an important role in Turkmenistan's policy to make the country self-sufficient with regard to food. Of the country's total surface area of 49.4 million ha, 40.7 million ha are classified as agricultural. Irrigated agriculture provides more than 70 per cent of gross agricultural production.

The main environmental problems are the degradation of vegetative cover of pasture lands, salinization of irrigated lands and waterlogging of desert ranges. Soil salinity and waterlogging has increased in the last decade from roughly 25 per cent to 50 per cent of the irrigated land, resulting in a decline in crop yield of 20-30 per cent. The drainage system is deficient and all discharged waters are diverted into the desert without any treatment. Furthermore, the inefficient irrigation system induces waterlogging and the free allocation of water for agricultural use does not provide any incentive for water-saving practices.

Overgrazing and the destruction of the vegetation cover is an acute problem in Turkmenistan. The draft Pasture Code is a step towards mitigating desertification. The current Land Code contains all the necessary provisions for territorial planning, land surveying and monitoring, and land and soil conservation; however, more detailed regulations for the implementation of its provisions, such as pasture rules, soil protection and liability for damages to the land cover, are still lacking.

Since 1991, no soil analyses have been performed. The lack of available data concerning the state of the soils and pollution by industrial activities in Turkmenistan impedes decision-making on the implementation of measures adapted to the state of the soils. Furthermore, there are no legal provisions regarding the installation of buildings or exploitation sites by enterprises, nor obligations upon enterprises to handle with care and eventually restore the vegetation cover.

Waste management

Waste management has only just begun to be recognized in Turkmenistan to be a priority in environmental management. Waste management is underdeveloped and lacks specialized legislation, and the practice of disposal of municipal solid waste is poor and does not meet international standards. However, there are financial and human resources available for the necessary modernization of waste management practices.

Management of medical waste receives significantly more attention than other types of waste. The 2009 Medical Waste Management Strategy defines methods of collection and sorting, transportation, treatment and disposal. Other sectors, particularly the oil industry and municipal solid waste sector, still lack sectoral strategies which take waste management into account.

Current waste disposal practices are either non-existent, not followed, or do not comply with international standards. Disposal sites for municipal waste are often located near towns to minimize transportation distances, exposing populations to nuisance and danger, and presenting a long-term threat to human health and the environment. Government institutions do not seem to be sufficiently informed about the status of disposal sites to enable them to efficiently regulate development of the country's waste management sector.

Although a party to the Basel Convention, Turkmenistan does not sufficiently implement it. The country does not fully participate in the activities of the Convention, and in the period 1999-2007 the required annual reporting was submitted only once.

Biodiversity and protected areas

The biodiversity of Turkmenistan has declined significantly over the past century due to desertification, land degradation and overexploitation. However, a comprehensive, up-to-date assessment of the conservation state of ecosystems and species throughout Turkmenistan is impossible due to the incomplete system of biodiversity monitoring. Recent assessments have identified the lack of capacity at the individual, institutional and systemic levels as a limiting factor in biodiversity and protected area (PA) management in the country.

NEAP and BSAP have been the fundamental national policy and planning documents on biodiversity and PA management. Both plans expired in 2010, creating a significant policy gap that calls for the creation of a realistic, effective and sufficiently supported national planning framework.

Turkmenistan's PA system currently consists of eight State reserves which have a strict protection regime. However, the system's effectiveness is limited by its small area of coverage, restricted range of PA categories and governance types, insufficient devolution of decision-making and financial authority, and the restricted participation of local stakeholders and resource users. There is now a critical mass of know-how which should be used to enlarge and diversify the PA system.

Reliable, up-to-date information on the status of and trends in biodiversity is an indispensable prerequisite for proper biodiversity management and decision-making. The third *Red Data Book of Turkmenistan*, published in October 2011, is not fully consistent with the current International Union for Conservation of Nature (IUCN) Red List system. A comprehensive State biodiversity monitoring system has not been established to date, and MoNP and its subordinate bodies lack sufficient capacity to establish it alone.

Turkmenistan has not acceded to a number of key international conventions on biodiversity. Ratifying key international agreements, such as CITES, the CMS and the Agreement on the Conservation of African–Eurasian Migratory Waterbirds (AEWA), would greatly benefit biodiversity governance in the country.

Forestry and forest management

The contribution of forests to environmental protection and the maintenance of the ecological balance is widely recognized in the country. For this reason, the establishment and proper management of State-protected natural reserves and significant areas of planted forests should continue. The new Forest Code, which came into force in July 2011, provides an important basis for better coordination of work and activities aimed at sustainable forest management.

The lack of recent data hinders the comprehensive and consistent classification of forests and wooded lands. Currently, there is no accurate, comprehensive, reliable and up-to-date information supporting sustainable forest management. The latest countrywide forest inventory was implemented in 1988/89.

Turkmenistan has a wealth of experience in the afforestation of desert areas. The country uses several techniques to manage desertification. These include establishing protective forest shelter belts; fixing moving sands; selecting and introducing appropriate resistant species; introducing advanced technology and agrotechnology; and applying more advanced methods in the organization of forestry work. However, these activities are still insufficient to meet countrywide needs.

The lack of appropriate funding and sufficient qualified specialists prevent proper forest monitoring. Proper organization and development of the forestry sector in Turkmenistan is prevented by the lack of budgetary provision. All the measures undertaken by the Government so far have not yet been sufficient to raise the forestry profile to the level of real sustainable forest management.

Climate change

Turkmenistan is faced with serious environmental threats in the light of climate change. The main impacts will be temperature increase and reductions in humidity and rainfall, and as well as in available water resources. The major sources of greenhouse gas (GHG) emissions are the oil and gas industry, the electricity subsector and the transport sector. Inefficient management of energy resources and the use of obsolete technologies add to this problem.

Turkmenistan recognizes the importance of taking initiatives related to climate change at the regional level. Climate change is one of the pillars of the Water Management Development Concept of Turkmenistan until 2030. However, the country has prepared neither a programme to adapt to climate change nor a low-emission development strategy. A major gap overall is that the methodology used to conduct ecological expertise does not address carbon dioxide (CO₂).

The level of public awareness regarding climate change in Turkmenistan is low. Currently, water, electricity (up to a certain limit), gas and a significant amount of fuel are free of charge to the population, resulting in non-efficient use. There is a general lack of conscience among those using these free-of-charge commodities.

Energy and environment

It is believed that Turkmenistan has one of the world's largest reserves of natural gas. Natural gas is the most critical export in terms of national export revenue. However, the production and export of oil and gas can cause severe damage to the environment and there are no publicly available data which ensure that preventive measures are taken during these activities.

As oil and gas pollution poses a major threat to Turkmenistan's coastline, the Caspian Sea deserves special attention. The environmental aspects of production-sharing agreements (PSAs) with foreign companies are not made publicly available. There are no data directly related to pollution caused by refineries; however, the refinery in the city of Turkmenbashi is considered to be a significant source of air, water and land pollution.

The most critical environmental problem related to the hydrocarbon sector is the burning of associated petroleum gas (APG). Nonetheless, regular and reliable statistics on APG flaring are non-existent in Turkmenistan. The country faces major challenges in addressing APG flaring and venting due to the lack of a legislative framework, technologies and resources.

Turkmenistan's energy intensity is very high. The Government has not yet developed any legal or institutional framework for energy efficiency and saving, and electricity tariffs are not attractive enough for investors in energy-efficiency projects. Turkmenistan possesses a certain potential for wind and solar energy production, which could be used to promote sustainable development.

INTRODUCTION

I.1 Physical context

Turkmenistan is a landlocked country in Central Asia, bordering the Caspian Sea to the west. The Caspian Sea coast, 1,786 km long, is the longest of the country's borders. Its other borders are with the Islamic Republic of Iran (to the south, 992 km long), the Islamic Republic of Afghanistan (to the south-east, 744 km), and the Republics of Uzbekistan (to the north and east, 1,621 km) and Kazakhstan (to the north, 379 km). Turkmenistan has 488,100 km² of territory, which stretches 1,100 km from west to east, and 650 km from north to south.

The country has a wide range of elevation extremes. The highest point, Mount Ayrybaba, which is located in the Köýtendag Range of the Pamir-Alay chain in the south-east of the country, rises 3,139 metres above sea level, while the lowest point, in Lake Sarigamish, which has a fluctuating water level, is around 100 metres below sea level. The average elevation level, however, is relatively low, ranging from 100 to 220 m.

In western Turkmenistan, Mount Arlan (Uly Balkan Gershi), the highest point of the Balkan Daglary range, peaks at 1,880 metres above sea level.

The Kopetdag mountain range on the frontier between Turkmenistan and the Islamic Republic of Iran extends about 650 km along the border, east of the Caspian Sea. This mountain range area is characterized by foothills, dry and sandy slopes, mountain plateaus and steep ravines. The highest point of the Kopetdag range in Turkmenistan is Mount Shahshah (2,912 m), situated south-west of the capital Ashgabat. The Kopetdag region belongs to a seismic belt that can have powerful earthquakes. In 1948, an earthquake that registered nine on the Richter scale destroyed the city of Ashgabat.

The topographical features of north-western Turkmenistan are the Krasnovodsk and Ust-Jurt (Üstýurt) plateaus. The dominant feature of the landscape is the Karakum Desert, which occupies some 70 per cent (350,000 km²) of the country's territory. Shifting winds create sand dunes that can be 20 m high and several kilometres long. Common natural features include chains of such mountains, steep elevations and smooth, concrete-like clay deposits formed by the rapid evaporation of flood waters in the same area over a number of years.

Large, marshy salt flats exist in many depressions, including the Garasor, which occupies 1,500 km² in the north-west of the country. The Sandykly Desert west of the Amu Darya River is the southernmost extremity of the Kyzyl Kum Desert, most of which lies in Uzbekistan to the northeast.

Most of the country's territory lacks constant surface water flow. The main rivers are located in the south-eastern corner of the country. The most important is the Amu Darya River, which begins as a border river between the Republic of Tajikistan and northern Afghanistan then flows through south-eastern Turkmenistan and crosses finally to Uzbekistan. The river runs for 744 km within Turkmenistan's borders. Water from the Amu Darya River is used for irrigation, which has had an effect on the amount of water reaching the Aral Sea, causing severe environmental impact on the Aral Sea. Other major rivers are the Tejen River (1,124 km); the Murgab River (852 km); and the Atrek River (660 km).

Turkmenistan has a continental desert climate. Summers, lasting from May to September, are hot and dry, while winters are generally mild and dry, although occasionally cold and damp in the north. Most of the precipitation falls between January and May, although precipitation is slight throughout the country, with annual averages ranging from 300 mm in the Kopetdag region to 80 mm in the north-west. Because of the desert climate, some areas have an average annual precipitation of only 12 mm.

Average annual temperatures range from highs of 16.8 °C in Ashgabat to lows of -5.5 °C in Dashoguz, on the Uzbek border in north-central Turkmenistan. The highest temperature recorded in Ashgabat is 48.0°C and Kerki, an extreme inland city located on the banks of the Amu Darya River, recorded 50.1°C in July 1983. The almost constant winds are northerly, north-easterly, or westerly.

I.2 Natural resources

Turkmenistan has substantial oil and gas resources, but estimates of the scope of these reserves vary depending on the source. The country is divided into seven oil and gas regions according to the geological development of the sedimentary complex, the conditions for the accumulation of oil and gas: West Turkmen, Central Karakum, Beurdeshek-Khiva, Chardzhou, Zaunguz, Murgab and Badkhyz-Karabil.

Turkmenistan has proven oil reserves of roughly 600 million barrels. However, it is possible that oil reserves are over two billion barrels (bbl) plus six billion bbl of undiscovered reserves. According to the *BP Statistical Review of World Energy June 2008*, Turkmenistan produced an average of 197,800 barrels of crude oil per day (bpd) in 2007, which was about 0.25 per cent of total production worldwide.

Turkmenistan contains several of the world's largest gas fields, located primarily in the Amur Darya River basin in the east, the Murgab River basin, and the South Caspian basin in the west. Nevertheless, the use of these reserves is constrained by the lack of available natural gas transport infrastructure.

The International Energy Agency (IEA) reports that the lack of data is hindering the estimation of the true hydrocarbon reserve and production potential of Turkmenistan. IEA confirms that it is generally believed that Turkmenistan has the world's fourth largest reserves of natural gas, although it is not clearly explained how this has been verified.

According to the *BP Statistical Review of World Energy June 2008*, in 2007 Turkmenistan had proved natural gas reserves of 2.66 trillion m³, 1.5 per cent of the world total. This reserve level ranks Turkmenistan among the top 12 countries in terms of natural gas reserves. In 2007, Turkmenistan had natural gas production of 67.4 billion m³ and

consumption of 21.9 billion m³. Turkmenistan exports most of its natural gas production.

Other than oil and gas, the main minerals mined commercially are bentonite (a clay used in oil and gas drilling mud, and a variety of other industries), salt and gypsum.

I.3 Demographic and social context

The most important change in Turkmenistan's demography is its strong population growth. Over the past 10 years, the country's population has grown about 10 per cent from 4.5 million in 2000 to 5.1 million in 2011. The infant mortality rate fell from 56.1 per 1,000 live births in 2003 to 46.9 in 2010. During this same period, the total fertility rate decreased slightly in 2010 to 2.4, which is higher than the 2007 European Union (EU) average of 1.5. Average life expectancy at birth for women increased from 68.3 years in 2003 to 69.1 years in 2010, while the increase for men was from 60.4 to 60.8 years.

The average population density is 10 inhabitants per km², but density varies significantly due to the topography and local level of urbanization. The capital and administrative centre, Ashgabat (population 695,300 according to the 2001 census estimate), is located next to the country's mountainous southern border.

Photo I.1: Monument to Magtymguly¹, Ashgabat



¹ Magtymguly Pyragy, born 1733, died 1797, Turkmen leader and philosophical poet

Other major urban centres are the second-largest city of Turkmenabat (population 254,000), located on the banks of the Amu Darya River near the border with Uzbekistan, and the city of Balkanabat (population 87,822), an industrial centre for petroleum and natural gas production situated at the foot of the Balkan Daglary mountain range.

In 2003, Turkmenistan's human development index (HDI), as calculated by the United Nations Development Programme (UNDP), was 0.738 (on a scale of 0.0 to 1.0), and the country ranked 97th of 177 countries reviewed. The country's HDI dropped in 2011 to 0.686, ranking Turkmenistan 102nd of 187 countries and placing it in the group of countries with medium-level human development.

The official language is Turkmen (as per the 1992 Constitution), although Russian is still widely spoken and used, especially in cities, as a lingua franca. Turkmen is spoken by 72 per cent of the population, Russian by 12 per cent, Uzbek by 9 per cent and other languages by 7 per cent.

I.4 Economic context

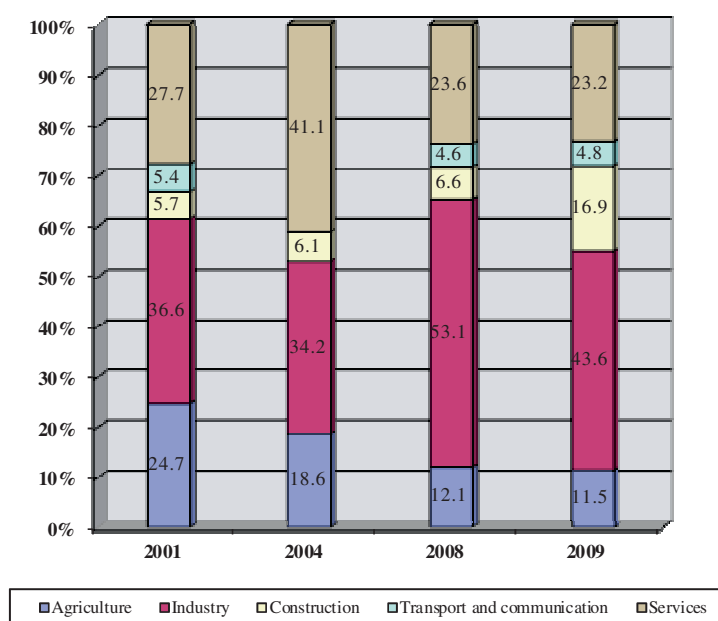
According to official reports, Turkmenistan's budgetary performance remains strong. The Ministry of Economy and Development (MED) reported that, in 2010, revenue was 25.1 per cent above target and expenditure was 7.8 per cent below target. This is a very narrow and partial picture of the budget situation, since the non-continuous budget data,

which can be acquired occasionally from a variety of sources, seem to represent only a part of overall government spending.

It is clear from the available sources that GDP has been growing since 1998. The rate of growth diminished in 2009 but remained very strong at 6.1 per cent. The Turkmen Government reported real GDP growth of 9.2 per cent in 2010. The sectoral development of GDP is presented in Figure I.1. Agricultural production's share of GDP was halved between 2001 and 2009, while the share of construction shot up in 2009 because of investment in both hydrocarbons and the housing sector. Unfortunately, it is impossible to assess inflation since data for CPI and PPI are not readily available.

The Economist Intelligence Unit (EIU)'s *Country Report Turkmenistan* in April 2011 estimated that inflation in 2010 was about 10 per cent and that it would increase to 15 per cent in 2011, but these figures are hard to verify. The same source also estimated that the current account, which had had surpluses owing to gas exports, swung into deficit in 2009. This was primarily due to the fact that gas exports to the Russian Federation were halted during most of 2009 owing to a dispute over pricing and volumes, and while trade resumed in 2010 the volume was much lower than in 2008. Turkmenistan is dependent on its hydrocarbon exports. In 2001, gas brought in 57 per cent and crude and refined oil 26 per cent of the country's export income.

Figure I.1: GDP by sector in 2001, 2004, 2008 and 2009, per cent of total GDP



Source: Statistical Yearbook 2000-2008, 2009; Statistical Yearbook 2000-2009, 2010.

I.5 Institutions

Turkmenistan became a constituent republic of the Union of Soviet Socialist Republics (USSR or Soviet Union) in 1924 and gained independence in December 1991. The Constitution of independent Turkmenistan was adopted on 18 May 1992, and has since been amended several times, most recently on 26 September 2008.

The President is the Head of State and wields executive power. He (or she) enacts the Constitution and laws, signs the laws, and can use the right of suspensive veto and return the law with his or her objections to Parliament for a second hearing and vote. The President can also issue decrees, decisions and orders. The President appoints the prosecutor general and the prosecutors in each province, while the Procurator General appoints prosecutors for the smallest political jurisdictions, the districts and the cities.

The Cabinet of Ministers is an executive and administrative body. It ensures execution of the laws of Turkmenistan and compliance with acts of the President and Parliament. The Cabinet of Ministers, within its competence, adopts resolutions and issues binding orders. It can revoke the legal acts of ministries and departments and the bodies of local executive power. Table I.1 presents the list of ministries as at mid-2012.

The 2008 constitutional amendments dissolved the People's Council and bestowed its powers on a unicameral Parliament that has 125 deputies elected from single-mandate constituencies. Parliament is the highest legislative authority due to its role in passing laws, monitoring their use and interpretation, and ratifying international treaties.

Administratively, Turkmenistan is divided into five provinces (*velayats*) and one city with a status of a province – Ashgabat. The provinces are subdivided into districts (*etraps*), which may be either counties or cities. Below the level of districts the administrative units are towns, settlements and *gengeshliks*. In these smaller units beneath district level, the local authorities are called *gengeshes*. Provinces, cities and districts are governed by

hyakims (governors) who are the representatives of and accountable to the President in their local area and are appointed by and can be dismissed by the President. The decisions taken by *gengeshes* within the limits of their competence are binding in their territory.

In 1991, the Turkmen Communist Party changed its name to the Democratic Party of Turkmenistan and was the only registered party in the country. The single-party political system was changed in 2010, when the ban on opposition parties was lifted and the registration of another party, the Farmers' Party, was approved. This approval, however, does not seem to have had any effect on the party structure of the country as yet. In addition to the establishment of a new party, some "civil society" groups were allowed to register candidates in the 2010 elections.

The court system is divided into three levels. At the highest level, the Supreme Court consists of 22 members, including a president and associate judges, and is divided into civil, criminal and military chambers. The Supreme Court hears only cases of national importance; it does not function as an appeals court.

At the next level are the appellate courts, which function in the five provinces and the city of Ashgabat. The lowest level of courts consists of 61 trial courts operating in the districts and in some cities, with jurisdiction over civil, criminal and administrative matters. In courts at this level, a panel of judges presides in civil and criminal suits, and, typically, one judge decides administrative cases.

Specialized courts include military courts, which decide cases involving military discipline and crimes committed by and against military personnel. The Supreme Economic Court arbitrates disputes between enterprises and State agencies.

All judges at all levels are appointed by the President for five-year terms, and may be reappointed. Judges enjoy immunity from criminal and civil liability for their judicial actions, but can be dismissed from office by decision of a court and for reasons enumerated in the law.

Table I.1: Ministries of Turkmenistan in mid-2012

Ministry of Agriculture
 Ministry of Communication
 Ministry of Construction Materials Industry
 Ministry of Culture
 Ministry of Defence
 Ministry of Economy and Development
 Ministry of Education
 Ministry of Energy and Industry
 Ministry of Finance
 Ministry of Foreign Affairs
 Ministry of Health and Medical Industry
 Ministry of Internal Affairs
 Ministry of Justice
 Ministry of Labour and Social Protection
 Ministry of Municipal Services
 Ministry of National Security
 Ministry of Nature Protection
 Ministry of Oil and Gas Industry and Mineral Resources
 Ministry of Railway Transportation
 Ministry of Road Transport
 Ministry of Textile Industry
 Ministry of Trade and Foreign Economic Relations
 Ministry of Water Economy

Map I.1: Turkmenistan

Source: United Nations Cartographic Section, 2011.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

***PART I: ENVIRONMENTAL POLICY
AND MANAGEMENT***

CHAPTER 1

DECISION-MAKING FOR ENVIRONMENTAL PROTECTION

1.1 Introduction

Since 2000, Turkmenistan has been experiencing rapid economic development with subsequent pressure on natural resources and their unsustainable use. At the same time, legislation on environmental protection has not kept pace with the country's progress and its development has been slow and incomplete. Global environmental challenges and internal demand have created a need for the development of appropriate sustainable development strategies and environmental policies at the national level, and their systematic improvement.

1.2 Institutional framework

The governmental institutions involved in environmental protection have been subject to numerous changes in their titles, structure, functions and interrelations with other State bodies. The governmental bodies with responsibility for environmental protection and sustainable development are:

- Ministry of Nature Protection;
- Ministry of Water Economy;
- Ministry of Agriculture;
- Ministry of Health and Medical Industry;
- Ministry of Economy and Development;
- State Committee for Fisheries;
- National Committee on Hydrometeorology under the Cabinet of Ministers;
- Various interdepartmental commissions.

It is also common to assign the management of sectoral issues to State concerns, which are central executive bodies subordinated to the Cabinet of Ministers. In addition, there are State associations grouped together on the basis of the interests of certain economic sectors: livestock, food and grain products (Chapter 8). Some State functions are also delegated to State enterprises and agencies, for instance, the State Enterprise on Caspian Sea Issues and the State Agency for the Management and Use of Hydrocarbon Resources, both under the President of Turkmenistan.

The system of local self-government is formed by the *gengeshes* and the bodies of territorial public self-government. *Gengeshes*, inter alia, have the right to

determine the basic directions of economic, social and cultural development of their territories, and to define measures for rational use of natural resources and environmental protection.

In addition to these traditional executive bodies, also worthy of note are State commissions, which are intersectoral governmental bodies. State commissions work on a non-permanent basis and are established to deal with issues and problems of an intersectoral nature, such as climate change and the Caspian Sea. They are established by the President with broad membership, normally consisting of representatives of interested ministries, committees, agencies (usually top-level officials), State companies and associations. State commissions take decisions, make recommendations, and agree on draft plans, strategies and policy documents. Depending on their mandate, they manage certain State interests and/or coordinate activities in different sectors with different ministries and stakeholders on problems or issues of State importance. The decisions of the commissions are directly enforceable and are obligatory for governmental bodies and any other entities, regardless of ownership.

The institutional framework undergoes constant change by means of improvements and clear separation of monitoring and permit-issuing powers, and clarification of functions among central executive bodies. The coordination process on environmental protection issues is complex, multilevelled and time consuming, and is hampered by a lack of information exchange. No additional financial or human resources (on a permanent basis), or equipment are allocated to facilitate the work of environment-related interdepartmental commissions. As a consequence, these bodies do not meet regularly and the enforcement of their decisions could be problematic.

Ministry of Nature Protection

MoNP develops and implements State environmental policy and monitors the protection and rational use of natural resources, including forest resources. Its other main tasks are implementing the Programme of the President on the development of forestry, protecting and renewing natural resources, managing nature

protection and distributing environmental information.

Other MoNP functions consist of conducting the State ecological expertise (SEE), issuing licences and permits for ecological activities, preparing the Red Data Book of Turkmenistan and enforcing the Red List, defining annual quotas for hunting and managing State-protected areas.

MoNP coordinates the work of ministries and departments during the implementation of international obligations emanating from the country's MEAs. Together with MED, it coordinated implementation of the National Environmental Action Plan of the President of Turkmenistan (NEAP) among other ministries, departments and local executives (*hyakims*). MoNP is also responsible for the coordination of activities of other State bodies within its competences.

At the time of this EPR, there were some 40 professional staff members within MoNP. The central apparatus of MoNP consists of five departments:

- Department of Protection of Flora and Fauna;
- Department of Environmental Protection;
- Department of Coordination of Ecological Programmes;
- Department of Investments, Material-Technical Supply and Personnel;
- Department of Accounting and Finance.

Its structure includes five provincial departments of nature protection (DNPs) in Akhal, Balkan, Dashoguz, Lebap and Mary, as well as eight State reserves. MoNP supervises the specialized inspectorate CaspEcoControl; the National Institute of Deserts, Flora and Fauna (NIDFF); the Service for Forest-Seed Farming and Natural Parks Protection, and the Department of Forestry (Figure 1.1).

The Department of Forestry was created as a separate legal entity in April 2009. Currently, it consists of 14 forest enterprises. According to its Statutes, the Department is a self-financing entity and enjoys economic independence. Its main functions consist of the implementation of State forest policy, including forest protection, rational use of forests and reforestation.

NIDFF conducts and coordinates fundamental and applied research work in the area of flora and fauna preservation, as well as with regard to efforts to

combat desertification, and environmental protection and monitoring. Its structure includes eight scientific laboratories (designated for plant ecology and cytology; vegetable resources; invertebrates; vertebrates; forests and pastures; stabilization and afforestation of sands; State-protected natural areas (PAs); and monitoring of desertification and remote sensing methods).

The Research and Production Centre on Environmental Monitoring (RPCEM) of NIDFF conducts monitoring of environmental pollution. In 1997, the Centre to Combat Desertification was established within NIDFF to coordinate and carry out the measures required for the implementation of the United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD).

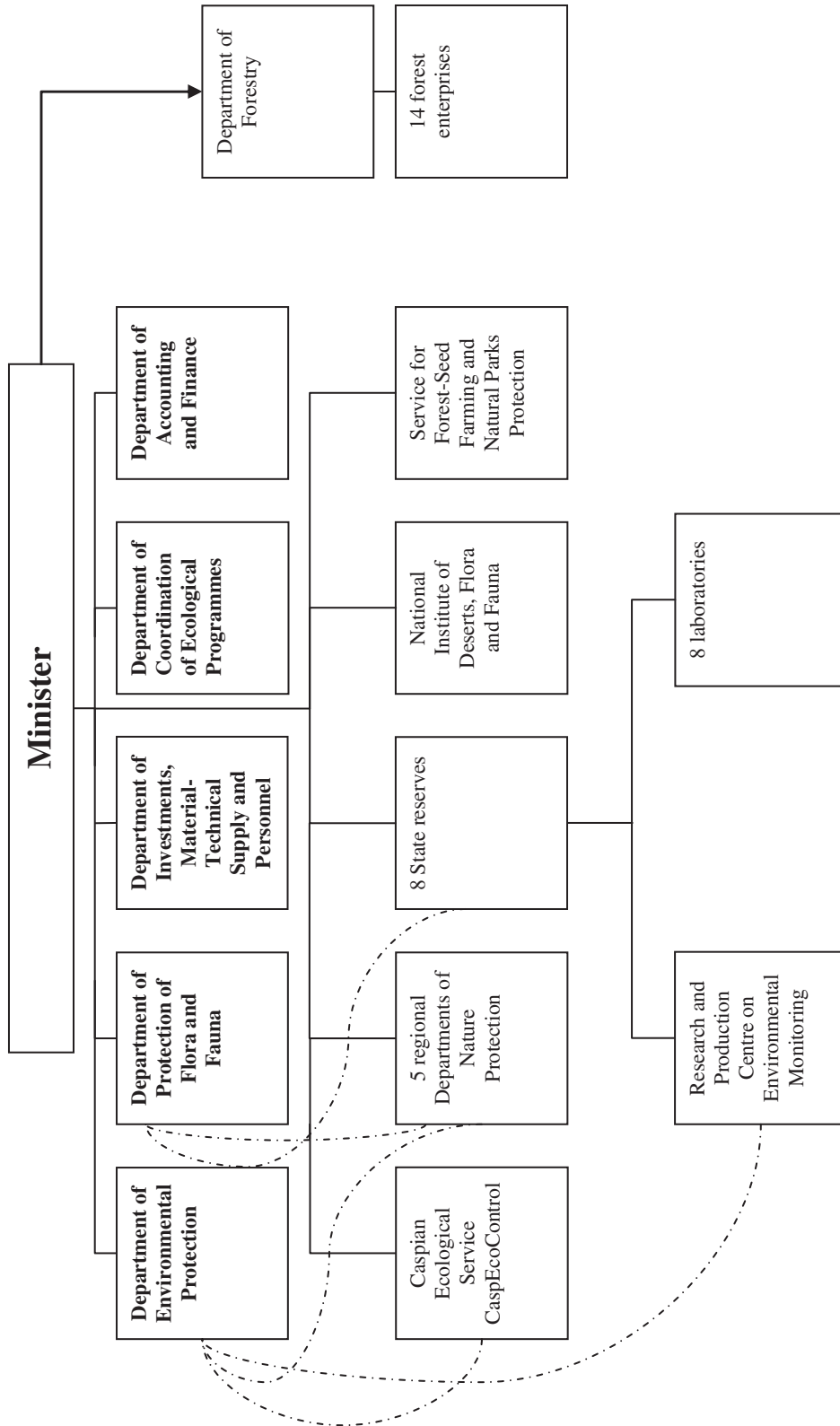
CaspEcoControl exercises State control and monitoring of water areas and adjacent coastal zones in the Turkmen sector of the Caspian Sea. It is accountable to the Department of Environmental Protection of MoNP. At the level of provinces (*velayats*) the DNPs perform inspections, and their inspectors are accountable to the Department of Environmental Protection.

Ministry of Water Economy

The Ministry of Water Economy (MoWE) is one of the main governmental bodies responsible for the management of water resources, in particular water quantity. It handles management (control, monitoring and planning) of water use, and allocation of water to different users. It is responsible for construction of strategic hydrotechnical facilities of national importance, in addition to operating irrigation systems and their canals.

Its structure includes the Institute Turkmensuvlymtaslama, the Karakum Canal Management Department, five water management departments in the provinces and others at the district level. The Institute Turkmensuvlymtaslama is the main institute within MoWE and is responsible for scientific and research activities, project design and development, specific monitoring (analysis of geological material, soils and water), and some other functions. In the course of its activities, the Institute develops measures for rational use and protection of water resources, and prevention of deterioration of water quality and pollution of water. There are 50 MoWE personnel in the central office.

Figure 1.1: Structure of the Ministry of Nature Protection



Source: Ministry of Nature Protection, August 2012.

Ministry of Agriculture

The Service of Land Resources of the Ministry of Agriculture (MoA) enjoys the special status of a separate legal entity within the structure of the Ministry. It implements the State programme on land reform and land management, and monitors the rational use of lands. It is responsible for registration of land use and ownership rights. It manages the State land cadastre, conducts land monitoring, controls land use, and coordinates State expertise on schemes and projects related to land use, land ownership and rational use of lands. The Service of Land Resources also has its own local departments in cities, provinces and districts.

Ministry of Health and Medical Industry

Within the Ministry of Health and Medical Industry (MoHMI), the Sanitary and Epidemiological Service (SES) performs inspection and regulatory functions. It monitors the quality of drinking water and water bodies used by people, the quality of food and goods, and components of the environment inside working areas, in public places and in settlements. SES conducts assessments of construction projects and development plans, and issues the conclusions of sanitary-hygienic expertise. It has a branch in the city of Ashgabat, five at provincial level and others in the districts.

Ministry of Economy and Development

MED is responsible for financing strategies and State programmes. It drafts annual investment programmes for each sector of the economy, including the environmental sector. It is actively involved in the process of preparing sectoral policies and programmes. It coordinates and revises sectoral strategies in line with the country's main strategic documents, in addition to mainstreaming ecological concerns (e.g. water availability) into such strategies. During the implementation of sectoral plans and strategies, ministries report monthly to MED on the performance of economic indicators for investment programmes.

State Committee for Fisheries

The State Committee for Fisheries is the central executive body subordinated to the Cabinet of Ministers. It is vested with the powers of ownership, use and distribution of fish resources in all fishery waters and in the adjacent basin of the Caspian Sea. It is responsible for fish processing, fishing and protection of fish stocks.

It includes a separate controlling and management department, the State Department for the Protection of Fish Resources, with the rights of a legal entity. Its fishing inspectors are empowered to enforce fishing rules in all fishery waters. It also issues fishing permits, concludes agreements on fishing conditions, and issues permits for dredging and explosive activities in fishery waters. Five inspection units are in operation at provincial level.

National Committee on Hydrometeorology under the Cabinet of Ministers

The National Committee on Hydrometeorology under the Cabinet of Ministers (Hydromet) is responsible for forecasts of hydrometeorological conditions. Hydromet also carries out monitoring activities (Chapter 5).

Interdepartmental commissions

There are few environment-related interdepartmental State commissions established at the national level: the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes, State Commission on Climate Change, Interdepartmental Commission on the Clean Development Mechanism, and Interdepartmental Commission on the Issues of the Caspian Sea. They are superior to the ministries and their role consists of coordinating the work of different ministries, committees, and other State bodies and companies.

State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes

The State Commission was established in 1999 with the aim of coordinating the activities of ministries, committees and other State bodies. At the national level, the Commission serves as the sole intersectoral body aimed at coordination, administration, awareness-raising and reporting on implementation of international obligations under United Nations MEAs. It consists of eight working groups corresponding to agreements ratified by Turkmenistan (Chapter 4) and the National Implementation Centre (for NEAP). The State Commission's main functions are:

- Organizing the development of national programmes and action plans on environmental protection and rational nature use, in compliance with United Nations environmental agreements and programmes;

- Participating in the development of legal and regulatory norms on nature use and environmental protection;
- Drafting national reports on implementation of commitments arising from United Nations environmental agreements and programmes;
- Coordinating activities of ministries and committees within the framework of United Nations agreements and programmes on rational nature use and environmental protection.

The State Commission meets as necessary, but at least once per year. Decisions taken within its competence have mandatory application to all State bodies, organizations and companies, regardless of their legal status. In practice, the Commission coordinates intersectoral drafting of strategies. For example, The Biodiversity Strategy and Action Plan for Turkmenistan for the Period 2002-2010 (BSAP) was prepared by MoNP under the guidance of the Commission, which acted as a steering committee.

The Commission's working groups decide how often they meet. The focal point for a convention is usually appointed as the head of the relevant working group. The heads and members of the working groups are approved during the meetings of the Commission. Members of working groups are different from members of the Commission, and are usually lower-level officials or scientists. In practice, working groups' curators are appointed from among members of the Commission. Working group chairpersons regularly report to the plenary of the Commission and might request the Commission to make an appropriate decision on certain issues.

State Commission on Climate Change

The State Commission on Climate Change was established in 1997. Its goal is to coordinate the work of ministries and committees with regard to the implementation of obligations arising from the United Nations Framework Convention on Climate Change (UNFCCC), by executing State policy on the decrease of adverse human impact on the climate and the stabilization of concentrations of GHGs at a safe level.

The Commission participates in and initiates the drafting of legislation on climate change, organizes the preparation of national reports, coordinates efforts by ministries and committees on issues of implementation of clean technologies for GHG emission reduction, and oversees such activities. The Commission meets as necessary, but at least once per year.

Interdepartmental Commission on the Clean Development Mechanism

The Interdepartmental Commission on the Clean Development Mechanism (CDM) was established in 2009 and facilitates the development of CDM operational rules, which are awaiting adoption. This body has met only once (Chapter 12).

Interdepartmental Commission on the Issues of the Caspian Sea

The Interdepartmental Commission on the Issues of the Caspian Sea was established in 2007. It includes representatives of key ministries and committees working on Caspian Sea issues and coordinates their work in this field. One of its mandates is the protection of the environment of the Caspian Sea and sustainable development of the Caspian Sea coastal area. The Commission meets at least three times per year.

Intersectoral cooperation and coordination

Ministries, committees and other governmental bodies are grouped into 10 clusters, each of which is headed by a deputy chairperson of the Cabinet of Ministers. These deputy chairpersons are responsible for everyday coordination of activities within their clusters, including law-making and decision-making. MoNP, MoA and MoWE are grouped within the Agriculture Cluster. The draft laws developed by MoNP are directed to the Cabinet of Ministers, which then carries out consultations with corresponding authorities. Coordination of the activities of ministries within the same cluster is more timely and effective than coordination of day-to-day activities among ministries belonging to different clusters, for instance, between MoNP and the Ministry of Oil and Gas Industry and Mineral Resources, or between MoNP and MoHMI. Deputy chairpersons facilitate the decision-making process when it affects the interests of more than one sector and as part of the law-making process, and report to the President on behalf of the relevant cluster.

The importance of the coordinating role of the interdepartmental State commissions dealing with environment-related concerns cannot be underestimated. Their effectiveness is far from satisfactory. Their legal status and rules for their operation, including the issues of their powers and decision-making procedures, are unclear.

The most important condition for boosting the effectiveness of coordination, monitoring and control of environmental measures and their management at

the national level is the establishment of a uniform information system and electronic database on all aspects of environmental protection. At present, some state-of-the-environment information is kept within the subdivisions of MoNP and some within other ministries and departments, so that the information is not used systematically in environment-related decision-making. Establishment of a uniform information system with an electronic database on the state of the environment would ensure permanent and systematic access to information on the state of all elements of the environment (land and water resources, the Caspian Sea, desert pastures, biodiversity, climate change and meteorological elements) throughout the country. Such a database would allow user-friendly and easy access to such information for different users, that is, the Government, governmental organizations, non-governmental organizations (NGOs) and the public.

1.3 Strategies, policies and programmes

The majority of strategic sectoral programmes and policies were approved by the President after numerous consultations and considerations in Parliament, Government and State commissions. Requirements of MEAs ratified by the country prevail over requirements of national legislation unless the latter are stricter.

Sustainable development policies

The term “sustainable development” is rarely used in the policy documents of Turkmenistan. Sustainable development principles are applied in strategies for national socioeconomic development.

The main policy document related to sustainable development is the National Strategy of Economic, Political and Cultural Development of Turkmenistan for 2011-2030 (Strategy 2030), adopted in 2010. This document was developed on the basis of experience gained with the implementation of its predecessor, the 2003 President’s National Strategy of Economic, Political and Cultural Development of Turkmenistan for the Period until 2020 (Strategy 2020). Strategy 2030 is quite a comprehensive document outlining State policy in the areas of economic and political life, including environmental protection, agriculture, land management, the oil and gas industry, planning and health. All sectoral policies and action plans should be coordinated with it. The Strategy is socially oriented, and economic development is declared to have a social focus. Strategy 2030 outlines the long-term priorities for the economy and nature use as a unified whole. The main strategic goal in terms of environmental protection is conservation

and recovery of nature. To this purpose, State policy will be geared to the following tasks: protection of atmospheric air and development of “green belts”; protection of water, land and forest resources; and conservation of biodiversity.

Environmental policy documents

In Turkmenistan, the development of most environment-related strategies and programmes started in the second half of the 1990s. The development of environmental policies, programmes and action plans is in line with the country’s international environmental obligations and, in most cases, their implementation is supported by the international donor community. This relates, for instance, to BSAP and the National Action Plan to Combat Desertification (NAPCD).

National Environmental Action Plan

To enable the implementation of the environmental part of BSAP, NEAP was adopted in 2002, covering the period 2002-2010. Its main strategic goals were:

- Enhancing the ecological situation and preventing its deterioration;
- Alleviating negative environmental impacts on human health;
- Improving environmental governance and rational use of natural resources;
- Actively participating in international cooperation for the solution of national and global environmental problems.

NEAP concentrated on several main nationwide problems, studied their causes, and provided possible solutions to such issues as insufficiency of water resources and their pollution; pollution and salinization of land; degradation of the environment in the Turkmenistan part of the Aral Sea region; air pollution; environmental pollution from the oil, gas and energy industry; decline in biodiversity; and the need to conserve natural and cultural monuments. NEAP provided an action plan including institutional and legislative measures, and investment projects for environmental protection aimed at solving these problems.

NEAP implementation was monitored annually through the mechanism of annual reporting by 28 ministries and agencies. For this purpose, the State Committee on Statistics (SCS) prepared the reporting form that was filled in by all ministries and State agencies and returned to the Committee for analysis. The real implementation status of NEAP could not be verified within the framework of this EPR, as reports on its implementation were not available for review.

Photo 1.1: Ashgabat at the foothills of Kopetdag Mountains

However, it is evident that more progress is needed to integrate environmental concerns into all sectors of the economy, and therefore to expand the strategic and guiding role of such policy documents.

The Government empowered the Deputy Chairperson in charge of the Agriculture Cluster, and the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes, to control NEAP implementation and coordinate the activities of all stakeholders. To this end, the National Implementation Centre was established within the State Commission in 2003. Its role covers not only the development and implementation of the projects suggested in NEAP, monitoring of the fulfillment of a complex of environmental measures, coordination and facilitation of implementation of NEAP, and monitoring of NEAP implementation (completed in 2010), but also coordination of the drafting of a national environmental programme for the period 2012-2016 and its future implementation. MoNP is currently developing this programme and its adoption is expected by the end of 2012. Its main priorities will include the tackling of air pollution, land degradation and desertification; conservation of biodiversity; improvement of environmental laws; development of effective environmental monitoring and protection of water resources.

Biodiversity Strategy and Action Plan

BSAP was developed for the period 2002-2010 as part of Turkmenistan's implementation of the CBD

and was financially supported by the Global Environment Facility (GEF). Nevertheless, it was never formally adopted (Chapter 10).

As BSAP was drafted a little earlier than NEAP, the two programmes were coordinated and consistent. In 2007, MoNP conducted an assessment of BSAP implementation which showed that, by 2007, around 50 per cent of all the actions planned had been implemented. With its report, MoNP also supplemented BSAP by adding 23 new measures. Development of the new BSAP for the period until 2020 has not started (Chapter 10).

National Caspian Action Plan

NCAP was adopted in 2008 on the basis of the Strategic Action Plan of the Framework Convention for the Protection of the Marine Environment of the Caspian Sea (Tehran Convention). NCAP is consistent with Strategy 2030 and also aligns with the provisions of NEAP. It outlines the priorities for the development of Caspian Sea coastal areas, which are mainly of an economic nature, listing separately four transboundary concerns: pollution of the environment, loss of biodiversity, deterioration of industrial fish resources and depreciation of coastal infrastructure.

Its stated goal is the improvement of the ecological situation in the Caspian Sea area and the prevention of environmental degradation due to anthropogenic activities. It initially covered the period until 2010, but its operation was prolonged until 2011. Currently,

a new action plan for the period until 2015 is being prepared. Control over NCAP implementation was delegated to the State Enterprise for the Caspian Sea under the President of Turkmenistan, which is responsible for collecting and analysing regular individual reports from all ministries and agencies concerned.

Environment-related sectoral policy documents

Within the Central Asian Countries Initiative for Land Management (CACILM), the National Framework Programme on Sustainable Use of Land Resources was developed. An integral part of Strategy 2030, it foresees activities aimed at increasing the amount of irrigated land and solving the problem of soil salinization. NAPCD, adopted in 1997, was of a descriptive character and lacked concrete activities and measures. No financial resources were allocated to implement this action plan.

Turkmenistan participated actively in the development and adoption of a subregional action plan to combat desertification for the Central Asian region, which was adopted in 2003. The working group dealing with desertification issues under the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes recommended developing a new, more comprehensive national action plan on desertification, with a list of actions and allocation of financial resources to perform those actions based on analysis of NAPCD implementation, as was also recommended by the Conference of the Parties (COP) of the UNCCD.

Other sectoral policies implemented in Turkmenistan form integral parts of Strategy 2030. For instance, according to the National Programme on Rural Development for the period 2008-2020, the Government plans to spend US\$3.661 billion on development in the provinces. The programme specifies the sectors that the Government intends to focus on and the activities to be undertaken. The education, water supply and electricity sectors will receive most of the funds. The State Programme on Drinking Water Supply to All Rural Settlements by 2020 was approved in 2010. It foresees not only the establishment of a centralized supply of drinking water, but also the construction of sewerage systems in rural areas. The development of a sectoral water policy by 2015 is under way under the responsibility of MoWE, as is a draft policy on the development of fish resources of the Caspian Sea by 2030.

In 2011 the following programme activities were covered: protection of water, land and air; prevention of pollution by oil and gas; conservation of nature monuments; and conservation of biodiversity. These annual investment programmes should correspond to the National Programme until 2030, and every ministry and State agency submits its proposals for environmental protection activities that require financial support in the upcoming year. On the whole, the integration of environmental concerns into sectoral policies is not sufficient. Environmental concerns play a marginal role in strategies for the development of some economic sectors, because economic objectives prevail over environmental ones.

Statistical information on implementation of strategies and policies is collected by the SCS on a regular basis (annually). However, the lack of external access to such information and the incomplete nature of the data collected limit the effectiveness of this exercise.

1.4 Legal framework

The law-making process in Turkmenistan is regulated by the Law on Normative Legal Acts. Each ministry and central executive body plans its law-making activity for the year ahead, and parliamentary commissions draw up similar schedules for laws that have to be drafted. During the process of law drafting, the interests of all the central executive bodies, governmental enterprises and associations are coordinated and considered through the establishment of working groups (commissions) on the development of a given law, by decision of the Cabinet of Ministers each time the necessity for such a law becomes apparent.

All of the ministries and other agencies concerned are represented on such commissions, allowing them to provide their input to the draft law and promote their interests at the initial stage. The draft law is circulated among relevant stakeholders for consultation, after which it is submitted to Parliament and its committees for further consideration. The key ministries responsible for the law must present it to Parliament and provide any clarification required.

Draft laws may be published for consultation purposes following a decision by Parliament. However, the Law on Normative Legal Acts does not specify which particular draft laws must be published, as a result of which there are relatively few instances of publication of draft laws for public discussion.

Environmental legislation

Legal norms on environmental protection are contained in the Constitution, the 1991 Law on Nature Protection, and laws on air protection, ecological expertise, biodiversity conservation, and land, water, forest and mineral resources. Legislation on the use and protection of certain components of the environment is codified: Land, Water and Forest Codes are in force.

Some of the most important environmental or environment-related laws were adopted before 2000 and are therefore in need of modernization. They lack sections on terminology and principles of State policy in the relevant area. Nor do they provide clear allocation and separation of the powers of central executive bodies. Often, the development of secondary legislation is needed in order to render the laws applicable and enforceable. Concerning nature protection, the legal system has a more anthropogenic approach and, as a result, State policy on the use of natural resources is focused primarily on the improvement of the well-being of the population, while nature protection is given secondary priority.

The Law on Nature Protection is the main law on the environment. It stipulates the main principles of environmental protection, elements of nature subject to protection, and the powers of national and local authorities with regard to environmental protection. It contains provisions relating to economic mechanisms of environmental protection; normative, technical and meteorological mechanisms of environmental protection; SEE; standards of environmental protection during economic activities; regulations on ecological emergencies; control over nature protection; citizens' rights to a safe and healthy environment; and participatory rights and norms concerning responsibility for environmental damage. MoNP is currently preparing a new draft Law on Environmental Protection because the existing 1991 Law on Nature Protection is outdated: it lacks a clear distribution of the powers of central executive bodies at the national level. Principles of environmental protection given in the Law do not reflect internationally recognized principles such as sustainable development, precaution and prevention, and "polluter pays". Very limited provisions are devoted to environmental safety standards and rules for rational use of natural resources.

The 1992 Law on State Protected Natural Areas stipulates the main forms of PAs, their status, the powers of State bodies, control over protection of such areas, and responsibility for violations of the regime covering such areas. However, the Law omits

to regulate the procedure for the establishment of PAs, as a result of which no new PAs have been established since its adoption. Nor does the Law foresee such a PA category as national parks. Notwithstanding, this category is mentioned in other laws, making it possible to combine the function of conservation with recreational, tourism and educational functions.

In 2011, MoNP prepared a new draft law which proposes allowing tourism and recreation in natural reserves and facilitating sustainable development of neighbouring local communities. Model regulations for natural reserves, buffer zones for natural reserves, nature monuments and State sanctuaries were developed and approved by the President. Model regulations for State national parks have been drafted and are awaiting approval by the President to replace the 1995 Model Rules for State Reserves.

The 1993 Law on Protection and Rational Use of Flora and the 1997 Law on Protection and Rational Use of Fauna specify the powers of State bodies with regard to the use and protection of flora and fauna, the main types of such use, measures of protection, and State control and monitoring of flora and fauna. These instruments are also quite outdated; their provisions contradict more recent laws, and drafting of new versions of these laws was expected to start in summer 2011.

In particular, definitions are lacking and the competences of MoNP for the use and protection of flora and fauna are not spelled out. The Model Rules on State Nurseries of Threatened Species of Flora and Fauna were adopted in 1995. A Red Data Book was developed based on the 1997 Regulations for the Red Data Book of Turkmenistan (Chapter 10).

The 1995 Law on State Ecological Expertise lays down the principles of ecological expertise, its aims and the competence of State executive bodies, as well as procedure for the conduct of SEE. The Law is supplemented by secondary legislation, such as the 1996 Regulation on Implementation of State Environmental Impact Assessments, the 1996 Regulation on the Status of Expert of Ecological Expertise, and the 2000 State Standards on Environmental Impact Assessments (Chapter 2). A new version of the Law on State Ecological Expertise is expected to be drafted by the end of 2012.

The 1996 Law on Protection of Atmospheric Air stipulates, in particular, the competences of State bodies for air protection and their powers of control, the preparation and operation of norms of air emissions and air quality, and control of air

emissions from stationary sources. It also identifies which violations of air law entail responsibility. The Law foresees the development of regulating by-laws by MoNP but these have not been fully developed (Chapters 5 and 6).

The 1997 Criminal Code includes articles imposing criminal responsibility for damage to natural resources. According to the 1984 Code on Administrative Offences, administrative responsibility for violation of environmental legislation and compensation for damage are determined in the following cases: non-compliance with standards and norms; refusal to pay for use of resources, emissions and discharges; environmental pollution exceeding the environmental capacity of a territory (including the import of environmentally dangerous products); and failure to take the necessary actions for restoration of the environment (Chapter 2).

The 1998 Law on Hunting and Hunting Management establishes, inter-alia, the competences of State bodies on hunting, hunting types and documents required for different types of hunting, and the operation of hunting organizations.

The 2004 Land Code identifies the main categories of lands and special provisions for their use and allocation. It outlines the competences of State bodies and local authorities in land issues and the procedures for allocation of land into ownership or lease. It also prescribes environmental requirements for planning and construction of facilities. According to the Law, State control over the use and protection of lands is based on the principles of priority of environmental safety over economic interests, full compensation for environmental damage resulting from violation of land laws, and rational use of land resources entitled to special protection by the State (Chapter 8).

The 2004 Water Code outlines the main rules for water resource management and conservation. It foresees the establishment of water zones for protection of waters from pollution, that is, water protection zones and coastal water protection strips. The Water Code obliges water users to use water rationally. According to the Water Code, general and basin schemes for the use and protection of waters should be developed by MoWE and approved by the Cabinet of Ministers (Chapter 7).

The 2008 Law on Hydrocarbon Resources regulates activities for the extraction of hydrocarbon resources and the construction and operation of hydrocarbon transportation systems. Hydrocarbon resources in their natural state are exclusively owned by the State,

and ownership rights are assigned to the Government. The right to oil exploration and/or extraction is based on a licence, which should contain the obligations of its holder in terms of environmental protection. Systematic or significant violations of environmental laws could lead to suspension of a licence.

The Law contains a chapter on the protection of the environment. Each operator of oil facilities must develop a plan of environment protection, safety and human health protection measures and have it approved by appropriate State bodies. The Law bans oil works within PAs and lists activities prohibited during oil works, such as dumping of waste without permission, and uncontrolled emissions and discharges. Each operator is also obliged to perform environmental monitoring and share the results with State bodies (Chapter 13).

The 2008 Law on the Licensing of Certain Activities establishes requirements for the licensing of specific activities related to the use of natural resources and nature protection.

The 2009 Law on Protection of the Ozone Layer regulates activities related to the use of ozone-depleting substances (ODS). It establishes the competences of State bodies for control over, and production, import and consumption of ODS. The legislative measures described therein are designed to limit the use of ODS within the country by means of the maximum reduction of their production, import and export; their phased replacement by alternative, environmentally friendly substances; and increased monitoring of private and governmental institutions working with ODS (Chapters 4 and 6).

The 2009 Sanitary Code outlines the competences of public authorities in providing for the sanitary and epidemiological safety of citizens. It establishes the right of every citizen to a safe environment and the right of citizens to participate in decision-making affecting human health and the environment. It also regulates the procedure for performing sanitary-hygienic expertise, which serves as a State mechanism to ensure that planning decisions, construction and operation of different facilities do not adversely impact upon human health (Chapter 12).

The 2009 Law on Radiation Safety aims to protect human health and the environment from the adverse effects of ionizing radiation, of both natural and human causes. It grants all citizens the right to radiation safety, which should be ensured by appropriate preventive measures implemented by the State and producers of ionizing emissions. In

addition, it bans the import of radioactive waste for the purpose of storage and disposal.

The 2010 Law on Drinking Water contains a set of comprehensive rules on the system for supplying drinking water to all users and measures aimed at preventing pollution of water used for drinking purposes. It establishes that drinking water supply to citizens and water discharge into the sewerage system is free within the established limits. It establishes three systems of drinking water supply (centralized, non-centralized and autonomous) and State guarantees with regard to access to drinking water and its quality (Chapter 7).

The 2011 Forest Code lays down the definition and main principles of forest policy, and establishes the classification of forests into different categories. It regulates forest use and ownership rights, logging activities, and the monitoring, management, control and State accounting of forests (Chapter 11).

Use of natural resources, protection of biodiversity and environmental safety in the Caspian Sea area are regulated by the 1991 Regulation on Measures on Drastic Improvement of the Ecological Situation in the Caspian Sea Basin and the 2005 Rules on Protection of Coastal Waters from Pollution from Ships.

The current legal framework for environmental protection is not sufficient to ensure effective nature protection and rational use of natural resources in the context of the country's rapid economic development. Some important laws are lacking, thus weakening the protection of the environment and prevention of environmental degradation. For instance, there is no law on waste while few articles concerning waste management could be found in various laws and by-laws.

Neither is there a law on access to information (in particular to environmental information), a law regulating the issues of biological safety and use of genetically modified organisms (GMOs), a law promoting energy efficiency and renewable energy or a law on soil. Few important draft laws are in the pipeline, such as a new law on pastures. Some laws adopted in the 1990s require significant amendments. For this purpose, in 2011 MoNP created the Working Group on Improvement of National Environmental Legislation and developed a detailed working plan on the introduction of modifications to existing laws and the preparation of new draft laws.

1.5 Conclusions and recommendations

The importance of the coordinating role of the interdepartmental State commissions dealing with environment-related concerns cannot be underestimated. Their effectiveness is far from satisfactory. Their legal status and the rules for their operation, including the issues of their powers and the decision-making procedure, are unclear.

Coordination of the work of different ministries and committees relating to different sectors of the economy is impeded by the lack of sufficient exchange of information. As a result, it is not always possible to include environmental and sustainable development concerns in the governmental decision-making process regarding some economic sectors which have negative environmental impacts.

Appropriate environmental information, accessible to governmental officials in a timely and comprehensive manner, is often lacking. SCS is not able to ensure effective provision of information to decision-makers to help ensure that the interests of environmental protection and the rational use of natural resources are considered on an everyday basis.

Recommendation 1.1:

The Cabinet of Ministers should improve:

- (a) *The effectiveness of interdepartmental State commissions dealing with environment-related issues by strengthening their mandates;*
- (b) *The exchange of information between different ministries and committees by creating a uniform environmental information system at the governmental level.*

The National Environmental Action Plan expired in 2010. At the end of 2011, the drafting of a new national environmental programme for the period 2012-2016 had started. This document will specify the country's environmental priorities.

Recommendation 1.2:

The Cabinet of Ministers should adopt the draft national environmental programme for the period 2012-2016 with effective mechanisms of financing, control over and monitoring of its implementation.

The current legal framework for environmental protection is not sufficient to ensure effective environmental management and rational use of natural resources in the context of the country's rapid economic development. Some important laws are

lacking, a factor which does not allow the effective protection of the environment and prevention of environmental degradation.

Recommendation 1.3:

The Cabinet of Ministers should:

- (a) *Facilitate drafting and adoption of new laws on flora and fauna, on protected natural areas, on waste management, on renewable energy and energy efficiency, and on pastures;*
- (b) *Facilitate the introduction of provisions on access to environmental information to existing laws, and the updating of existing laws, such as those regulating biodiversity conservation, protection of atmospheric air and ecological expertise;*
- (c) *Develop and adopt secondary legislation that would strengthen the system of environmental, land and water legislation.*

National and international experience has shown that the existence of a national strategy for sustainable

development is a prerequisite for the effective integration of environmental policy into economic and social sectors.

In the case of Turkmenistan, although the term “sustainable development” is used in some subregional policy documents adopted by the country, a functional legal definition has not yet been developed.

Recommendation 1.4:

The Cabinet of Ministers should:

- (a) *Develop a functional legal definition of “sustainable development” that will allow its integration into policy documents;*
- (b) *Improve policies that promote sustainable development;*
- (c) *Develop a national sustainable development strategy, including a coherent set of targets;*
- (d) *Strengthen institutional mechanisms of intersectoral cooperation by creating a body that will promote the development and implementation of sustainable development programmes and plans.*

Chapter 2

REGULATORY INSTRUMENTS FOR ENVIRONMENTAL PROTECTION

2.1 Introduction

Turkmenistan is a country with a centrally planned economy, and many large industrial enterprises remain in State hands. National economic conditions significantly impact upon possibilities for environmental enforcement authorities to inspect enterprises and to apply sanctions for their non-compliance with the environmental legislation. First, unlike most members of the Commonwealth of Independent States (CIS), Turkmenistan has no clearly defined procedures for operators' inspections of industrial activity. Due to the prevalence of State-owned enterprises (SOEs), it is considered that there is no acute need to protect them from unlawful and discretionary interference by State inspectors and overly frequent inspections by law enforcement authorities. Second, administrative and criminal sanctions are applied in Turkmenistan only to individuals, private entrepreneurs, and officials of companies and organizations. While fines are the most frequently imposed sanction, they remain low in cases involving non-compliance by operators of industrial activities. Moreover, monetary sanctions are rarely applied to SOEs.

2.2 Legislative framework for environmental inspection and enforcement

The Law on Nature Protection stipulates that the objective of environmental enforcement is to ensure that individuals and legal entities comply with environmental requirements. The Law on Nature Protection and other environmental laws, such as laws on PAs, and protection of ambient air, fauna and flora, contain provisions concerning the competencies of relevant public authorities; self-monitoring by operators of industrial activities; monitoring of compliance by public associations, unions of employees and the population at large; and liability of offenders for non-compliance and inflicted environmental damage.

In comparison with other CIS countries, Turkmenistan's procedures for conducting inspections, detecting administrative offences and

reporting on them are not clearly defined. This particularly concerns the inspection and enforcement activities undertaken by MoNP. Inspections by MoNP are conducted on the basis of broad provisions of statutes of provincial DNPs and nature reserves, and the 1995 Provision on Hunting approved by Presidential Resolution No. 2422.

Procedures for imposing administrative and civil liability for non-compliance with environmental requirements are defined by the 1984 Code on Administrative Offences and the 1963 Code of Civil Procedure. Since their adoption, both instruments have been subject to various amendments; notwithstanding, many of their provisions seem to be outdated. In January 2011, the President defined the development and adoption of a new Code on Administrative Offences and a new Code of Civil Procedure as one of the priorities of the ongoing legal reform.

Currently, the Code on Administrative Offences sets penalties that can be applied for non-compliance and defines specific elements of administrative offences relating to environmental protection and use of natural resources. The main legal references for criminal enforcement are the 1997 Criminal Code and 2009 Code of Criminal Procedure. The Criminal Code defines types of environmental crimes and penalties for committing such crimes (Table 2.1), whereas the Code of Criminal Procedure establishes procedures to be followed in criminal cases.

Special regulations related to enforcement of legislation on protection of fauna were adopted by presidential resolutions, including the 1995 Provision on Hunting and the 1998 Provision on Protection of Fish Stocks and Regulation of Fishing in Territorial and Inland Waters. In other areas, inspections are carried out on the basis of general provisions of the statutes of environmental enforcement authorities, for example, the 2000 Statute of MoNP approved by Presidential Resolution No. 4830, and the 1997 Statute of the State Agency for the Management and Use of Hydrocarbon Resources approved by Presidential Resolution No. 3189.

Table 2.1: Environmental crimes and types of criminal sanctions

Article	Type of environmental crime	Criminal sanction
311	Violation of environmental safety during works	Deprivation of the right to hold a certain position or engage in certain activity or imprisonment
312	Violation of rules of transportation, storage, disposal, processing of environmentally dangerous substances and wastes	Fine, correctional works or imprisonment
313	Water pollution	Deprivation of the right to hold a certain position or engage in certain activity, or fine, or correctional works or imprisonment
313-1	Misappropriation of water resources	Fine or imprisonment
314	Air pollution	Deprivation of the right to hold a certain position or engage in certain activity, or fine, or correctional works or imprisonment
315	Pollution of marine environment	Deprivation of the right to hold a certain position or engage in certain activity, or fine, or correctional works or imprisonment
316	Violation of legislation on continental shelf	Fine and deprivation of the right to hold a certain position or engage in certain activity or correctional works
317	Damaging land	Fine and deprivation of the right to hold a certain position or engage in certain activity or correctional works
317-1	Illegal occupation of lands	Fine with confiscation of yield or imprisonment
318	Illegal catch of water fauna and flora species	Fine, correctional works or imprisonment
319	Violation of rules on protection and use of mineral resources	Deprivation of the right to hold a certain position or engage in certain activity, or fine or correctional works
320	Violation of rules on protection of water resources	Deprivation of the right to hold a certain position or engage in certain activity, or fine or correctional works
321	Illegal hunting	Fine, correctional works or imprisonment
322	Illegal cutting of trees and bushes	Fine or correctional works
323	Destruction or damaging of forests	Fine, correctional works or imprisonment
324	Violation of the regime of protected areas	Deprivation of the right to hold a certain position or engage in certain activity, or fine or correctional works

Source: Criminal Code.

It should be noted that a number of environmental regulations and amendments to environmental laws are either not available or not easily accessible in Turkmenistan for the general public. Some laws and regulations are placed on the online newspaper *Turkmenistan: Golden Age*, or made available through the collection of Turkmenistan's legislation on nature protection published by MoNP in 2002 or the *Handbook for Entrepreneurs* published by the Organization for Security and Co-operation in Europe (OSCE) Centre in Ashgabat in 2010. However, texts of these documents are not often updated.

2.3 Environmental enforcement authorities

The key environmental enforcement authority is MoNP. Up until March 1999, the Ministry was called the Ministry of Natural Resources and Environment. The main purpose of its reorganization was to increase the role of this authority with regard to the enforcement of laws on natural resources and ensure a clearer division of functions on management of natural resources and their protection. Currently, the

status and functions of MoNP are defined by the Provision approved by the 2000 Presidential Resolution No. 4830. The competences of this Ministry include monitoring of compliance and enforcement of legislation regarding the protection of ambient air, water and land resources; treatment of industrial and municipal waste; and protection of fauna, flora and forests, as well as the PA regime. Also, it is entitled to coordinate the relevant activities of other public authorities involved in conducting inspections and enforcing requirements on protection of the environment and natural resources.

Within MoNP, inspection and enforcement activities are carried out by the Department of Environmental Protection, Department of Protection of Flora and Fauna, Department of Forestry and CaspEcoControl. The Department of Environmental Protection deals with compliance and enforcement of environmental legislation by industrial enterprises and other operators of economic activities with regard to the protection of ambient air, land and water, and the treatment of industrial and municipal waste. Compliance and enforcement of legislation on PAs

(Chapter 10) and protection of flora and fauna outside these areas (illegal hunting and fishing, logging of trees, illegal harvesting of medicinal plants, etc.) is the responsibility of the Department of Protection of Flora and Fauna, and the Department of Forestry. CaspEcoControl monitors compliance with and enforcement of environmental requirements in respect of oil and gas companies and other operators of industrial activities in the Turkmenistan part of the Caspian Sea, including the two-kilometre coastal strip (Chapter 7).

Inspection of enterprises and the imposition of sanctions for violations of environmental requirements are mainly handled by inspectors from units for environmental protection and ecological expertise of five regional offices of MoNP (Akhal, Balkan, Dashoguz, Lebap and Mary provincial DNPs) and CaspEcoControl. A specific feature of some of the provincial departments' activities is their almost unchanging approach to the organization of operators' inspections of industrial activities, based on very narrowly defined priorities and target goals. The most obvious example in this regard is the Dashoguz provincial DNP.

Table 2.2 shows that the number of conducted inspections of enterprises and detected cases of non-compliance by Dashoguz DNP has remained very stable over the last five years. The same applies to the number of detected cases of non-compliance by Balkan Province's DNP. These two DNPs seem to be merely monitoring the results of their inspection activities in previous years. This can be explained by the fact that performance of environmental inspectors is evaluated by MoNP mainly on the basis of comparison with previous reporting periods of numbers of inspections, detected cases of non-compliance, amount of fines and compensation for environmental damage.

The total number of violations detected in all provincial DNPs and by CaspEcoControl in recent years has been gradually increasing despite the fact that the number of inspected enterprises and ships fluctuated at approximately the same level during the period 2006-2010. This increase in the number of detected cases of non-compliance was achieved mainly by environmental inspectors of the Akhal and Lebap provincial DNPs. Detailed information on the type and gravity of detected violations is not available, making it impossible to draw any conclusions in this regard.

In the case of the Department of Protection of Flora and Fauna, patrols of natural sites to monitor compliance with the requirements on protection of

wild species and natural sites are conducted by the inspectors of eight nature reserves (Amu Darya, Badkhyz, Kaplankyr, Kopetdag, Kugitang, Repetek, Syunt-Khzardag and Khazar), as well as by the inspectors of units of protection of flora and fauna of the provincial DNPs. In 2009 and 2010, they revealed respectively 2,358 and 1,887 violations of legislation on the protection of flora and fauna in the PAs, and 1,484 and 1,626 violations outside those areas. The number of cases of non-compliance in PAs differs significantly from year to year (Figure 2.1). Almost half of violations detected in PAs concerned non-compliance with requirements on protection of flora (about 44 per cent in 2009 and 2010), while outside these areas inspections focused more on illegal hunting and fishing (37.3 per cent and 34.6 per cent respectively in 2010).

The Department of Forestry also carries out inspections and implements enforcement actions. Statistical data on violations detected and penalties applied by the Department of Forestry are merged with the data of the Department of Protection of Flora and Fauna.

Other public authorities are also involved in environmental enforcement in Turkmenistan, such as the State Committee for Fisheries, the State Agency for the Management and Use of Hydrocarbon Resources under the President, the Service of Land Resources under MoA, and SES under MoHMI.

Within the State Committee for Fisheries, the State Department for the Protection of Fish Resources monitors compliance with and enforces legislation on protection of fish and other aquatic animals, including the requirements set by licences for commercial fishing and fish processing. It has branches in the five provinces.

The State Agency for the Management and Use of Hydrocarbon Resources under the President of Turkmenistan monitors operators' compliance with environmental requirements, which are stipulated in licences for exploration and extraction of oil and gas. The Department of Control of this Agency often conducts inspections of oil and gas companies jointly with CaspEcoControl.

Within the Service of Land Resources under MoA, the Department for Control and Protection of Land Resources monitors compliance with legislation on land protection and applies sanctions for violations detected. It has units in all five provinces, and between two and three inspectors at the level of districts (*etraps*).

Table 2.2: Inspections and detection of non-compliance, 2006-2010

Province		2006	2007	2008	2009	2010
Akhhal	Inspected enterprises	359	402	402	422	430
	Violations	181	282	312	380	389
Balkan	Inspected enterprises	378	375	375	292	294
	Violations	232	223	225	247	248
Dashoguz	Inspected enterprises	385	387	388	388	389
	Violations	307	310	312	315	317
Lebap	Inspected enterprises	250	252	280	284	307
	Violations	250	252	228	309	328
Mary	Inspected enterprises	354	259	262	276	389
	Violations	183	214	216	218	223
CaspEcoControl	Inspected enterprises	160	120	117	155	153
	Inspected ships	240	97	113	116	107
	Violations	196	167	198	212	213
Total	Inspected enterprises	1,886	1,795	1,824	1,817	1,962
	Inspected ships	240	97	113	116	107
	Violations	1,349	1,448	1,491	1,681	1,718

Source: Ministry of Nature Protection, 2011.

The competence of the SES includes the monitoring of compliance with the requirements on air quality at industrial premises, allowable levels of noise, vibration, radiation and electromagnetic radiation, as well with the requirements on food safety, quality of drinking and bathing water, and sources of drinking water supply. SES has territorial offices at the levels of provinces, districts and cities.

2.4 Mechanisms to ensure compliance and enforcement

The main mechanisms for monitoring compliance with environmental laws are scheduled inspections and patrols of natural sites. Scheduled inspections are conducted on the basis of annual plans approved by the relevant ministries, committees and agencies. As for MoNP, such plans are made for each province's DNP and CaspEcoControl. In accordance with such plans, inspectors from MoNP annually control compliance with environmental requirements by around 1,800 enterprises. Plans of inspections indicate the names of actions, sites and deadlines for inspections, and responsible inspectors.

The list of enterprises which are subject to inspection is not rigid, as it may be amended in the course of work. Monitoring of compliance and enforcement of requirements concerning protection of fauna, flora and PAs is not based on scheduled inspections.

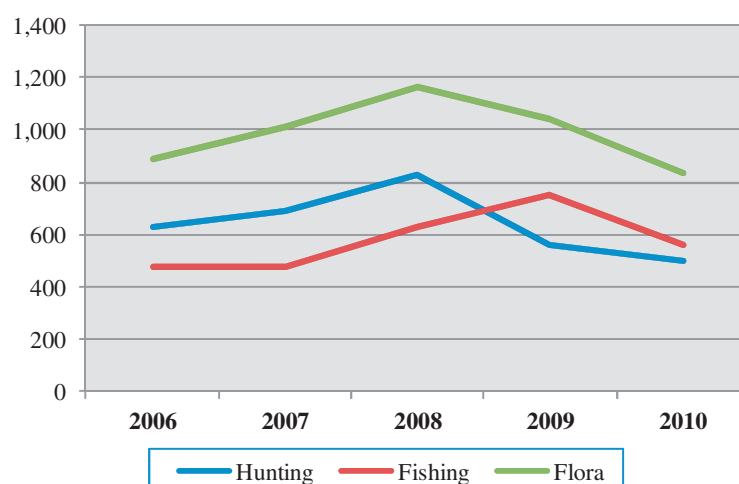
A specific feature of the compliance and enforcement mechanisms of environmental legislation is the involvement of non-State inspectors of public associations, namely the Turkmen Society of Nature Protection and the Society of Hunters and Fishermen. The inspectors of the Turkmen Society of Nature

Protection participate in inspections jointly with the State inspectors of MoNP. These inspections cover hunting and fishing sites, among others. Fifty per cent of the fines levied can be transferred to the Turkmen Society of Nature Protection. At present, however, the Turkmen Society of Nature Protection is only involved in inspection activities on an irregular basis, notwithstanding its staff of 50 inspectors. At the same time, the Society of Hunters and Fishermen continues active inspection activity by monitoring compliance with the requirements on hunting and fishing on the sites it manages. Statistical data on hunting and fishing do not include violations detected by the Society of Hunters and Fishermen on their sites.

Because the special roles and status of these two public associations in environmental protection are recognised, they remain the main avenue in Turkmenistan for citizens' participation in environmental enforcement.

2.5 Compliance assurance

Monitoring of compliance with environmental requirements is ensured through inspections of enterprises; visits to places of illegal disposal of municipal and industrial waste, sites for hunting and fishing, and areas of possible poaching, illegal collection of plants and tree felling; and patrols of natural reserves. In the event that a violation is found, the inspector prepares a report with basic data relating to the detected case of non-compliance and identification data on the offender. Based on their activity results, inspectors submit periodic reports (monthly, quarterly, semiannual and annual). With the same frequency, the provincial offices provide

Figure 2.1: Numbers of violations in protected areas, 2006-2010

Source: Ministry of Nature Protection, 2011.

quantitative data on the results of inspections and sanctions applied against offenders to the central office of the relevant law enforcement authority.

In the case of MoNP, such reports are submitted by the provincial DNPs (separately on environmental protection, and flora and fauna issues), CaspEcoControl, offices responsible for the PAs and the Department of Forestry. They include data on the type and number of violations, total amounts of fines imposed and collected, average amount of fine per violation, and amounts of compensation charged and collected for environmental damage. In turn, MoNP provides monthly reports on its inspection and enforcement activities to the Cabinet of Ministers. Monthly reports include data on the number of violations, total amount of fines, and amounts of compensation charged and collected for environmental damage. In addition, it presents to SCS semi-annual and annual data on its inspection and enforcement activities in the format of the statistical report, “1-tg”. However, the report is treated as information for internal use only.

Environmental laws contain only brief provisions on administrative, criminal and civil liability for non-compliance. The assurance of compliance with environmental requirements is based first of all on the use of the command-and-control approach, since possibilities for the use of economic incentives for enterprises are very limited. The influence of administrative sanctions on the behaviour of polluters (most of which are SoEs) is negligible. During the review mission, it was not possible to comprehend the link between the law enforcement activities of MoNP and decision-making on the allocation of appropriate funding for environmental protection at

enterprises which do not comply with environmental requirements. The decision-making in Turkmenistan depends to a large extent on the Government.

2.6 Enforcement tools

The Code on Administrative Offences and the Civil Code provide a range of enforcement tools as punishment for infringements of environmental legislation. They vary from “soft” response measures for non-compliance, such as inspectors’ written instructions and warnings, to “harder” measures, such as administrative fines and compensation for environmental harm and deprivation of special rights, for example, the right to hunt. Moreover, in the case of some violations related to PAs, hunting and fishing inspectors can confiscate items that have served as instruments to commit administrative offences. The range of available enforcement tools varies depending on the area of inspection and type of violation.

The most commonly used enforcement tools in Turkmenistan are administrative fines and the payment of compensation for environmental harm. Not surprisingly, periodic reports on inspection and enforcement activities provide data only on these tools. Nevertheless, written instructions are used quite often with regard to non-compliance by operators of industrial activities. For example, in 2010, CaspEcoControl issued 29 written instructions addressed to two oil companies with follow-up monitoring of their implementation. In addition, inspectors can use warnings in cases of insignificant violations, but this measure is rarely applied. According to the Akhal Province DNP, its inspectors issued a single warning in 2010.

According to the Criminal Code, enforcement tools to punish the perpetrator of a serious environmental offence include fines, deprivation of the right to hold a certain position or engage in a specific activity, correctional works and imprisonment. According to MoNP, criminal sanctions are rarely applied in Turkmenistan for environmental offences.

The Code on Administrative Offences provides a number of criteria that can be used to determine the specific level of a fine or other penalty for a particular offender. They include, inter alia, the nature of non-compliance, the economic and social situation of the offender, and the degree of the violator's culpability or wilfulness. Thus, in the case of environmental violations by individuals, inspectorates have some flexibility in applying sanctions.

For example, decisions on the imposition of fines by provincial DNPs are made by commissions consisting of top officials from the departments and representatives of labour unions. According to the Akhal Province DNP, when making such decisions, commissions take into consideration the economic and social situation of offenders (e.g. for ordinary citizens, whether they have a big family). In principle, decision-making on the imposition and amount of fines by commissions makes it possible to mitigate, to a certain degree, disproportionalities within the sanctioning regime in current Turkmen legislation.

2.7 Fines, penalties and non-compliance fees

The Code on Administrative Offences sets administrative fines for all types of cases of non-compliance with environmental legislation, including on protection of land, mineral resources, water, forest, ambient air, waste treatment, flora and fauna, and PAs. The Department of Environmental Protection and the Department of Protection of Flora and Fauna collect the fines which they impose. Currently, all fines for non-compliance with environmental legislation and all instances of compensation for environmental damage are paid into the special account of MoNP.

The amounts of administrative fines are set in base rates and vary from 0.5 to 30 base rates. Before 1 July 2010, the base rate was 50 manat. The current base rate is 75 manat. This is why the amounts of administrative fines have increased significantly since 2010; for example, the total amount of fines imposed and collected by the Department of Protection of Flora and Fauna was 203,800 manat in 2010 compared with 166,700 manat in 2009.

Disproportionalities in size exist in administrative monetary sanctions as set by the Code on Administrative Offences. The Code sets low fines for serious violations by operators of industrial activities, for example, for development of mineral resources in non-compliance with environmental requirements (up to 3 base rates) or for non-disclosure of information on environmental pollution (up to 8 base rates). However, Turkmenistan applies quite strict sanctions for certain offences on protection of flora and fauna. Fines for environmental violations established by the Code do not take into account the scale and nature of activities, for example, how hazardous they are.

According to the authorities, the size of fines set by the Code on Administrative Offences often lacks a deterrent effect, especially in cases of repeated or systematic offences. Repeated regular environmental offences can involve stricter administrative penalties (a fine that is doubled) only in the case of illegal collection and trade in liquorice root.

The State Committee for Fisheries also mentioned that there are no administrative penalties to punish certain activities which have significant negative consequences for the environment, such as trade in illegally caught sturgeon, which are sold openly on markets in Ashgabat. In 2009, the Committee prepared amendments to the Code on Administrative Offences to close this legislative gap, but these have not yet been adopted.

2.8 Assessment tools

State ecological expertise and environmental impact assessment

Turkmenistan relies on SEE to assess the potential environmental effects of planned economic activities. According to the Law on State Ecological Expertise, planned economic activities are subject to assessment for compliance with the requirements of environmental protection, rational use of natural resources and environmental safety of citizens. This Law sets out the basic legal requirements for the application of SEE. In addition to this Law, the 1996 Presidential Resolution No. 2864 regulates in greater detail the procedure for conducting SEE and determines the status of experts in this respect. This Resolution also determines a list of environmentally hazardous economic activities that are subject to SEE, which includes the following sectors or types of economic activities:

- Chemical, petrochemical industry and refineries;
- Production of construction materials (glass, cement, asbestos products and other);

- Biochemical, biotechnological, pharmaceutical manufacturing;
- Extraction and processing of oil and natural gas;
- Handling, transportation, storage and disposal of hazardous industrial waste;
- Production, transportation, storage and use of chemical fertilizers, pesticides and toxic chemicals;
- Storage and transportation of flammable, explosive and toxic substances.

Each year, hundreds of projects undergo SEE (e.g. in 2010 MoNP issued SEE conclusions on 197 projects). Experts from the Department of Environmental Protection and provincial DNPs conduct SEE. The experts from the Department of Environmental Protection deal with a large number of industrial facilities, while experts from the provincial departments carry out smaller-scale expertise. The division of “objects” of SEE is based on the sanitary classification of industrial hazardobjects, with five levels of hazard.

The Department of Environmental Protection deals with industrial facilities at levels I-III, while the DNPs deal with industrial facilities at levels IV-V. Four employees are engaged in SEE at the central office of MoNP and, as a rule, there are one or two such employees in the provincial departments.

On the basis of the SEE conducted, MoNP issues its conclusions, including an opinion on possible environmental consequences (environmental impacts), the conditions on which a project can be implemented, comments on proposals and opinions given by interested parties, and recommendations regarding implementation of the reviewed project of economic activity. The conclusions of the SEE may be positive or negative. A positive conclusion is an environmental permit *per se*, since the implementation and funding of the planned economic activity which is subject to the SEE depend on a positive conclusion.

From the beginning of the 2000s, environmental impact assessment (EIA) of planned economic activity has been actively applied. The detailed legal framework for EIA was established by State Standard TDS 579-2001 “Environmental Impact Assessment of the Planned Economic and Other Activities in Turkmenistan” approved by the 2001 Decree of the Main State Service Turkmenstandartlary. It stipulates the purpose and principles of EIA, the basic requirements for public participation and access to information relevant to an assessment, and the content of EIA documentation.

Moreover, it defines a list of economic activities for which EIA is mandatory. In addition to the above-mentioned list of activities subject to SEE, it includes:

- Production and processing of metals;
- Production of pulp and paper;
- Thermal power plants and other combustion plants with a heat input of 300 MW or more;
- Trading ports, inland waterways and ports for inland-waterway traffic;
- Large dams and water reservoirs;
- Construction of motorways, express roads, railway lines of 700 km or more, and airports with a basic runway length of 2,100 m or more;
- All activities in or on the Turkmenistan part of the Caspian Sea and its coastal zone.

Thus, unlike the situation in other countries applying SEE, in Turkmenistan the list of activities subject to EIA is much broader than the list of activities subject to SEE. Compared with the list of activities subject to article 6 of the Aarhus Convention, the energy sector is only partially covered. The Turkmen list does not include installations for the disposal of municipal waste, sewage treatment, construction of overhead electrical power lines or processing of agricultural products.

On the other hand, most of the activities in the list are determined without thresholds, that is, the EIA tool can be applied to them more widely. The absence of legally defined thresholds entails an obligation for MoNP to ensure that the EIA procedure is applied even when it is unlikely that a project will have significant effects on the environment. Altogether, it requires the Ministry to have enough human and other resources in place to deal with projects subject to EIA and relevant public participation procedures. In practice, this often leads to discretionary determination of activities considered to be subject to EIA and public participation requirements in Turkmenistan.

Only some of the projects submitted for SEE review go through the EIA procedure in Turkmenistan. According to information provided by MoNP, approximately 45-50 projects of economic activity per year undergo EIA. Examples in 2010 included a joint project of the State-owned company Turkmengaz and the company Petrofac on development of the South Eloten gas field, the project of the State Concern TurkmenChemistry to construct a mining plant for the production of calcium chloride in Lebap Province, and the oil company Dragon Oil’s laying of pipeline in the Jeytun oilfield.

Photo 2.1: Caspian Sea shore

The general procedure for the assessment of environmental impact using EIA and SEE includes the following main stages:

- Submission of a notice on the proposed type of activity to MoNP by a developer;
- Preparation of EIA documentation by an organization contracted by the developer;
- Organization of public participation procedures;
- Review of EIA documentation by MoNP, preparation of the review document and conclusion of the SEE.

Developers are responsible for organizing and conducting EIA. As a rule, foreign consulting companies and expert organizations are invited to implement this. In such cases, EIA documentation, together with the project documentation and plan for environmental management, are submitted for SEE. Such projects are considered directly by employees of the Department of Environmental Protection, who may consult with provincial DNP staff and CaspEcoControl. The EIA documentation is often extremely voluminous and includes more than a thousand of pages of text, maps, diagrams and calculations. At the same time, according to the information provided by MoNP, only two of its employees are qualified to review EIA documentation submitted for SEE. Although the legislation envisages the possibility of the Ministry involving independent experts and establishing expert panels (groups) for the fulfilment of this work, in practice this has not yet occurred.

Public participation in EIA remains very rare in Turkmenistan. The only recent example provided by

MoNP of there being some public involvement in the EIA procedure is the project on development of the South Eloten gasfield. Public consultations took the form of a meeting between representatives of TurkmenGas, Mary Province's DNP, local authorities and a labour union. Yet, even in this case, the affected population and environmental public associations were not involved in the public consultations.

Another example of EIA with some public participation relates to the proposed north–south railway line, which will improve Turkmenistan's access to Kazakhstan, the Gulf countries, the Russian Federation and South Asia. The environmental assessment report prepared by the Ministry of Railway Transportation for the Asian Development Bank (ASB) provides information on two consultative meetings on this project held in July 2010, but refers to the involvement in public consultations mainly of employees supporting construction works.

Strategic environmental assessment

The Law on State Ecological Expertise includes certain strategic documents in the list of objects of SEE. This applies to programmes, schemes of allocation according to industries and economic sectors, and methodical, normative and technical documents regulating economic activity. To some extent, the conduct of SEE on these documents could be considered a sort of strategic environmental assessment as is applied in many countries in the ECE region. However, they are not included in the more detailed list of the Provision for the procedure

of carrying out SEE approved by Presidential Resolution No. 2864. In practice, assessment of the environmental consequences of strategic decision-making, including programmes and legislation, is not applied.

As yet, strategic environmental assessments are not applied in Turkmenistan. MoNP has provided some examples when it served as expert environmental authority in drafting new legislation, for example, the draft Law on Fisheries or the draft Regulations on the Import, Export and Trade of Chemical Products. However, these examples relate to the practice of its involvement in the preparation of draft legislation by other public authorities rather than to strategic environmental assessment. Decision-making on the above-mentioned legislative documents has not been followed by public consultations, and the conclusions of the SEE on the draft decisions reviewed were not presented. In addition, according to the report by the NGO Crude Accountability, *Turkmenistan's Environmental Risks in the Era of Investment in the Hydrocarbon Sector*, even when some large plans on the oil sector, transport infrastructure and water management are implemented in Turkmenistan, they are treated as isolated projects and are therefore not subject to a strategic environmental assessment.

Environmental audits

Current legislation neither contains provisions directly related to environmental audits nor establishes cases when this should be mandatory. However, the Law on State Ecological Expertise envisages conducting SEE on current economic activities, but this provision has not been sufficiently developed in the Law and regulations adopted for its implementation. In practice, voluntary environmental audits may be conducted at the initiative of enterprises themselves. However, environmental audits have not been applied. During the review mission, it was not possible to obtain information on concrete examples of environmental audits carried out in the country.

2.9 Environmental permits and licences

The system of issuing permits for installations is based entirely on former ad hoc practice, with maximum allowable emissions (MAEs) calculated ad hoc on the basis of maximum allowable concentrations (MACs). Neither technology-based emission limit values (ELVs) nor generally binding quantitative technical requirements are in place. The concept of IPPC has not been introduced. BATs are not defined and therefore not applied in EIA procedures.

The 2008 Law on the Licensing of Certain Activities envisages, inter alia, the licensing of activities aimed at the use of natural resources and environmental protection. The 2009 Presidential Resolution No. 10281 identified a more detailed list of licensed activities as well as a list of public authorities entitled to issue such licences. In addition, on 28 February 2010, MoNP approved the Provision on Licensing of Activities on Environmental Protection. According to Turkmen legislation, licences can be issued to commercial legal entities and individual entrepreneurs who meet the set organizational and technical requirements. For example, depending on the licensed activity, a licence holder can be required to have the premises necessary for keeping wild animals, laboratories for testing analysis, special equipment, documents regulating the conditions of wild animals in captivity, etc.

MoNP is the main public authority dealing with licensing of activities related to the use of natural resources and environmental protection. It is authorized to issue licences to experts to enable them to render services on the development of ecological passports, ELVs for air pollution and water discharges, and EIA. In addition, the Ministry also issues licences for activities related to the use of wild species of fauna and flora, including licences for hunting and catching wild animals; the collection of protected wild species of flora; import, export and trade in wild species; and their conservation ex situ, inter alia, in botanical gardens and zoos.

According to information provided by MoNP, it does not yet issue licences for rendering services on the preparation of ecological passports, ELVs for air pollution and water discharges, and conducting EIA. As stated above, EIA services are provided by foreign consulting companies and expert organizations, which currently are not required to obtain the corresponding licences in Turkmenistan. Domestic organizations provide services for the preparation of ecological passports, and ELVs for air pollution and water discharges, but they do not have licences to undertake these services. In practice, MoNP issues them a letter confirming their qualifications to provide such services. The MoNP employees interviewed explain the delay in the introduction of environmental protection licences by the fact that the legal framework defining the conditions and procedure for issuing licences has been developed relatively recently.

Some other licences are required for the use of natural resources. For instance, licences for commercial fishing and fishing for aquatic animals are issued by the State Committee for Fisheries of

MoA, while licences for exploration and extraction of gas and oil are issued by the State Agency for the Management and Use of Hydrocarbon Resources under the President of Turkmenistan. However, these licences mention environmental aspects or requirements only indirectly.

2.10 Promotion of environmental management systems in enterprises

The process of implementing environmental management standards is still at an early stage. There have not been many activities by national public authorities to promote environmental management systems (EMS) in enterprises. Nor is there any established system of incentives encouraging national companies to adopt International Organization for Standardization (ISO) standards, which are often viewed as an unnecessary administrative and financial burden on their activities. According to the 2008 ISO Survey of Certifications, there was only one ISO 14001:2004-certified company in the country in December 2008.

2.11 Conclusions and recommendations

Currently, the inspection activities of MoNP lack effectiveness and efficiency. One of the main reasons for this is that the performance appraisal undertaken by environmental inspectors from MoNP is based mainly on comparison with previous reporting periods. As mentioned above, the only data from the reporting by inspectors, nature reserves and the Ministry's departments which is analysed are the number of inspections conducted, the number of detected cases of non-compliance, amounts of fines imposed and collected, and level of compensation payable for environmental damage.

It is not surprising that some provincial DNPs report almost identical results on inspections and detection of non-compliance with environmental requirements from one year to another. Accordingly, it can be concluded that many environmental inspectors are simply trying to repeat once-achieved results, and this is not considered to be a deficiency of the current reporting system.

Recommendation 2.1:

The Ministry of Nature Protection should:

- (a) *Improve its current approach to the performance appraisal of environmental enforcement activities of its subordinated structures;*
- (b) *Review, by taking into account international practices, performance indicators allowing*

measurement of progress achieved through the inspection and enforcement activities.

EIA is already included in national legislation, and EIA documentation is reviewed in approximately half of the projects subject to SEE. In most cases, however, EIA is carried out without the application of public participation procedures. The few examples of projects with some public consultation seem to be inconsistent with the requirements of international standards on public participation in EIA. Affected populations and even the few environmentally focused public associations in Turkmenistan have not been involved in discussion of the potential environmental impacts of relevant projects. This also concerns strategic decisions relating to the environment, including plans and programmes, which are usually made without the active involvement of the public.

Recommendation 2.2:

The Ministry of Nature Protection should undertake necessary practical measures for the implementation of the requirements on public participation of the Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters, and the national environmental impact assessment (EIA) legislation through the involvement of the public in the EIA procedures and State ecological expertise process, as well as into decision-making on programmes, plans and policies relating to the environment.

The lack of public access to information is deemed to be one of the most serious shortcomings of enforcement of the environmental protection regime in Turkmenistan. Even basic data on inspection and enforcement activity collected through statistical reporting are kept confidential. Furthermore, the texts of many environmental regulations and requirements are either not available or not easily accessible for the public, making the overall process of environmental enforcement non-transparent and less understandable for the regulated community and the public.

Recommendation 2.3:

The Ministry of Nature Protection should ensure the availability to the general public of information and data on environmental inspections and enforcement, and on environmental regulations and requirements.

As a whole, environmental enforcement lacks clear priorities and target goals with regard to ensuring compliance by the regulated community with environmental legislation. No policy or legal documents establish such objectives, priorities and targets. Moreover, analysis of data included in

inspectorate reports and information has not shown a clear relationship between the inspection and enforcement activities carried out and achievement of the country's environmental objectives. At least, such analysis is not considered to be a priority by the provincial DNPs, CaspEcoControl, nature reserves and MoNP inspectors.

On the one hand, it seems that environmental enforcement is too focused on detection of environmental violations by individuals and the application of sanctions upon them. On the other hand, when they inspect industrial operations, environmental enforcement authorities are focused on compliance with formal requirements, such as the requirement for facilities to have positive conclusions from SEE, approved ecological passports, and emission and discharge limit values. However, environmental enforcement is insufficient to adequately tackle real-time environmental and health-related issues such as water, air and land pollution, particularly by operators of industrial activities.

Recommendation 2.4:

The Ministry of Nature Protection should develop an environmental enforcement strategy with a focus on the environmental performance of operators of industrial activities and measures taken by operators for the achievement of better compliance with environmental requirements.

The system of permit-issuing for installations is fully based on former Soviet ad hoc practice (with MAEs calculated ad hoc on the basis of MACs); neither technology-based ELVs nor generally binding quantitative technical requirements are in place. The concept of IPPC has not been introduced. BATs are not defined and therefore not applied in EIA procedures.

Recommendation 2.5:

The Ministry of Nature Protection, in cooperation with other relevant ministries, should:

- (a) Consider, in the medium term, preparing new legislation setting rules for environmental permit-issuing, taking into account the concept of integrated pollution prevention and control (IPPC);*
- (b) Define guidance for national best available techniques (BATs), taking into account country-specific conditions; these national BATs should be utilised as a background for setting technology-based emission limit values and for permit-issuing;*
- (c) Introduce technology-based emission limit values and other generally binding, quantified requirements to reduce, step by step, air and water pollution in selected major polluting sectors and industries (including technically and economically achievable compliance deadlines).*

Chapter 3

ECONOMIC INSTRUMENTS AND FINANCING OF ENVIRONMENTAL PROTECTION

3.1 Introduction

Turkmenistan has experienced strong and sustained economic expansion over the past decade. According to official statistics, real GDP rose at an average annual rate of nearly 13 per cent during 2000-2010. Rapid economic growth led to a considerable increase in average real per capita income, which tripled over this period. The World Bank classifies Turkmenistan as a middle-income country. The production and export of hydrocarbons, especially natural gas, has become the major engine of growth, accounting for 90 per cent of total merchandise exports in 2008. Another important driver of economic growth in recent years has been construction activity (residential and office buildings and other public infrastructure). Turkmenistan is also a major exporter of cotton. As the economy relies on hydrocarbon resources to a very large extent, diversification of economic activity is a major policy priority. The goal of diversification of industrial activity is complemented by the target of achieving self-sufficiency in food supply.

Turkmenistan has pursued its own model of economic development, in which the State plays a leading role. Most productive assets are State owned, and privatization has been mainly limited to small businesses in the services sector. The State also plans and controls domestic agricultural production. State subsidies correspond to 50 per cent of agricultural production costs. The two main crops (cotton and grain) are subject to a State procurement system with fixed prices, which are well below levels prevailing in world markets, although they have been raised twice since 2009.

The foreign trade system is very restrictive, requiring the prior registration of nearly all trade deals with the Turkmen State Commodity and Raw Materials Exchange. The role of the private sector in the economy is modest. It is estimated that the private sector currently accounts for a mere 25 per cent of total GDP. According to official statistics, the private sector's share of production outside the oil and gas sector is some 40 per cent at present. However, the Government has announced that it intends to increase this share to 70 per cent by the year 2020.

Another important feature of the economy is the pervasive and heavy subsidization of basic necessities and services for the population. A 1993 decree of the former President established that the provision of electricity, gas and water supply is basically gratis for the population. In 2003, this entitlement was extended to 2020 and in 2006, was further prolonged to the year 2030.² Moreover, car owners are entitled to a free monthly allocation of petrol. There are also widespread subsidies for municipal housing.

More generally, structural reforms designed to promote the transition to a market-based economic system have been quite limited so far. Under the current President, who was elected in 2007, a range of measures has been adopted, however, which could suggest an increased openness towards economic reforms. These include the liberalization of the foreign currency exchange market. Against the background of considerable cumulative inflation, there was a redenomination of the national currency at the beginning of 2009 (5,000 old manat are equivalent to 1 new manat).

An amended Law on Foreign Investments, which entered into force in March 2008, has been designed to create a more conducive business environment for foreign investors; there was also new legislation aimed at promoting the development of small and medium-sized enterprises. Taxes on exports and imports of goods were reduced. What is more, the new Constitution, which was adopted in October 2008, acknowledges for the first time the concept of a market economy with private property and private enterprises.

3.2 Institutional, legal and policy framework

MoNP is responsible for the application and collection of environmental charges and fines. However, the actual establishment of rates of environmental charges and fines requires the approval of MED. The Ministry has also been involved in the determination of water tariffs. But in

² The prolongation until 2030 was based on a resolution of the XVII People's Council (Halk Maslakhaty) of 25 October 2006.

April 2011 (i.e. after the Review mission), a new Ministry of Municipal Services was established, which will *inter alia* be in charge of water utilities and the setting of water tariffs. But MED will continue to set tariffs for organizations financed by the State budget.

The legal basis for the use of economic instruments designed to promote environmental protection is provided by article 7 of the Law on Nature Protection, which specifies a number of instruments, not all of which, however, are actually used. The following economic instruments are applied in Turkmenistan:

- Charges for emissions of air and water pollutants;
- Waste disposal charges;
- Fees for the use of natural resources;
- Fines for the violation of environmental regulations;
- Payments for environmental damage compensation.

The other instruments which are listed in article 7 but have not been applied so far are:

- Tradable emission permits;
- Special tax on the use of environmentally dangerous technologies and activities;
- Tax subsidies and soft loans for the installation of clean and resource-saving technologies.

Article 7 also contains a provision for granting financial benefits for managers and employees of companies which have excelled in environmental protection measures, or, conversely, financial penalties for the non-observance of environmental protection plans and norms. This instrument has never been used in the past and there is no information on the underlying rules and procedures. The Law on Nature Protection also stipulates that additional instruments can be established by local governments within the limits of their competence, but this has not been the case so far.

As regards the financing of environmental policy measures, articles 9 and 10 of the Law on Nature Protection indicate the following sources:

- Environmental funds at the State and local government level;
- State budget and local government budgets;
- Own funds of enterprises;
- Special funds of governmental agencies;
- Voluntary contributions from the public.

While voluntary contributions from the population have not been used for financing environmental protection, there are a number of projects that have benefited from foreign assistance (grants and loans). Overall, however, the latter has been used on a relatively limited scale only. In any case, it is striking that foreign assistance is not explicitly mentioned in the Law as a source of environmental financing.

An important feature of policy-making in Turkmenistan is the setting of qualitative and quantitative goals within the framework of long-term national development plans. The 1999 National Strategy of Socio-economic Transformation of Turkmenistan for the Period until 2010 identified as priority areas – besides the transition to a market economy – economic independence, food security, social protection and ecological safety.

This development plan was replaced in 2003 by Strategy 2020, which has the overarching goal of promoting the welfare of the population and raising living standards to the level prevailing in developed countries.

NEAP for the period up to 2010, which was adopted in 2002, specified legal and institutional measures for the design and implementation of environmental policies. Furthermore, it also specified a detailed list of environmental related investment projects and associated planned expenditures (section 3.4). A new national environmental programme for the period 2012-2016, which would possibly be linked with the current long-term national development strategies, is being prepared. It could possibly complement the latest long-term development plan, Strategy 2030. Among the major aims of the new programme is to promote the diversification of production structures and raise the level of competition within the domestic economy with corresponding market and institutional reforms.

Another national programme with potentially strong environmental and health impacts is the Rural Development Programme for the period 2008-2020, which aims *inter alia* to modernize and extend the water sector network (irrigation systems, water supply and sewerage systems), and the road transport and energy supply systems. Other major policies covering environmental protection issues, with associated implications for the State budget, are related to the achievement of the national Millennium Development Goals (MDGs), the implementation of the UNCCD and the mitigation of GHG emissions under the UNFCCC, as well as adaptation to climate change.

3.3 Use of economic instruments for environmental protection

Economic instruments are designed to ensure that environmental costs and benefits are included in decision-making of enterprises and households in order to promote environmentally sound and efficient production and consumption patterns.

Air pollution charges

The Law on Protection of Atmospheric Air (article 35) stipulates that emissions from stationary sources are subject to payment of a charge. As is the case with the other Central Asian countries, air quality standards are based on the specification of MACs for each pollutant. In Turkmenistan, levels of MACs are determined by MoHMI, and they are, in principle, specified in such a way as to exclude any short- and long-term risk to human health. Since 2001, the environmental quality standards applied (i.e. the sanitary-hygienic norms and standards) are those adopted by the Russian Federation (Chapter 5). The MACs for individual pollutants are complemented by annual ELVs which are specified in corresponding permits for enterprises issued by MoNP. There are no official prescriptions with regard to specific technology standards for pollution abatement and control.

Charges per ton (t) of emissions of specific air pollutants are differentiated with regard to their human toxicity as reflected in the MACs. Basic rates do not vary across regions or economic sectors. It is noteworthy, however, that foreign companies operating in the oil and gas sector under PSAs are exempted from the payment of air pollution charges. The currently applied pollution charge rates³ were established in the 2000 administrative Instruction on Standards of Payments for the Emissions of Pollutants. Rates are quite low, amounting to US\$ 3.2 per t of nitrogen oxides (NO_x) and about US\$ 2 per t of dust (total suspended particulates, or TSP) and sulphur dioxide (SO₂). Charges per t of other air pollutants are only some US\$ 0.02 or even less (Table 3.1), that is, they are practically equal to zero. Basic rates have not changed since they were established in 2000. The upshot is that, in the face of high cumulative inflation which amounted – at a minimum – to some 100 per cent between 2000 and

2010, the already low nominal rates declined in real terms by at least 50 per cent over this period.⁴

In principle, some 80 pollutants are subject to pollution charges but only a few are actually monitored. Emissions above the established limits are subject to fines unless they are due to uncontrollable events. Enterprises that observe excess emissions have to report to MoNP and discuss possible remedies. In general, this appears to have prevented the imposition of fines in most such cases in the past.

The upshot is that the charge rates for air pollutants are much too low to create any meaningful incentives for enterprises to commit funds to pollution abatement. There is no publicly available information on revenues collected from pollution charges and fines, both of which are earmarked for financing environmental expenditures.

Water effluent charges

Turkmenistan does not apply a system of water effluent charges based on payments for the discharge of individual pollutants. Rather, the charges that companies have to pay are based on the total volume of wastewater discharged. Charge rates are low. Wastewater discharges by domestic enterprises (all State owned) are subject to a charge of 0.0057 manat (US\$ 0.002) per m³. Companies operating under a joint venture agreement (up to 2010, always with a Turkmen majority stake) are charged US\$ 0.01 per m³, five times the rate of domestic firms. Foreign companies pay US\$ 0.02, 10 times the rate of domestic enterprises. As is the case with air pollution taxes, rates for wastewater discharge were set in 2000 and have not been adjusted for inflation since. Nor is there any information on revenues collected. The introduction of pollution charges for a limited number of pollutants such as nitrate, phosphorous and biological oxygen demand (BOD) effluents in combination with a use-based classification of water bodies has not yet been considered by MoNP. Nor is there any information on revenues collected.

Charges for water supply and sewerage services

Municipal water supply and sanitation services are mainly provided by specialized water companies, which are subordinated to local government administrations. The latter also own the

³ Pollution tax rates are expressed in the national regulation as monetary units per “conditional ton” of emissions. A “conditional ton” of a pollutant is calculated by dividing a unit ton by the value of its MAC. To illustrate, one ton of NO₂ (SO₂) emissions corresponds to 25 (20) conditional tons.

⁴ This is based on the change in the consumer price index between 2000 and 2010. The change in the GDP deflator, the other major measure of inflation in the economy, was some 240 per cent.

Table 3.1: Charges on emissions of air pollutants

Pollutants	Manat per conditional ton	MAC	Manat per ton	US\$ per ton
Dust/TSP	0.28	0.05	5.60	1.96
SO ₂	0.28	0.05	5.60	1.96
CO	0.05	3.00	0.33	0.12
Hydrocarbons	0.10	0.67	0.15	0.05
VOCs	0.03	0.46	0.65	0.23

Source: Ministry of Nature Protection; ECE calculations, 2011.

Notes: MAC (mg/m³) = maximum allowable concentrations (24-hour mean).

One conditional ton of a pollutant is defined as a “normal” ton divided by the corresponding value of the MAC. Exchange rate: US\$ 1 = 2.85 manat.

corresponding water supply and sewerage infrastructure. In some residential areas, small-scale water supply systems are operated by industrial enterprises. Uniform water tariffs for the whole country are determined by the central government, but there is no formal (and published) tariff regulation methodology.

The Law on Drinking Water adopted in autumn 2010 confirms that water supply to the population continues to be free of charge, which has been the case since 1993. There is, however, an upper limit to free water use, which is set at 250 l per capita per day (Table 3.2), but use above this limit is priced at a nominal rate of 0.006 manat (US\$ 0.002) per m³. Given that water meters have been installed only recently in new residential buildings (mainly in the capital, Ashgabat), water use by most of the population cannot be controlled. The upshot is that only a small minority of households can actually gauge their water use, but payments, if any, for water use above the limit are likely to be very small. There is no payment for sewerage services.

Besides private households, there are four other consumer categories in the official tariff schedule: budget organizations, SOEs, domestic private firms and foreign firms. Foreign companies and domestic private firms pay significantly more for water supply and sewerage services than budget organizations and SOEs (Table 3.2), pointing to considerable cross-subsidization of tariffs for SOEs.

Information from the water company Clean Water in Ashgabat suggests that only water supply tariffs for the aggregate of the enterprise sector may allow the recovery of unit operating costs. But the total volume of water unaccounted for is not known. However, given the lack of revenue from household water use, water companies' overall revenues are generally insufficient to recover operating costs. The upshot is that operations of the water supply and sanitation

networks are financially unsustainable and require heavy subsidies from the State budget, including for the repair and maintenance, extension and improvement of the water sector infrastructure. Given the prevailing tariff policy, there are also no incentives for private investors to become engaged in the water supply sector.

More generally, adequate management of the water supply sector is hardly possible without measurement of water production and consumption. Metering would at least make it possible to detect and repair existing leaks in the water networks, thereby reducing water losses. Yet, more generally, the provision of a free supply of water to the population will tend to lead to waste of scarce water resources. It also amounts to unequal treatment of higher-income households (who can afford to pay) and lower-income households, many of whom may need some assistance to be able to afford adequate access to water. In a similar vein, there is unequal treatment between enterprises (which have to pay for water) and households.

Fees for irrigation water

Agriculture is the main user of fresh water in Turkmenistan. Water used for irrigation is provided to farmers free of charge. Costs for transportation of irrigation water via the external State irrigation network to the boundaries of the farmland are covered from State budget funds allocated to MoWE.

Costs of maintenance of irrigation and drainage networks within the boundaries of the agricultural area to be irrigated are financed by the members of farmers' associations and owners of land. The same holds for the repair and maintenance of other parts of the internal network, such as pumping stations, as well as costs of manpower for operating these facilities. Farmers' contributions to the costs of maintenance of the internal networks is based on a

Table 3.2: Water supply and sewerage tariffs

Consumer category	Manat/m ³		US cents/m ³	
	Water supply	Sewerage	Water supply	Sewerage
Private households				
up to 250 l pcpd	0.00	0.00	0.00	0.00
Budget organizations	0.17	0.03	6.00	1.10
State-owned enterprises	0.24	0.08	8.42	2.80
Domestic private companies	0.50	0.12	17.50	4.20
Foreign companies	0.60	0.18	21.10	6.30

Source: Ashgabat AgyzSu (Ashgabat Clean Water Company), 2011.

Notes: Exchange rate: US\$ 1 = 2.85 manat.

lpcpd = litres per capita per day.

scheme of differentiated tariffs, depending on the type of crops produced (mainly cotton and wheat).

These tariffs are developed by MoWE based on calculations of standard maintenance costs of the internal irrigation network and are subject to approval by MED. The average tariff applied since 2000 amounts to 5.2 manat (US\$ 1.82) per ha of irrigated land. The funds collected for the maintenance of internal irrigation networks are transferred to special accounts of enterprises associated with MoWE, which carry out the maintenance works of the internal irrigation networks.

Farmers' associations finance the costs of maintenance of the internal irrigation network on the basis of soft loans from a State bank. The collateral to the credit is the expected harvest, which is slated to be sold to the bank at a price determined annually by the Government. The farmers then receive the payment for the harvest after deduction of the loan used to finance the costs of irrigation water supply. The bank, in turn, sells the harvest to the State procurement system. Exports of crops are handled by the State Commodity and Raw Materials Exchange of Turkmenistan.

MoWE also establishes water tariffs, subject to approval by MED, for industrial companies which abstract water from the irrigation network for activities which are not related to irrigation. The tariff has been 0.01 manat (US\$ 0.0035) per m³ since 2001.

Electricity tariffs

Electricity generation, transmission and distribution are carried out by a vertically integrated monopoly, the State Power Corporation TurkmenEnergo under the Ministry of Energy and Industry. Energy sector assets (electricity, gas and oil) have been formally

excluded from privatization at least until 2020. The Ministry of Energy and Industry is responsible for the overall management of the electricity sector. It also establishes the electricity tariffs for final consumers, in cooperation with the Ministry of Finance. Overall nationwide tariff policy is subject to approval by the Cabinet of Ministers. Electricity tariffs were set for the last time in the 1996 Regulations on the Use of Electricity and Thermal Energy, and there have been no significant changes since. It is noteworthy that tariffs have not been adjusted to compensate for the considerable cumulative inflation (more than 200 per cent) between 1997 and 2010.

Domestic electricity supply is not based on commercial principles. Electricity used by private households has been free of charge up to a certain threshold since 1993. Consumption of electricity, however, is controlled by means of individual meters. For a one- or two-person household, the free allotment is 90 kWh per month or 1,080 kWh per annum. For households composed of three or more persons, the free allotment is 35 kWh per person per month, or 420 kWh per person per annum. The free amount of electricity is quite generous given that electricity use by households amounted, on average, to some 350 kWh per capita in 2008.⁵

Consumption above the threshold has to be paid at a nominal rate of 0.0096 manat (US\$ 0.00337) per kWh, which includes 15 per cent value-added tax (VAT). Excluding VAT, the price is 0.0083 manat (US\$ 0.0029) per kWh. Assuming that a Turkmen household would exceed the consumption threshold by 1,000 kWh per annum, it would only have to pay the trivial amount of 9.6 manat (some US\$ 3.40). By comparison, in Kazakhstan the average household tariff was US\$ 0.056 per kWh in the first half of 2010

⁵ Statistics published by the IEA show that total final consumption of electricity by residential users in Turkmenistan amounted to 1,837 GWh in 2008.

(without any free supply). In other words, households in Turkmenistan pay only some 5 per cent of the average price per kWh in Kazakhstan, and this only *after* the very generous free supply has been used up.

There is no publicly available information on the detailed tariff schedule applied to the non-residential sector in Turkmenistan. The average tariff is, however, quite low at 0.013 manat (US\$ 0.0046) per kWh, but there is no free distribution of electricity. Nor is there any publicly available information on the tariff level that would make it possible to cover operating costs and investment costs. To some extent, domestic losses from tariffs below cost recovery levels may be offset by electricity exports, which accounted for 10 per cent of electricity production in 2008.

Revenues from domestic tariffs have, in any case, been eroded due to the lack of adjustment for inflation. Basic tariffs in Turkmenistan have not changed for more than a decade in nominal terms. This makes operations in the sector, notably investments, largely dependent on transfers of funds from the State budget.

Gas tariffs

The gas sector in Turkmenistan is operated and managed by the monopoly State Concern TurkmenGas. As with electricity, gas tariff-setting is under direct Government control. Domestic prices have not changed over the past decade or so. Supply of gas to residential users is free for up to three “consumption points”, which typically are cooking, heating and hot water supply. In the case of more than three consumption points, there is a nominal charge of 2 manat (US\$ 0.70) per 1,000 m³ of gas consumed. In the latter case, however, households are obliged to arrange for the installation of a gas meter.

Otherwise, they would be charged on the basis of technical supply parameters, which would result in much higher payments compared with actual metering of consumption. There is no publicly available information on the aggregate volume of residential gas consumption. It appears that practically all households have only up to three consumption points, and therefore hardly any residential user pays for gas consumption. The average tariff for the non-household consumer categories is only 3.6 manat (US\$ 1.26) per 1,000 m³.

Pricing of fuels for road transport

Sustained economic and population growth has led to a significant increase in passenger and freight traffic

over the past decade. The overall motor vehicle fleet includes a considerable number of old and obsolete vehicles, which have been contributing to the increase in national emissions of air pollutants, including GHG (Chapter 6).

All motor vehicles are imported, but imports of vehicles more than 10 years old have been prohibited since July 2011; the previous age limit for vehicles, in force since December 2009, was 12 years. In addition, imports of passenger cars with an engine volume larger than 3.5 l have been prohibited since July 2011. In principle this should help reduce car emissions. Imports of motor vehicles are subject to a duty of US\$ 0.30 per cm³ of engine size. There is an exemption for ambulances and special cars for disabled people. There is, moreover, a municipal tax on the sale of vehicles, which has to be paid by legal entities or natural persons selling vehicles in the territory of Turkmenistan. The tax rate is 5 per cent of the market value of the sold vehicle.

All fuels for motor vehicles are produced domestically (Chapter 6). Fuel prices are subject to State control, and Turkmenistan has a long tradition of being among the countries with the most heavily subsidized gasoline and diesel in the world. In fact, both the use of motor vehicles and fuel consumption have been strongly encouraged by the essentially free distribution of fuels to vehicle owners since 1993. By way of illustration, between 2000 and the beginning of 2008, the price of a litre of petrol corresponded to only some 1 to 2 US cents.

Petrol prices were, however, raised sharply in early February 2008. Thus, the price of high-grade petrol (RON 95) rose from US\$ 0.02 to US\$ 0.22 per litre (Table 3.3), corresponding to a current price of 0.62 manat per litre. The decision to curb price subsidies can be seen as part of a gradual move towards a market economy system. It should be noted that the price of petrol per litre includes, in principle, an excise tax which, according to the Tax Code, amounts to 40 per cent of the cost.

In order to mitigate the social repercussions of the sharp petrol price increases, the Government decided at the same time to introduce a system of monthly free allotments of gasoline and diesel to vehicle owners. The monthly free allotments, which are specified in the Presidential Decree on Regulating the Allotment of Gasoline and Diesel Fuel to the Owners of Private Vehicles, are as follows:

- 120 l for vehicles with a weight of maximum 3.5 t and maximum 8 passenger seats;
- 200 l per month for trucks with a weight up to 3.5 t, buses and vehicles with more than

- 8 passenger seats (excluding the driver's seat) and all types of tractors;
- 40 l per month for motorcycles and scooters.

Despite the massive increases, prices of gasoline and diesel continue to be heavily subsidized. There are currently three filling stations in the country for trucks and lorries which use condensed natural gas (CNG). The price is reported to be very low. One indicator for this is that the domestic price of fuels is still less than one third of the world market price of crude oil (Table 3.3). Fuel prices in Turkmenistan are also significantly below those in other Central Asian countries, which are also at low levels due to Government subsidies (Table 3.4).

Against this background, it may be surmised that the price increase enacted in Turkmenistan in 2008 will mainly strain the budgets of households with low incomes rather than restraining the overall growth in fuel consumption and associated emissions of air pollutants.

It is noteworthy that the recent strong increase in fuel prices has led to a twentyfold increase in public transport prices, albeit from a very low level. Most public passenger transport is operated by the State,

and tariffs continue to be below cost-recovery levels, even after the recent transport tariff increases.

Payments for exploration and development of hydrocarbon resources

Oil, gas and other subsoil resources are the exclusive property of the State, which can grant rights (licences) to engage in subsoil activity on the basis of a contract. The 1992 Law on Mineral Resources stipulates that mineral resources are non-renewable national wealth and that their rational use and protection for the benefit of future generations is one of the most important tasks of the State. The principal instrument establishing rules for subsoil activity is the 1996 Law on Hydrocarbon Resources, which has been complemented by various regulations concerning its implementation. A revised version of the Law entered into force in August 2008. The major change was to define the rights and status of the new State Agency for the Management and Use of Hydrocarbon Resources under the President. The Agency is in charge of the issue of licences for exploration and development of deposits, as well as oil and gas production and transport. These competences were taken away from the Ministry of Oil and Gas Industry and Mineral Resources.

Table 3.3: Retail fuel prices, 2000-2008 and March 2011

Fuel type	US cents per litre					
	2000	2002	2004	2006	2008	2011 March
Super gasoline (RON 95)	2.0	2.0	2.0	2.0	22.0	22.0
Diesel	2.0	1.0	1.0	1.0	20.0	20.0
<i>Memorandum item</i>						
World market price of crude oil	17.9	15.7	24.0	40.9	61.0	63.0

Sources: Fuel prices for 2000-2008: GTZ, *International Fuel Prices 2009*, p. 34; Price for March 2011: ECE; Crude oil prices: OECD, Economic Outlook 88 database, November 2010 (www.oecd.org); IEA, *Oil Market Report*, 15 March 2011 (www.oilmarketreport.org).

Notes: Last GTZ fuel price survey was on 15-17 November 2008.

Figure for 2011: Average for January-February 2011.

Table 3.4: Comparison of retail fuel prices in Central Asian countries, November 2008

	US cents per litre	
	Super gasoline	Diesel
Kazakhstan	83	72
Kyrgyzstan	80	88
Tajikistan	103	100
Turkmenistan	22	20
Uzbekistan	135	75

Source: GTZ, *International Fuel Prices 2009*, p. 34.

Note: The world market price for 1 litre of crude oil was US\$ 0.61 in 2008.

1 barrel = 158.99 l.

Table 3.5: Selected hunting fees, per unit

Species	Manat	US\$
Wild boar	160	56.0
Wolf	20	7.0
Rabbit	24	8.5
Fox	20	7.0
Swamp beaver	20	7.0

Source: Ministry of Nature Protection, 2011.

Note: Exchange rate: US\$ 1 = 2.85 manat.

Figures are rounded.

The Law on Hydrocarbon Resources includes provisions for the issuing of licences for oil and gas operations for a number of years. Operations are mainly based on a PSA, but can also take the form of an agreement on joint activities (AJA). PSAs are concluded between a (foreign) company (the “contractor”) and the State Agency for the Management and Use of Hydrocarbon Resources, which is the primary national authority for PSA matters. It is noteworthy that Turkmenistan has so far excluded PSAs for its huge onshore gas fields, but several foreign companies are operating under PSAs in Turkmenistan’s area of the Caspian Sea.

The Law on Hydrocarbon Resources also defines the fiscal regime for the activities of contractors and their subcontractors. A contractor has to make the following mandatory payments to the State Agency: profits tax; a royalty on hydrocarbon production; and signing and production bonuses (art. 48).

A 10 per cent share of all income received from PSAs is transferred by the State Agency to the State budget. All of the above-mentioned payments are designed to raise Government revenue and not intended to ensure that environmental considerations enter into the decision-making of companies. Contracts also determine inter alia environmental protection obligations and work safety requirements, but there is no publicly available information on these matters.

Subsoil tax

There is also a subsoil use tax, which has to be paid by legal entities and individual entrepreneurs which or who mine minerals and use underground or surface water for the purpose of extracting chemical elements and compounds. The tax is imposed on the sale of minerals mined by the corresponding company and on the use of these minerals for their own needs, including processing. However, under the Law on Hydrocarbon Resources, hydrocarbon contractors and subcontractors are not subject to payment of the subsoil use tax.

Fees for use of flora and fauna

Current fees for collection of plants, hunting of animals and catching of fish were established in 2000. In general, these fees are much too low relative to the economic benefits from these activities. A selection of hunting fees is shown in Table 3.5. In the forest sector, the collection of fuelwood is charged at 58 manat (some US\$ 20) per m³.

Fines for violations of environmental regulations

Failure to meet regulations concerning environmental protection and the use of natural resources is subject to administrative sanctions in line with the Code on Administrative Offences or, in the case of criminal liability, the Criminal Code. In addition, the Civil Code provides for civil liability in the form of compensation for environmental damage caused. Methodologies for the assessment and valuation of environmental damage have been developed for the environmental domains of air, land and water resources by MoNP and approved by MED, MoA and MoWE. However, final review and approval of these methodologies by the Cabinet of Ministers is still pending.

Administrative fines are imposed by the inspectorate of MoNP. The calculation base for the fines has changed in recent years. In 2009 and until July 2010, the “basic wage rate” was used as a base for calculating fines. It amounted to 50 manat (US\$ 17.5) and fines were determined as a multiple of that wage rate, which should not be confused with the level of the monthly minimum wage which is established by Presidential Decree. The latter was set at the end of November 2009 at 598 manat (about US\$ 210).

As from the beginning of July 2010, the basic wage rate was renamed as the “basic calculation unit” and was raised to 300 manat (about US\$ 105). Because of concerns about the ability of offenders to pay, differentiated coefficients have been applied on this unit. For environmental offences, since July 2010, this coefficient has been set at 0.25, and therefore the basis for the calculation of fines is 75 manat (US\$ 26.30). The new level is still 50 per cent higher than the basic rate for calculating fines applied in 2009 and the first half of 2010, which was set at 50 manat.

As an example, among the highest possible fines are those imposed for emission of air pollutants above the established threshold, which entails a fine corresponding to eight basic calculation units (i.e. 600 manat). In contrast, infringements of regulations pertaining to water pollution are

sanctioned with one basic calculation unit (75 manat) for ordinary citizens and three units (225 manat) for officials (i.e. civil servants). The breaching of rules for water use, including discharge of wastewater, can entail fines ranging from three to 10 basic calculation units, that is, from 225 to 750 manat.

There is no publicly available information on effective rates or fines imposed and collected concerning violations of regulations for air emissions and wastewater discharges by companies. It is noteworthy that these categories of fines do not apply to legal entities; should there be a violation by a legal entity, a fine would be imposed on the physical person in charge of the legal entity.

Financial penalties for violations of rules pertaining to the use of flora and fauna consist of two components, fines and compensations (so-called claims). Fines are imposed for violations of general environmental protection regulations (forests, PAs and other areas), and are determined in line with the Code on Administrative Offences mainly as a multiple of the basic calculation unit. In contrast, claims are intended to be compensation for damage done to nature. To illustrate, the (illegal) killing of a species included in the *Red Data Book of Turkmenistan* would be subject to both a fine for violation of existing regulations and a compensation (claim) for harm done to nature. The amount of compensation is determined by MED. In the case of the killing of a markhor (*Capra falconeri*), the compensation for environmental harm caused amounts to 710 manat (about US\$ 250), while for a gazelle (*Gazella subgutturosa*) the corresponding payment imposed is 500 manat (US\$ 176) (Table 3.6). To this would be added a fine for a violation of hunting regulations, which for ordinary citizens can amount to up to 10 basic calculation units (750 manat) for hunting of rare species listed in the *Red Data Book*. Officials (i.e. civil servants) can be charged up to 20 basic calculation units (1500 manat) in a similar case.

There were some 3,510 violations of rules for use of flora and fauna (on average about 9.5 per day) during

2010. In 2009, this figure was some 10 per cent higher. Broadly speaking, the cases are equally distributed between the categories of hunting, fishing and plant collection. There are no published data on the incidence of illegal logging. The average fine per case amounted to 58 manat (US\$ 20.40) in 2010, up from some 43 manat (US\$ 15.20) in 2009. Total revenues from fines amounted to some 205,000 manat (US\$ 72,000) in 2010. The increase in revenues from fines compared with 2009 occurred despite a decrease in the number of cases, but this was more than offset by an increase in the average fine per case (Table 3.7). The latter reflects inter alia the rise in the basic calculation unit that is used for calculating the fines noted above.

Payments of claims for compensation of damage done to nature amounted to 454,000 manat (US\$ 159,000) in 2010. This is more than twice the revenue from fines and more than a fourfold increase compared with 2009. There is no information on the causes for this considerable increase in such payments. Total collected revenue from fines and claims was some 660,000 manat (US\$ 230,000) in 2010, up from some 271,000 manat (US\$ 95,000) in 2009. The collection rate is reported to be close to 100 per cent. Revenue from fines and claims is earmarked for financing environmental expenditures and allocated to a special MoNP account.

3.4 Financing of environmental expenditures

Environmental expenditures in Turkmenistan have been financed from a variety of sources, namely:

- The State budget (central and local government);
- Off-budget special Government funds, including the State Environmental Fund;
- Own funds of (mainly State-owned) enterprises;
- Foreign assistance.

Innovative sources of finance, such as carbon finance within the framework of the CDM, have not been used to date.

Table 3.6: Environmental damage compensation for violations of hunting regulations, payment per unit

Species		Manat	US\$
Wild mountain sheep	(<i>Ovis vigne</i>)	600	211
Gazelle	(<i>Gazella subgutturosa</i>)	500	176
Markhor (goat)	(<i>Capra falconeri</i>)	710	250
Red deer	(<i>Cervus elaphus</i>)	805	282
Amu Darya Sturgeon	(<i>Pseudoscaphirhynchus</i>)	640	224

Source: Ministry of Nature Protection, 2011.

Notes: Species included in *The Red Data Book of Turkmenistan*.

Exchange rate: US\$ 1 = 2.85 manat.

Table 3.7: Revenue from sanctions for violations of regulations for use of flora and fauna

Type of payment	Nature reserves		Other areas		Total	
	2009	2010	2009	2010	2009	2010
Fines (thousand manat)	80.2	88.3	86.5	115.5	166.7	203.8
Compensation for environmental harm (thousand manat)	40.3	40.3	64.1	413.9	104.4	454.1
<i>Memorandum items</i>						
Total payments (US\$ 1000)	42.3	45.1	52.9	185.7	95.1	230.5
Number of cases (fines)	2,358.0	1,887.0	1,484.0	1,626.0	3,842.0	3,513.0
Average fine per case (manat)	34.0	46.8	58.3	71.0	43.4	58.0
Average fine per case (US\$)	11.9	16.4	20.5	24.9	15.2	20.4
Average payment per case (manat)	51.1	68.1	101.5	325.6	70.6	187.3
Average payment per case (US\$)	17.9	23.9	35.6	114.2	24.8	65.7

Source: Ministry of Nature Protection; ECE calculations, 2011.

Note: Exchange rate: US\$ 1 = 2.85 manat.

State budget

The public finance accounts of Turkmenistan are opaque. Detailed information on the structure of the State budget (revenues and expenditures) is not publicly available, as is the case with the significant off-budget expenditures through extrabudgetary funds and lending. The State budget recorded large surpluses in recent years, mainly on account of favourable trends for revenue from oil and gas exports. In October 2008, the Government established a sovereign wealth fund, the Stabilization Fund of Turkmenistan, which will accumulate State budget surpluses to be invested in foreign-exchange-denominated assets. In the past, most hydrocarbon revenue was channeled to the Foreign Exchange Reserve Fund (FERF). Besides accumulating funds for future generations, an important function of the Stabilization Fund is to finance domestic infrastructure investments – which could also include environmental infrastructure – and to provide a cushion for adverse external shocks. The Stabilization Fund is under the supervision of the Ministry of Finance, but its operational and governing rules have not yet been published.

A reform of the fiscal system based on a new Budget Code, which is being drafted with assistance from the EU, is planned in the near term. The question is, however, to what extent the Government will be effectively reducing the use of off-budget funds, which is part and parcel of increased fiscal transparency.

Although the bulk of environmental expenditures in Turkmenistan is reported⁶ to have been financed from the State budget over the past decade, there is only

very limited published information on actual expenditure levels. A major priority area in recent years appears to have been the agricultural sector, viz the construction and rehabilitation of irrigation networks, rehabilitation of irrigated lands and construction of drip irrigation systems. Other main expenditure items were flood protection measures, construction of water supply and sewerage systems, and sand-fixing measures to control desertification.

The State budget has also financed operating costs, including repair and maintenance in various areas, notably for activities related to land management of the MoA. The FERG was used to purchase specialized machinery for MoWE for the development of new lands, rehabilitation of irrigated lands, construction of drainage collectors (notably for the melioration system of Lake Altyn Asyr or Turkmen Golden Age Lake) and for limiting the desertification process. There are, moreover, a number of (off-budget) special State development funds for various economic sectors to finance investment projects which, to some extent, also had an environmental component. In principle, funds for financing prioritized environmental protection projects have been allocated in accordance with the Government's national development programmes. Allocation of budget funds for financing infrastructure projects is the responsibility of MED. The Ministry of Finance, in turn, is responsible for the allocation of budget funds designed to finance operating costs.

Since the early 2000s, the ministry in charge of the economy, currently MED, has been developing annual and medium-term national investment programmes for the major economic sectors, including environmental protection investments. This was also reflected in the 2002 NEAP, which was completed in 2010. NEAP environmental protection

⁶ Direct communication from the Ministry of Economy and Development.

expenditures were part and parcel of a large number of infrastructure and other investment projects designed to promote overall economic development in Turkmenistan. Overall, the total planned investments amounted to some 9.7 billion (new) manat, of which about 1.5 billion manat (some 15.5 per cent) were marked as the environmental component of the overall planned expenditures.

Planned environmental expenditures within the NEAP framework (Table 3.8) were mainly allocated to water resources protection (about 43 per cent), reduction of air pollution (28.5 per cent) and land resources protection (about 23 per cent). The arithmetic annual average of the planned environmental protection expenditure under NEAP for 2003-2010 corresponded to 1.6 per cent of GDP in 2003. There is no publicly available information, however, on NEAP implementation and associated actual expenditures.

The planned public sector environmental expenditures (including for SOEs) for 2011 amount to some 1.2 billion manat (US\$ 414 million), corresponding to 1.8 per cent of GDP projected for 2011 (Table 3.9). The majority of funds (58 per cent) are allocated to water resources protection, followed by biodiversity protection (22 per cent) and land resources protection (12 per cent). Besides NEAP, another major environmental programme that has been mainly funded out of the State budget is NCAP. It was elaborated within the framework of the Caspian Environmental Programme (CEP) and the associated Strategic Action Programme (SAP). CEP is a regional initiative that was launched in 1998 by the five Caspian littoral States (the Republic of

Azerbaijan, the Islamic Republic of Iran, Kazakhstan, the Russian Federation and Turkmenistan) with the overall objective of ensuring the environmentally sustainable development and management of the Caspian Sea environment. NCAP contains a range of measures to be implemented over the period 2003-2012. Total planned expenditures amount to some 616 million (new) manat or some US\$ 592 million at the official exchange rate of 2003. The two most important projects in financial terms were aimed at pollution control and abatement at the Turkmenbashy refinery and a chemical industrial conglomerate (Karabogazsulfate), which together accounted for some 80 per cent of total planned expenditures. During 2002-2005, activities implemented within the NCAP framework involved funds amounting to US\$ 185 million, of which 84 per cent was for pollution control (Table 3.10).

Environmental funds

An extrabudgetary State Environmental Fund was established in 1996 based on Presidential Decree No. 2570 and became operational that same year. Earmarked revenues allocated to the Fund were generated by fines for violations of environmental regulations, payments of pollution charges, licence fees for use of flora and fauna, environmental damage compensation, permit fees for hunting and fishing, fees for inspection and registration of small vessels, and payments by enterprises and other institutions for the use of natural resources. Expenditures on specific projects financed by the Fund were subject to the approval of the Ministry of Finance.

Table 3.8: Planned environmental expenditures within the framework of the National Environmental Action Plan for the Period 2003-2010

Environmental domain	Million manat	Percentage share
Water resources protection	653.3	43.2
Air protection	431.6	28.5
Land resources protection	353.1	23.4
Cultural heritage protection	2.5	0.2
Conservation of biodiversiy	2.1	0.1
Turkmenistan Aral Sea Zone	0.3	0.0
Total	1,511.9	100.0
<i>Memorandum items</i>		
Total expenditures in million US\$ (at 2001 official exchange rate)	1,453.7	
Total expenditures in million US\$ (at 2010 official exchange rate)	530.5	

Source: National Environmental Action Plan, 2002.

Note: Official exchange rate in 2001: US\$ 1 = 1.04 manat; average exchange rate in 2010: US\$ 1 = 2.85 manat.

Table 3.9: Planned public environmental investment expenditures as percentage of projected GDP, 2011

Environmental domain/administrative spending unit	Million manat	Percentage share
Water resources protection	683.5	57.9
Local governments (provincial)	625.2	53.0
Ministry of Agriculture	55.6	4.7
State Concern Turkmenneft (petroleum)	1.0	0.1
Land resources protection	140.7	11.9
Ministry of Agriculture	87.7	7.4
Association Turkmenmallare	2.1	0.2
State Concern Turkmenavtoyollary (road infrastructure)	16.0	1.4
Atmospheric air pollution	20.0	1.7
Mitigation of pollution in the oil and gas sector	78.7	6.7
State Concern Turkmenneft (petroleum)	10.8	0.9
Turkmenbashi petroleum refinery complex	67.9	5.8
Biodiversity protection	255.7	21.7
State Committee for Fisheries	255.4	21.7
Ministry of Nature Protection	0.3	0.0
Nature and historical monuments	1.1	0.1
Ministry of Culture	1.1	0.1
Total	1,179.7	100.0
<i>Memorandum items</i>		
Total expenditures in USD million	413.9	
Environmental investment expenditures as per cent of GDP	1.8	

Source: Ministry of Nature Protection; ECE calculations, 2011.

Notes: Estimate of GDP for 2011 provided by IMF World Economic Outlook database, October 2010.

Exchange rate: US\$ 1 = 2.85 manat.

Table 3.10: Environmental expenditures on the Caspian Sea

	Planned expenditures 2003-2012		Actual expenditures 2002-2005		
	million manat	million US\$	Total	National contribution	Other
			million US\$		
Pollution control	588.7	566.1	182.5	182.5	0.0
Management of fisheries	16.9	16.2	31.8	14.9	16.9
Biodiversity conservation	0.2	0.2	3.0	1.5	1.5
Coastal zone management and planning	0.5	0.5	0.1	0.1	0.0
Social and economic issues	26.1	25.1			
Khazar State Reserve	0.2	0.2			
Total	632.6	608.2	217.3	198.9	18.4

Sources: State Enterprise on Caspian Sea Issues under the President of Turkmenistan, National Caspian Action Plan of Turkmenistan, Ashgabat 2008; SAP/NCAP Implementation Review; Caspian Environment Program, CEP-SAP Project, Ashgabat 2006 (www.caspianenvironment.org).

Note: Expenditures in national currency units were converted into new manat. Figures in US\$ for planned expenditures 2003-2012 were calculated applying the official exchange rate during 2002-2005 of US\$ 1 = 1.04 manat. Actual expenditures in US\$ as provided in source.

The State Environmental Fund was abolished in 2008 together with a number of other off-budget funds. The corresponding financial resources have been allocated to two special accounts, one for MoNP and the other for the State Committee for Fisheries. The operating principles are the same as for the former State Environmental Fund.

There is no publicly available information on revenues and expenditures of the State Environmental Fund and the subsequently created special accounts. However, it is known that in 2010, MoNP used funds accumulated in its special account to purchase some 30 motor vehicles for the environmental inspectorate.

Enterprise expenditures on environmental protection

SOEs account for the bulk of economic activity in Turkmenistan. Their annual investment expenditures are coordinated by MED. This also pertains to expenditures related to pollution abatement and control equipment. Using a special form (Form No. 4 – OC), enterprises have to report to SCS their current and investment expenditures on environmental protection as well as payments of environmental taxes and other charges. It is reported⁷ that SOE funds accounted for only a small share of total resources allocated to environmental protection over the past decade, but concrete figures are not publicly available.

International assistance

The role of foreign assistance designed to support general economic and social development in Turkmenistan has been quite small over the past decade. This partly reflects the determination of the Government to minimize reliance on foreign loans and grants, along with the increasing stream of Government revenues from hydrocarbon exports.

However, access to external funds has also been limited by a range of other factors, such as the slow progress in political and economic reforms, the underdeveloped financial sector and the lack of adequate institutional capacity. Notably, the working environment for foreign assistance has been adversely affected by lengthy bureaucratic procedures as well as weak financial planning capacities and management skills. Against this background, major international financial institutions (the Asian Development Bank (ADB), European Bank for Regional Development (EBRD), International Monetary Fund (IMF) and World Bank) have not been engaged in any lending activities over recent years.

The lead role in foreign assistance coordination has been assigned to the Ministry of Finance, which reports to the Cabinet of Ministers in these matters. Among the donors themselves, coordination is largely limited to the exchange of information. However, various donors concluded a Strategic Partnership Agreement (SPA), which has supported the development of CACILM for UNCCD implementation. These donors include ADB, the Canadian International Development Agency (CIDA), Deutsche Gesellschaft für Technische

Zusammenarbeit (GTZ, now Deutsche Gesellschaft für Internationale Zusammenarbeit, GIZ), the Swiss Development Cooperation Agency (SDC), the International Fund for Agricultural Development (IFAD), the UNCCD Global Mechanism, the International Center for Agricultural Research in the Dry Areas (ICARDA) and UNDP.

Annual inflows of total official development assistance (ODA) corresponded, on average, to some 0.15 per cent of GDP between 2002 and 2009, as reported by the Development Assistance Committee of the OECD (OECD/DAC) (Table 3.11). Cumulative total disbursements during this period amounted to US\$ 159 million, of which US\$ 4 million (2.5 per cent) were focused on environmental protection. Most of this was allocated to environmental policy and administrative management issues, biodiversity and site protection. Turkmenistan has received much less environmentally focused ODA than the other four Central Asian countries, both in absolute terms and on a per capita basis (Table 3.12).

There is some discrepancy between the ODA data and a register of environmental projects supported by foreign assistance kept by MoNP. The latter suggests that total foreign resources involved in completed projects during 2005-2010 amounted to US\$ 8.4 million (Table 3.13). This discrepancy could inter alia reflect incomplete donor reporting of the functional purpose of their assistance in the OECD/DAC database, or differences in the reporting period and in exchange rates used for converting funds in national currency units into US dollars. In any case, according to the MoNP register, the largest resources were used for a project on sustainable management of land resources (US\$ 2 million), biodiversity protection in the Khazar State Reserve⁸ at the Caspian Sea (US\$ 1.7 million) and for the monitoring of Caspian Sea pollution and development of action plans for environmental hotspots (US\$ 1.25 million).

Projects started but not completed (at the end of February 2011) have planned resources of US\$ 12.2 million (Table 3.13). The greatest amount (US\$ 5.5 million) has been allocated to the regional CaspEco project; this became operational in April 2009 and is scheduled to last 30 months. Its main focus is on restoring depleted fisheries in the Caspian Sea and strengthening regional environmental governance through support of the Tehran Convention process. It involves all five Caspian littoral States.

⁷ Direct communication from the Ministry of Economy and Development.

⁸ Also known as the Hazar State Nature Reserve; see <http://whc.unesco.org/en/tentativelists/5437/>

Table 3.11: Official Development Assistance to Turkmenistan, 2002-2009

Current US\$ million

	2002	2003	2004	2005	2006	2007	2008	2009	Cumulative 2002-2009
Total gross disbursements	24.5	15.7	11.5	11.2	7.3	12.0	24.2	15.8	122.2
DAC countries	24.5	15.7	11.5	11.2	7.3	12.0	24.2	15.8	122.2
<i>of which</i>									
General Environmental Protection (410)	0.0	0.7	0.1	0.4	0.4	0.2	1.0	1.2	4.0
DAC countries	0.0	0.7	0.0	0.3	0.2	0.0	0.5	0.1	1.8
Multilateral	..	..	0.1	0.1	0.2	0.1	0.5	1.1	2.1
Water Supply and Sanitation (140)	0.3	0.0	0.0	..	0.0	0.1	0.0	0.0	0.4
DAC countries	0.3	..	..	..	..	..	..	..	0.3
Multilateral	0.0	0.0	0.0	..	..	0.0	0.1	0.0	0.1
<i>Memorandum items</i>									
Total ODA as per cent of GDP	0.3	0.2	0.1	0.1	0.1	0.1	0.2	0.1	
<i>of which</i>									
General Environmental Protection	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	

Source: OECD/DAC database (<http://stats.oecd.org>). Data extracted on 14 March 2011.

Note: Creditor Reporting System. Figures in brackets following sector names are DAC sector codes.

Table 3.12: Environment-oriented Official Development Assistance to Central Asian countries, 2002-2009

Country	Cumulative 2002-2009 US\$ million	US\$ per capita
Kazakhstan	34.6	2.3
Kyrgyzstan	23.1	4.5
Turkmenistan	4.0	0.8
Uzbekistan	43.2	1.6

Source: OECD/DAC database (<http://stats.oecd.org>). Data extracted on 9 February 2011.

Note: Creditor Reporting System. ODA allocated to sector "General Environmental Protection" (DAC sector code: 410 IV.1). Data cover bilateral ODA from DAC countries and multilateral ODA.

The project is funded by GEF and implemented by UNDP. Total GEF funding for the overall project amounts to US\$ 4.7 million. Other major projects are sustainable land management (US\$ 2 million) and management of PAs (US\$ 3.5 million).

Multilateral financial assistance

The World Bank has assisted Turkmenistan in the areas of poverty reduction, private sector development, financial sector reforms and infrastructure development. An urban transport project that was started in 1997 was closed in 2001 due to disagreements with the Turkmen Government over contractual rules and procedures. In a similar vein, a water supply project that focused on non-urban residents in Dashoguz, one of the poorest regions of the country, was started in 1997 and closed in 2004 (only some 20 per cent of the project loans

were actually disbursed.) In both cases, practically all loans scheduled were cancelled.

The World Bank supported Turkmenistan in developing NEAP for the period up to 2010. Cooperation between the Bank and the Government resumed in 2008, in various areas which are not directly related to environmental issues, with the exception of technical assistance concerning the modernization of hydrometeorological services and statistical capacity-building. In June 2009, the World Bank and the Government signed an agreement on a grant of US\$ 387,500 for financing a project on Statistical Capacity-building for Growth and Poverty Reduction. A major focus is on the development of a statistical master plan and the conduct of a household budget survey which could provide information on the characteristics and size of the informal sector in Turkmenistan.

Table 3.13: Foreign assistance projects in Turkmenistan, 2003-2013

Donors	Environmental domain	Resources US\$ million	Time frame
ONGOING PROJECTS			
GEF/UNDP	(CaspEco)	5.50	2009-2012
GEF/UNDP/Succhow foundation, Germany/United Kingdom of Great Britain and Northern Ireland	Management of protected areas	3.55	2010-2012
GEF/UNDP	Sustainable management of pastures	0.50	2010-2013
UNEP	Montreal Protocol implementation	0.14	2010-2012
UNIDO	Technical assistance, Montreal Protocol	0.18	2010-2013
Total		9.87	
COMPLETED PROJECTS			
Germany/The Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety	Sustainable management of land resources	1.99	2009-2011
Germany/GTZ	Management of transboundary water resources	0.16	2010-2011
EC/TACIS	Implementation of Kyoto Protocol	0.16	2009-2011
GEF/UNDP/GTZ	Sustainable management of land resources	2.05	2007-2010
GEF/UNDP	Biodiversity in Khazar State Reserve (Caspian Sea)	1.71	2006-2010
EC/TACIS	Monitoring of Caspian Sea Action Plan for hot spots	1.26	2006-2009
EC/TACIS	Pollution in Caspian Sea area from oil and gas industry	0.70	2009-2010
Germany/Greifswald University	Adaptation to climate change	0.47	2009-2010
GEF/UNDP	Second National Communication on Climate Change	0.47	2006-2009
United Kingdom of Great Britain and Northern Ireland/ University of Leeds	Conservation of Caspian seals	0.26	2006-2009
United Kingdom of Great Britain and Northern Ireland	Biodiversity in Caspian Sea region	0.24	2006-2009
United Kingdom of Great Britain and Northern Ireland	Bird protection	0.18	2008-2010
UNDP	Protected areas under the biodiversity convention	0.15	2008-2010
GEF/UNDP	Biodiversity protection	0.13	2005-2007
Multilateral fund for the implementation of the Montreal Protocol	Montreal Protocol implementation	0.12	2005-2008
EC, Directorate for Research	Management of environmental risks from landfills	0.11	2006-2008
United Kingdom of Great Britain and Northern Ireland	Bird protection	0.11	2005-2008
Other		0.44	2003-2010
Total		10.68	
Grand Total		20.55	
<i>Memorandum item</i>			
EC/TACIS	Implementation of Aarhus Convention: €1.5 million for five Central Asian countries	2.09	2007-2009

Source: Ministry of Nature Protection, 2011.

Notes: Funds allocated in € and GBP were converted into US\$ using the average annual exchange rate for 2009.

“Completed Projects: Other” comprises projects with an individual value of less than US\$ 100,000.

As at the end of February 2011.

So far, the ADB has not been engaged in any lending activity in Turkmenistan. The elaboration of a Country Partnership Strategy for Turkmenistan is planned. ADB has supported several technical assistance projects, including a feasibility study for a road project and a statistical survey on household living standards. There are also some regional technical assistance projects, including on environmental protection and land management,

which cover Turkmenistan. EBRD provided loans for financing eight projects (concerning infrastructure, textiles, oil and gas) with a total commitment of € 107.5 million. Most of these projects were signed before 2000, and most of the loans have been repaid. Since 2002, EBRD has limited its activities to financing small and medium-sized enterprises, with the proviso that the funds provided are not effectively controlled by the State.

Photo 3.1: Market in Ashgabat

The Islamic Development Bank (ISDB) extends loans to its member countries for financing infrastructural and agricultural projects in both the public and private sectors. In Turkmenistan, ISDB has committed some US\$ 74 million (of which 37 per cent is on concessional terms) for 11 projects, including the construction of medical centres, the rehabilitation of a section of the Mary–Tejen highway and a rural water supply project. In conformity with Sharia rules, loans granted are interest free, but the Bank levies a service fee to recoup its expenses. ISDB also co-financed a water project for towns and rural settlements on the Caspian Sea. The project has further been supported with funds amounting to US\$ 5.2 million by the Organization of the Petroleum Exporting Countries (OPEC) Fund for International Development, since 2002.

GEF has backed a range of projects since 1997 in the areas of climate change, energy efficiency, biodiversity and land degradation. Cumulative GEF grants amount to US\$ 8.7 million, complemented by co-financing from other donors to the tune of US\$ 21.5 million. The most recent planned project, and financially the largest, which was approved in March 2010, aims at reducing GHG emissions by improving energy management and reducing energy consumption in the residential sector in Turkmenistan. It involves a GEF grant of US\$ 2.6 million and co-financing of US\$ 15.5 million. UNDP has been the implementing agency for all GEF projects in Turkmenistan.

Current EU cooperation with Turkmenistan is taking place within the framework of the EU and Central Asia: Strategy for a New Partnership and an associated Regional Strategy Paper for assistance to Central Asia 2007-2013. Region-wide support aims at promoting regional cooperation and good neighbourly relations.

Bilateral assistance has mainly focused on support for poverty reduction and increasing living standards, good governance and economic market reforms. These assistance programmes can also have an impact, directly and indirectly, on environmental sustainability. Bilateral cooperation with each of the five Central Asian countries is implemented within the framework of Partnership and Cooperation Agreements (PCAs). An interim PCA with Turkmenistan entered into force in 2010.

Until 2006, assistance for the five Central Asian countries was covered by the European Commission's Technical Assistance to the Commonwealth of Independent States (TACIS) regional support programme. Between 2007 and 2010, EU assistance has been provided under the new Development Cooperation Instrument (DCI). As regards bilateral cooperation, total resources (grants) allocated for the five Central Asian countries amounted to some € 220 million, of which € 22 million (10 per cent) was for Turkmenistan. Assistance has been provided mainly in the form of transfer of know-how and capacity-building.

The Indicative Programme for the period 2011-2013 allocates total EU grants of some € 321 million to the five Central Asian countries, of which € 105 million is allocated to regional cooperation and € 216 million to bilateral assistance programmes. The allocation for Turkmenistan amounts to some € 31 million (14 per cent of total bilateral assistance). On a per annum basis, this amounts to € 10.3 million, up from € 5.5 million during the period 2007-2010. Notably, the assistance programmes (project assistance, transfer of know-how, capacity-building) will focus on strengthening the economic and social development of rural areas, and long-term sustainable energy development.

UNDP has been cooperating with the Government of Turkmenistan on the basis of five-year Country Programme Action Plans (CPAPs). A first such Country Programme was implemented during the period 2000-2004. This involved inter alia support for NEAP development and improvement of municipal services. A second programme for 2005-2009 has inter alia supported Turkmenistan's efforts to meet the national MDG targets by providing technical assistance in the areas of economic and social policy development, basic social services and the environment. In the latter, the main focus of support was the design, implementation and enforcement of environmental legislation, improved environmental monitoring and data collection, and the mainstreaming of environmental protection into national and sector development plans. The indicative budget for the CPAP environmental component for 2005-2009 was US\$ 1.2 million.

The UNDP Country Programme for the period 2010-2015 aims inter alia at improving sustainable development and inclusive growth. A major focus of the UNDP programmes is capacity-building and access to international good practices, along with knowledge, skills and resources in the design of national development policies and strategies, including taking into account environmental and energy considerations. Since 2007, in response to domestic reforms, UNDP has been expanding work on the environment and climate change. The planned budget for this priority area (improved sustainable development and inclusive growth, and mainstreaming of environment and energy) is US\$ 12 million, of which US\$ 2 million is from the regular UNDP budget.

Bilateral assistance

There has been relatively little bilateral foreign assistance in the field of environmental protection in Turkmenistan. Direct project support mainly

involved Germany and the United Kingdom of Great Britain and Northern Ireland (UK). Germany and Turkmenistan concluded a cooperation agreement in March 2009. The main emphasis will be on climate change and nature-protection-related projects, including the development of national parks. Development cooperation in recent years has been operated by GTZ (now GIZ) with a focus on sustainable forest management and sustainable land management. There is also support for a regional project on transboundary water management in central Asia. The UK has been involved in bird protection projects and a project focusing on conservation of seals in the Caspian Sea.

The United States Agency for International Development (USAID) has been a major bilateral donor organization in Turkmenistan since the country's independence.

Overall assistance programmes in the period 1993-2010 had a cumulative worth of some US\$ 90 million. These programmes, which mainly had an indirect impact on environmental protection, focused on improving social services (health and education), democratic and economic reform (including the strengthening of local government capacity to provide services effectively), and a range of measures designed to underpin economic growth (such as support for the implementation of economic reforms, notably the development of a competitive private sector).

New planned assistance programmes aim at promoting transparency, good governance and integration with regional energy markets to promote the development of regional energy resources. A renewable energy project is expected to start during 2011.

3.5 Foreign direct investment

The legal and economic basis for attracting foreign direct investment (FDI) was established with the 1992 Law on Foreign Investments. However, in the face of complex bureaucratic procedures and uncertainties about property rights, FDI remained relatively modest for many years.

The revised Law on Foreign Investments in Turkmenistan, which entered into force in March 2008, aims to create a more favourable environment for FDI mainly by new provisions that provide for repatriation of profits, exemptions for many duties and fees for foreign entrepreneurs, and speedy issuing of multi-entry visas for employees of foreign companies. The Law also cancelled the requirement

for joint ventures with Turkmen enterprises, but does not specify the types of investments in which foreigners can engage.

The State Agency for Foreign Investments, established in 1996, was later renamed the State Service Foreign Investments (SSFI). Its main function is to make recommendations to the President concerning the approval or rejection of foreign companies for certain investment projects. Projects approved by the President must then be registered by SSFI before they become operational.

FDI is strongly concentrated in the hydrocarbon sector. The recent changes to the 1992 Law on Foreign Investments may have played a role in the significant increase in FDI to US\$ 1.36 billion in 2009, a rise of 65 per cent compared with the preceding year and corresponding to some 7 per cent of annual GDP. In comparison with that in other Central Asian countries with hydrocarbon resources, the total stock of FDI in Turkmenistan is still relatively modest. In 2009, it corresponded to two thirds of the level attained in Azerbaijan and only 8.5 per cent of the level recorded for Kazakhstan.⁹ On a per capita basis, however, the FDI stock in Turkmenistan corresponded to about one fourth of the corresponding level in Kazakhstan, and was some 10 per cent higher than in Azerbaijan.

As noted above, the environmental obligations of foreign companies operating in the hydrocarbon sector are specified in the contracts concluded with the Government concerning PSAs. Details are not disclosed.

3.6 Conclusions and recommendations

Turkmenistan imposes charges on enterprises for the pollution of air and water. Rates were set some 10 years ago and have remained unchanged ever since. Nominal rates have declined significantly in real terms due to the lack of compensation for considerable cumulative inflation since 2000. There is evidence to support the environmental effectiveness of such pollution charges which, however, are much too low to create meaningful incentives for polluters to engage in pollution abatement. While there are differentiated charge rates for major air pollutants, there is no equivalent system of effluent charges. Instead, enterprises pay a nominal charge per m³ of wastewater discharged.

The upshot is that the current system of pollution charges is quite distant from an effective application of the “polluter pays” principle. Also, the effectiveness of the fees applied for the use of flora and fauna in ensuring adequate nature conservation has not been established. These fees have also declined in real terms due to the lack of adjustment for cumulative inflation over the past decade. Revenue generated by pollution charges and fees for the use of flora and fauna is therefore likely to be quite modest, although there are no data available to assess their revenue-generating capacity.

Recommendation 3.1:

The Ministry of Nature Protection, in cooperation with relevant authorities, should:

- (a) Strengthen the effectiveness of pollution charges in creating adequate incentives for pollution abatement and control. It is also important to create a legal provision that ensures a timely adjustment of charge rates and fees for use of flora and fauna to compensate for inflation;*
- (b) Review existing charges for air emissions and wastewater discharges in order to introduce an optimal and effective set of charges based on a limited number of specific pollutants;*
- (c) Abolish existing exemptions from payment of air pollution charges by oil companies working on the basis of production sharing agreements.*

A striking feature of Turkmenistan’s economic system is the generous provision of subsidies for use of water by the population and in agriculture. Agriculture is by far the dominant water user (and a major water polluter) in Turkmenistan, given the strong concentration on the cultivation of irrigation-intensive crops (cotton and grain). Farmers do not pay for the volume of water abstracted, and only a nominal fee is charged for the maintenance of the internal irrigation and drainage networks, while the external network is maintained with funds allocated from the State budget.

As regards water supply tariffs, the feature has been free provision of water to the population since 1993. Although there is a legal provision for an upper limit to water supply, it cannot be enforced because of the general lack of water meters. The subsidy policy does not discriminate between the poor, who would need some support to afford adequate access to water resources, and the better-off strata of society, who could afford paying a price that covers the costs of water supply and sewerage services. In fact, it may be assumed that many people would be prepared to

⁹ Data compiled from the UNCTAD statistical database: www.unctad.org.

pay for these services if this were accompanied by an improvement in quality of service delivery. The current system tends to create perverse incentives for consumers, who do not know the real value of the water resources they are using. There are, therefore, no incentives for resource savings, which, in turn, leads to a wasteful use of water resources.

Yet Turkmenistan has relatively scarce water resources, which can be expected to diminish with progressive climate change over the coming decades. The Government is investing heavily in modernizing the water supply and sewerage networks, notably in rural areas, which can be expected to reduce major technical water losses. The irrigation and drainage network also needs to be rehabilitated, which should also result in water savings due to the planned shift to more efficient irrigation techniques, such as drip irrigation.

But these technical measures are not a substitute for creating effective incentives for a rational use of water resources by private households and in agriculture. The experience gained in developed countries and beyond suggests this is best done by putting a price on water resources, which, in turn, requires measuring the actual use of water. In other words, the installation of water measuring devices and charging for water use are part and parcel of an effective water conservation policy.

Given the current situation in Turkmenistan, these measures can only be implemented over a longer time period. They need to be embedded in a broader package of complementary reforms which address issues such as the modus operandi of water utilities and their financial sustainability; the financing of the installation of water meters; and the affordability of adequate water use by low-income earners.

Recommendation 3.2:

The Cabinet of Ministers should develop and implement a strategy for the introduction of effective mechanisms and instruments for rational use of water resources. This involves, notably:

- (a) *The universal installation of water measuring meters in households and water user associations and provision of appropriate financial support for that purpose;*
- (b) *Gradually raising water tariffs to a level that allows full recovery of operating and investment costs and therefore ensures the financial sustainability of the water sector.*

Operations in the energy sector of Turkmenistan are not based on commercial principles. The sector has

remained vertically integrated and State owned. There are frequent disruptions of electricity supply. Power generation and distribution networks are in poor condition and require significant upgrading. Free provision of electricity and gas to the population and tariffs which are most likely significantly below cost recovery levels, preclude efficient use of energy and, instead, stimulate excessive consumption. Subsidized prices for electricity and gas have also adversely affected the competitiveness of renewable energy sources (wind and solar power). There is a need for gradual price reform for energy products which could be part and parcel of a general reform of the energy sector, involving the unbundling and commercialization of the various activities.

Recommendation 3.3:

The Cabinet of Ministers should

- (a) *Ensure the installation of gas meters to all households and provide appropriate financial support for that purpose;*
- (b) *Consider reforming energy tariffs by gradually raising prices of electricity and gas to levels that ensure full cost recovery and create effective incentives for the efficient use of energy.*

The traditional supply of petrol for all owners of motor vehicles at a nominal price of only 1 to 2 US cents per litre came to an end in February 2008, when the Government enacted a significant increase in petrol prices. However, petrol prices are still heavily subsidized. Moreover, the authorities have introduced a coupon system that entitles every owner of a motor vehicle to obtain a certain amount of petrol per month free of charge. In the event, the costs of petrol are still so low that there are no real incentives for vehicle owners, with the possible exception of those in low-income households, to economize on the consumption of petrol, with associated adverse consequences for urban air pollution. In principle, the pump price of petrol includes an ad valorem excise tax which amounts to 40 per cent of the pump price. It is not clear whether this tax was applied to all vehicle owners before 2008, when pump prices corresponded to only 1 to 2 US cents. In any case, in order to uncouple the corresponding tax revenues from the petrol price, the Government could consider introducing a specific excise tax per litre of petrol sold.

Recommendation 3.4:

The Cabinet of Ministers should continue the process of gradually raising vehicle fuel prices to levels which limit the adverse environmental impacts of higher vehicle fuel consumption, while taking into account broader socioeconomic implications of such

measures and, at the same time, supporting environmentally sustainable modes of transport.

There is very little publicly available information on *actual* domestic environmental expenditures in Turkmenistan. This pertains notably to the public sector, which is reported to account for the large bulk of these expenditures. But the information that is available suggests that environmental expenditures are relatively high, although it is another matter whether or not they are sufficient for effectively addressing all the major environmental problems. The use of foreign assistance (grants and loans) has remained relatively limited so far. Turkmenistan has relied only moderately on international financial institutions, special mechanisms (such as GEF and the Montreal Protocol's Multilateral Fund) and bilateral assistance.

Recommendation 3.5:

The Cabinet of Ministers should:

- (a) Ensure that there is adequate funding for the implementation of the country's international environmental commitments;*
- (b) Increase transparency concerning the environmental expenditures made by the State and the enterprise sector;*
- (c) Increase cooperation with multilateral institutions and bilateral donors – notably,*

developed countries – to benefit more than in the past from targeted financial and technical assistance.

The extent to which environmental considerations have been effectively integrated into various long-term national development strategies is difficult to gauge in the absence of detailed information on the implementation of these strategies. However, the fact that there are no overall institutional mechanisms for cross-sectoral discussions of economic and environmental issues suggests that there is a need for strengthening the integration of environmental considerations in development strategies for major economic sectors. In this context, it would also be useful to have a forum for discussing the best combination of economic and regulatory instruments to increase the overall effectiveness of environmental policy.

Recommendation 3.6:

The Ministry of Nature Protection, in cooperation with other competent governmental bodies, should review the extent to which the existing combination of regulatory and market-based (economic) environmental policy instruments should be changed in order to improve the effectiveness of environmental policy.

Chapter 4

INTERNATIONAL COOPERATION

4.1 General framework for international cooperation

Between 1993 and 2010, Turkmenistan acceded to or ratified nine major MEAs. Turkmenistan has shown pragmatism with regard to the pace of ratification. It opted for a sensible rhythm, thereby allowing the country to address implementation tasks.

Turkmenistan adopted a new version of the Constitution in 2008, which accords supremacy of international treaties over national legislation. Nevertheless, increasingly diverse international environmental obligations demand that countries incorporate their requirements into a coherent and comprehensive national framework on environmental policy.

Efforts are being made to bring Turkmen legislation in line with the country's international treaty obligations, a task that has been given clear priority by the President of Turkmenistan. International obligations are reflected in both the legal system and various implementation programmes.

4.2 Institutional and policy framework

In order to ensure thorough implementation of international legal and political environmental commitments, a coordinating and oversight State commission under the chairmanship of the Deputy Chairperson of the Cabinet of Ministers was established by 1999 Presidential Decree No. 4091, amended in 2000 by Decree No. 4641. The State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes enables the Government to enforce its obligations stemming from relevant United Nations conventions and programmes related to environment.

The State Commission is responsible for coordinating the activities of ministries and departments overseeing the implementation of national commitments stemming from the MEAs ratified by Turkmenistan, United Nations programmes related to environment, NEAP, and public policy for the protection and rational use of natural resources and the environment.

The State Commission is also in charge of organizing the development of national programmes and plans of action within the United Nations framework on environmental protection and management; participating in the development of legislative and other normative domestic legal acts on natural resources and environmental protection; writing up drafts of national reports on implementation of the country's commitments deriving from United Nations conventions and the United Nations Environment Programme (UNEP); preparing proposals for the country to take positions at the sessions of the governing bodies of United Nations conventions on the environment, and international programmes related to environmental protection and environmental management; and coordinating the activities of ministries and departments under the conventions and United Nations programmes on environment.

The State Commission meets at least once per year, and takes decisions by simple majority vote which are binding on all ministries, governmental organizations, enterprises, institutions and other organizations, irrespective of their public or private nature.

Through its Statute Law, MoNP has also been entrusted with responsibility for coordinating the activities of ministries and departments to fulfil Turkmenistan's obligations arising from MEAs. MoNP's responsibilities with regard to international environmental obligations are mostly in the nature of implementation.

There are major shortfalls in MoNP and its institutions in terms of the number of human resources assigned to follow-up and implementation activities in relation to international processes. In general, MEAs to which the country is a party are followed by a single collaborator with occasional recourse taken to external expertise. Except for biodiversity and, to some extent, climate change, MoNP depends largely on external experts to produce the reports on MEAs. Institutional capacity in terms of both technical and managerial skills is also insufficient. Besides all monitoring, reporting and planning activities which MoNP staff have to deal with, they are also responsible for managing international projects.

Additionally, priorities on environmental international cooperation can be deduced from the main programmatic documents on environment, such as NEAP. MoNP is drafting a new NEAP. It would be extremely useful, especially for international donors, to have those priorities clearly specified in such documents. Turkmenistan can benefit from external development assistance to overcome environmental bottlenecks.

However, financial flows from international donors are inevitably linked to the need to ensure a clear and strong enabling environmental policy, without which such assistance would not deliver desirable results.

4.3 Implementation of multilateral environmental agreements and commitments

Turkmenistan has ratified or acceded to 11 MEAs. Annex I provides an overview of MEAs to which Turkmenistan is a party.

Biodiversity and nature conservation

Pursuant to the ratification of the CBD in 1996, a national country study on biological diversity was conducted in Turkmenistan. Furthermore, MoNP developed and implemented BSAP for the period 2002-2010, with technical assistance from the international NGO Fauna and Flora International (FFI), and with funding from GEF through UNDP. In 2002, BSAP was adopted by the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes (2002 Decree No. 2) (see Chapter 10).

The overall aim of BSAP was also reflected in NEAP and the National Action Programme to Combat Desertification (NAPCD).

In 2009, Turkmenistan presented its Fourth National Report on Implementation of the United Nations CBD at National Level. This accounted for 49 per cent implementation of the measures planned in BSAP, the preparation in 2008 of a plan of additional measures, and the country's readiness to set up a Centre for a Clearing-House Mechanism designed to serve as a platform for the exchange of thematic information with all parties to the Convention. Despite ongoing work, the Centre has not yet been established.

Turkmenistan acceded to the Cartagena Protocol on Biosafety in 2008 and is currently in the preparatory stage for compliance with the Protocol's obligations on ensuring the safe handling, transport and use of

living modified organisms (LMOs). Early ratification of the Nagoya–Kuala Lumpur Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Biosafety (opened for signature from 7 March 2011), that lays down international rules and procedures on liability and redress for damage to biodiversity resulting from LMOs, is under Government consideration on the basis of a proposal from MoNP.

Almost 4 per cent of Turkmenistan's territory is classified as having PA status. Significant attention is being paid to the development of a network of PAs, with a focus on the creation of national parks. The network includes eight nature reserves, one biosphere reserve, 17 nature monuments (2,020 ha), 14 sanctuaries (1,061,200 ha) and protected zones of the reserves (63,600 ha).

Furthermore, Turkmenbashi Bay (Khazar State Reserve) was designated as a wetland of international importance following the 2009 ratification of the Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat. Turkmenistan has not ratified the 1987 Regina Amendments to the Ramsar Convention, which established a Conference of Parties to review and promote the implementation of the Convention. Nevertheless, as a party to the Convention, it has undertaken to develop a strategic approach to designating a coherent and comprehensive national network of Ramsar sites.

Even though the country has not ratified either CITES or the CMS, Turkmenistan plays an important role in Central Asian wildlife conservation strategies due to its many different kinds of ecosystems, which offer a variety of habitats for animals. Numerous migratory species found in Turkmenistan are listed under CMS Appendices I and II. Three memoranda of understanding (MoUs) among Central Asian countries have already been signed by Turkmenistan within the CMS framework: the MoU concerning Conservation Measures for the Siberian Crane,¹⁰ the MoU concerning the Conservation and Restoration of the Bukhara Deer,¹¹ and the MoU concerning the Conservation, Restoration and Sustainable Use of the Saiga Antelope.¹²

¹⁰ Signed by the Islamic Republic of Afghanistan, the Republic of Azerbaijan, the People's Republic of China, the Republic of India, the Islamic Republic of Iran, Japan, the Republic of Kazakhstan, Mongolia, the Islamic Republic of Pakistan, the Russian Federation, Turkmenistan and the Republic of Uzbekistan.

¹¹ Signed by the Republic of Kazakhstan, the Republic of Tajikistan, Turkmenistan and the Republic of Uzbekistan.

¹² Signed by the Republic of Kazakhstan, the Russian

Turkmenistan is located at the crossroads of several migration routes (the Black Sea–Mediterranean, West Asian–East African and Central Asian–South Asian flyways), and the country is a range State to a large number of Single Species Action Plans (SSAPs) developed under AEWA, such as the International Action Plan for the Conservation of the Lesser White-fronted Goose (Western Palearctic population). Ninety-two waterbird species protected under AEWA occur in Turkmenistan, including the critically endangered slender-billed curlew (*numenius tenuirostris*) and the sociable lapwing (*vanellus gregarius*). Notwithstanding the fact that the country is not a party to AEWA, it is actively participating in the AEWA Lesser White-fronted Goose International Working Group.

More than 40 projects on biodiversity involving international partners have been implemented in the country between 2000 and 2010. GEF, UNDP and World Wide Fund for Nature (WWF) contributions in this respect are worth noting. This reflects Turkmenistan's active participation in the international community on biodiversity.

The ongoing project Strengthening the Management Effectiveness of the Protected Area System 2009–2012, supported by GEF and UNDP Turkmenistan (with GEF funding of US\$ 950,000 and UNDP funding of US\$ 160,000), aims at complementing governmental efforts to expand and strengthen the PA system. In particular, it addresses the expansion of the PA system aimed at improving representation and coverage and supporting the development of adequate institutional and individual capacity for management of the expanded system.

Turkmenistan is a party to the Convention Concerning the Protection of the World Cultural and Natural Heritage (WHC). Ancient Merv, Kunya-Urgench, and the Parthian Fortresses of Nisa were included in the World Heritage List in 1999, 2005 and 2007 respectively. A tentative list of an additional eight sites in Turkmenistan, six of which are natural sites, has been prepared.

A proposal for the nomination of the Badkhyz State Nature Reserve is under consideration by the Cabinet of Ministers. If Badkhyz State Nature Reserve is incorporated into the World Heritage List as a natural World Heritage site, it will be granted the status that has been attained by only one natural site so far in Central Asia: Saryarka in Kazakhstan.

Desertification

Turkmenistan has been active in the preparation and approval of the UNCCD, especially as regards the regional action programme for Asia. It ratified the Convention in 1996. NIDDF, under MoNP, holds the main technical responsibility for implementing the UNCCD, is accountable for the implementation of the National Action Programme to Combat Desertification, and hosts the Centre on Desertification. This has been recognized internationally since the 1960s as one of the centres of excellence for research on desertification problems.

About 16 per cent of Turkmenistan's territory is susceptible to moderate desertification and around 6 per cent to high desertification. Land degradation results largely from improper land use. The most severe forms of land degradation, however, relate to the loss of vegetative cover, salinization, water pollution and inefficient use of irrigation water. The NAPCD was concluded in 1997.

In 2006, Turkmenistan submitted its Third National Report on implementation of the UNCCD. The report highlighted the significance of the Land Code adopted in 2004. The Code includes a significant range of provisions which, although generally not specifically devoted to combating desertification, are designed to protect land resources and use them rationally, conserve soil fertility, and reduce levels of negative impact on flora and fauna and natural resources below ground.

The rational use and protection of land resources constitutes a prime consideration in the State's economic policy, as reflected in Strategy 2030. The following priority actions are established: protection of land and water resources; comprehensive reclamation of irrigated areas; building of new drainage networks and reconstruction of existing ones; implementation of a range of agrotechnical and land-improvement measures; introduction of scientifically grounded methods of crop rotation in new areas and those which are being "reconstructed"; and introduction of technology providing for the use of alternative methods for harnessing desert areas through the use of irrigation.

Several international mechanisms have been triggered to advance the implementation of UNCCD obligations, namely through close cooperation between Turkmenistan and a number of international and development organizations such as UNDP, UNEP, GEF, GIZ, the World Bank and TACIS.

Within the framework of efforts to combat desertification and land degradation, CACILM must be underlined. This partnership, established by the five Central Asian countries together with a group of development cooperation partners, pursues the restoration, maintenance and enhancement of the productive functions of land, leading to the improved economic and social well-being of those who depend on these resources while preserving the environmental functions of these lands in the spirit of the UNCCD. CACILM and projects under its umbrella are decisive for advancing regional cooperation to combat desertification and land degradation and to assist the country in formulating and implementing national measures in this area.

Currently, among current CACILM projects in Turkmenistan, the only one showing substantial activity is the Multi-Country Capacity Building Project being implemented by UNDP, GIZ and the UNCCD Global Mechanism, and funded inter alia by GEF. It is aimed at improving coordination and cooperation between sectors on land management issues, enhancing land use legislation and promoting innovative finance, developing a targeted capacity-building programme and formulating a national finance strategy on sustainable land management.

Climate change

Turkmenistan submitted its Second National Communication under the UNFCCC in November 2010. Following the submission of its Initial Communication in 2000, an in-depth study on capacity-building constraints in the priority economic sectors for climate change was conducted and published in 2006.

Turkmenistan participates in CDM, as a non-Annex I Party to the UNFCCC and a non-Annex B Party to the Kyoto Protocol. The designated authority on CDM was established in 2009, which will make it possible inter alia to attract foreign and advanced technologies. This accomplishment is particularly relevant in view of the fact that the country, albeit a non-Annex B Party to the Kyoto Protocol, is steadily increasing its contribution to global warming.

Turkmenistan's willingness to become actively involved in global efforts to reduce the anthropogenic impact on the climate system is reflected in main State programmes, including Strategy 2030.

Turkmenistan has concentrated its ongoing work dealing with climate change mostly on mitigation issues. Climate change adaptation efforts will constitute a new work front for the country; the

development of an action plan on adaptation to climate change is necessary, especially bearing in mind that the country faces significant challenges as regards water scarcity.

Several projects are currently being implemented in Turkmenistan, most driven by UNDP, which will continue to strongly assist the country in assessing climate change vulnerability in key sectors, integrating climate change risk considerations into national development plans and policies, and gaining access to new funding sources to support innovative adaptation initiatives.

Turkmenistan has been quite active within the Asia-Pacific Network for Adaptation to Climate Change, a knowledge-based online clearing house which provides a platform for policy dialogue and consultation within the region and supports capacity-building for developing countries in the region. This network was created by UNEP in collaboration with key United Nations agencies and international organizations. It aims to assist countries in increasing their ability to adapt to climate change through the mobilization of existing knowledge and technologies. From the Central Asia region, two members were selected for the Network's Steering Committee: Turkmenistan has the seat for Political Affairs while Kazakhstan has the one for Scientific Affairs.

Turkmenistan also participates in many international projects and programmes on climate studies, carried out by UNEP, the World Meteorological Organization (WMO), World Health Organization (WHO), United Nations Educational, Scientific and Cultural Organization (UNESCO) and other organizations, including the World Climate Programme, World Climate Study Programme and Global Climate Observation System.

Protection of the ozone layer

Turkmenistan acceded to the Vienna Convention for the Protection of the Ozone Layer and the Montreal Protocol on Substances that Deplete the Ozone Layer in 1993, the Amendment of London in 1994 and the Amendments of Montreal, Copenhagen and Beijing in 2008. The initial Country Programme was prepared and approved in July 1998, with the assistance of UNDP and UNEP, and financial assistance from GEF. The Ozone Office of MoNP was established in October 1999.

The earliest legal basis for ozone layer protection was included in the 1991 Law on Nature Protection. The Law contained general provisions on the regulation of the use of chemicals that deplete the ozone layer

and was subsequently reinforced by the 1996 Law on Protection of Atmospheric Air, which included measures to prevent harmful impacts on the ozone layer and emphasized the importance of ecological assessment. In 2009, Turkmenistan adopted the Law on the Protection of the Ozone Layer, regulating the import and export of ODS and products containing ODS.

In 2004, Turkmenistan was reclassified as an article 5 country at the XVIth Meeting of Parties, taking into account that the per capita consumption of Annex A and Annex B substances of the party was below the limits specified under article 5 of the Montreal Protocol. As a result, the party was classified as a low-income country by the World Bank. Turkmenistan's reclassification meant that complete ODS phase-out would be required by 1 January 2010.

Accordingly, the Government updated its CPAP and applied for assistance to the Multilateral Fund for the Implementation of the Montreal Protocol. Funding was granted for the continuation of institutional strengthening, implementation of a methyl bromide phase-out project and a national strategy for adaptation to methylene diphenyl diisocyanate (MDI) that does not contain chlorofluorocarbon (CFC).

In February 2005, MoNP established the ODS quota system by issuing annual import quotas. An import/export and licensing system regulated the trade of ODS in bulk and of products containing ODS. In 2009, Turkmenistan had reported a CFC consumption of 3.3 ozone-depleting potential (ODP) t and methyl bromide consumption of 2.9 ODP t (Table 6.5).

Turkmenistan has implemented numerous ozone-related projects with the assistance of UNDP, UNEP and the Ozone Secretariat of the Multilateral Fund, and is quite engaged in the Fund's network of regional ozone officers. Strong cooperation with the United Nations Industrial Development Organization (UNIDO) has enabled the realization of various projects on hydrochlorofluorocarbon (HCFC) phase-out planning and elimination of methyl bromide. The activities of the Ozone Office of MoNP concerning the technological aspects of ozone-related issues depend on technical and financial assistance from the international community.

International chemicals regime

Turkmenistan is not a party to the global chemicals regime consisting of the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International

Trade (PIC Convention) and the Stockholm Convention on Persistent Organic Pollutants (POPs). Furthermore, Turkmenistan is not participating in the Strategic Approach to International Chemicals Management (SAICM).

However, accession to the Stockholm Convention is being considered within MoNP, and the development of a global, legally binding instrument on mercury is being followed with interest by the Turkmen national authorities. Much work remains to be done in the country to achieve the goal set at the 2002 World Summit on Sustainable Development, namely, that by 2020 chemicals would be used and produced in ways that help minimize significant adverse effects on human health and the environment.

Transboundary movements of hazardous wastes

Turkmenistan has been a party to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal since 1996. The designated focal point is the Ministry of Foreign Affairs, which might result from the fact that no jurisdiction in the area of waste was assigned to MoNP in its Statute Law. The country has not yet ratified the protocols to the Basel Convention.

Turkmenistan has presented insufficient information to the Convention Secretariat, thus not fully complying with the reporting requirements under the Convention. The lack of national legislation on waste and the absence of a regulatory framework on hazardous waste, including its import, export and storage, deserve particular attention and should be remedied in the short term (Chapter 9).

4.4 Regional cooperation

Turkmenistan became a member of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP) in 1992 and of ECE in 1993.

United Nations Economic and Social Commission for Asia and the Pacific

Turkmenistan participated in the Sixth Ministerial Conference on Environment and Development in Asia and the Pacific, which took place in September 2010. There, countries reaffirmed their commitment to the implementation of the Rio Declaration on Environment and Development and the provisions of the United Nations Agenda 21, the outcomes of the World Summit on Sustainable Development (in particular the Johannesburg Plan of Implementation

which incorporates the priority initiatives of the Phnom Penh Regional Platform on Sustainable Development for Asia and the Pacific), the 2005 World Summit, where the MDGs were agreed, and the Programme of Action for the Sustainable Development of Small Island Developing States.

Strengthening regional and subregional cooperation for the promotion of environmentally sustainable economic growth, or green growth, as one of the prerequisites for attaining the MDGs and sustainable development, was another decision endorsed by countries at the meeting.

United Nations Economic Commission for Europe

Turkmenistan has followed irregularly the regional environmental and cross-sectoral processes developed under the auspices of ECE, namely the Environment for Europe process; the Transport, Health and Environment Pan-European Programme; and the Strategy for Education for Sustainable Development (ESD). Although Turkmenistan has participated in the Working Group on Environmental Monitoring and Assessment, and the Steering Committee on Education for Sustainable Development, the country's attendance at meetings has been irregular.

Turkmenistan is a Party to only one of the five ECE environmental conventions (the Aarhus Convention). Although it has not yet ratified the other four – CLRTAP, the Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention), the Convention on the Transboundary Effects of Industrial Accidents, and the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention or Water Convention), the country has implemented them to some degree. It should be noted that the country has committed itself to a significant amount of the substantive obligations of the ECE conventions as a result of having ratified the Tehran Convention (articles 13 and 17).

Ongoing work between Turkmenistan and the convention secretariats indicates that ratification processes may be initiated in the medium term, although national developments towards accession to the four remaining conventions are at present at different stages.

Convention on Environmental Impact Assessment in a Transboundary Context (Espoo Convention)

Turkmenistan is not a party to the Espoo Convention; however, national provisions for EIA, most of which can be found in the 1995 Law on State Ecological Expertise, follow closely the principles and procedures of the Convention. Turkmenistan's list of activities subject to the EIA procedure are equivalent to that in appendix I of the Convention.

Under the Tehran Convention, the Protocol on Environmental Impact Assessment in a Transboundary Context has been prepared. It will be submitted for approval and subsequent signature by parties to the Convention. In terms of substance, this protocol is consistent with the Espoo Convention. Turkmenistan also participated actively in the development of the guidebook on transboundary environmental impact assessment in Central Asia prepared by the governments of Central Asian countries with assistance from Switzerland.

Convention on Long-range Transboundary Air Pollution

The level of emissions in Turkmenistan has been increasing since the early 1990s, emanating mainly from stationary sources (the oil-processing industry, oil and gas production, chemical, engineering and power industries, and production of building materials). The expansion of industry and significant growth in road transport are the main contributors to the increase in air pollution. Besides these factors, there are natural sources of air pollution in Central Asia – the Karakum and Kyzyl-Kum deserts as well as the dried-up bed of the Aral Sea from where large amounts of salt dust are raised and transported by the wind from west to east, affecting all of the Central Asian countries and making it essential for them to intensify cooperation with each other.

Cooperation between the countries of Central Asia to prevent transboundary air pollution is one of the priorities of the sub-regional Framework Convention on Environmental Protection for Sustainable Development in Central Asia, which was ratified by Turkmenistan. The country works with the Meteorological Synthesizing Centre – East, an international centre of the Co-operative Programme for Monitoring and Evaluation of the Long-Range Transmissions of Air Pollutants in Europe (EMEP), which provides national data on heavy metals and POPs. Ratifying CLRTAP would enhance further development of policies and measures to combat the discharge of air pollutants and boost the exchange of information with other countries, including those in Central Asia that have ratified the Convention, namely Kazakhstan and Kyrgyzstan.

Photo 4.1: Turkmen carpets

Convention on the Transboundary Effects of Industrial Accidents

Compliance with ecological safety requirements for potentially harmful activities, subject to specific licensing procedures, is assessed and monitored by MoNP. Preventing accidents of a potentially transboundary nature, reducing their frequency and severity, and mitigating their effects, are the overarching aims of the Convention on the Transboundary Effects of Industrial Accidents, which was adopted in 1992 and entered into force in 2000. Moreover, the Convention supports active international cooperation, encouraging the sharing of information and technology, and promoting cooperation on research and development. Accordingly, the Convention offers a platform for cooperation which cannot be provided by national legislation. Recently, contacts between the Turkmen authorities and the Convention Secretariat have been intensified.

Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters

Turkmenistan acceded to the Aarhus Convention in June 1999. To date, it has not ratified either the Convention's Kiev Protocol on Pollutant Release and Transfer Registers or its 2005 amendment on public participation in decisions relating to genetically modified organisms.

After acceding to the Convention, the country has striven to align national legal provisions with the Convention's obligations. It should be noted that the right to information is enshrined in the national Constitution (article 26), as well as being reflected in several laws on environmental protection. Access to justice regarding environmental issues is covered by relevant articles of the Constitution, the Code on Administrative Offences and the Criminal Code, and is also reflected in the laws on environmental protection.

Turkmenistan has undertaken a range of activities to implement the Convention. Several publications, public events and television programmes dedicated to raising environmental awareness and stimulating public participation in environmental matters have been implemented. MoNP and the Society for the Protection of Nature have been the main promoters of such actions. International projects have been implemented with the assistance of UNEP, OSCE and TACIS. In 2007-2009, a project entitled Strengthening Public Participation and Civil Society Support to Implementation of the Aarhus Convention was carried out under the TACIS Central Asian Programme.

In 2005, a Decision (II/5c) was adopted at the second Meeting of the Parties endorsing findings by the Aarhus Convention Compliance Committee that Turkmenistan's 2003 Law on Public Associations did not comply with the Convention in several respects.

In the Decision, the Meeting of the Parties requested Turkmenistan to amend the Law on Public Associations with a view to bringing all of its provisions into compliance with the Convention.

Since 2005, Turkmen authorities and the Compliance Committee have exchanged information on the issues raised by the Compliance Committee. In 2008, the third Meeting of the parties to the Convention decided to issue a caution to Turkmenistan, to become effective on 1 May 2009 unless Turkmenistan had fully brought the Law on Public Associations into compliance with the Convention. In light of the Compliance Committee's subsequent findings that Turkmenistan had not done so, the caution entered into effect on 1 May 2009.

However, following recent close contacts between the Compliance Committee and Turkmenistan, the Government recently undertook to revise the Law on Public Associations to address the Compliance Committee's findings. Following this positive development, in 2011, a Decision (IV/9g) to suspend the caution of 1 May 2009 was adopted at the fourth Meeting of the Parties. The caution should re-enter into force on 1 January 2013, unless Turkmenistan has amended its Law on Public Associations.

Convention on the Protection and Use of Transboundary Watercourses and International Lakes

Although Turkmenistan is a downstream country facing potential water scarcity, it has not ratified the Convention on the Protection and Use of Transboundary Watercourses and International Lakes (Helsinki Convention, or Water Convention). Of the Central Asian countries, only Kazakhstan and Uzbekistan have ratified it. It should be emphasised, however, that Turkmenistan is currently considering becoming a party to the Water Convention.

Interstate Commission on Sustainable Development

The Interstate Commission on Sustainable Development (ICSD) was founded under the International Fund for Saving the Aral Sea (IFAS) in 1994 in Ashgabat following the approval of the Agreement on Joint Actions to Settle the Aral and Circum-Aral Area Problems, Improve Environmental Conditions, and Ensure the Socioeconomic Development of the Aral Region, signed by the Heads of Central Asian States on 26 March 1993 in Kzyl Orda.

Over the last decade, ICSD has become an active platform for environmental cooperation, going far

beyond problems related to the Aral Sea. The main task attributed to ICSD is the coordination and management of regional cooperation in the field of environmental protection and sustainable development in Central Asian countries. ICSD approved the Regional Environmental Action Plan in 2001.

Framework Convention on Environmental Protection for Sustainable Development in Central Asia

In November 2006, at the ICSD forum in Ashgabat, the Framework Convention on Environmental Protection for Sustainable Development in Central Asia was adopted. It aimed to enhance further cooperation among the Central Asian countries on the preservation and sustainable management of natural resources on common and transboundary issues in the sub-region. The Convention covers a range of issues and touches on all environmental domains (protection of atmospheric air, protection of water and sustainable use of water resources, conservation and rational use of land resources, waste management, conservation of mountain ecosystems, conservation of biodiversity, cooperation in emergency situations) and was the first regional legal instrument to be signed and adopted in Central Asia.

To date, only Kyrgyzstan, Tajikistan and Turkmenistan have ratified this legal instrument. As a result, the Convention has not yet entered into force since it requires ratification by the five Central Asian countries.

Economic Cooperation Organization

Turkmenistan is a member of the Economic Cooperation Organization, an intergovernmental regional organization established in 1985.¹³ The Treaty of Izmir, signed in 1977, established three objectives for the Organization directly related with the environment. These are to intensify mobilization and utilization of the Economic Cooperation Organization region's natural resources, in particular energy resources; to facilitate cooperation in the fields of ecology and environmental protection within the region; and to promote mutually beneficial interaction and cooperation between the Organization and other regional and international organizations as well as financial institutions.

¹³ Current membership comprises the Islamic Republics of Afghanistan, Iran and Pakistan; the Republics of Azerbaijan, Kazakhstan, Tajikistan, Turkey and Uzbekistan; Kyrgyzstan and Turkmenistan.

4.5 Bilateral cooperation

There are some bilateral agreements including environmental protection components, which are in force between Turkmenistan and countries in geographical proximity such as the Islamic Republic of Iran and Uzbekistan. There is also a memorandum of mutual cooperation between Turkmenistan and Turkey on forestry.

Bilateral cooperation between Turkmenistan and Germany has been very active since 1997. GIZ supports the National Secretariat of CACILM and assists MoNP through several projects such as Capacity-building and On-the-Ground Investments for Sustainable Land Management, Sustainable Forestry Management in Turkmenistan, Transboundary Water Management in Central Asia, Support for Legal and Judicial Reforms in Central Asia, and Advanced Training of Specialists for the Agrarian Sector in Central Asia.

Cooperation with the European Union/European Community

Cooperation with the EU has been strengthened in recent years. A PCA with Turkmenistan was signed in May 1998 and ratified in April 2009 by the EU Member States and the European Parliament. The list of likely priority areas foreseen under the Indicative Programme 2011-2013 for Cooperation Assistance to Turkmenistan is drawn from the European Community Regional Strategy Paper for Assistance to Central Asia for the Period 2007-2013, and is intended to contribute to the implementation of the EU Political Strategy for Central Asia adopted by the European Council in June 2007.

The main aim of this exercise is to address areas which have not been adequately covered by European Community (EC) or other donor assistance in Turkmenistan but which represent key priority areas in need of financial assistance, especially in view of the development of the country, as well as areas for which assistance is required to follow up previous programmes. Cooperation will focus on strengthening environmental integration and environmental governance, dealing with climate change effects, and promoting sustainable, integrated water management, including transborder and regional sea aspects.

4.6 Millennium development goals and sustainable development

Turkmenistan supported the United Nations initiative and was one of the 189 signatory States to the

Millennium Declaration. At the 2005 World Summit, four other targets were added to those included in the Millennium Declaration. National targets were also included in the country's 2003 National Strategy of Socio-economic Transformation of Turkmenistan for the Period up to 2010. The national MDGs serve as a basis for the Development Assistance Frameworks signed every four years between the Government of Turkmenistan and the United Nations Country Team in Turkmenistan.

In 2004, a national MDG report, prepared jointly by Turkmenistan and the United Nations Country Team, was published. By that time, Turkmenistan had already attained a number of United Nations development goals and targets set for the period up to 2015.

On Goal 7 (Ensure environmental sustainability), Turkmenistan has committed to achieve by 2015 the following targets: (i) prevent exhaustion of natural resources; (ii) reduce the proportion of people without access to safe drinking water and sanitation; and (iii) to have achieved significant improvement in housing conditions. On the latter two targets, there is clear evidence that Turkmenistan has made progress. Water treatment plants and desalination units have been built, and water supply and drainage networks and facilities are under construction throughout the country. Housing conditions are being improved. Turkmen banks are authorized to grant special-purpose soft loans to citizens to cover part of their housing costs. In 2008, the term of payment for long-term construction credit, at a lending rate of 1 per cent, was extended from 15 to 30 years. On the first target, namely, preventing the exhaustion of natural resources, available data do not allow a robust assessment to be made.

4.7 Special focus: water issues

Economic, particularly agricultural, expansion and population growth over the last two decades have placed a great strain on the water resources of the Central Asian region. Countries have been striving to develop fair and rational bases for sharing and using their water resources.

The volume of accessible water resources in Turkmenistan is determined not only by the natural water content of the transboundary rivers but also by bilateral agreements on water allocation. In accordance with these agreements, Turkmenistan is allocated 22.15 billion m³ of water each year on condition that water levels are at least 90 per cent of those forecast for the year. In drier years, the volume of water intake is determined by a decision of the

Interstate Commission for Water Coordination of Central Asia (ICWC), whose members are the ministers responsible for water management in the Central Asian countries.

Protection of water resources, a comprehensive reconstruction of irrigated areas, the building of new drainage networks, and the reconstruction of existing ones were priority actions laid down in NEAP. Although there is clearly an urgent need for internal improvement in the management of water and to increase the efficiency of water use, national efforts will not be sufficient to address the magnitude of the challenge.

As noted above, Turkmenistan is not a party to the ECE Water Convention. Neither is it a party to the 1997 United Nations Convention on the Law of the Non-navigational Uses of International Watercourses. Both these MEAs embody the principle of equitable and reasonable utilization of transboundary waters.

In 2010, under the country's cooperative agreement with the European Commission, a national policy dialogue focusing on the Water Convention principles was initiated in Turkmenistan through ECE. The National Policy Dialogues on Integrated Water Resources Management (IWRM) assist governments in implementing IWRM in line with the principles of the Water Convention, the 1999 Protocol on Water and Health, and the EU Water Framework Directive. National water policy dialogues are the main operational instrument of the EU's European Water Initiative, an international partnership that aims to contribute to the achievement of the water-related MDGs.

Cooperation on the Aral Sea

While being dynamically engaged in the National Policy Dialogues at present, Turkmenistan has also been actively involved in other regional cooperation mechanisms relating to water resources, such as that dealing with the Aral Sea basin. The Aral Sea basin covers the territory of five Central Asian States,¹⁴ the northern part of Afghanistan and the Islamic Republic of Iran, and a small part of the People's Republic of China. The surface area of the Aral Sea has shrunk significantly, with profound negative impacts on biological resources and ecosystems.

In the early 1990s, the Central Asian countries decided to establish a framework for joint

management of water resources based on the principles of equality and mutual benefit, followed by the establishment of the ICWC to agree on water allocation and water reservoir operations in the basins of the Amu Darya and Syr Darya rivers.

With the support of international donors between 1992 and 1994, IFAS was created. Its role was primarily to generate funds and increase awareness within the international community with regard to the Aral Sea environmental disaster. The main goals of the Aral Sea Basin Programme (ASBP) are: stabilization of the environmental situation in the Aral Sea basin; rehabilitation of disturbed ecosystems of the Aral Sea region; improvement of methods of water and land resources control in the basin; establishment of administrative structures at all levels for planning; and implementation of the actions laid down in the Programme. UNDP, UNEP, the World Bank, GEF, EBRD, ADB, TACIS, GIZ, the Kuwait Fund for Arab Economic Development (KFAED), USAID and other international and national organizations, together with experts and scientists from Central Asian countries, took part in the preparation of the Programme.

Cooperation on the Caspian Sea

CEP has also proved to be a key regional programme for achieving the goals established under the Tehran Convention. As a partnership between the five littoral States, with the assistance of several international partners including the EU, UNDP, UNEP and the World Bank, CEP develops and strengthens regional environmental dialogue and cooperation on the Caspian Sea and supports resource mobilization initiatives, inter alia through the identification and preparation of investment projects. Turkmenistan is active within CEP activities and is vigorously implementing its National Caspian Sea Action Plan.

Turkmenistan participated in an EU project, the Caspian Water Quality Monitoring and Action Plan for Areas of Pollution Concern, which assisted the country as well as the other Caspian littoral countries in developing a new regional water quality monitoring programme, thereby contributing to improved quality of the marine and coastal environment of the Caspian Sea. The project started in 2005 and ended in 2010. It also helped the country to develop pollution action plans for specific areas of pollution concern.

Prevention of pollution from ships

In 2009, Turkmenistan ratified the International Convention for the Prevention of Pollution from

¹⁴ Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan

Ships (MARPOL), including all six of its annexes. The country has for some years been involved in technical cooperation programmes undertaken within the auspices of the International Maritime Organization (IMO), participating in the Caspian Sea regional studies on ballast water management under the Integrated Technical Co-operation Programme (ITCP).

4.8 Conclusions and recommendations

Turkmenistan has increased its international cooperation with multilateral bodies. The country has expanded its engagement within the international community on environmental issues over the last 20 years and has made progress with respect to a number of international environmental issues. It is currently a party to 11 MEAs. The country has made use of several international mechanisms to acquire technical and financial assistance in support of its national environmental priorities and is actively engaged in a number of regional agreements. Progress has been made in pursuing national follow-up to the Conferences of the Parties of almost all conventions to which the country is a party.

However, further rationalizing and improving environmental legislation would strengthen provisions with respect to enforcement of international obligations and overcome some inconsistencies in the way international obligations are being transposed. These inconsistencies can be overcome by efforts over time to plug the loopholes, enforce compliance and adopt a coherent approach. NEAP, the main State programme on the environment, has expired and national priorities for external assistance are not clearly defined, which are weaknesses which undermine the cohesion of environmental measures and the effectiveness of external assistance.

Recommendation 4.1:

The Cabinet of Ministers should:

- (a) *Continue strengthening national actions in support of multilateral environmental agreements (MEAs) and programmes;*
- (b) *Utilize fully the technical and financial support available from the international community through these mechanisms by concluding the alignment of national legislation with international and regional obligations of MEAs to which the country is a party.*

Although the institutional framework for enforcing international environmental obligations in Turkmenistan is solidly developed, there is an

unclear boundary between the powers of the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes, and those attributed to MoNP, in meeting the country's obligations. MoNP has insufficient capacity to implement the wide range of international obligations stemming from international conventions.

Recommendation 4.2:

The Cabinet of Ministers should:

- (a) *Improve the mechanism of work and the coordinating functions of the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes;*
- (b) *Strengthen the capacity of focal institutions responsible for multilateral environmental agreements and programmes and expand their participation in international environmental networks.*

Despite progress made so far, Turkmenistan has to strengthen implementation of some MEAs such as the Basel Convention, Aarhus Convention and the Cartagena Protocol, at both the level of implementing measures and the level of reporting.

There is a need for the country to keep up the pace as part of international efforts to address biodiversity challenges. Acceding to MEAs to which Turkmenistan is not a party would be another step, given the efforts made within the country to protect the environment. This would also raise the country's international profile. A matter concerning non-compliance with the Aarhus Convention has not yet been resolved.

Recommendation 4.3:

The Ministry of Nature Protection, in cooperation with other relevant authorities, should take appropriate measures to fully comply with the:

- (a) *Basel Convention on the Control of Transboundary Movements of Hazardous Waste and their Disposal;*
- (b) *Aarhus Convention on Access to Information, Public Participation in Decision-making and Access to Justice;*
- (c) *Cartagena Protocol on Biosafety to the Convention on Biological Diversity.*

Recommendation 4.4:

The Ministry of Nature Protection, in cooperation with other relevant authorities, should assess the costs and benefits of and promote accession to those

multilateral environmental agreements to which it has not yet become a party, such as the:

- *Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade;*
- *Stockholm Convention on Persistent Organic Pollutants (POPs);*
- *Convention on International Trade in Endangered Species of Wild Fauna and Flora;*
- *Convention on Migratory Species;*
- *Agreement on the Conservation of African-Eurasian Migratory Waterbirds;*
- *Convention on Long-range Transboundary Air Pollution, and its protocols;*
- *Convention on Environmental Impact Assessment in a Transboundary Context, and its Protocol on Strategic Environmental Assessment;*
- *Convention on the Transboundary Effects of Industrial Accidents;*
- *Nagoya Protocol on Access to Genetic Resources to the Convention on Biological Diversity.*

Once these have been ratified, the Cabinet of Ministers should take steps to achieve their effective implementation.

Water management in Turkmenistan depends not only on the country's own efforts but also on cooperation among the riparian States of the Amu Darya river basin. Given the transboundary nature of the water system, the long-term solution needs to be a negotiated one. Ratification of MEAs embodying the principle of equitable and reasonable utilization of transboundary waters would support these efforts.

Recommendation 4.5:

The Ministry of Water Economy, in cooperation with other relevant authorities, should assess the costs and benefits of, and promote accession to, the following multilateral environmental agreements:

- *United Nations Convention on the Law of the Non-Navigational Uses of International Watercourses;*
- *Convention on the Protection and Use of Transboundary Watercourses and International Lakes, and its Protocol on Water and Health.*

Recommendation 4.6:

The Cabinet of Ministers should extend the dialogue with neighbouring countries on issues related to transboundary rivers, with a view to ensuring sound management of water quality and quantity, and increasing cooperation among Central Asian countries.

Chapter 5

ENVIRONMENTAL MONITORING, INFORMATION, PUBLIC PARTICIPATION AND EDUCATION

5.1 Introduction

Over the past two decades, Turkmenistan has managed to maintain its observation network for assessment of environmental pollution and its impact on air, water and soil quality, and biodiversity. Nevertheless, there remains a need to strengthen environmental monitoring, and many further actions are required. Among these actions are further improving data management and information-sharing to strengthen evidence-based decision-making, modernizing technical equipment to enhance monitoring capacity, and providing the general public with free access to environmental information in order to raise public awareness and encourage a conscientious approach to environmental problems.

Since its independence, the country has made some progress in the area of environmental education and training. However, much still needs to be done by the Government and specific public authorities to promote public participation at large and in decision-making, to enable broad public access to information, and to introduce sustainable development principles into the educational system and training at various levels. The preparation of new regulations and the clarification of existing ones are important steps in this direction. Similarly important are building the capacities of government officials and NGOs (public associations), and raising awareness among citizens and governmental officials alike with regard to the environmental rights of citizens.

5.2 Institutional, policy and legal framework

Environmental monitoring

Within MoNP, the Research and Production Centre of Environmental Monitoring (RPCEM) under NIDFF is the main public authority that carries out air, surface water and soil quality monitoring in the country. MoNP's provincial DNPs carry out monitoring through mobile stations. CaspEcoControl is responsible for monitoring the environmental status of the coastal area of Turkmenistan.

MoHMI, through SES, monitors air quality in the sanitary protection zones of enterprises and workplaces.

At present, different governmental authorities are responsible for carrying out monitoring of water resources. These include RPCEM, MoWE and their subordinate offices in the provinces, the Institute Turkmensuvlymtaslama under MoWE and Hydromet.

The Institute Turkmensuvlymtaslama under MoWE is responsible for research activities and project design and development. It carries out specific monitoring of water, geological material, soil, etc., but only with regard to new projects. The Institute has two laboratories. Recently, MoWE started, albeit irregularly, conducting chemical analyses for nitrates and chlorides in water from the drainage collectors. These analyses are carried out in the Institute's laboratories.

The State Concern TurkmenGeology is responsible for monitoring groundwater sources, in terms of both quantitative (levels, usage, stocks) and qualitative (physiochemical, chemical) characteristics.

Through the country's five administrative provinces, SCS collects information on air pollution by major enterprises. SCS is responsible for compiling and processing environmental data collected by the various bodies.

Land cadastre

The State Committee for Land Use, Land Management and Land Reform under the Cabinet of Ministers was responsible for keeping the land cadastre in Turkmenistan from 1991 until 1998. On 16 December 1998, the State Committee was downgraded to the Service of Land Resources under MoA. The number of staff in the central office was reduced three times; from 45 in the 1990s to the current total of 16. The soil monitoring laboratory with 70 staff was abolished in 1997. As a result, since

that time there has not been any qualitative assessment of land in Turkmenistan. The Department for Land Assessment was also abolished.

Although the 2004 Land Code envisages that land resources shall be managed by a State body (committee or agency), the Service of Land Resources has not been re-established in its original status as a State committee. Moreover, there is a conflict of interest, as the Service of Land Resources is under MoA, which is one of the main land users in the country.

Public participation, access to information and access to justice

Non-governmental associations

The 2003 Law on Public Associations, which replaced the 1991 Law on Public Associations, provides the legal framework for the operation of public associations in Turkmenistan. A major difference compared with the situation before the Law was passed, is that it then became unlawful to operate without prior registration. Registration itself is effected by the Ministry of Justice.

In article 5, the Law prescribes that State authorities cannot become founders, members or participants in public associations. The Law also defines the legal forms of public associations and introduces two types of public associations, at the national and local (such as province, district or city) levels. The founding of a provincial-level public association requires five members as signatories.

However, the threshold for national public associations is set much higher, at 500 members. Local public associations cannot carry out activities outside their province. Only nationwide associations are explicitly defined in the Law as operating in more than one province, with all the requirements which are associated with their classification, such as the 500 members required in order to qualify for registration as a nationwide public association.

According to the Law, activities of non-registered public associations are prohibited. This means that, at the time of this EPR, registered public associations concerned with environmental protection are the only form of association that citizens may use to participate in environmental matters and actions. The Law prohibits the formation of informal – that is, not registered – associations and initiatives, although modifying that aspect of the Law is currently under consideration. This is a restriction because it constrains the ability of people to form ad hoc

groups; instead, it obliges them to channel actions and initiatives through an established public association, which, by default, can be expected to have a much wider agenda and limited resources to pursue it. In addition to posing serious challenges with regard to the right of association, this constraint has a considerable impact on public participation on environmental matters.

At the time of the EPR mission, there was no Aarhus centre functioning in the country, although there were efforts by OSCE and the Government to open such centres. In the absence of an Aarhus centre, work done by the OSCE country office included organizing workshops and round tables on the Aarhus Convention in 2000-2002, regional and national conferences on awareness-raising and cooperation, and the 2003 opening of an office as the Aarhus Convention national focal point.

Access to information and access to justice

The key instrument concerning requests for environment-related information is the 1999 Law on Addresses of Citizens. The Law itself is more general, since it covers a number of “addresses” by citizens towards State institutions, including complaints and suggestions. It does specify the duties and obligations of officials and implications if these duties and obligations are not observed. Importantly, it sets time limits of 15, 30 or 45 days, depending on the nature of the enquiry, within which a citizen’s request should be replied to. Furthermore, the Law specifies that should the request not fall within the jurisdiction of the body to which it has originally been submitted, that body has an obligation to forward the request to the appropriate authority within five days and to inform the requesting citizen accordingly. It was not possible to establish during the EPR mission the extent to which environmental information requests by citizens are submitted in this way and whether the prescriptions of the Law are followed.

The Law remains vague and general with regard to environmental matters, and therefore it is unlikely that it is used by citizens extensively, if at all. Nor is the procedure for the submission of environment-related enquiries clear. Therefore, in terms of implementation, the Law does not appear to meet the country’s international obligations vis-à-vis the Aarhus Convention.

A related law is the 1998 Law on Appeals. Article 1 of the Law declares that any citizen whose constitutional rights and freedom are violated or restrained by actions or decisions of State structures,

public associations, local authorities or officials has the right to appeal the matter in court. This could be understood to cover environment-related rights as well, but these are not clearly delineated in the 1999 Law on Addresses. At the same time, awareness of the rights of citizens is limited, among both officials and the wider public.

Education

The right to environmental education is established in the Law on Nature Protection. The same Law prescribes continuous education on nature protection covering preschool, primary, secondary and higher education.

According to the 2009 Law on Education, the Ministry of Education is the key institution for the implementation of national education policy, defining the direction of education, setting educational standards, coordinating the activities of educational institutions, and preparing and authorizing educational materials. In addition, the Ministry is responsible for the accreditation and certification of educational institutions. It is also tasked with proposing the State budget on education.

Two key public authorities responsible for promoting environmental education and ESD are the Ministry of Education and MoNP. In practice, youth public associations in Ashgabat and the country's provinces, alongside the Turkmen Society for Nature Protection and the Turkmen Society of Hunters and Fishermen, are actively involved in informal education through, for example, support for summer camps and walking tours.

The introduction or modification of textbooks is decided by the joint commission of the Academy of Sciences and the Ministry on Education that consists of 15 experts from higher education institutes. The Academy of Sciences is an independent, autonomous body with close links to the Ministry of Education. It was abolished by the previous President of Turkmenistan in 1998, but was re-established by the current President in 2009.

Local authorities have implementation responsibilities and are mostly responsible for administering education at preschool, primary and secondary levels and ensuring that standards set by the Ministry of Education are followed. However, it has been noted that effective teaching requires enough adequately trained educators, which in some instances, especially in the provinces outside Ashgabat, may not be the case.

Especially since 2006, education policies have paid particular attention to strengthening education curricula and infrastructures. The 2007 Order No. 4610 on Improvement of the Educational System increased the duration of primary and secondary schooling from nine to 10 years, and higher education from four to five years. This was followed by considerable investments in new buildings and resources available for teaching and research.

5.3 Environmental monitoring

Air quality monitoring

RPCEM currently monitors air quality at 14 fixed monitoring stations in six major cities. Five of them are located in Ashgabat, two in Mary, two in Turkmenabad, one in Balkanabad, two in Turkmenbashi and two in Dashoguz. Air quality monitoring was discontinued at three monitoring stations in 2007 owing to the relocation of the cement factory from the city of Abadan to outside populated areas in Akhal province. The NPDs take samples from the fixed observation stations three times a day and report the results to RPCEM on a daily basis. Observations are taken manually since at present the monitoring stations are not provided with equipment for automated measurement and transfer of data. RPCEM provides methodological guidance to the provinces. Monitoring procedures follow the requirements of the monitoring instructions that were in use in the former USSR.

The monitoring programme covers four harmful pollutants in the atmosphere: TSP, nitrogen dioxide (NO₂), nitrogen monoxide (NO) and sulphur dioxide (SO₂). Other parameters are added to the measurement programme depending on the polluting industries and the characteristics of nearby cities and the surrounding areas. Carbon monoxide (CO), despite the high values, is measured only in Ashgabat, Mary and Turkmenbashi. Air concentrations of a number of pollutants identified by the international community as being most harmful to human health and the environment – fine particulates PM_{2.5} and PM₁₀ and ground-level ozone – are not measured in Turkmenistan; neither does RPCEM monitor benzo(a)pyrenes and heavy metals.

The average concentration of dust in the air in all six major cities ranged between 1.3 MACs and 2.6 MACs during the period 2005-2009. Storms and strong winds contribute to the high concentration of dust; however, measurements do not distinguish between dust coming from natural and anthropogenic sources. Despite the large amounts of salt and dust transferred from the drained basin of the Aral Sea,

the volume of the transboundary transport of pollutants is not estimated. Pollution from anthropogenic sources transported by air, for example, the remains of pesticides and fertilizers from agricultural activities, is not assessed. Given the great loads of pollutants transferred from the Aral Sea, the application of internationally agreed methodologies could help to assess the transboundary effect and solve transboundary air pollution problems in Turkmenistan.

The age of the monitoring equipment used by RPCEM ranges from 15 to 30 years. Owing to the insufficient supply of testing chemicals, reference specimens and other reagents, a number of parameters are measured only sporadically. All RPCEM laboratories need to be modernized, which would make it possible to conduct new types of chemical analysis. RPCEM plans to enhance the monitoring information network by introducing automatic processing and storage of information in one single electronic hub. In addition, it plans to equip the laboratories in the NPDs with computers to enable automatic exchange of monitoring data.

The current number of monitoring stations is insufficient given the fast-growing population. For a city the size of Ashgabat (population 773,400), there should be between seven and 14 stations, but there are currently only five. Another consequence of the fast-growing population in Ashgabat is that some of the newly built neighbourhoods are not monitored at all. It is considered necessary, as a priority, to install fixed monitoring stations in newly built city areas and additional monitoring stations in all big cities in Turkmenistan.

Pollution from mobile sources

The number of motor vehicles in Ashgabat and other major cities has increased in recent years. Car passenger turnover, which represents 85 per cent of all passenger transport, increased by more than two and a half times over the last 10 years. In Ashgabat, there are two mobile observation stations, which monitor 12 crossroads at a rate of four per day. At present, they monitor only one pollutant (CO), which is far from sufficient. Each NPD has one mobile observation station which takes samples at vulnerable points in the cities.

Pollution from stationary sources

The main source of industrial air pollution is the fast-developing oil and gas extraction and processing sector, which represented 73 per cent of all industry in Turkmenistan in 2009 (as opposed to 54 per cent

in 2000). Other industries which pollute the air in Turkmenistan are the chemical, metallurgy, construction and energy generation industries. Pollutants include CO, NO_x, SO₂, ammonium nitrate, phenol, formaldehyde and hydrogen sulphide. SCS collects data from 305 enterprises on emissions of harmful substances into the atmosphere. Data are summarized by provinces, ministries, industry sectors and cities. However, only data on emissions from stationary sources in the main cities (Table 6.3) are published in the statistical yearbook. Data show emissions in thousands of t of TSP, SO₂, NO_x and CO. Enterprises also send SCS data on hydrocarbons, including volatile organic compounds (VOCs), but these data are not published.

Indoor air quality

MoHMI, through SES, monitors the indoor air quality of enterprise workplaces.

Surface water monitoring

RPCEM alone monitors the chemical parameters of water quality in Turkmenistan. Methodological guidelines exist with regard to sampling and chemical analysis methods, but there are no concrete instructions on the number of observation points and coverage of water bodies. At present, RPCEM maintains 35 observation points. The monitoring system of water quality covers 14 surface water bodies, which include seven rivers, four canals, two reservoirs and one lake. Samples are usually taken by the provincial laboratories and sent to Ashgabat. They are taken manually according to the approved workplan, in most cases on a monthly basis, depending on the size of the water body, and according to hydrological phases. Where necessary, probes on several nearby points are taken on the outskirts of cities. The current network provides data to assess chemical composition on more than 20 parameters.

According to the methodological instructions, the physical parameters (temperature and water debit) and some chemical parameters (dissolved oxygen and CO₂) are measured by specialists of provincial laboratories at the sites where the samples were taken. In addition to on-site analyses, the RPCEM central laboratory also conducts analyses for major ions, nutrients, organic pollutants and chlororganic pesticides. Although the RPCEM laboratory has the technical capacity to do so, monitoring of heavy metals is not carried out. Full chemical analysis is hardly possible due to the aging equipment of the RPCEM laboratory and a lack of testing materials and chemical reagents.

MoWE, through its provincial Water Management Departments, performs monitoring of irrigation networks and drainage collectors. Water is mainly analysed for irrigation purposes (salinity and ions, and some physiological parameters such as turbidity). An inspector from each province takes samples manually, which are then analysed in one of the three provincial laboratories (Akhal, Dashoguz and Lebap). Under MoWE, the Karakum Canal Management Unit carries out measurements on water use, water volume in the water reservoirs and water available for irrigation, and conducts chemical analyses of drinking water.

Hydromet carries out systematic observations and monitoring of the hydrological regime of surface water bodies at 30 gauging stations, including 27 stations on seven rivers and Karakum Canal, and three stations on water reservoirs. There are no gauging stations on lakes. The number of gauging stations has been more or less constant in the past. These stations measure as basics flow, levels and temperature of water and, in addition, different stations also measure velocity, turbidity, sediment loads and evaporation. The measuring process is not automated. The information is sent to the central office through the hydrometeorological centres located in each of the five provinces and in Ashgabat. Hydromet maintains the water cadastre, covering rivers, lakes and reservoirs.

Turkmenistan cooperates with its neighbours with regard to the use and protection of transboundary waters. For example, Hydromet exchanges information on a daily basis with the neighbouring countries of Uzbekistan and Tajikistan on meteorological events having an impact on the Amu Darya River flow. The Amudarya Water Management Department sends information to MoWE on a daily basis, including hydrological and hydrochemical parameters (salinity, ions, water hardness, temperature, etc.) with the main objective of evaluating the discharge of saline drainage water from irrigated fields into the Amu Darya River. There is no exchange of information on important quality parameters such as nitrates, nitrites, sulphate, hydrocarbons and phenol.

Current monitoring activities are dispersed. MoWE does not exchange information with RPEM and vice versa, there is no information exchange with the municipalities, and responsibilities and functions often overlap. There are no clear functions assigned. The methodology, including standard parameters of analysis, differs from one institution to another. Supplies and chemical reagents are insufficient to

conduct probes. New equipment and staff training are needed.

Groundwater monitoring

There are four hydrogeological bases (expeditions) which measure water quality on all operational groundwater wells: one each for Akhal, Dashoguz and Balkan Provinces, and a shared one for Mary and Lebap Provinces. They regularly conduct reduced chemical analyses on the quality of water in groundwater wells, and twice a year conduct a full chemical analysis in the central laboratory of TurkmenGeology, which is considered the best equipped in the country. Once or twice a year, the expeditions conduct analyses on hydrocarbons, phenol, pesticides, etc. Except for that on the Cheleken Peninsula (Box 5.1), there are no observation points to monitor for adverse impacts of industry on groundwater quality. Pollution by nitrates from the application of fertilizers in agriculture is not estimated.

TurkmenGeology conducts an examination of project documentation related to the use and protection of groundwater. Currently, an important project is related to a new gas field located in Mary Province, where there is a high risk of contamination of groundwater with hydrogen sulphide (H₂S).

Groundwater resources are of great importance for Turkmenistan for the supply of drinking water to the population. Two bodies, TurkmenGeology and SES, are responsible for checking drinking water quality. According to the Law on Drinking Water, TurkmenGeology is responsible for monitoring the quality and use mode of fresh groundwater on a regular basis, and protection of groundwater from exhaustion and pollution. Samples taken from aquifers supplying groundwater for drinking water are fully analysed against drinking water quality standards.

SES carries out monitoring of drinking water quality only in the centralized water system. It monitors microbiological, toxicological and organoleptic parameters of drinking water, in addition to monitoring water quality in basins where discharged water from cities is collected. The results of the analyses are not publicly available.

Caspian Sea quality monitoring

Almost 200 enterprises located on the Caspian coast of Turkmenistan report to CaspEcoControl, which is the main institution responsible for monitoring in the

Caspian Sea area. Of these enterprises, about 15 have their own laboratories. If the measurements exceed the MACs, CaspEcoControl makes additional checks. Four times a year, specialists from the CaspEcoControl laboratories meet with the enterprises to verify the quality of their measurements.

CaspEcoControl conducts monitoring of seawater and air quality. It has two laboratories for water and air quality analysis. New equipment for monitoring water quality was installed in early 2009 under an EU/TACIS project. Every three years, the laboratory equipment of CaspEcoControl is subject to inspection by the Main State Service Turkmenstandartlary. CaspEcoControl has five control points where seawater probes are taken four times a year. In Turkmenbashi Bay, probes are taken every month and at resorts every week.

The water is analysed for salt, density, nitrites, ammonium nitrogen, sulphate, heavy metals, hydrocarbons, and synthetic active substances on the surface. CaspEcoControl monitors the seabed for hydrocarbons and heavy metals, and air quality at two control points in the city of Turkmenbashi for TSP, CO₂, nitric oxide (NO) and anhydride. Reports are sent to MoNP on a monthly basis.

Hydromet has six monitoring stations at the Caspian Sea. Measurements on several parameters (sea level, water and air temperature, direction and speed of wind, etc.) are sent to the central office four times a day.

Soil quality monitoring

RPCEM monitors soil pollution on agricultural land for pesticides only. The provinces (except for Balkan Province, mostly because its major economic activity is oil and gas extraction) send samples taken from 15 observation points twice a year (in spring and autumn). Other chemical substances, including soil acidity (pH), and humus are not measured. Nor is soil analysed for pollutants emitted by industry.

SES carries out analyses of physiological characteristics of soil only on request (e.g. from a construction company). Chemical components, including nitrates, heavy metals and microbial contamination, are not analysed. In the past, Hydromet conducted analyses of physiological characteristics of soils, but this was discontinued in 2005.

Although the RPCEM laboratories have the capacity to conduct soil monitoring, it is not included in the

monitoring programme. On rare occasions, upon special request, MoNP has tasked RPCEM with conducting a full chemical analysis of soil samples.

Radioactive monitoring

Although monitoring of radioactive pollution was conducted at 30 stationary observation points until 1998, it is no longer considered necessary. RPCEM discontinued measurement of radioactive background levels except in Ashgabat, where measures are taken on a daily basis.

Monitoring of biodiversity and forests

The last State inventory of forests in Turkmenistan was carried out in 1988. According to the Forest Code, an inventory of forests should be conducted as part of forest management. There is no forest cadastre at present, and there is no methodological guidance for the preparation of such a tool (Chapter 11).

The present monitoring system represents stationary observations of individual species in the nature reserves, including rare (Red Data Book) species. Eight nature reserves provide monthly reports to NIDFF. In addition, the NPDs collect data on biodiversity components (law enforcement and infringements, protection, etc.) on the basis of guidelines called *Nature Chronicles*. The information is analysed by NIDFF and sent to SCS.

Every year, MoNP issues a decree containing the list of species which can be hunted, hunting quotas and areas, and the dates of hunting seasons. In the event of a reduction in the number of animals, certain territories can be closed for hunting. The number of animals hunted is reported to MoNP at the end of the hunting season. While the impact of legal game hunting and fishing on biodiversity is well monitored, illegal hunting and fishing remains a serious threat to biodiversity. At present, there are no State game husbandry farms, although the establishment of such has been included in BSAP.

There is no unified biodiversity monitoring programme in place to serve as a basis for the systematic collection of data from different sectors of the economy, which would make it possible to evaluate the impact of economic activities on biodiversity.

There is no biodiversity monitoring in terms of long-term tracking of species status to identify trends. In general, the effect of anthropogenic activities on biodiversity is not estimated, except for sporadic

examinations of environmental impact to partially assess threats to biodiversity (Chapter 10).

5.4 Information management and reporting

RPCEM publishes daily bulletins which only include air monitoring results. These bulletins are submitted to selected ministries and agencies (10 addresses in all). RPCEM submits annual reports to MoNP on the results of its monitoring activities for air, surface waters and soils. The NPDs produce information bulletins which are distributed to the provincial administrations, and to RPCEM, on a monthly basis. MoNP does not upload monitoring data and its annual report onto its website, as a result of which the information is not available to the public at large.

RPCEM does not regularly receive monitoring data from other monitoring institutions (MoWE on collector-drainage water, the State Committee on Geology on groundwater, MoHMI on drinking water, Hydromet on climate and surface water – i.e. quantitative hydrological parameters). There is no environmental data exchange between the governmental bodies involved in monitoring activities in the country. Many data sets and much other information stored by the governmental bodies are not in electronic form and not easily accessible for users, including the general public.

There is no evidence that RPCEM is linking various data flows to help study cause-and-effect relationships and to develop an environmental database that is user friendly and accessible to all interested public authorities and the general public. The hydrometeorological and geological databases, together with the environmental monitoring bulletins and monthly and annual reports of the main departments and NPDs may provide the basis for such a database.

MoNP's bilingual (Turkmen and Russian) website (http://www.natureprotection.gov.tm/index_ru.php) provides information on selected issues, but is not regularly updated. The section on environmental legislation contains the texts of nine major laws. Apart from this the website, environment-related information is generally not easily available on websites of relevant government institutions with environmental responsibilities. MoNP has established the Ecological Programmes Coordination Department which, among its other duties, is responsible for the preparation of environmental information for the public. There is a regular TV show for public at large on which MoNP staff promote various environmental issues.

Reporting on the state of the environment

Turkmenistan does not regularly publish state-of-environment reports. This is contrary to the country's obligations under the Aarhus Convention (article 5.4), to which Turkmenistan has been a party since June 1999 (Chapter 4). State-of-environment reports were prepared in 1998 by MoNP in cooperation with UNEP/Grid Arendal (in electronic form) and in 1999 by MoNP in cooperation with UNDP (in printed form).

MoNP has not established a legal and institutional framework for producing regular environmental assessment reports, as recommended by the ECE Guidelines on the Preparation of Governmental Reports on the State and Protection of the Environment, and the Guidelines for the Preparation of Indicator-based Environment Assessment Reports in Eastern Europe, Caucasus and Central Asia, which were endorsed at the 2003 (Kiev) and 2007 (Belgrade) Environment for Europe Ministerial Conferences, respectively.

Box 5.1: Monitoring the Cheleken Peninsula on the Caspian Sea

Turkmengeologia Institute under the State Concern TurkmenGeology has been monitoring the Cheleken Peninsula on the Caspian Sea since 2002. This area was specifically selected for monitoring because of the mixed use of industry and areas for recreational activity. About 10 industrial enterprises of national importance from the oil and chemistry sectors are concentrated on the Cheleken Peninsula. The Institute visits the area four times a year and conducts monitoring on ground and seawater, and seabed sediments. The analysis is conducted on six macrocomponents (HCO_3 , CO_3 , CL, Ca, Mg, stiffness), nitrates, nitrites, phenol (only in water) and heavy metals (Fe, Cu, Zn, Co, Mn, Cd, Ni, Pb). Ground samples are taken from about 300 observation points, and water and sediment samples from about 100 observation points.

The Institute also carries out monitoring of dust. In the past, samples have been taken in the vicinity of enterprises; however, since 2008 the entire peninsula has been covered, samples being taken every 200-500 m. Although the Institute has a laboratory in Ashgabat, it sometimes, though rarely, uses the facilities of the better-equipped central laboratory of the State Concern TurkmenGeology, for example, in cases where chemical reagents for heavy metals analysis are lacking or for the purpose of conducting bitumoids, spectroscopy, pesticides and other analyses. The Institute's laboratory is currently being renovated, and it is expected that in the future it will also be able to measure chemicals such as lithium, arsenic and hydrocarbons, as well as to carry out analyses of heavy metals with greater precision.

In order to assist national statistical agencies and institutions responsible for the production of national state-of-environment reports, the Joint Task Force on Environmental Indicators was established under ECE. Representatives from Turkmenistan have not participated in the Joint Task Force so far. Nor is there any evidence that SCS uses the Guidelines for the Application of Environmental Indicators in Eastern Europe, Caucasus and Central Asia.

Reporting under the multilateral environment agreements

In compliance with its legally binding obligations, Turkmenistan has prepared several communications to governing bodies of MEAs. In 2000 and 2010 respectively, the country submitted its initial and second communications under the UNFCCC (Chapter 9).

In 2002, 2007 and 2009, Turkmenistan submitted national reports to CBD. The country still has to meet one of the global CBD targets, namely on the preparation of an openly accessible list of known plants as a step on the way towards a complete inventory of world flora. Although significant scientific material on flora and vegetation taxonomy has been accumulated (covering 7,064 species), it has still not been fully transferred onto electronic media and is therefore not easily accessible (Chapter 10).

In 2000, 2002 and 2006, Turkmenistan submitted national reports to the UNCCD (Chapter 8).

Turkmenistan does not fully comply with the reporting requirements under the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (Chapters 4 and 9).

MoNP does not upload the reports to MEAs onto its website.

Environmental statistics

SCS publishes an annual statistical yearbook on environmental protection and the use of natural resources. It is circulated only within governmental bodies and is not available to the public.

SCS also publishes a bilingual (Turkmen and Russian) statistical yearbook of Turkmenistan, with a print run of 200 copies. It contains statistical data related to the environment, namely on water abstraction and wastewater discharge, land use, reforestation and air emissions from stationary sources.

Environmental statistics are for restricted use only, are not uploaded onto the website of SCS and are not available to the public.

Environmental quality standards

During the 1990s, Turkmenistan used the environmental quality standards of the former USSR. On 25 April 2000, the Minister of Health issued Order No. 14, On the Use on the Territory of Turkmenistan of Sanitary Norms, Rules and Hygiene Standards, which are approved by the State Committee for Sanitary and Epidemiological Supervision of the Russian Federation. The idea behind the Order was to temporarily apply the Russian standards before the national Turkmen standards were developed and adopted. In this regard, however, no further developments have taken place.

A large number of pollutants are currently regulated in Turkmenistan. However, some of them are monitored due to the current economic situation. Furthermore, due to budget limitations, there is no routine monitoring of many pollution parameters that should be measured according to monitoring standards.

Cadastres

The Department of Land Cadastre in the Service of Land Resources under MoA carries out activities relating to the land cadastre. Two staff are responsible for the land cadastre in each province and one in each district. Information on all land users is collected annually at the district and provincial levels using a special statistical form which is then sent to Ashgabat, where the aggregated cadastre is prepared. GIS technologies are not applied and remote sensing data are not used in the cadastre preparation. All equipment is degraded and obsolete. There is no information centre with a database of land cover and land use information in Turkmenistan.

There are four hydrogeological soil-reclamation laboratories in the country. They collect information on the levels of soil salinity and of groundwater tables. The Cadastre of Reclaimed Lands is prepared based on the information from these laboratories.

According to article 100 of the Water Code, the State water cadastre should include quantitative and qualitative data on the state of water resources, as well on all water users and water use throughout the country. MoWE plays a coordinating role in maintaining the water cadastre. The water cadastre has not been updated for at least the past 10 years.

Map 5.1: Air and water monitoring points



Source: Ministry of Nature Protection, 2011.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

A special subunit of TurkmenGeology maintains the State Cadastre of Ground Water. NIDFF is currently developing the State Cadastre of Fauna and Flora, in cooperation with the nature reserves and the provinces.

Only printed versions of all cadastres exist, and they are for internal use only.

5.5 Public participation

Non-governmental organizations

Turkmenistan has a limited number of registered, and therefore active, environmental NGOs, known as public associations. These are engaged in raising public environmental awareness, education and training, and environmental improvements in areas such as nature conservation.

The two main environmental public associations in the country are the Society for Nature Protection (Box 5.2) and the Society of Hunters and Fishermen. Each has five provincial branches. Active in

environmental matters but of lesser importance are the Red Crescent Society of Turkmenistan and the City Youth Unions of Turkmenistan named after Magtymguly. They are active in Ashgabat city, and Dashoguz, Lebap and Mary Provinces.

MoNP cooperates actively with the registered environmental public associations, circulating information on their activities and occasionally inviting their representatives to discuss legal and policy initiatives. Furthermore, it involves the Society for Nature Protection and the Society of Hunters and Fishermen in inspections. Participation in inspection is the main source of income for these public associations, alongside membership fees.

Since the entry into force of the 2003 Law on Public Associations the number of associations has declined. For example, the Ecofund and Ecoforest NGOs mentioned in the 2002 NEAP were not among national public associations registered with the Ministry of Justice by the end of 2010. No international environmental NGO operates in Turkmenistan.

Box 5.2: Society for Nature Protection

The Society of Nature Protection of Turkmenistan currently has around 50,000 members. It organizes lectures and training courses on environmental protection in Ashgabat and the country's provinces.

In collaboration with MoNP and other interested ministries and public associations, the Society contributes to the organization of environment-related conferences, activities, meetings, workshops seminars, training courses and competitions in order to raise awareness on issues of environmental protection. Many of these activities are organized during national and international holidays. Some examples include Independence Day, the Neutrality Day of Turkmenistan, the Day of the State Flag and the Day of Ahalteke Horses.

Since 1978, the Society has been a member of the International Union for Conservation of Nature (IUCN) and since 1995 of the IUCN World Commission on Protected Areas.

Access to information

The Law on Nature Protection (article 28) has clear provisions stipulating citizens' rights of access to, and officials' obligations to provide, environmental information. The existing framework, however, does not specify a clear mechanism and administrative procedure. As a result, awareness among both officials and citizens concerning access to environmental information is not great. The information unit of MoNP can play an active role in raising awareness on both sides

Participation in environmental decision-making

Proposals for amendments to or drafts of environmental laws are usually not available to the general public. Public associations are occasionally invited to offer opinions and input on legal and policy initiatives. The participation of public associations in the development of plans and programmes is limited.

Although the State standard TDS 579-2001, Environmental Impact Assessment of the Planned Economic and Other Activities in Turkmenistan, established basic requirements for public participation in EIA, there are only a few examples of public participation in EIA.

5.6 Environmental education and education for sustainable development

Preschool, primary and secondary education

Basic environmental education is taught at primary school in grades 2 to 4. General biology courses are taught in high schools. The basics of ecology are taught in grade 10, covering two major areas – Ecosystems, and Biosphere and Humans.

The definition of sustainable development has not yet been adequately developed and delineated in national legislation (Chapter 1). Sustainable development principles do not appear to be integrated into school curricula. The lack of a conceptual approach to the broader issues of ESD in schools makes it doubtful that the majority of school graduates gain a holistic understanding of environmental concerns. The country has not yet adopted or developed an action plan for the implementation of the ECE Strategy for Education for Sustainable Development.

Higher education

As a separate specialization, environmental studies are mostly concentrated at the Turkmen State University named after Magtymguly, the Turkmen State Institute of Architecture and Construction and the former Turkmen State Polytechnic Institute. In addition, the Turkmen University of Agriculture covers specializations related to hydrotechnology, land planning and agronomy. Ecology is taught as a general course in all institutions of higher education.

Until 2010, ecology was taught within the Department of Geography of the Turkmen State University named after Magtymguly, by the joint Department of Hydrometeorology and Ecology. In 2010, however, the Department of Geography was split into four departments: Ecology, Cartography, Geography and Hydrometeorology. The Department of Ecology itself employs seven regular staff, most with natural science backgrounds, but also uses instructors from other specialized faculties to cover more specialized courses (e.g. from the Faculty of Law for environmental law, the Department of Hydrometeorology for hydrology).

The decision on annual intake of students is taken by the Ministry of Education based on a five-year plan. The Department of Ecology usually accepts between

Photo 5.1: Turkmen State University named after Magtymguly

10 and 12 students each year. The number may vary, based on the number of experts requested by MoNP and other public authorities, as well as State-owned companies. Students are taught a total of 46 courses covering a wide range of environment-related areas including sustainable development and international relations. Currently, the ratio of admissions to applications is roughly one to six. Although the curriculum has been enriched with courses on economics and law, the focus is on natural sciences. Environmental management is not adequately covered.

The Turkmen State University named after Magtymguly is funded fully by the State budget. Textbooks and tuition are provided free of charge, and students receive generous scholarships (higher than the minimum salary) until they complete their studies. At the Turkmen State Institute of Architecture and Construction, ecology is taught at the Department of Chemical Technology and Ecology. The focus of the Institute is on the engineering disciplines.

5.7 Conclusions and recommendations

The country's monitoring system of air quality is not adapting fast enough to growing needs. The current number of monitoring stations is insufficient given the rapidly growing population in big cities and newly built urban areas. Important pollutants, such as ground-level ozone, are not measured.

The monitoring equipment used by RPCEM ranges in age from 15 to 30 years old. Owing to the

insufficient supply of testing chemicals, reference specimens and other reagents, some parameters are measured only sporadically. All RPCEM laboratories need to be modernized, which would make it possible to conduct new types of chemical analysis. RPCEM plans to enhance the monitoring information network by introducing automatic processing and storage of information in a single electronic hub. In addition, it plans to equip the laboratories in the NPDs with computers, to enable automatic exchange of monitoring data.

Responsibility for water monitoring is shared among various institutions in Turkmenistan, but there is little cooperation and exchange of information between them. The coverage of water bodies remains low; for example, only two of 16 reservoirs are monitored.

Recommendation 5.1:

The Ministry of Nature Protection should review the national environmental monitoring system to identify gaps, weaknesses and inconsistencies, and to develop a strategy with an action plan for further modernization and upgrading of the monitoring networks in line with international guidelines and best practices.

Turkmenistan is making little effort to ensure that environmental information is accessible to the public. MoNP does not regularly update its website. Other ministries, such as MoHMI, MoWE, MoA and the Ministry of Energy and Industry, as well as SCS, do not actively communicate to the general public the environment-related data and information that they collect or produce. National reports and

communications to the governing bodies of MEAs are not uploaded onto websites and are thus not available to the general public.

Recommendation 5.2:

The Cabinet of Ministers should ensure that relevant ministries and other government bodies regularly upload onto their websites environment-related data and information that they collect or produce.

Recommendation 5.3:

The Ministry of Nature Protection should regularly upload onto its website copies of national reports and communications submitted to the governing bodies of multilateral environmental agreements in the national and, if available, other languages.

Turkmenistan produces a substantial amount of environmental data and information. However, it does not publish state-of-environment reports. This is contrary to the country's obligations under the Aarhus Convention, to which Turkmenistan is a party. The Cabinet of Ministers has not established a legal and institutional framework for producing regular environmental assessment reports, as recommended by the Guidelines on the Preparation of Governmental Reports on the State and Protection of the Environment, and the Guidelines for the Preparation of Indicator-based Environment Assessment Reports in Eastern Europe, Caucasus and Central Asia, which were endorsed at the 2003 (Kiev) and 2007 (Belgrade) Environment for Europe Ministerial Conferences, respectively.

Recommendation 5.4:

The Cabinet of Ministers should establish a system for periodically producing national indicator-based environmental assessment reports, taking into account the internationally agreed guidelines. For this purpose, in particular:

- (a) The Cabinet of Ministers should establish an inter-agency expert group composed of all relevant State institutions and representatives of academia and non-governmental organizations;*
- (b) The Ministry of Nature Protection should establish a dedicated supporting working unit.*

Due to its current status and number of staff, the Service for Land Resources under MoA cannot perform all the same activities as did the State Committee for Land Use, Land Management and Land Reform under the Cabinet of Ministers (the State Committee was abolished in 1998). There has been no qualitative assessment of land in Turkmenistan since that date. In the process of

cadastre preparation, GIS technologies are not applied, and remote sensing data and satellite images are not used. The equipment is obsolete and there is no information centre with an electronic database of information on land cover and use in Turkmenistan.

Recommendation 5.5:

The Cabinet of Ministers should ensure that:

- (a) The land assessment of the country is carried out and the land cadastre is updated periodically, through modern technologies such as geographical information systems technologies, remote sensing data and satellite images;*
- (b) An information centre with data on all land users in the country is established.*

Following the introduction of the 2003 Law on Public Associations, the number of such associations in the country has been reduced. As a result of changes introduced by the 2003 Law, the only available channel for interested citizens to engage with or in environmental initiatives is through the handful of currently registered national public associations, since non-registered associations and initiatives are prohibited by law. This is not in accordance with international practices and is considered to restrict the ability of the wider public to participate in non-centralized, non-bureaucratized and spontaneous initiatives aimed at improving environmental protection, education and awareness.

Recommendation 5.6:

The Cabinet of Ministers should consider revising the 2003 Law on Public Associations to encourage environmental initiatives, and to facilitate the registration and operation of environment-related public associations.

The absence of an adequately developed conceptual approach to the broader issues of ESD in schools makes it difficult for the majority of school graduates to gain a holistic understanding of environmental concerns. ECE has developed the Strategy on ESD to assist the efforts of member States to better apply ESD principles and introduce relevant materials in school curricula.

Recommendation 5.7:

The Cabinet of Ministers should:

- (a) Develop and adopt an action plan for the implementation of the ECE Strategy on Education for Sustainable Development (ESD) and nominate focal points for ESD in the Ministry of Education and the Ministry of Nature Protection;*

(b) *Strengthen cooperation with ECE and its Steering Committee on ESD to enhance the*

implementation of ESD, and to exchange materials, experiences and good practices.

***PART II: MANAGEMENT OF
NATURAL RESOURCES AND POLLUTION***

Chapter 6

AIR QUALITY MANAGEMENT

6.1 Introduction

Air quality in Turkmenistan is mostly influenced by the geographical character of the country (deserts and semi-deserts which represent 80 per cent of the total area, and seashore), very low air humidity and generally good dispersion conditions. One specific problem lies in the increasing areas which are saline and polluted by dust blowing from the dried seabed of the Aral Sea to Dashoguz Province. Of the total agricultural land (40.2 million ha), more than 1.7 million ha (4.2 per cent) are affected by increasingly frequent salt dust storms.

About 430,000 t (70 per cent) of the 600,000 t of aerosols accumulate annually on the agricultural crops in the irrigation zone, the remaining 30 per cent falling into the desert zones and populated areas. The resultant air pollution is the combination of natural and anthropogenic factors. The percentage of natural contribution to the total concentration of TSP in the air is not known.

Notwithstanding the medium-level air pollution (standards for certain pollutants – mainly TSP and SO₂ – are exceeded), air quality assessment and management is among the priorities of environmental policy. The existing air quality assessment and management system is separated from activities focused on mitigation of climate change, which means that potential synergies cannot be exploited. Turkmenistan is not a party to CLRTAP, and does not plan to become a party in the coming years.

On the other hand, certain important practical measures have been and are being implemented to reduce anthropogenic air pollution from the energy, industry and transport sectors, as well as to reduce dispersion of TSP of natural origin.

In the case of stationary sources, several important energy and industrial installations have been either rebuilt (e.g. with a fuel switch to natural gas or upgrade of boilers) and/or moved outside populated areas (e.g. cement kilns or glass factories). In the case of emissions from mobile sources, major measures are being taken to improve transport infrastructure and management.

6.2 Institutional, policy and legal framework

Institutions

MoNP is the main State administration body for air quality assessment and management. Its main role lies in the implementation of the State environmental policy, compliance control and coordination of activities on protection and rational use of natural resources. At the operational level, MoNP conducts ecological expertise, issues environmental permits, and collects and processes air quality data.

MoHMI performs sanitary–hygienic expertise on project proposals and controls compliance with air quality standards in populated and working (production) areas.

Assessment of fuel quality (compliance with standards) is being carried out by the Main State Service Turkmenstandartlary, the Ministry of Oil and Gas Industry and Mineral Resources, and the Ministry of Energy and Industry.

NIDFF, and especially its RPCEM, is the main supporting institution which carries out air quality monitoring.

Hydromet is engaged in climatology, meteorology and hydrology and does not have any activities related to air quality management. SCS collects data on emissions into the air and publishes them in its annual statistical yearbook.

Policies

There is no special strategy, policy or plan explicitly focused on air quality assessment and management. There are relevant policy documents in place, mainly NEAP (which expired in 2010) and Strategy 2030, which creates the framework for the future development of specialized strategies, policies and plans.

Both these documents provide, inter alia, for the improvement of air quality, especially in cities and other human settlements. NEAP included measures and activities to reduce emissions from stationary and

mobile sources as well as measures to reduce the dispersion of dust of natural origin. In addition, measures to reduce the use of ozone-depleting substances were proposed.

MoNP is drafting a national environmental programme for the period 2012-2016, under the framework of Strategy 2030, which is expected to comprise an air quality component including monitoring as one of the priorities.

Legislation

The legislation in force relevant to atmospheric air includes the 1991 Law on Nature Protection, the 1996 Law on Protection of Atmospheric Air, the 1995 Law on Environmental Impact Assessment, the 1995 Law on State Ecological Expertise, the 2009 Sanitary Code, the 2009 Law on the Protection of the Ozone Layer and the 2001 National Standard TDS 571-2001 On Environmental Impact Assessment of Planned Economic and Other Activities in Turkmenistan.

The 1996 Law on Protection of Atmospheric Air (last amended in 1999) provides for the basic principles and elements of air quality protection, air pollution charges, import of chemicals, and management of chemicals and ODS. The Law would need an update in order to ensure a modern and efficient air quality assessment and management system, as applied in EU Member States or other developed countries.

The 1995 Law on State Ecological Expertise outlines the principles of the permit-issuing procedure in relation to ecological expertise. It specifies the powers of State executive bodies and the procedure for conducting ecological expertise.

The 2009 Sanitary Code provides in general for issuing air quality standards and other sanitary-hygienic standards, their implementation and compliance assessment.

The 2009 Law on the Protection of the Ozone Layer creates a sufficient framework for reducing consumption of ODS.

6.3 Air quality standards

Air quality standards (approximately 300 MACs) are still those which were used before Turkmenistan's independence.

In 2000, MoHMI issued the Order on Temporary Use on the Territory of Turkmenistan of Sanitary Norms, Rules and Hygiene Standards, which are approved by

the State Committee for Sanitary and Epidemiological Supervision of the Russian Federation (Chapter 5).

In 2009, the Ministry of Construction approved and introduced SNT 2.09.04-09, "Construction Standards of Turkmenistan. Sanitary Standards for the Construction of Industrial Installations", which includes the list of MACs and Sanitary Protection Zones which are to be observed by all ministries and other authorities.

The most important MACs, for those air pollutants which are being monitored regularly, are presented in Table 6.1 and compared with the air quality standards of the EU, WHO and the United States of America (USA). Besides air quality assessment, MACs are used for the ad hoc calculation of maximum allowable emissions and of maximum ground level concentrations in dispersion modelling.

Turkmenistan's MAC values, averaging periods and scope of pollutants differ from the air quality standards applied in the EU or USA, and from those recommended by WHO. They have been developed on a health-impact basis without taking into account the technical or economic feasibility of compliance. There are no special standards for ecosystem protection. There are no MACs for PM_{2.5} and PM₁₀.

Fuel standards

Fuel standards are set by the Main State Service Turkmenstandartlary. After the modernization of the oil refineries, the quality of petrol and diesel is compliant with EU standards. In particular, 100 octane gasoline is unleaded and sulphur content in diesel fuel lies between 500 mg/l and 1,000 mg/l.

Emission standards

There are no technology-based ELVs or other generally binding quantitative requirements related to technologies in place. Regulation of emissions from stationary sources is being carried out via the conduct of ecological expertise on the basis of pollutants dispersion modelling.

6.4 Air quality monitoring

Air quality monitoring is being carried out by RPCEM, under NIDFF. Seventeen manual monitoring stations (where probes are taken for 20 minutes, three times per day – at 7, 13 and 19 hours – and analysed in laboratories) are located in six big cities (Ashgabat, Balkanabat, Damoguz, Mary, Turkmenabat and Turkmenbashi). Dust (TSP), SO₂,

N₂O and nitrogen dioxide (NO₂) are measured at all stations, CO at Ashgabat, Mary and Turkmenbashi, formaldehyde and phenol in Ashgabat, hydrogen sulfide in Turkmenbashi and chlorine in Balkanabat (Table 6.2). There is no automated monitoring station in place. Results of monitoring (real concentrations of pollutants in the air) are recorded in daily bulletins which are distributed to relevant authorities (10 addresses in all), and collected in the database of RPCEM. In addition, monthly and annual reports are prepared.

Manual air quality monitoring in residential and working areas is carried out by SES, under MoHMI, and measures TSP, SO₂, NO_x, CO and certain heavy metals.

Monitoring programmes under MoNP and MoHMI are not coordinated.

Interpretation of data by dispersion models using emission and meteorological data is not carried out. There is no regular cooperation between RPCEM and Hydromet, which monitors meteorological parameters.

Annual average concentrations of major air pollutants in the biggest Turkmenistan cities in the period 2005-2009 are presented in Table 6.2 in µg/m³. It can be seen that the average annual concentrations of TSP are rather high (most are between 200 µg/m³ and 400 µg/m³), but below the MAC value of 500 µg/m³ in all six major cities, which can be explained by the considerable contribution of TSP of natural origin.

Average annual concentrations of SO₂ are high in Turkmenbashi (see below), which can be explained by the contribution of local industrial installations, and rather moderate in other cities. Concentrations of NO₂, between 10 µg/m³ and 70 µg/m³, are around the EU standard (40 µg/m³) and below the USA standard (100 µg/m³). Concentrations of CO are moderate, below international standards. It should be emphasized that the comparison of monitored values with the international standards is complicated due to different methodologies of measurement and different definitions of standards.

According to the preliminary MoNP assessment, at the national level, the average annual concentration of dust (TSP) in 2010 represented 160 per cent of the MAC value, while the average annual concentrations of SO₂ and NO_x remained lower than the respective MAC values. In Turkmenbashi, average annual concentrations of SO₂ were at 380 per cent of MAC.

6.5 Air emissions and pollution

General

Total national values of emissions of the main air pollutants are published in various sources; the published record is neither complete nor fully compatible, and is sometimes contradictory.

Competent authorities (MoNP and SCS) collect emissions from registered stationary sources on the basis of annual reporting by the ministries and authorities on all enterprises in accordance with statistical questionnaire No 2-TP (Air).

Levels of emissions from mobile sources and non-registered stationary sources are not available, with the exception of data for 2000 and 2004. Data on emissions from registered stationary sources in the biggest cities of Turkmenistan are presented in Table 6.3.

Industry

The oil and gas industry represents the major source of emissions in the western and eastern parts of the country (75 - 95 per cent of total emissions from stationary sources). Other important sources of emissions can be found in the chemical, manufacturing and construction materials industries.

Certain major pollution sources are being rebuilt or moved outside populated areas (e.g. the reconstruction of oil refineries in Turkmenbashi and the relocation of the Bezmeinskogo cement factory). Construction materials production plants are gradually being equipped with dust abatement equipment.

Energy

The energy sector (electricity and heating) is entirely based on natural gas. Installed capacity of power stations is approximately 7,500 MW. Energy savings and energy efficiency measures are not efficient due to low costs of both natural gas and electricity (namely for households).

It is planned to complete the technological cycle of gas turbines with the Number of Transfer Units (NTU) method in the near future, in particular by installation of heat recovery steam generators, technologically connected with NTU, where the temperature of flue gases from the pipe gas turbines (540-560°C) will be reduced to 100°C by steam generators.

This will improve the microclimate in the affected area and reduce harmful emissions into the atmosphere.

In February 2011, a decision was taken by the Cabinet of Ministers to modernize the biggest power station (Mary, 1,680 MW). The first solar power station (1.2 MW) is planned, to serve also as a demonstration and educational unit.

Transport

The number of cars has increased significantly since Turkmenistan's independence, but the composition of the car fleet is still not satisfactory (there is a high percentage of obsolete cars). Information on the current number of vehicles and the structure of the vehicle fleet is not available. According to the ECE Transport Statistics database, the 2008 vehicle fleet

of Turkmenistan included 403,970 cars, 26,053 motor coaches, buses and trolley buses, and 117,282 motorcycles. As road transport volume is increasing rapidly (Table 6.4), it can be expected that the contribution of mobile sources to total national emissions is also increasing.

Recently, manifold measures have been introduced to limit air pollution from road transport. This includes the use of high-octane gasoline without additives, the growth of a gas-fuelled vehicle fleet, traffic infrastructure measures (removal of freight transport from settlements, construction of road structures to prevent vehicle congestion at intersections), the introduction of efficient maintenance and control of vehicles, and continued work on the introduction of automated ("green wave") traffic management systems on the main thoroughfares of cities.

Table 6.1: Air maximum allowable concentrations

Pollutant	Averaging period	micrograms per m ³			
		Turkmenistan	EU	WHO	USA
Dust (TSP)	24 hours	150	-	-	-
	Maximum value	500	-	-	-
Dust from cement industry	24 hours	100	-	-	-
	Maximum	300	-	-	-
PM ₁₀	24 hours	-	50	50	150
	Year	-	40	-	50
PM _{2.5}	Year	-	25	-	15
SO ₂	24 hours	50	125	20	365
	Maximum value	500	-	-	-
	Hour	-	150	-	-
NO ₂	24 hours	40	-	-	-
	Maximum value	85	-	-	-
	Hour	-	200	200	-
	Year	-	40	-	100
NO	24 hours	60	-	-	-
	Maximum value	400	-	-	-
CO	24 hours	3,000	-	-	-
	Maximum value	5,000	-	-	-
	8 hours	-	10,000	10,000	10,000
Ground-level ozone	8 hours	-	120	-	157
Formaldehyde	24 hours	3	-	100	-
	Maximum value	35	-	(0.5 hour)	-
Phenol	24 hours	30	-	-	-
	Maximum value	100	-	-	-
Chlorine	24 hours	30	-	-	-
	Maximum value	100	-	-	-
Ammonium	24 hours	40	-	-	-
	Maximum value	200	-	-	-
Hydrogen sulfide	Maximum value	8	-	-	-
Hydrogen fluoride	24 hours	5	-	150	-
	Maximum value	20	-	1	-

Sources: Ministry of Nature Protection; European Union; World Health Organization; United States Environmental Protection Agency.

Table 6.2: Annual average concentrations of major air pollutants in main cities, 2005-2009

City	Pollutant	micrograms/m ³				
		2005	2006	2007	2008	2009
Ashgabat	Dust (TSP)	400	400	400	400	200
	Sulphur dioxide (SO ₂)	30	40	40	40	20
	Carbon monoxide (CO)	3,000	3,000	3,000	3,000	2,000
	Nitrogen dioxide (NO ₂)	40	40	40	40	40
	Nitrogen oxide (NO)	10	10	10	10	20
	Phenol	5	5	5	5	5
	Formaldehyde	18	18	18	17	15
Mary	Dust (TSP)	200	200	300	200	300
	Sulphur dioxide (SO ₂)	20	20	20	30	20
	Carbon monoxide (CO)	4,000	3,000	4,000	3,000	3,000
	Nitrogen dioxide (NO ₂)	20	20	20	20	20
	Nitrogen oxide (NO)	20	20	20	20	20
Turkmenabat	Dust (TSP)	300	200	200	200	100
	Sulphur dioxide (SO ₂)	20	30	30	40	40
	Nitrogen dioxide (NO ₂)	40	30	30	40	30
	Nitrogen oxide (NO)	40	30	30	30	30
Dashoguz	Dust (TSP)	300	300	300	400	300
	Sulphur dioxide (SO ₂)	50	50	50	50	50
	Nitrogen dioxide (NO ₂)	40	40	40	40	40
	Nitrogen oxide (NO)	30	20	30	30	30
Turkmenbashy	Dust (TSP)	300	300	200	200	200
	Sulphur dioxide (SO ₂)	200	190	220	210	200
	Carbon monoxide (CO)	4,000	4,000	5,000	4,000	4,000
	Nitrogen dioxide (NO ₂)	60	60	60	70	70
	Nitrogen oxide (NO)	30	20	30	20	20
	Hydrogen sulphide (H ₂ S)	1	5	5	4	4
Balkanabat	Dust (TSP)	200	200	400	300	300
	Sulphur dioxide (SO ₂)	10	10	20	20	20
	Nitrogen dioxide (NO ₂)	10	10	20	20	20
	Nitrogen oxide (NO)	10	10	20	10	10
	Chlorine (Cl)	10	10	10	10	10

Source: Ministry of Nature Protection, 2010.

Table 6.3: Emissions from stationary sources in main cities, 2000, 2007-2009

City	Pollutant	ton/year			
		2000	2007	2008	2009
Ashgabat	Dust	200	100	100	100
	Sulphur dioxide	100	0	0	0
	Nitrogen oxides	400	700	700	700
	Carbon monoxide	3,400	4,600	4,700	4,900
Mary	Dust	1 300	1 200	700	1 200
	Sulphur dioxide	-	-	-	-
	Nitrogen oxides	7,200	7,100	7,100	7,200
	Carbon monoxide	1,500	1,400	1,300	1,600
Turkmenabat	Dust	1,000	600	500	700
	Sulphur dioxide	400	700	900	800
	Nitrogen oxides	400	400	600	600
	Carbon monoxide	3,900	3,600	3,500	3,400
Turkmenbashy	Dust	700	300	300	300
	Sulphur dioxide	2,700	500	400	300
	Nitrogen oxides	3,600	2,800	3,200	4,400
	Carbon monoxide	7,300	5,700	6,700	9,300

Sources: Statistical Yearbook, 2000-2008, 2009; Statistical Yearbook 2000-2009, 2010.

Table 6.4: Development of road transport performance, 2000, 2008-2009

	Unit	2000	2008	2009
Goods	Million ton-kms	4,452	9,648	10,439
Persons	Million passenger-kms	8,994	21,127	24,244

Source: State Committee on Statistics, 2011.

The issue of imports of obsolete cars has been solved. Importation of cars and trucks manufactured prior to 2000 is banned. This will help not only to improve air quality but also to reduce the generation of waste (old tyres, obsolete engines).

6.6 Permit issuing and enforcement

Buildings and infrastructure in the industrial, energy (power generation and heating), transport, agricultural and housing sectors are being assessed from the point of view of their environmental and health impacts. The impact of installation or activity is determined by its class of risk.

Under the SEE (permit-issuing) procedure, installations, structures and buildings are assigned to one of five categories of environmental risk. Ecological expertise for the high risk categories (I-III) is conducted by MoNP, and for the lower risk categories (4 and 5) by the provincial DNPs. MoNP issues the respective permit (Chapter 2). SEE is based on former Soviet practice, which includes the following steps:

- Application (technical documentation);
- Environmental assessment (including EIA in the case of installations listed in annex A of TDS 5679-2001);
- Conclusions of expertise (issued by MoNP or its provincial departments).

Once the conclusions of the ecological expertise are available, the investor is allowed to start construction. After commissioning and achieving compliance with technology regulations, the operator must prepare an “environmental passport” which includes all relevant information (emissions into the air, resource consumption and effectiveness of emission abatement measures) and submit it to MoNP or one of its provincial departments for approval within six months. As part of the approved passport, MAEs are set as well as emission charges. Approval is issued for five years provided that no substantial change (reduction or extension) is introduced within this time.

MAEs of pollutants for particular installations are being calculated ad hoc on the basis of MACs. Various dispersion models are being used for the

calculations. The main rule for the setting of MAEs is that the concentration of pollutant around the installation should be lower than or equal to the respective MAC. There are no generally binding technology-based ELVs or other quantified requirements.

In the event that calculated MAEs cannot be complied with, the operator proposes temporary MAEs to the relevant environmental authority for approval. The operator is obliged to prepare and implement a step-by-step emission reduction plan. In the event that MACs are not defined for the pollutant, MAEs can be calculated using another sanitary-hygienic criterion, the guiding value being acceptable health impact. These values are listed in SNT 2.09.04-09.

Provincial DNPs carry out inspections of permitted installations to check compliance with their permits and apply measures in case of non-compliance.

The system of environmental permit-issuing is based on an ad hoc approach to individual polluting installations and does not reflect recent developments, in particular IPPC, which takes into account all environmental media and all environmentally relevant issues. BATs have not been defined and, therefore, are not taken into account during the permit-issuing procedure.

6.7 International agreements

Turkmenistan is not a party to the Convention on Long range Transboundary Air Pollution and does not expect to become a party soon.

Turkmenistan is a party to the Vienna Convention for the Protection of the Ozone Layer and to the Montreal Protocol on Substances that Deplete the Ozone Layer (including the London, Copenhagen, Montreal and Beijing Amendments), and is active in implementing the respective requirements. To facilitate the implementation of the Montreal Protocol's requirements, the Ozone Office was established in MoNP and the National Programme for Phasing-out Ozone-depleting Substances was adopted. Recently, the 2009 Law on Protection of the Ozone Layer was adopted.

Photo 6.1: Public walkway**Table 6.5: Ozone-depleting substance consumption, 2000-2009**

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Baseline
CFCs	21.0	57.7	10.5	43.4	58.4	17.9	16.8	5.6	1.2	3.3	37.3
Halons	..	..	..	..	..	..	..	..	..	..	..
Other fully halogenated CFCs	..	..	..	..	..	..	..	..	..	..	..
Carbon tetrachloride	..	..	..	..	..	..	..	..	0.3	..	..
Methyl chloroform	..	..	..	..	..	..	..	..	0.0	..	..
HCFCs	2.6	4.4	0.4	1.0	0.8	3.8	5.6	2.7	8.6	6.9	..
HBFCs	..	..	..	..	..	..	..	..	..	..	..
Bromochloromethane	..	..	..	..	..	..	..	..	..	..	..
Methyl bromide	..	..	..	19.2	..	5.6	..	..	..	2.9	3.6

Source: United Nations Environment Programme, 2011.

Turkmenistan does not produce ODS. The development of national ODS consumption is presented in Table 6.5 for the period 2000-2009.

6.8 Air management and climate

Air quality management (especially air pollutant emission reduction) is not coordinated with measures to mitigate climate change (GHG emission reduction). As a result, the benefits of the “one measure, two effects” approach are not achieved. Both the main air pollutants and CO₂ have the same dominant source – combustion of fossil fuels. Therefore, certain measures to reduce the consumption of fossil fuels will have two effects: reduction of air pollutants (TSP, SO₂, NO_x and CO) and reduction of CO₂ emissions.

On the other hand, certain other measures to reduce GHG emissions may have a negative impact on air quality, for example, combustion of biomass or the

switch from petrol to diesel fuel. As it is necessary to reduce both air pollution and GHG emissions, appropriate measures (energy efficiency, energy savings, non-combustion renewable sources) will produce shared benefits while avoiding trade-offs between air quality and climate change mitigation.

6.9 Conclusions and recommendations

Every year, air quality standards for TSP are reported as having been exceeded in all big cities, but the contribution of dust of natural origin to total air pollution by suspended particulate matter is not known. Existing air quality standards are not sufficient to enable up-to-date air quality assessment. Standards are lacking for certain important pollutants – mainly particulate matter PM₁₀ and PM_{2.5}.

The existing system of air quality monitoring is obsolete and not coordinated, and its results are not

being interpreted by dispersion models (taking into account emissions and meteorological data). There is no automated monitoring station in operation. No air quality information system is available to the public. The national emission inventory is not complete, as it does not cover all relevant emission sources and pollutants.

Recommendation 6.1:

The Ministry of Nature Protection and the Ministry of Health and Medical Industry, in cooperation with relevant institutions, should:

- (a) *Develop methodology for calculations and measurements to assess the contribution of nature-originated dust to total pollution by suspended particular matter (measurement of mass–size distribution of particles and analysis of the chemical composition of particular size fractions);*
- (b) *Consider revision of existing air quality standards and the introduction of additional standards (in the first stage for PM_{10} and, in the second stage, for $PM_{2.5}$), taking into account the contribution of nature-originated dust, and set realistic compliance deadlines;*
- (c) *Replace, gradually, existing manual stations by automated air monitoring stations;*
- (d) *Ensure coordination between the stations' respective air quality monitoring programmes;*
- (e) *Introduce a methodology for air quality assessment (interpretation of monitoring data by the dispersion model, taking into account emissions and meteorological parameters);*

- (f) *Improve the existing national air quality information system and operate it in cooperation with the National Committee on Hydrometeorology under the Cabinet of Ministers.*

Recommendation 6.2:

The Ministry of Nature Protection, in cooperation with the State Committee on Statistics, should:

- (a) *Improve the methodology of national emission inventories (including emissions from mobile sources, small (not registered) stationary sources and diffused sources);*
- (b) *Strengthen reporting mechanisms on emission data;*
- (c) *Incorporate emission data into the national air quality information system.*

An air quality assessment and management system is being developed and implemented separately from mitigation of climate change (reduction of GHG emissions), as a result of which potential synergies cannot be used.

Recommendation 6.3:

The Ministry of Nature Protection, in cooperation with other relevant ministries, should:

- (a) *Introduce an integrated approach to measures related to air quality management and climate change mitigation (the “one measure, two effects” approach);*
- (b) *Support non-combustion renewable sources of energy (hydro, solar, wind) as well as energy efficiency measures and energy savings.*

WATER MANAGEMENT AND PROTECTION OF THE CASPIAN SEA ENVIRONMENT

7.1 Introduction

Water resource management is a key issue for Turkmenistan. Water resources are very limited owing to the country's geographical conditions and climate.

The desert areas (the Karakum Desert, Caspian coastal desert and Ustyurt plateau) occupy more than 80 per cent of the country's territory. The climate of Turkmenistan is continental and extremely dry. This is due to the peculiarities of atmospheric circulation, the intracontinental location of the country, the nature of the underlying surface, and the presence of mountain ranges in the south-east and south. Summers are usually very hot and dry. Air temperature is highest in July and, in the coastal regions, August. In the south-west, between the Murgab and Tejen Rivers and in the central part of the Karakum Desert, the average monthly temperature of the air in July exceeds 32° C. Elsewhere, it varies from 27-30° C. The absolute maximum (48-50° C) was recorded in the central and south-eastern Karakum Desert.

Average annual precipitation varies from 100 mm (Kara-Bogaz-Gol Bay and the north-east of the country) to 400 mm (Koine-Kesir in the Kopetdag Mountains). Rainfall occurs during the winter season, mainly in October and April. There is practically no surface run-off on the territory of Turkmenistan. Episodic run-off can occur only in some places formed by takyr¹⁵ and takyr-like soils after rains of more than 3-5 mm. This local run-off and reserves of groundwater form the water resources of the desert of Turkmenistan. As the local run-off relates only to the plots with weakly permeable soils, and its volume is small, reserves of groundwater are limited and the desert's own water resources are insufficient for economic development in desert regions. Water formed on the territories adjacent to the desert is widely used for desert irrigation.

In Turkmenistan, the issue of water resources stands out as one of the most critical factors limiting the

future development of the economy and the welfare of the country. An old Turkmen proverb says, "A drop of water is a grain of gold". This reflects the historical attitude of the Turkmen people to water as one of the most precious natural resources.

Although agriculture's share of GDP has decreased over the years, declining from 18.6 per cent in 2004 to 11.5 per cent in 2009 (mainly due to the increase of other sectors), agricultural output has stayed more or less stable. Water for irrigation is crucial.

Agriculture, including irrigation, is the major water-using sector in Turkmenistan (using close to 90 per cent in 2008 and 2009). The other water uses are: domestic and drinking water supply, industry and other uses. The breakdown of data for 2008 and 2009 is presented in Table 7.1. The cultivable area is estimated at 7 million ha, or 14 per cent of the total area of the country.

Table 7.1: Water use per sector, 2008 and 2009

Water Use	million m ³	
	2008	2009
Agriculture (incl. irrigation)	16,872	15,883
Domestic and drinking water supply	460	458
Industry	1,425	1,423
Other	11	8
Total	18,768	17,772

Sources: *Statistical Yearbook 2000-2008, 2009; Statistical Yearbook 2000-2009, 2010.*

The same irrigation canals and reservoirs are the sources of water for municipal, rural and industrial water supply and, on a smaller scale, for power generation, watering of pastures, commercial fishing, transport and recreation.

Water management in Turkmenistan was formerly based on traditional arid-zone water management schemes, which underwent gradual change due to the construction of extensive canal systems, the largest being the Karakum Canal, together with a collector-drainage network and artificial lakes such as Lake Altyn Asyr. The overall length of the irrigation canal

¹⁵ The bottom of a lake that dries up periodically; found in areas of clay-based soils in desert and semidesert zones.

system is 42,500 km and the collector-drainage network up to 35,000 km. Due to extensive use of old, traditional irrigation technology using increasing amounts of water, a large share (more than 60 per cent) of agricultural land is now salinized. Extensive work is ongoing to improve this situation, the goal being to decrease the amount of salt in the ground by some 5-7 million t per year. According to preliminary analyses and assessments, Turkmen authorities expect that the construction and finalization of drainage-collector systems for Lake Altyn Asyr should lower the groundwater level over a large swathe of territory and stop the process of salinization as well.

Although water is free for all, resources are limited and there is insufficient access to water in many rural areas. The Government keeps water high on the political agenda. Strategies are in place to improve water supply conditions for the overall population. The complicated complex of governmental authorities includes a number of ministries and institutions which are responsible for the implementation of governmental water programmes. These programmes are mainly funded by the Government.

7.2 Institutional, policy and legal framework for water management

Institutional arrangements

The Cabinet of Ministers executes the following functions: improvement of the main parameters and programmes related to water resource development, regulation and supervision of transboundary cooperation with neighbouring countries, and definition and regulation of some other duties relating to water management. There are two line ministries, MoWE and MoNP, responsible for water resource management and water protection.

MoWE is responsible for water management, water delivery and canal systems. The majority of water intakes, larger canals and water mains, and reservoirs are under MoWE management and supervision. For example, MoWE operates 33,400 km of internal canals which are part of the irrigation network, including the Karakum Canal, which has a length of over 1,300km, incorporates 115 hydrotechnical facilities and features three reservoirs with a total capacity of 2.4 km³. MoWE has provincial branches which operate within provincial administrative boundaries. The main tasks of MoWE are:

- Managing water resources, planning, distributing, controlling and accounting for the rational use of water;

- Managing the water inventory;
- Implementing within its competence, and monitoring compliance with the work of meteorology and standardization;
- Acting as customer and general contractor for the design and construction of the Karakum Canal, as well as other large water projects and its own production facilities, to implement maintenance activities on water systems, and as contractor for the construction of water facilities on the orders of ministries, departments, enterprises and organizations;
- Issuing licences to perform work on the design, construction and operation of water systems and carrying out State supervision of the correct implementation of commitments on these issues.

MoNP is the main institution responsible for State policy and intersectoral control over environmental protection and use of natural resources (Chapter 1). It is also responsible for overall control of remedial actions and the protection of ecosystems, prevention of deterioration of surface and groundwater resources, monitoring of environmental media and ecological appraisal of projects. RPEM, which is subordinated to MoNP through NDIFF, is responsible for systematic monitoring of environmental pollution and assessment of the state of the environment. MoNP's provincial NPDs, in cooperation with the MoWE branches, issue water-use permits (Chapter 2).

There are a number of other governmental institutions with different functions related to water management. Hydromet is responsible for monitoring and forecasting within the hydrometeorological regime; the State Concern TurkmenGeology is responsible for carrying out geological surveys and monitoring groundwater; SES (under MoHMI) is responsible for nationwide supervision of epidemiological status and the quality of drinking water; and the State Committee for Fisheries is responsible for the protection of fish stocks. The Institute Turkmensuylymtaslama is a State enterprise responsible for the design of water supply and sanitation, as well as water schemes. The Basin Water Organization AmuDarya of the Interstate Commission for Water Coordination regularly performs hydrological and hydrochemical monitoring on the Amu Darya River. Five provincial departments on water resources management are also involved in monitoring work.

Some of the subordinate governmental agencies are technically capable of conducting monitoring according to current regulations, whereas many

provincial laboratories are not capable of executing these functions at the required level due to a lack of technical and adequate human resources.

Local administrations also have certain responsibilities in water conservation management, as local executive powers approve water protection zones at the water distribution mains and other water supply facilities.

However, institutional arrangements indicate that there is an overlap between functions of the main agencies, as the water resource management system is mainly based on territorial administrative methods. In the current situation, interdepartmental communication among different parties, such as water supply organizations, provinces, districts and community-based organizations, NGOs and the general population, is insufficient and may mitigate against finding a more efficient solution to the water problem. In addition, the participation of the private sector in water resource management activities is insufficient and needs to be improved.

Water policy

Public access to safe drinking water is officially declared to be a priority of State policy. This policy is mainly implemented through the development of centralized systems of water supply and sewerage services. Turkmenistan has planned to achieve the water supply and sanitation targets of the MDGs, given that by 2015 the centralized water supply systems are expected to cover 92.7 per cent of the urban population and 71 per cent of the rural population.

NEAP, which expired in 2010, aimed at addressing environmental issues by implementing activities such as protection of ground and surface water. Another important document is Strategy 2020, which is complemented by Strategy 2030. According to the latter, a considerable proportion of irrigated agricultural land is to be transferred to the private sector. Private land users are expected to introduce more effective and efficient water use technologies and water-saving practices.

A general Programme on Improvement of Pure Drinking Water Supply to Settlements is in place and relevant large-scale projects are under way in all provinces. The Programme includes such actions as the construction of new pipelines, pumping stations and water purification stations, and the rebuilding of old water supply systems.

Legislation

The 2004 Water Code sets the boundaries of jurisdiction and defines the responsibilities of the main public authorities for water management.

According to the Water Code, water for household and drinking purposes is free of charge, as is water for irrigation (according to permit specifications). Only water for industry shall be delivered for fees, according to established tariffs. At the same time, the reconstruction and operation of water supply systems shall be the responsibility of municipalities and shall be done at the expense of the State. Consequently, as water users are not responsible for maintenance expenditures, it is complicated and difficult to achieve reductions in water use in general (Chapter 3). Such an approach completely eliminates the possibility of using flexible financial mechanisms and incentives to stimulate the introduction of modern water-saving technologies and practices. This is particularly important for Turkmenistan, where water losses from the irrigation network and evaporation due to water-extensive irrigation practices are still high.

The main principles of integrated water management are specified in the Water Code, as a requirement for the development of basin schemes for the integrated use and protection of water resources. Such schemes are designed by MoWE and approved by the Cabinet of Ministers.

As there was a further need to improve water supply and regulate the water sector, the Law on Drinking Water was adopted in 2010. It defines requirements with regard to quality assurance of drinking water and its safety for public health, in addition to protection of sources of potable water and their use. The economy and financing of drinking water supply depend on State support in the form of soft loans, State funding and local budgets. In the event that users exceed the limit of free water use (240 l per person per day) established by the Cabinet of Ministers, they pay according to fixed tariffs. In other cases, the limit of free water use is fixed in the permit.

The Water Code contains standards in respect of the use and protection of water, such as a standard of environmental safety of water use, an environmental standard of water quality in water bodies, maximum permissible discharge of pollutants, industry

technological standards of generation of substances dischargeable into water bodies, and technological water-use standards. In many cases, these standards are obsolete and need to be revised and updated, in cooperation with other Central Asian countries where necessary.

7.3 Water resources and their use

Water resources

There is practically no surface run-off on the territory of Turkmenistan. The episodic run-off can occur only in some places formed by takyr and takyr-like soils after rains of more than 3-5 mm. This local run-off and reserves of groundwater form the water resources of the desert of Turkmenistan. Since the rivers' flow mainly forms beyond Turkmenistan's boundaries, the main source of irrigation for the major Turkmen oases is water from the country's neighbours.

Surface water

Turkmenistan's surface water resources may be divided into two groups. The first group includes the rivers formed beyond the country's boundaries, such as the Amu Darya, Atrek, Murgab and Tejen Rivers, and small rivers of the eastern and central Kopetdag area (Table 7.2). The second group is composed of 20 small rivers of the northern slopes of the Kopetdag Mountains and more than 350 dry river beds in Greater and Lesser Balkhanov and Köytendag. A feature of the country is that almost the entire hydrographic network, except for small streams on the north-eastern slopes of the Kopetdag Mountains, i.e. 95 per cent of surface water, is formed outside the country.

The most important river is the Amu Darya River, which is 2,540 km long and has a catchment area of 309,000 km². The Amu Darya River basin lies in the eastern part of Turkmenistan and part of Tajikistan and Uzbekistan, Kyrgyzstan and Afghanistan. The Amu Darya River plays an important role in the economy of the country. The agreed share of Turkmenistan is 22 km³ per year (Chapter 4). Every year, 10-12 km³ of water is diverted from the Amu Darya River to the Karakum Canal for the central part of Turkmenistan. Irrigation systems in Lebap Province take 3-5 km³ and Dashoguz Province 4.5-7.5 km³.

The Murgab River is the second largest river, with a drainage basin of almost 46,900 km². It is 852 km long, of which 350 km is on Turkmenistan territory. The annual discharge of the Murgab River is 1.631 km³ per year. Since ancient times, irrigated

agriculture has been the predominant water user in the basin. Currently, the irrigation return waters do not significantly influence the river's water quality. According to the 2006 measurements (at Iolontanj and Takhtabazar stations), the river's mineral salt content was moderate, reaching 500 mg/l, and the maximum concentrations of nitrogen compounds exceeded the MAC values only by a factor of 3.

The oxygen regime was satisfactory. However, water pollution by organic compounds increased over the last couple of years: in 2006, the mean annual chemical oxygen demand (COD) was 65 mg O₂/l and its maximum was 154 mg O₂/l (at Iolontanj station).

The Tejen River is 1,124 km long, with a drainage basin of 112,204 km², and flows to the west of the Murgab River. Its annual discharge there is about 0.87 km³ per year. Irrigated agriculture is the predominant water user. However, the river's waters can only satisfy the water demand of 15 per cent of the agricultural land suitable for irrigated agriculture.

To better satisfy agricultural water demand, in 2005, the Islamic Republic of Iran and Turkmenistan completed the construction of the Dostluk ("friendship") dam and reservoir (of 1,250 million m³) on the Tejen River. Following a bilateral agreement between the two countries, the reservoir's water resources are equally shared. The irrigation return waters heavily influence the river's water quality. In 2006, the river's mineral salt content was in the order of 1,900-2,000 mg/l and COD reached 277 mg O₂/l (at Tedshen city station). In some years, between February and June, the Tejen River has significant flooding.

The Atrek River is located in the south-west of the country. Its flow to the Caspian Sea is not significant and can occur only with floods. It is caused not only by the small amount of precipitation falling in the Atrek River's watershed, but also by the intensive withdrawal of water for irrigation in the Islamic Republic of Iran. The average annual flow is 0.26 km³ (260 million m³ per year). The long-term mean annual discharge of the river in Turkmenistan is 0.354 km³. Following a bilateral agreement, the river's water resources are equally shared between the Islamic Republic of Iran and Turkmenistan.

Irrigated agriculture is the predominant water user in the Atrek River basin. Of the total area of fertile land in the basin, only 25 per cent can be irrigated due to a lack of water resources. The irrigation return waters heavily influence the river's water quality; its mineral salt content reaches 1,800 mg/l. According to the 2006 measurements in Turkmenistan, the mean

annual oxygen content was “satisfactory”. The mean annual concentration of nitrogen compounds did not exceed the MAC values and their maximum values exceeded the MAC values only by a factor of 3. The maximum values for phenols, oil products and sulphates, however, exceeded the MAC values by a factor of 11, 12 and 10 respectively.

The total average flow of the large and small rivers and large springs is 25 km³ per year and the flow of 90 per cent probability is 22.8 km³ per year. In addition, there are a number of small freshwater aquifers with an average flow of 0.47 km³ per year, and return waters from irrigation with an average of 9.9 km³ per year. An additional source of surface water is three natural lakes of seepage origin in Balkan Province. Water from these lakes is used for industrial and household supply.

Groundwater

Estimated resources of fresh groundwater are less than 9.4 million m³ per day, while confirmed resources are about 3.5 million m³ per day. Renewable groundwater resources are estimated at 3.36 km³ per year, of which about 3 km³ per year are estimated to be infiltrated from the rivers. The uneven location of proven groundwater resources complicates the use and development of water supply systems as far as households and enterprises are concerned.

Groundwater within the territory of Turkmenistan is mainly salty, but in 124 sources of groundwater the water is fresh and good as drinking water. Groundwater abstraction decreased during recent years, from 0.426 km³ per day in 2000 to 0.286 km³ per day in 2009.

Table 7.2: Available water resources

River/source	Annual discharge km ³ /year
Amu Darya River	22.000
Murgab River	1.631
Tejen River	0.869
Atrek River	0.354
Small rivers, large springs	0.150
Total surface water	25.004
Total groundwater	1.269
Total	26.273

Sources: NEAP, 2002; Ministry of Nature Protection, 2011.

Water use and the status of the water infrastructure

Canals

There are a number of canals and water reservoirs in Turkmenistan. The Karakum Canal, one of the longest canals in the world, is 1,375 km long. Its capacity is 630 m³/s and the average intake is 340-380 m³/s. Accordingly, every year the Karakum Canal brings 10-12 km³ of water to the central part of Turkmenistan. Water loss from the canal is estimated at 18 per cent, and has caused massive waterlogging and salinization of the surrounding land. The Karakum Canal, together with a cascade of small reservoirs, forms an integrated irrigation complex extending across four provinces.

Irrigation

As in other Central Asian States, the main water use in Turkmenistan is for irrigation, which accounts for more than 90 per cent of all water used. The irrigated area of land covers nearly 2 million ha. In recent years, the volume of water used for irrigation has been between 16 and 19 km³ per year.

There are 16 reservoirs for irrigation purposes with a total capacity 3.7 km³. Three reservoirs are built along the Karakum Canal and have a total capacity more than 2.5 km³.

Current irrigation practice, which is characterized by low coefficients of water use efficiency together with intensive drainage, has led to the drastic activation of geochemical flows, deterioration of water resources quality, and development of soil salinization. In 41 per cent of the irrigated area, the groundwater has salinity of 1-3 g/l; groundwater with salinity of less than 1 g/l was observed over an area of 60,200 ha; and groundwater of more than 5 g/l was observed over an area of 688,000 ha. The highest salinity value of groundwater was observed in Akhal Province (more than 10 g/l over 37 per cent of its irrigated area) while in Lebap and Dashoguz Provinces the salinity of groundwater in irrigated lands is relatively low. Such significant volumes of highly saline drainage water have resulted in the increased salinity of river water, which is particularly manifested in their middle and lower parts. Salinity of the water in the Karakum Canal doubled during the decade to 2011.

Discharge of drainage water into natural depressions has brought about the formation of 275 lakes with a total area of 4,286 km².

The quota of water for agricultural purposes in three provinces (not counting Balkan and Dashoguz) is 92.5-96.4 per cent of total water supply. In Dashoguz Province, this figure runs as high as 99.7 per cent. An updated intrafarming irrigation network with lining, troughs and pipes exists only in the newly developed lands of Akhal, Balkan and Mary Provinces, while in Dashoguz and Lebap Provinces and the lands under "old" irrigation, such an updated irrigation network is lacking, accounting for only 0.6-1.2 per cent of the total irrigation system. Thus, in Dashoguz and Lebap Provinces, actual water use for irrigation is 18,400-18,800 m³/ha, while average water use in Turkmenistan is 17,000 m³/ha – both these measures, however, far exceed the agrotechnical standards for irrigation.

The transition from extensive to intensive water use is critically important. It includes the qualitatively new technical level of water economy, reconstruction of the irrigation system, wide application of water-saving technologies, and the introduction of recurring use of treated drainage water.

Turkmen authorities are involved in discussions with other Central Asian countries to reduce the water deficit in the subregion by the improvement of the technical state of the irrigation system and the application of modern water-saving irrigation techniques and closed systems of water supply.

Households

The majority of water supply systems were built in the period 1950-1980. It is not possible today to deliver water in the required quality and quantity to water users. About 60 per cent of the urban population obtains water from centralized water supply systems around the clock. Other users have access to water 6-8 hours per day. As there is a high level of water loss (up to 75 per cent), there is also high average water use – up to 320 l per person per day; in Ashgabat, up to 490 l per person per day. The population's level of access to drinking water is especially low in the rural settlements, where only 42 per cent have access to water, and they might use it for watering their plots.

Although there are more than 1,200 water intake facilities in Turkmenistan, there are only 17 water treatment facilities, which is not sufficient for all people. In many small towns and settlements, the lack of professional skills and various other factors

limit maintenance works to emergency and rehabilitation works.

In recent years, the Government has implemented the Programme on Improvement of Pure Drinking Water Supply to Settlements. During 2008-2010, 54 km of water supply pipelines were constructed, which marks a step towards normal water supply conditions in Ashgabat. However, the pace of such work is insufficient for the country's needs. For example, in Ashgabat alone, where the water supply system was mainly constructed in the period 1970-1980, there is a need to renovate 240 km of old pipelines, of which 23 km are asbestos-cement pipes, which are not suitable for drinking water systems at all.

Hydropower

The gross hydropower capacity potential of the country is estimated at 5.8 GWh. There is only one hydropower plant, at Mary, with an installed capacity of 1.2 MW, which corresponds to 0.03 per cent of the total installed capacity of 4,100 MW in 2010. The greatest potential for small hydropower is seen in the southern part of country, on the Murgab and Tejen Rivers and the Karakum Canal.

7.4 Water quality and monitoring

Surface water

The Amu Darya River is classified as being moderately polluted. More than 5.3 billion m³ of collector-drainage water is discharged into the river from irrigated land. The mineralization of river water reaches its maximum level at Darganata at about 2.2 g/l. During the period of spring floods, the mineralization level reduces to 0.43-1.38 g/l. The chemical composition of water in the Karakum Canal corresponds to the chemical composition in the Amu Darya River.

The water quality in the Murgab River is more favourable, but in some sections of the river it is already necessary to carry out urgent measures to protect water resources.

The quality of water in the Tejen River is worse than that in the Murgab River. Concentrations of the main polluting substances are often higher than the MACs. The highest quality of surface waters is in small rivers in the central Kopetdag Mountains.

Groundwater

The quality of groundwater in the mountainous area of Kopetdag, the piedmont plains and the desert

areas, and along the Karakum Canal, is generally in line with the State drinking water standard. However, in some water intakes along the water mains, increased mineralization, phenols and nitrates are present.

Monitoring

Currently, many public authorities are responsible for and conduct regular monitoring of water resources. Their work is rather scattered, uncoordinated and geared to sectoral interests. Furthermore, data and information collection is poor, and reports are available to selected institutions but rarely to the public (Chapter 5).

7.5 Wastewater management

Collector-drainage water

The annual discharge of collector-drainage water into surface water amounts to 4.3 km³, of which about 1.82-2.66 km³ is discharged into the Amu Darya River, and the rest into canals and small rivers. In the lower reaches of the Amu Darya River, water salinity in the low-level period increases up to 3 mg/l. At present, collector-drainage water is not treated at all and is not used for irrigation. The annual volume of drainage water in Turkmenistan is 8 km³, of which 6.6 km³ is formed by drainage waters, of which 0.17 km³ is reused.

Return waters from agricultural fields are discharged through the collector-drainage network into natural cavities. As a result, artificial drainage lakes have formed. At present, these waters are diverted through a number of canals into Lake Altyn Asyr. This lake, with a planned volume of 130 km³ and a 2,700 km network of input canals, plays an important role in Turkmenistan's future plans. This water resource is used for improving water conditions of surrounding pastures and fields. It is intended to collect drainage water from the irrigated lands of the Lebap, Mary and Akhal Provinces, and partly from Dashoguz and Balkan Provinces, and direct it to the Karashor depression in northern Turkmenistan where Lake Altyn Asyr was created.

The lake is intended to receive drainage water via two systems – northern and southern. The northern system is to collect drainage water from Dashoguz and, partly, the Khorezm oasis of Uzbekistan, while the southern system is to collect drainage from Akhal, Mary and Lebap Provinces. The total length of the Trans-Turkmen Collector is 720 km. As no antifiltration measures are envisaged during the construction of the Trans-Turkmen Collector,

waterlogging of adjacent areas on both sides of the main collector may occur, and relevant monitoring and practical measures are required. As yet, there is no information about implementation of an effective method for neutralizing salinated drainage water. The programme on drainage water desalination, although potentially beneficial for the country, might not provide an optimum solution given the cost-benefit ratio. At this stage, it is necessary to start with the construction of small pilot installations, which could demonstrate the technical and economic possibilities of desalination.

Municipal wastewater

Sewerage systems are available only in major cities, covering some 62 per cent of the urban population. Rural areas are characterized by a lack of sewerage systems: only 2 per cent of the rural population is covered by sanitation systems and people discharge wastewater directly into ditches and soil courtyards, which remains a serious problem that may cause diseases. The volume of sewage water received by the sewerage systems is approximately 35 per cent of the total water delivered by the current centralized water supply systems. At the same time, the state of the existing sewerage systems is very poor. Only three sewage treatment plants existed in Turkmenistan in 2010 and were located in Ashgabat, Turkmenbashi and Turkmenabat.

Industrial wastewater

Although industrial production activities in Turkmenistan are not as extensive as in industrialized countries, untreated or insufficiently treated industrial wastewater may still cause considerable environmental problems, as one of the main industrial activities is fuel production. There are problems with oil pollution and inefficient wastewater treatment. In Balkan Province, for example, more than 50 per cent of all available water is used for industry. Untreated wastewater from industry is a problem there. However, reconstruction of the refinery and improvements to oil extraction practices have reduced oil pollution of the Caspian Sea, but permissible limits for discharges are still exceeded.

Water conservation

Water conservation is a very important issue for Turkmenistan in general, as water losses account for more than 50 per cent of total water use, due to ineffective irrigation systems, including obsolete equipment and pipelines. A significant proportion of

drainage water flows into the deserts without any treatment. A network of collectors was constructed to transport drainage water into desert depressions.

In order to achieve progress in this area, the irrigation schedule should be improved and integrated management of land and water resources introduced. In addition, more attention should be paid to the introduction and use of modern irrigation techniques.

7.6 Protection of the Caspian Sea environment

The main Turkmen enterprises of the oil and gas industry are concentrated in the coastal zone of the Caspian Sea, in Khazar and Balkonabad and the oil processing industries in the port of Turkmenbashi, along with chemical works in the towns of Khazar and Karabogaz. A large proportion of the population on the Turkmen coast of the Caspian Sea lives in urbanized settlements and is employed in the oil and gas industry, while a small proportion is still occupied with fishery and agriculture.

Biodiversity

The range of flora and fauna on the Turkmen south-east coast of the Caspian Sea includes 854 species, or one third of the biodiversity of the sea in general. This includes 420 vertebrate species, including 48 species of fish, 29 reptiles and two amphibians. There are 293 species of birds, representing 21 classes. Up to 600,000 birds are recorded annually to be wintering in the waterfowl habitat of the Khazar State Reserve.

Fishing

The Caspian Sea is crucial for Turkmenistan, as fishing, for example, continues to play an important role in rural seaside communities. There are more than 100 fish species and subspecies, of which the most famous are four species of Caspian sturgeon: the white, stellate, starlet and Russian sturgeon. Currently, fishing possibilities are rather limited, as there is no legal fishing for sturgeon in the Turkmen sector of the Caspian Sea. Turkmeniski Bay is considered one of the most important places where these species of fish grow.

The Government decided to build a fish breeding farm with capacity for 5 million fry (young fish) per year. The industrial complex for the artificial cultivation and production of sturgeon was built in Gyyanly, in Balkan Province. Its annual capacity will

provide stable production of around 120 t of commercial sturgeon, 5 t of sturgeon eggs and about 5 million units of juvenile sturgeon for release into the Caspian Sea.

Pollution

Currently, the most important forms of pollution in the Caspian Sea region are chemical pollution, discharges of nutrients causing eutrophication and oil spills, which exert adverse impacts on the marine environment. These pollutants originate primarily from sewage, agricultural run-off and oil-related activities, and are transported by rivers and discharged into the Caspian Sea.

Pollution from offshore extraction of oil

The coastline of Turkmenistan is approximately 1,200 km long and the marine environment is facing pressure from the oil industry. The area of greatest offshore development in Turkmen waters is near Turkmenbashi, Cheleken and Ogutchisky Island. There are 58 offshore platforms near Cheleken, with 116 wells. Many of these wells cause pollution in the Caspian Sea.

Oil terminals are another significant potential source of pollution in the Caspian Sea. Each year, three million t of oil and oil products are transported through Turkmenbashi port, 2.4 million t through Aladzha and 1.2 million t through Erekem. Estimated potential growth is up to 20-40 million t in total.

The general level of pollution along the Turkmen part of the Caspian Sea coast has fallen in recent years. A number of dangerous sources of pollutants have been reduced considerably. Nevertheless, there is still a clear risk of large-scale accidents in the future, in connection with the activity of the oil and gas sector economy. It is important to control maritime transport, as this is expected to become one of the main risk factors for the ecosystem of the Caspian Sea.

Agriculture

Cattle breeding is undertaken in pastures distant from the Caspian Sea, where the natural conditions include a shortage of water resources. There are no environmental pressures from agriculture in general on lands bordering the Caspian Sea, as it is impossible to grow agricultural crops on that land and the risk of coastal pollution by chemicals and pesticides is avoided.

Photo 7.1: Karakum Canal

Tourism

The Caspian coast in Turkmenistan is suitable for tourism, with its hundreds of kilometres of sandy beaches, unique natural landscape, generally clean sea water, low population density and a long bathing season. Until recent years, however, tourism has not been a well-developed sector.

Now the Government has started to pay focused attention to building up some tourism areas on the coast. The Avaza national tourist zone is one example of promising, ongoing economic projects. In Avaza, the new water treatment facility with a capacity of 11.9 million m³ per year has been put into operation to offer uninterrupted clean drinking water to citizens and guests of the town. The water supply system has also been rehabilitated in Turkmenbashi, where several new pumping stations, drinking water reservoirs and thousand of metres of new pipelines were installed.

International agreements, laws and plans

The Tehran Convention, ratified by Turkmenistan in 2004, is the first international agreement for environmental protection of the Caspian Sea. It is an important tool for ensuring uniformity and standardization of environmental standards with regard to economic activities in the Caspian Sea area. Issues such as emergency response management, protection of nature reserves and biological diversity are addressed through the Tehran Convention, and are essential considerations for oil and gas companies operating in the area.

The Law on Hydrocarbon Resources was recast in Turkmenistan in 2008. The Law stipulates that environmentally appropriate clean-up and restoration must be undertaken in the event of pollution as a result of oil-related activities. The Law also prohibits dumping or storing petroleum waste at sea, and only permits dumping wastewater at sea after it has been cleaned to a permitted level of pollution. Despite the Law, however, Turkmenistan still lacks the technical capacity to mitigate negative impacts of oil spills; for example, the country does not have even a single ship specialized in dealing with offshore oil pollution.

The Protocol Concerning Regional Preparedness, Response and Co-Operation in Combating Oil Pollution Incidents was adopted and signed by the parties to the Tehran Convention in 2011. When in force, it will help in coordinating responses to oil spills in the Caspian Sea.

CEP, based on principles of the Tehran Convention, established a sufficiently good environmental framework for all the littoral Caspian Sea States. Implementation of the Programme is supported by GEF under the supervision of the relevant Steering Committee. The total summary budget for the period 2008-2011 was US\$ 47.343 million, of which US\$ 32 million was provided by the Caspian Sea States. Turkmenistan's share of the Programme budget was relatively small. During the period 1998-2011 it was US\$ 1.475 million for environmental monitoring equipment and US\$ 0.85 million for projects and programme management. Among the activities were water supply projects for the coastal settlements of Chekislir and Gōjanlo, and the clean-up of coastal

areas in Turkmenbashi. MoNP is responsible for implementing the Programme on the Turkmenistan side and it coordinates relevant activities of different ministries and institutions quite effectively. However, more activities and investments within the framework of coastal zone management are needed, as many goals set under CEP require actions.

7.7 Conclusions and recommendations

The water management sector in Turkmenistan plays a significant role in the whole country's economy, as a big share of agricultural production depends on water availability, mainly for irrigation. There are also water supply needs for the population and for industry. The water sector has developed over the past 20 years based on a planned economic management system. The President and the Government outlined the country's priorities for water management in Strategy 2030. Much attention is given to reformulating and extending the legislative and regulatory framework, and the recently adopted Law on Drinking Water was a key step in that direction.

However, despite current regulations and programmes, water resources are not used efficiently and the quality of surface water bodies is degraded and under continuous pressure. Although the main principles of IWRM are set out in the Water Code, it is necessary to reorganize the water management system throughout the country, by means of a national IWRM plan covering not only the country as a whole but also individual water basins separately.

Recommendation 7.1:

The Ministry of Water Economy, in cooperation with relevant authorities in water management, should develop legal acts on integrated water resources management (IWRM) in water basins, based on the results of analysis of the current water legislation, to identify how to apply principles of IWRM.

Recommendation 7.2:

The Ministry of Water Economy should:

- (a) *Develop a national IWRM plan with the involvement of relevant water users in the planning process;*
- (b) *Establish basin management structures for the Murgab, Tejen and Atrek Rivers, and also for relevant canal systems, and ensure the coordination of actions according to a detailed plan.*

According to the Water Code, water in Turkmenistan for irrigation and drinking water purposes is free of charge within the allocated limits. The Government is

responsible for the development of irrigation and drainage systems at the basin and sub-basin level. Although the Government pays great attention to water-saving ideas, there is still a shortage of analyses and practical guidelines on how to save water, using both economic and technological means. To reduce the water deficit, it is possible to take measures by improving the technical state of irrigation systems and applying modern water-saving irrigation techniques and a closed system of water supply.

Recommendation 7.3:

The Ministry of Water Economy should:

- (a) *Analyze water economy and environmental consequences on water delivery by both open canals and pipelines;*
- (b) *Ensure water savings, and optimal and environmentally sustainable water use, by effective and cost-efficient regulatory, economic and technical measures.*

The value of water in the country is high. The national event, "A drop of water is a grain of gold", is widely celebrated every year at the beginning of April. There is widespread public understanding that water should be managed economically in a sound way. It became clear during the past decade that there would be a water shortage if the volume of water in the Amu Darya River were to decrease owing to the traditional method of water use.

The elaboration and implementation of modern economic instruments may help to better control the delivery and rational use of water. Use of economic instruments may also improve accountability for resources used, and provide incentives to improve technologies and management techniques. It is important to introduce effective economic mechanisms between water users and governmental water delivery institutions.

Recommendation 7.4:

The Cabinet of Ministers should:

- (a) *Develop further legislation facilitating the improvement of existing economic instruments, and the introduction of incentives and subsidiary mechanisms to support effective water use;*
- (b) *Develop a national water-saving programme with concrete incentives for introducing efficient water-saving methods;*
- (c) *Review the norms for household water use in order to promote water savings.*

There are governmental programmes to improve the water management situation in the country, both in

irrigation and in the water supply and sanitation sector. There are concrete tasks to undertake regarding the main drainage collectors and Lake Altyn Asyr. Important works are planned for the rural water supply sector. A State programme is being implemented for improving water supply. The Government plans to pursue its investment in the water sector. At the same time, there is a need to look for new funding possibilities (e.g. in the private sector), especially with the idea of improving settlements' water supply systems.

Recommendation 7.5:

The Cabinet of Ministers should continue mobilizing new investments programmes by more actively pursuing all possibilities, including the involvement of the private sector, in areas such as modern water-saving technologies for efficient irrigation practices and better water supply infrastructure.

The Caspian Sea and its resources are important for Turkmenistan. Turkmenistan has elaborated several plans and programmes to tackle environmental problems affecting sea areas. Among these are CEP and the Oil Spill Prevention and National Response Plan. The Government attaches high priority to implementing these programmes and plans, and the

general level of pollution along the Turkmen part of the Caspian coast has fallen in recent years, giving Turkmenistan an opportunity to use the potential of the Caspian Sea coast for recreational purposes. Accordingly, it is important to coordinate all available resources in a more effective way under coastal zone management plans, with clear and measurable indicators for supervision.

Recommendation 7.6:

The State Enterprise of Caspian Sea Issues under the President of Turkmenistan, together with other relevant institutions, should:

- (a) *Develop coastal zone management plans to significantly improve control over water pollution, introduce environmentally sustainable aquaculture and increase the marine area under protection;*
- (b) *Develop further monitoring capacity, both offshore and on the coast;*
- (c) *Expand the capacity for pollution response to minimize the risks from the activities of the oil and gas sector;*
- (d) *Assist with the implementation of obligations under the signed protocols on the protection of the Caspian environment.*

Chapter 8

LAND MANAGEMENT

8.1 Introduction

Land

In Turkmenistan, three main natural landscape zones may be distinguished: deserts, oases and mountains. The territory of Turkmenistan is 491,209 km². About 80 per cent is occupied by the Karakum Desert, one of the largest deserts in the world. Four fifths of the country lies at an elevation of 500 m above sea level or less. The Archakay depression located in the north-central part of the country is the lowest point, with an elevation of 92 m below sea level, and the highest point is the peak of Turkmenbashy (or Ayrýbaba), at 3,139 m in the Köýtendag range (the western extent of the Pamir-Alay). Thus, no high mountains with permanent snow and glaciers are present in the country.

The Kopetdag Mountains border the Islamic Republic of Iran and the Köýtendag Mountains are located in the extreme south-east on the border with Uzbekistan. The Balkan Mountains separate the coastal area into a northern and southern part, while the Usturt Plateau dominates north-western Turkmenistan. Along the Caspian Sea coast, elevations are at or below sea level for as far as 150 km inland.

Soils

The dominant soil type is desert sandy soil (38.7 per cent of the territory) and sierozem, grey desert soil (25.5 per cent). Pure sands cover 9.1 per cent of the territory and often move under pressure of the wind (deflation). These sand drifts are called barkhans. Takyr and takyr-like soil cover 10.4 per cent of the territory. Saline soils (solontchaks) occur in 5.5 per cent of the territory. The remainder includes alluvial soil (0.2 per cent), mountain brown soil (0.6 per cent), humic gley soil (2.7 per cent) and bare soil (7.5 per cent).

8.2. Institutional policy and legal framework

Institutional framework

State Commission on Land Issues

The State Commission on Land Issues is in charge of

supervising land use, performing official changes in land use, and monitoring land use (article 109 of the Land Code) (Chapter1).

Service of Land Resources of MoA

MoA is responsible inter alia for updating the State land cadastre, which comprises plots, land owners, tenants, users and quality, and actual use crops, and also performing inspections through its bodies. The Service of Land Resources of MoA ensures that the decisions of the State Commission are applied. The Department for Control and Protection of Land Resources within the Service of Land Resources monitors compliance with the legislation on land protection and applies sanctions for violations detected.

Units of the Department are established in all five provinces and at the level of districts. Provincial units have three inspectors each, and local units have between two and three inspectors. The district offices are in charge of the control of the land boundaries between the farmers' associations, and the inventory of cotton and wheat crops.

Inspections are made on land according to its destination (i.e. its specified use under the Land Code), respect for the borders of private plots and soil protection. Reports are compiled and sent to MoA. The information remains on paper. The cadastre is annually updated with the results of inspections. There is no modern electronic data system for updating and no GIS for compiling the results.

Local levels

In 1992, the former councils were replaced by local self-government bodies, *gengeshliks*, which are elected directly by the people of several settlements and which select the *archin*, head of the local government (*archinlik*). The *archinlik's* budget derives from the State budget. The *gengeshliks* endorse responsibilities in the regulation of local land use, and develop measures on conservation and exploitation of natural resources. They regulate water issues relating to the internal irrigation and collector-drainage networks on their territory.

Policies and strategies

Overall agricultural policy

The main objective of the agricultural policy is to make the country self-sufficient for all foodstuffs. Agriculture was a leading sector in Turkmenistan's economy, but its share of GDP has decreased from 18.6 per cent in 2004, to 12.1 in 2008 and 11.5 in 2009 (Figure I.1). Private farmers grow most of Turkmenistan's fruit and vegetables.

Cotton is the primary crop and occupies half of the irrigated land. Turkmenistan is also a net exporter of cotton fibre (90 per cent of agricultural production). In 2010, Turkmenistan was ranked ninth among the world's cotton producers. Between 1991 and 2004, some 14 new cotton-processing plants were opened, sharply increasing the capability of processing domestically produced cotton. More than 1.22 million t of cotton was harvested in Turkmenistan in 2010.

The other main crops – wheat and cotton – are entirely subject to State orders. Purchases of production are centralized by Turkmengalaonumleri (Grain Crops Association) and Turkmenpakta (Cotton State Concern). The Government estimates that the private sector in agriculture has not yet reached a satisfactory financial, technical, technological, and professional level and cannot be left without government support. Therefore, the State continues to support agricultural production, providing seeds, fertilizers, water supply up to the in-farm network and water disposal. There is a highly preferential system of taxation and credits for cotton and wheat producers working on a contractual basis. The State subsidizes 50 per cent of payment for seeds, chemicals and mineral fertilizers, techniques and machinery services.

According to Strategy 2030, wheat production is planned to grow 2.9 times and cotton production 4.9 times by 2020 as compared with 2000. Cotton and wheat production remained the priority task of the producers and (increased) targets were set for 2020 for wheat (4.25 t/ha) and for cotton (4.5 t/ha). Turkmenistan has a goal of export-oriented production in agriculture, not only for cotton but also for animal products. Accordingly, it is planned to expand the irrigated areas up to 4,000,000 ha by 2020. Nevertheless, the overall emphasis in the Strategy has been placed on increasing yields with less water and agricultural inputs.

Yields can be considered to be rather low (Table 8.1). By way of reference, the world average yield for

wheat was 3.5 t/ha in 2009 according to the Food and Agriculture Organization of the United Nations (FAO). According to the United Nations Conference on Trade and Development (UNCTAD), world average yield for cotton was 2 t/ha in 2007.

National Action Programme to Combat Desertification

NAPCD has been the main instrument for implementing the UNCCD. It was prepared in 1997 by NIDFF and UNEP.

In 2001, Turkmenistan joined CACILM. This offers a platform for countries to exchange experiences in implementing the UNCCD and to launch concrete projects at the local level, financed by foreign donors. Emphasis is placed on the participation of local stakeholders and land users in small-scale projects, on national capacity-building and on the selection and dissemination of good field experiences. The UNCCD national working group published the National Programme Framework (NPF) under CACILM in 2005 and the National Report on the Implementation of the Convention on Combating Desertification in Turkmenistan in 2006. A local secretariat of the CACILM coordination committee has been established.

Small-scale pilot projects were implemented under CACILM supported by GIZ, including planting trees (35 ha *Juniperus*) and fruit trees, reducing livestock in the mountains (Narhur) and the desert (Yzgant), fixing sand dunes (27 ha in Bokardok and Khalish), enhancing sustainable pasture management with the construction of wells and reservoirs (1,000 km²) in the Karakum Desert, and rehabilitating degraded and salinated land (85 ha) with the reconstruction of canals (10 km) in Sakarchaga. In 2007, the national project entitled Capacity-building and On-the-Ground Investments for Sustainable Land Management was launched, and a number of workshops and round tables were organized. Field studies to pilot plots are carried out with GIS referencing tools. After the implementation of the first phases, CACILM projects have not been continued.

Legal framework

Land Code

The 1990 Land Code, amended in 1991 and 2004, regulates land use. It contains the provisions for attributing land use according to its destination. The Code describes the territories or categories (as in Table 8.2).

Table 8.1: State-supported crops

	surface 2000 1,000 ha	yield 2000 100 kg/ha	surface 2009 1,000 ha	yield 2009 100 kg/ha	water need 2009 in m ³ /ha	Total water need 2009 in 1,000 m ³
Cotton	619.0	18	548.2	18	7,500	4,111,500
Wheat	741.0	11	878.5	16	6,500	5,710,250
Rice	11.7	..	18.6	..	21,000	390,600
Sugar beet	7.3	..	18.3	..	12,000	219,600
Total	1,379.0	..	1,463.6	..	47,000	10,431,950

Sources: *Statistical Yearbook 2000-2009*, 2010; Ministry of Water Economy, 2011.

For example, the State stock is at the disposal of the State and is used for agricultural purposes as long as it is not needed for other purposes. It has also been used for the establishment of private farms (see below). The Code stipulates that the transfer from one category to another requires an order from the Government or from the State Commission on Land Issues. It further specifies that the State establishes restrictions on the rights of land owners, land users and land tenants. Provisions on infringements (article 117) include damage to agricultural and pasture land. The Land Code outlines legal provisions for enterprises opening building or exploitation sites to handle with care and eventually restore the vegetation cover.

Furthermore, the Land Code contains provisions for qualitative soil protection, including the possibility of economic incentives for rational use and protection of the soil. The Land Code has all necessary provisions for territorial planning, land survey and monitoring, and land and soil conservation. The Regulations on Land Cultivation Procedure complement the Land Code. However, more detailed regulations for the implementation of the provisions, such as pasture rules, soil protection and liability for damage to land cover, are lacking.

A draft Law on Pastures has been prepared by MoA and was sent to the Cabinet of Ministers for consideration. This law would ensure the regulation of the allotment of pastures, define the rights and duties of pasture users and introduce a pasture fee in relation to the number of head of cattle on the pasture. It would define the carrying capacity of the pastures according to the standards of the existing pasture map and enforced by inspections.

Inspections would cover the number of head of cattle in relation to the carrying capacity and the state of the vegetation cover. Pasture users would be liable to restore degraded pastures according to the management plans set up by MoA and MoNP upon the recommendations of NIDFF, which has long years of expertise in this field.

The President issued a decree banning the transfer of arable land near populated areas to another category. However, there is no act regulating the use and the stocking of State-owned pasture.

8.3 Land use

Of the total 49.12 million ha of the country's surface, about 33.9 million ha are classified as agricultural land but it is mainly desert pasture (Table 8.2). Irrigated agriculture provides more than 70 per cent of gross agricultural production, and 80 per cent of it is concentrated in the south-east of the country.

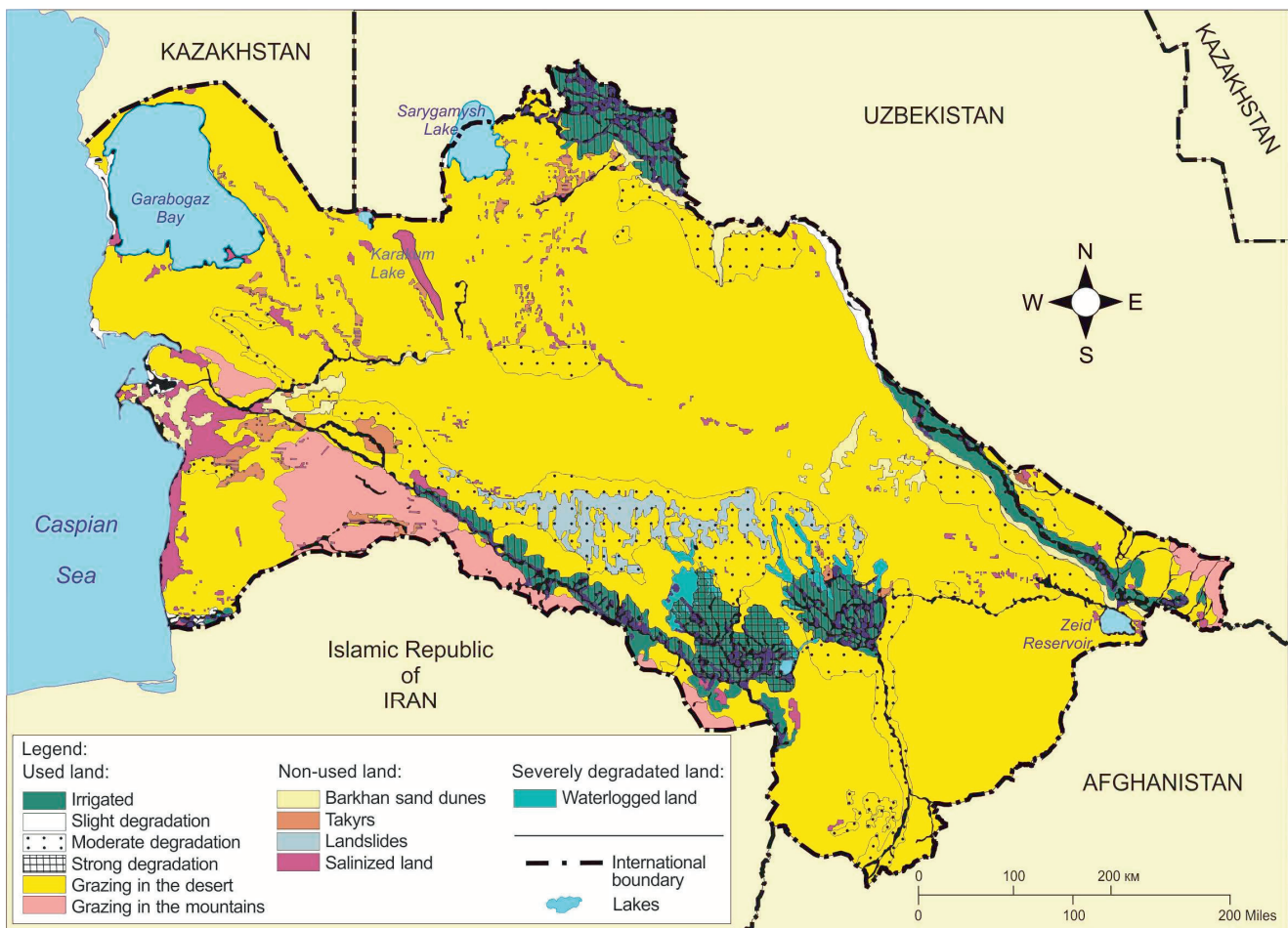
Oases and irrigated lands represent the most precious and fertile agricultural land. Natural watering agriculture had been developed in the country since the 1930s. Of the total area of Turkmenistan, 17 million ha are suitable for irrigation and agricultural cultivation; of these, 2 million ha are highly productive non-saline sierozems, which are also located in better-drained areas and less susceptible to land degradation. Only about 1.7 million ha are irrigated and used in intensive cultivation because of limited water resources. This total was increased by 371,000 ha between 1991 and 2001. The bogaras (non-irrigated crops) are limited to some 30,000 ha in the mountainous area because of the low rainfall. The intensifying shortage of water, which is absolutely essential for the development of agriculture, is the main challenge facing the country.

According to the Land Code, land users and owners are obliged to manage and use the land according to its destination and in a rational way; otherwise, private landholding or land use may be terminated. Users and owners are obliged to take all measures to preserve the fertility of the land and combat degradation, in irrigated land and in pasture. All land belongs to the State, except those plots allocated to private persons, with the right of succession, for farming in rural areas and for construction in cities and settlements. Irrigated land is rented to agricultural associations or any farming enterprise with payment of a long-term rent for 10 or more years.

Table 8.2: Official land use

	Surface 1,000 ha	%
Agricultural land	33,837.7	69.0
Forest fund	2,224.5	4.5
Water fund	460.1	0.9
State stock	10,033.0	20.4
Settlements (cities, settlements and rural settlements)	119.8	0.2
Land for industry, transport, energy, defence, others	1,657.2	3.4
Nature protection fund, including recreational, historical and cultural sites	788.6	1.6
Total	49,120.9	100.0

Source: Ministry of Agriculture, Service of Land Resources, 2011.

Map 8.1: Land degradation

Source: Ministry of Nature Protection, 2011.

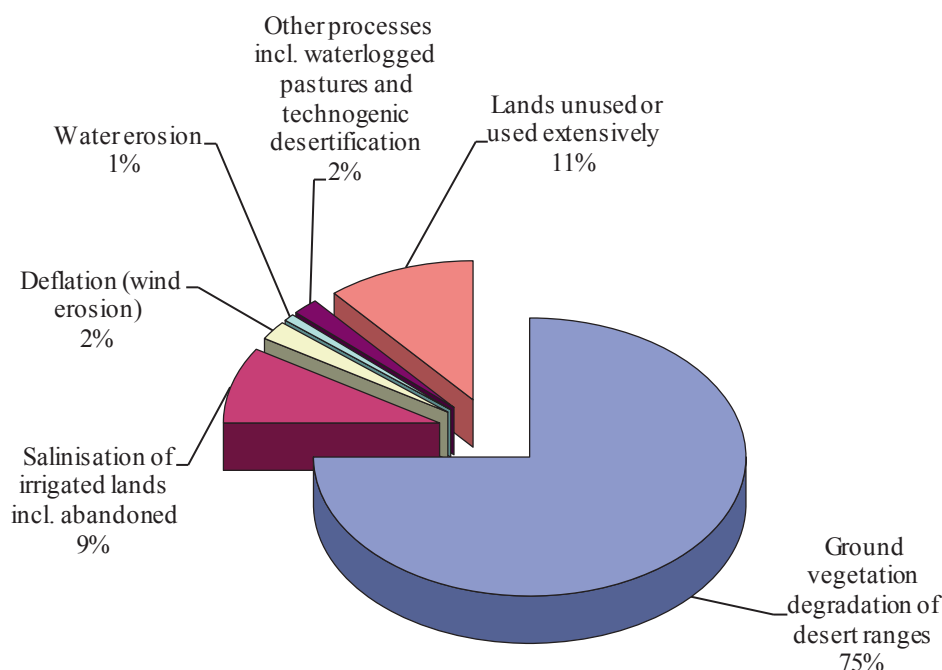
Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

The rental is under the condition that the fields' size and form are preserved, because of existing irrigation schemes. The minimum size of plots is 200 ha.

Private plots

Inhabitants of cities and towns were allocated plots of 0.10 ha for individual and private construction and

also for gardening, for their lifelong use with the right of inheritance. Citizens living in rural areas were allocated, free of charge, plots of land of 0.12-0.16 ha, and 0.32 ha in irrigated areas for the development of private subsidiaries (*melleks*) on which they grow crops (vegetables) for subsistence and for sale.

Figure 8.1: Type of land degradation

Source: NEAP, 2002.

Farmers may apply for and receive as private property land plots with an area of up to 3 ha (formerly 50 ha). If producers perform well over the terms of contract for 10 years, they receive land in private ownership. They also have the right of land utilization for the development of agricultural industry and product processing on the basis of free entrepreneurship. The decision on attribution of private property or a long-term lease is made by the farm associations (*daikhans*) themselves. With the 2004 Land Code, lands that could not be used properly by owners or lessors were taken back.

8.4 Land degradation

According to the 2006 National Report to the UNCCD, the main environmental issues in Turkmenistan are the degradation of the vegetative cover of pasture land inducing wind erosion and sand drift in the desert and water erosion in the mountains, salinization of irrigated lands, and waterlogging of desert ranges (Map 8.1).

Damage to the vegetation from industrial plants has increased. Desertification has been assessed with detailed criteria and classes, and described on maps at NIDFF (Figure 8.1). *Soil salinization*

The yield of agricultural crops is limited by soil salinity (Table 8.3) combined with saline irrigation

water and saline waterlogging. Irrigation water often does not meet the State standards for mineral content, and chlorides and sulfates are excessive. In Dashoguz Province, nearly 90 per cent of the irrigated lands are characterized as medium-to-heavy saline.

The incidence of hard saline soil is reported to reach 15.2 per cent in Dashoguz Province, 13.6 per cent in Akhal Province and 12.4 per cent in Mary Province. However, part of this soil is natural solontchaks (alkalisoil). Clay and takyr soil are more likely to accumulate salt than sand.

Water salinity in the Amu Darya River reaches 1.44 g/l and in its lower reaches (Darganata) 2.2 g/l. During high water, it decreases to 0.4-1.4 g/l, and, in the low-level period, increases up to 0.6-2.2 g/l. In certain areas, return water salinity reaches as high as 27-30 g/l.

The share of arable land affected by salinization and waterlogging has increased during the decade to 2011 from roughly 25-50 per cent of irrigated land, resulting in a crop yield decline of 20-30 per cent. About 36 per cent of this land also has groundwater of less than 2 m of the surface, exposing it to secondary salinization from evapo-transpiration. As the washing of the salts cannot be performed completely, salts accumulate and yields drop so far that the land cannot be used for farming anymore.

Another issue is the increase in saline and polluted dust blowing from the dried seabed of the Aral Sea to Dashoguz Province. More than 9 million ha, which include large cotton-growing surfaces, are affected by salt dust storms and these have become more frequent. About 430,000 t (70 per cent) of the 600,000 t of aerosols accumulate annually on agricultural crops in the irrigation zone, the rest falling into the desert zone.

Floods and waterlogging

The annual volume of effluents and drainage water in Turkmenistan is 8.7 million m³, of which 6.6 million m³ are formed by drainage waters. Practically all discharged waters are diverted without any treatment into the desert. Return waters from agricultural fields (both effluents and drainage waters) are discharged through the collector-drainage network into natural depressions (filtration fields) of the Karakum Desert. As a result, artificial drainage lakes have been formed in the desert surface nearby, and in 1998 it was estimated that about 700,000 ha of desert pasture lands had been affected by waterlogging and salinization.

Irrigated agricultural practices are reported to be inefficient, and losses occur in unlined intra- and inter-farm canals. Practically the whole irrigated area is irrigated by the passive flow of surface water sources, a form of irrigation that induces waterlogging. Waterlogging increases with uneven land surfaces and drainage inefficiency. Waterlogging and its consequent secondary salinization are also due to the condition of the irrigation and drainage infrastructure; 90 per cent is in unsealed earth channels, as a result of which about 40 per cent is infiltrated.

The collector-drainage water at peak flows of the Murgab and Tejen Rivers (the rivers irrigating the two important oases) released outside the oases has led to a reduction in the productivity of desert rangelands. Repeated flooding of the Murgab River has led to the inundation of 80,000 ha of croplands, damage to water constructions and siltation of the reservoirs. On the other hand, with the diversion of the Tejen and Atrek Rivers in Iran, these rivers dry up almost every summer, leading to a water supply shortage. The water table of about 38 per cent of the irrigated land is only 1-2 m deep, in particular in Dashoguz and Lebap Provinces, due to insufficient drainage from irrigated lands. The total amount of waterlogged land in the irrigation zone is estimated at 650,000 ha. This leads to secondary salinization of land, with rising levels of groundwater of high mineral content.

Between 2011 and 2015, it is planned to increase the drainage system from 36,000 km to 49,000 km, to increase the length of clean drainage canals from 19,000 km to 22,000 km, and to increase the irrigation system from 23,500 km to 24,500 km. Technically speaking, the volume of water for both irrigating and washing the soils must be added together for each crop. Theoretical calculations show that Turkmenistan has enough water to irrigate its crops and perhaps increase the surface of irrigated lands, but not enough water to reclaim the salinized soil every year (Table 8.3). In addition, to provide irrigated land expansion up to 4 million ha, it would be necessary to reduce irrigation to 4,200 m³/ha and increase the efficiency of the irrigation network from 0.58 to 0.75, build new reservoirs, and undertake a number of technical and organizational measures to increase efficiency.

The Government addressed the issue of spring floods with the establishment of the water reservoir on the Tejen River. The Dostluk dam reservoir (1.25 billion m³), opened at Serakhs on the Iranian border in 2005, has increased the volume of irrigation water. Plans call for a similar dam on the Atrek River west of Ashgabat.

Lake Altyn Asyr was established in the middle of the north-west desert together with the construction of the great collector across the Karakum Desert, to collect drainage wastewater from the whole country. It has now been in operation for two years. Although no measurements could be provided, it is reported that crop yields grew in the irrigated surfaces concerned and that the waterlogged desert surfaces shrank. Mildly saline drainage water should be reused for crops. With proper monitoring of soils and yields, Turkmenistan has an opportunity to follow up and to share with other countries this unique experience of a very large reclamation project.

Soil pollution

Pollution of irrigated lands by pesticides and mineral fertilizers is a recognized issue. However, as no soil analyses have been made for 15-20 years, no figures are available. The same goes for figures on soil pollution and oil spills. The central Soil Monitoring Laboratory was abolished in 1997. The use of fertilizers (urea, ammonium nitrates and phosphates), produced by the State Concern TurkmenChemistry for agricultural needs, seems to amount to some 200,000-250,000 t of active substance annually, and therefore 120-150 kg/ha on irrigated lands, which does not seem excessive for reasonable yields.

Table 8.3: Soil salinization of the ameliorative fund with urgent reclamation

	Light salinization	Moderate salinization	Severe and very severe salinization incl. saline soils	Total
Total solid residue in soil, in % *	0.2-0.4	0.4-0.6	>0.6	
Salt content of ground water, g/l *	3 to 6	6 to 10	10 to 30	
Salt content of irrigation water, g/l *	0.5-1.0	1.0-1.5	>1.5	
Seasonal salt accumulation, m ³ /ha *	16-30	30-45	40-80	
Loss in cotton yield, %	<15	15-40	45-80	
Surfaces **, thousand ha	1,098.8	1,183.7	3,071.3	5,353.8
as % of the suitable land for irrigation ***	6.2	6.7	17.4	30.2
Washing water need ****, m ³ /ha	2,500.0	4,500.0	10,000.0	
Total need 1,000 m³/year	2,747,000	5,326,650	30,713,000	38,786,650

Sources:

* Kharin, N., *Vegetation Degradation in Central Asia under the Impact of Human Activity*, p. 82, table 5.6.

** Ministry of Agriculture, 2011.

*** Total land suitable for irrigation is 17,699.1 thousand ha.

**** Ministry of Water Economy, direct communication.

Table 8.4: Pasture resources, 1989

	Surface 1,000 ha	per cent of total	Forage production 100 kg/ha *	Total capacity 1,000 sheep	ha/sheep
Sand deserts	20,021.80	56.65	0.6-2.3	1,886.00	10.62
Gypsum deserts	1,587.50	4.49	0.6-2.8	435.60	3.64
Clay deserts	2,249.80	6.37	0.8-4.2	190.20	11.83
Loessian foothills	3,303.30	9.35	1.5-3.1	715.50	4.62
Sand-gypsum deserts	1,635.90	4.63	0.7-1.0	167.00	9.80
Sand-clay deserts	1,221.10	3.46	1.0-2.1	140.90	8.67
Sand-Loessian foothills	2,642.80	7.48	1.3-2.3	467.00	5.66
River valleys	398.30	1.13	n.a.	71.70	5.56
Low mountain ranges	1,693.20	4.79	n.a.	439.30	3.85
Middle mountain ranges	299.20	0.85	n.a.	112.50	2.66
High mountain ranges	234.10	0.66	n.a.	119.70	1.96
Mountain valleys	54.50	0.15	n.a.	17.20	3.17
Total	35,341.50	100.00		4,762.60	7.42

Sources: Ministry of Agriculture, *Pasture Resources Map of Turkmenistan, 1989*, 2011;

* *Initial National Communication on Climate Change under UNFCCC*, 2006.

Pesticides are imported. The use of pesticides, herbicide defoliant and other chemical preparations declined by 2.9 times (from 543,900 to 193,400 kg) and the area of lands treated by 4 times (from 787,000 ha to 194,400 ha) between 1995 and 2001. Pest management was formerly the responsibility of specialized agencies, but has now been delegated to the farm level. Farmers do not wish to invest in pesticides, as they feel they are not able to recover the cost from the sale of production. There is no follow-up on the use of agrochemicals, and no recent detailed data on the types of pesticides used are available.

Land degradation

Desert rangelands carry a great variety of forage and constitute a base for animal breeding. The average annual carrying capacity of grasslands depends on the type of pasture, ranging from 3 to 12 ha per sheep; the average index is 7.42 ha per sheep (Table 8.4). In 1995, the total area dedicated to forestry was 9.9 million ha, of which 6.5 million ha was held by farmers' associations under long-term tenure and used for livestock. Desert ranges are considered both agricultural rangelands and bush forests (saxaul), which must be protected.

Vast areas have been severely degraded (1.7 million ha or 4.5 per cent) or moderately degraded (17.4 million ha or 45 per cent). Bush forest areas are grazed and cut for fuel, leading to a loss in quantity and quality of desert range production, a reduction in biodiversity, wind erosion of the denuded lands, and an increase in unfixed sands around roads, settlements and irrigated areas. Palatable species (*Haloxydon*, *Salsola*, *Carex* sp.) are replaced by non-edible ones (*Peganum* and *Stipagrostis* sp.) that are not typical to the station, leading to a decline in fodder quality.

The privatization of livestock, which is now 90 per cent in private hands, has resulted in a huge increase in livestock numbers (Figure 8.2). The theoretical carrying capacity of the desert range is only 4.7 million head. Watering points are randomly and scarcely available in the desert rangelands. Tracts better provided with water are overgrazed, and rangelands surrounding desert wells have been degraded because of excessive cutting of shrubs for firewood. Rangelands located close to agricultural zones and settlements are overexploited, and remote rangelands in the central Karakum Desert with no water supply are not properly used, also leading to losses in terms of the quality and quantity of available forage.

Furthermore, the region experiences droughts such as in the period 1997-2001, which was the main reason for a strong decline in pastures and yields. The mean many-year data demonstrated that, during the period 1990-2001, in the central Karakum Desert and in the north-west of the country, yields were lower than the mean (120-200 kg/ha) by 25-56 kg/ha, and in the eastern Karakum they were lower by 18-40 kg/ha. Increased temperatures and moisture deficits led not only to the decline of pasture yields but also to the mass drying-out of bushes and perennial herbs.

Since 1991, tree felling has been prohibited and is now an administrative offence. Since then, all inhabitants of Turkmenistan are provided with gas for fuel, free of charge (Chapter 11). A promising project is the planting of salt-tolerant halophyte plants (black saxaul and other species) to grow in areas with salty drainage water along the Great Turkmen collector or in saline soils, which can provide forage for the winter months and reduce pressure on the rangelands. The other urgent measure taken is the regulation of carrying capacity and pasture rotation, with better distribution of flocks over the territory.

Finally, the Government had set the objective of increasing sheep flocks to 31.5 million head by 2010. This objective has now been replaced by the

production of 960,000 t of meat (about 20 million head) by 2030. Setting the objective in terms of meat production rather than head of cattle will significantly facilitate the implementation by cattle breeders of sustainable and profitable cattle breeding practices.

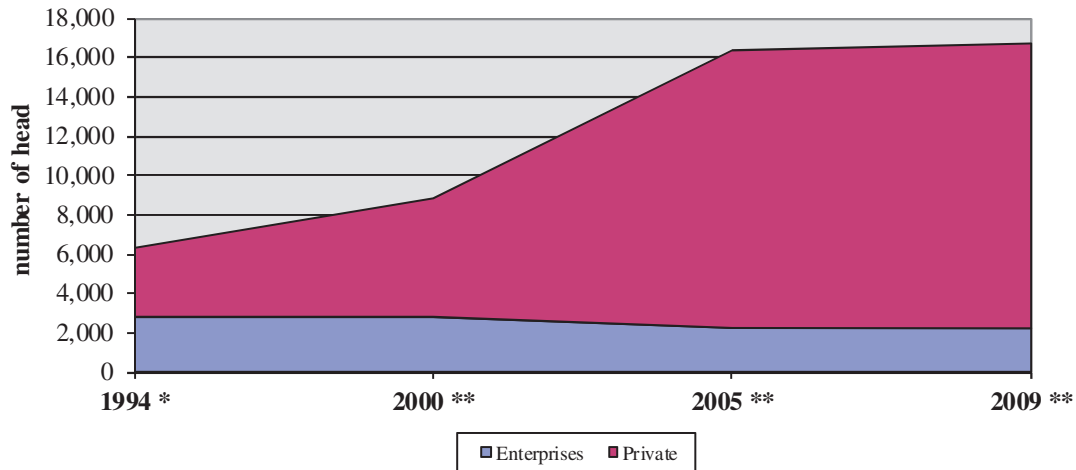
Sand drifts

Sandy deserts are particularly exposed to deflation (sand drifts), especially in the central and south-western Karakum Desert. More than 764,000 ha are exposed to deflation, of which about 40 per cent are exposed to heavy deflation. Natural factors (wind, scarce vegetation cover in arid zones, sand mobility) and anthropogenic factors cause deflation of desert lands. Irrational grazing and wood logging are not the only factors in vegetation degradation. In the sandy desert where infrastructures for oil and natural extraction have been installed, the plant cover has been removed.

The present industrial development of oil and gas production in western Turkmenistan threatens the soil cover. The vast oil and gas fields of Karakum have been exploited for over 20 years: 39 deposits of gas and 18 deposits of oil are currently in operation and 400 promising gas fields are being explored. Around each production facility, the vegetation cover of 300-600 ha (for large gas fields) has been stripped. Each drilling rig means the devastation of a surface from 3.5-4 ha. Hundreds of hectares of moving sand dunes have been formed annually, up to 500-600 m³ of sand in each site, threatening the normal operation of the complexes and the state of their machinery.

Oil and gas facilities' access tracks and exploration roads, together with the construction of pipelines, cause great damage to the vegetation cover. Additionally, the movement of heavy machinery in the vicinity of the facilities turns the surface from turf-covered soil with weak deflation to soil with heavy deflation.

The construction of railways and motorways creates wide strips of loosened sand drifts which in turn threaten the infrastructures, covering them with sands. For example, the strips of bare sands stretch for 200 km with a width of 300 m along the highway running along the Turkmenderya Canal. With the construction of the new railway and motorway between Ashgabat and Dashoguz, the sand dunes have been fixed along the infrastructure for 553 km. The planned new railway from Kazakhstan to the Islamic Republic of Iran through western Turkmenistan (Gyzylgaya-Bereket-Ekerem) will require the fixing of sand dunes on a large scale.

Figure 8.2: Development of sheep and goat numbers

Sources: * *Initial National Communication on Climate Change under FCCC*, 2000;
 ** *Statistical Yearbook 2000-2009*, 2010.

Box 8.1: Turkmenmellary endorses new responsibilities

The cattle breeders' association Turkmenmellary was founded in 1996. The association is part of the governmental structure. It plays a key role in the development of cattle production and flock management in the country. Its main objective is to increase livestock production and production quality, focusing mainly on Karakul sheep breeding.

In addition to a veterinary service and scientific research and consultancy in animal production, the association manages 13 million ha of pasture land of the farmers' associations, but accounts for only 11 per cent of total head of cattle. Thus, the lion's share of the flock is in private hands, and the owners have access to the pasture land of the farmers' associations – free of charge – and can acquire fodder from the stocks held by the farmers' associations.

Most of the land (11 million ha) is not irrigated, and the objective is to increase irrigated fodder crops.

According to the draft Law on Pastures, it is intended that Turkmenmellary will be in charge of the management and inspection of all pasture land in the country (over 38 million ha, belonging to the State), in close cooperation with MoA and MoNP.

The industrial development of the sandy desert becomes more intensive every year. Towns and villages grow in sandy sites, adjacent to oases. Large amounts of excavation create open, unfixed sands, which require recultivation. Nowadays, modern exploration and drilling technologies have less impact on the sites, whereas transport still has a full adverse impact on the vegetation cover.

At the initial stage of land-improvement works in Turkmenistan during the period 1951-1968, the forestry agencies planted pasture-protecting and sand-fixing plants on an area of about 140,000 ha. Turkmenistan, and in particular NIDFF, have unique expertise in the fixation of sand dunes. NIDFF is primarily involved in protecting railways and roads from sand drifts. Within the framework of NAPCD, NIDFF implemented a set of measures to stabilize moving sands, using mechanical devices such as those made from sprouts of rush or reed mace, sand-binding plants such as *Stipagrostis sp.* and saxaul

(*Haloxylon*), and chemicals such as tar and mazut. The techniques to fix the dunes can be simple, environmentally friendly and executed with simple materials (reed fences, clay ditches, shrubs), but are labour intensive (cost including labour: 2,000-4,000 \$/ha). The treated surfaces should return to grazing ground within 2-3 years. The methodology is tested for the protection of gas and electric power stations (500 ha), transportation tracks (gas, water-mains, cables: 400 ha), roads (200 ha) and electric lines (100 ha). The assessment of technogenic sand dunes with a map of the sand drifts is to be made on a scale of 1:500,000 and a database is to be set up. The measures should be extended to a number of infrastructures (Table 8.5).

8.5 Agrarian reform

In 1991-1992 (and, to some extent, even back in 1986-1987), Turkmenistan launched an agrarian reform programme.

Box 8.2: Solar pumps for wells in desert ranges

The whole desert territory of Turkmenistan is used as rangeland but only 64 per cent is supplied with water. Wells are the main source of water and pumping out is performed manually, as fuel cannot be made available in remote places and water wells are not connected to the nationwide electricity grid. Besides, the salt content of water in many wells can be above 15 g/l, which is inappropriate for drinking water for animals.

In conjunction with the NAPCD, Karrykul research station of NIDFF is carrying out research on an experimental solar generator that will ensure the pumping-out and desalinization of water, producing potable water with a salt content of 5 g/l for 3,000 animals and with 0.5 g/l of salt content for 20-30 people, as well as electricity for households.

A map of the areas suitable for the installation of solar generators (i.e. with water available for pumping) and the distribution of solar energy flux will be established. After testing, the solar generator will be constructed for mass production and distributed. Farmers' and shepherds' families will be trained to use solar generators. Subsequently, the measures will be extended throughout the country.

In the countryside, where electricity, water and gas are delivered free of charge to all inhabitants, it is expected that remote settlements will be provided with adequate solutions to obtain the same facilities.

Table 8.5: Sand dunes stabilization, hectares

	Akhal	Balkan	Dashoguz	Mary	Total
Roads	375	750	200	100	1,425
Railroads		1,500	2,000	200	3,700
Gas derricks		500	500	800	1,800
Total	375	2,750	2,760	1,100	6,985

Source: National Action Plan to Combat Desertification, 2006.

Photo 8.1 Irrigation system

A new stage of farm restructuring began in December 1996 with the use of the irrigated lands within the farmers' associations assigned to individual leaseholders in medium-term (10 years) leaseholds, with annual production contracts (Table 8.6). The farmers' associations take decisions on the use of the

irrigation water in the network on their land. The head of an association, the *bashlyk*, reports to the district administration. Every farmer is a member of a farmers' association, but may pursue private farming. Groups of farmers may associate among themselves for private production.

The new contracts were written for the plots actually cultivated by the farmers' association members in 1996, which represents continuation of the implementation of the reform programme, ensuring continued tenure on the same land. The new leaseholds were completed by March 1997. As a result of these direct contractual relations, each leaseholder had to open a bank account at Daikhan Bank in order to receive advance payments from marketing agencies for financing the farmers. Leaseholders pay 20 per cent of the gross value of production to cover administrative costs, services provided in common to all village residents, and land, water and income taxes.

In 2004, with the new laws on Daikhan Farms and Daikhan Associations, Turkmenistan embarked upon a new phase of agricultural reform. With the revision of the Land Code, land allocated for private use was restricted. Larger agricultural associations and agricultural joint stock companies (AJSCs) were established. An umbrella AJSC was created, which by the beginning of 2005 had created as many as 44 district-level AJSCs. The AJSCs perform the cultivation work and sell to the State 30 per cent of the yield (cotton, for instance) and the farmers are entitled to sell 70 per cent at a free price. The State pays 50 per cent of the production costs for the four State-supported crops (cotton, wheat, rice and sugar beet).

Earnings under this system tend to be higher and enthusiasm for the system is reported to be strong in the rural areas. However, at this stage of development the enterprises are not able to earn enough for the payment of salaries, and purchases of the means of production for future seasons depend on centralized credits.

Water delivery

The Water Fund is an exclusive public property and water use is free in Turkmenistan. Water use limits by provinces and districts are set by the Cabinet of Ministers according to the requirements of MoWE, in January each year when the water availability of the Amu Darya River can be estimated.

The Water Code stipulates that the water management authorities are to support and provide technical and other assistance to the farmers' associations on a contractual basis for the operation and maintenance of internal irrigation canals and facilities. Water management is handled at district level on the basis of contracts signed with farmers. At the farm level, water users' associations or unions have not been established yet. The establishment of larger farmers' organizations in place of individual farmers and tenants would make it possible to improve water management at farm level (Chapter 7).

Structure of land tenure and ownership

At present, two forms of ownership function within the structure of agriculture: the State form (farmers' associations, subsidiary plots of enterprises and organizations) and the non-State form (farmers, private producers and owners of personal land plots). The farmers' associations manage about 70 per cent of the country's agricultural fund. The lands of the State fund, occupying about one fifth of the total land fund, are at the disposal of the Government for agricultural use or other purposes: in recent decades, the total has shrunk by 27 per cent due to development and transfer to other sectors of land tenure.

Box 8.3: Use of the saxaul tree for desert reclamation

The saxaul (*Haloxylon ammodendron*) ranges in size from a large shrub to a small tree, between 4 and 10 m in height. It is found in the arid salt deserts of Central Asia, particularly in the Turkestan region and east of the Caspian Sea.

The black saxaul (*Haloxylon aphyllum*) has a deep pivotal root system allowing it to thrive in dry, saline and sandy environments. The white saxaul (*Haloxylon persicum*) is a hardy tree that can grow in nutritionally poor soil and can tolerate drought. The white saxaul is found in sand hills, deserts and sand ridges, where it often forms pure stands, with an average density up to 400-500 trees per ha. Black saxaul is more tolerant of salty soils than is white saxaul.

The tree is traditionally used for fuel by villagers in Turkmenistan, and provides year-round feed for livestock. It is useful for restoring and improving desert fringe areas. The tree's extensive root system is useful for stabilizing sandy soils. As it is highly drought resistant, it has played an important role in the establishment of shelter belts and the fixation of sand dunes as a counter to desertification. Large areas of saxaul forests have been removed, to be exploited as fuel and make room for infrastructure development. These surfaces are prone to desertification and sand drifts. Together with other plant species, the saxaul is now used in Turkmenistan for reforestation and desert reclamation.

Table 8.6: Agricultural property structures, 2000, 2005 and 2009

	2000 *	2005 *	2009 *	average surfaces 2009 ha **	total ha
Farmers' associations	592	593	604	2,602	1,571,708
Private subsidiary gardens	616,000	756,500	758,700	0.16	121,392
Private enterprises	7,100	2,500	2,300	3	6,900

Sources: * Statistical Yearbook 2000-2009, 2010;

** according to the Land Code, article 25.

8.6. Conclusions and recommendations

Overgrazing and destruction of the vegetation cover is an acute problem in Turkmenistan, in particular around the settlements and the wells in the desert ranges. Pilot projects and actions against desertification have been developed which focus on this issue. The implementation of the relevant regulations and promotion of sustainable land management would impact upon desertification. It is estimated that the current capacity of the utilized grasslands could be maintained if proper measures on the preservation and rehabilitation of pastures were implemented, even if grassland productivity were to decrease further as a result of climate change. Although there is cooperation between various public stakeholders on some topics related to desertification, it is still weak. For example, full scale monitoring and assessment of desertification is still lacking.

The National Framework Programme on Sustainable Use of Land Resources has been developed within CACILM. As an integral part of Strategy 2030, it proposes activities aimed at increasing the amount of irrigated land and solving the problem of soil salinization, but the country lacks a strategy on sustainable land management. The 1997 NAPCD is of a descriptive character and lacks concrete activities and measures. A revision of NAPCD and related actions would strengthen activities on fixing sand dunes and other erosion control measures.

Recommendation 8.1:

The Cabinet of Ministers should:

- (a) Strengthen cooperation between the governmental authorities in charge of forestry, pastures, agriculture and water management to promote sustainable land management focusing on desertification monitoring and assessment, early warning systems, water resource use, combating soil deflation and salinization, and rangeland management;
- (b) Develop a sustainable land management strategy taking into account the National Framework Programme elaborated under

the Central Asian Countries Initiative for Land Management;

- (c) *Revise the National Action Plan to Combat Desertification, to strengthen actions for fixing sand dunes and other erosion control measures, including actions which could be delegated to farmers' and other associations.*

Overgrazing and destruction of vegetation cover pose an issue around the settlements and wells in the desert ranges. The current capacity of the used grasslands could be maintained if proper measures for the preservation and rehabilitation of pastures were implemented, even if grassland productivity were to decline further as a result of climate change.

The necessary measures for the preservation and rehabilitation of grasslands are part of a comprehensive approach to flock management in cooperation with flock owners. This includes the creation of grassland and protecting fodder fields with wood and bush plants. The irrigation of some grassland territory and the cultivation of new forage species in the crop rotations are additional measures to decrease pressure on natural ranges. Furthermore, integrated feeding management of flocks could be developed, combining adequate grazing, pasture rotations, fodder crop feeding and distribution of winter reserves in cattle pens.

Recommendation 8.2:

The Ministry of Agriculture and the Association Turkmenmellary should introduce extension services at district level, in order to help the farmers' associations, private owners and shepherds to make animal production both more profitable and environmentally friendly.

Turkmen crop rotations are limited and cotton often occupies more than half of the surface, which is not sustainable and causes soil degradation and loss of fertility. To combat this problem, soil fertility can be increased by enforcing science-based crop rotation adapted to the specificities (climate and soil potentials) of the country's territories. Integrated good practices, which also limit the use of pesticides

and fertilizers, have been developed in pilot projects, supported by foreign donors. Lessons can be drawn from these pilots and extended to the country as a whole.

The main reason for the loss of soil fertility is the salinization and secondary salinization of the agricultural soils that are irrigated, but where the drainage system is deficient. The rehabilitation and maintenance of the irrigation and drainage channels are necessary. Water is free of charge for agricultural use. Most probably, pricing for water as a resource – even at a symbolic price such as that which applies to the land rented to the farmers – would help implement water-saving practices.

The State gives a 50 per cent discount on payment for seeds, techniques and machinery services, and chemical and mineral fertilizers. However, the provisions of such grants are not conditional on respecting sound crop rotations and good agricultural practices.

Recommendation 8.3:

The Ministry of Agriculture should:

- (a) *Develop and implement market mechanisms conducive to improving land and water management in relation to the specific land and soil quality conditions of each district;*
- (b) *Revise guidelines on agricultural systems and crop rotations for agricultural stockholding societies, to promote the prevention of soil degradation and loss of fertility, among other purposes.*

Recommendation 8.4:

The Cabinet of Ministers should introduce rewards to farmers and farmers' associations using environmentally friendly agricultural and water-saving practices.

Since 1991, no comprehensive soil analyses have been performed. The central Soil Monitoring Laboratory was closed in 1997. As a result, no updated and reliable figures can be produced on the state of the soil in Turkmenistan over recent decades, hampering decision-making on the implementation of measures adapted to the state of the soil.

The assessment of irrigated farmland by means of an electronic database and a monitoring system for soil salinization is poorly developed in Turkmenistan. This is one of the serious issues demanding urgent resolution.

Recommendation 8.5:

The Cabinet of Ministers should:

- (a) *Establish a system of regular soil monitoring and assessments by the Ministry of Agriculture;*
- (b) *Re-establish agrochemical laboratories at the provincial level for soil analysis to be performed both to meet the needs of agricultural production and support environmental protection.*

The impact of industrial development on the desert increases every year. Cities and settlements make use of desert lands near the oases. As a result, significant areas of open, unfixed sand surfaces appear and require urgent attention. Moving sands pour onto infrastructure facilities (ring-roads, railways, highways, and pipelines), threatening their use.

These sands may also cover fertile soil, turning it into desert soil. According to the Land Code, land damaged as a result of extraction of mineral resources and construction of infrastructure must be reclaimed. In addition, soil quality and the soil cover must be protected.

This is applicable to grazing activity but not to industrial activities which are polluting the soil and destroying the land cover. There are currently no laws or by-laws containing provisions on soil protection inspections.

Recommendation 8.6:

The Ministry of Nature Protection, in cooperation with relevant institutions, should extend existing legislation on soil protection to cover damage to land cover caused by industrial activities.

In 1989, the pasture map (scale 1:200,000) was prepared with extensive field scouting and a great level of accuracy (samplings in transects, laboratory analysis of the samples, use of air photographs). This map is an important basic tool for environmental research and the application of environmental policy. It has not been updated.

Recommendation 8.7:

The Ministry of Agriculture and the Ministry of Nature Protection should:

- (a) *Ensure the updating of the pasture map using modern survey systems to account for the progression of the desertification;*
- (b) *Ensure that the results of State inspections of the land cover are used for updating the pasture map.*

Chapter 9

WASTE MANAGEMENT

9.1 Introduction

Since its independence, Turkmenistan has paid increased attention to environmental management, including waste management, although important work is still necessary in order to ensure that waste management in Turkmenistan reaches international standards. Certain steps in that direction are being undertaken. For example, increased attention is given to the organization of reliable waste collection and materials recovery. Waste generation decreases in connection with industry modernization, and as international companies in the oil sector introduce new standards in relation to waste. Furthermore, territories within Turkmenistan have been cleared of toxic waste, mostly pesticides, by the State Concern TurkmenChemistry.

An important step in reducing municipal solid waste (MSW) is the commissioning of a mechanical biological treatment plant in Ruhabade. However, in order to conform to international standards, the practice of recycling of solid waste needs to be strengthened.

The oil and gas sector is the main generator of industrial waste, generating about 90 per cent of all registered industrial waste. However, in current practice, the organization of waste collection and utilization in this sector is not carried out in consultation with the Government. Responsibility for processing and recycling is assigned to separate companies on the basis of separate agreements.

Despite the progress achieved, much work is still necessary. At present there are no specialised legal acts concerning the organization of waste collection, and materials recovery and disposal, and, as a consequence, waste management is not yet recognized in Turkmenistan as an element contributing to environmental improvement. As an example, the 2002 NEAP did not contain sections on waste management.

A significant improvement was achieved with the approval by MoHMI of the National Programme of Safe Management of Medical Waste in Health Facilities and with the development of the medical waste sterilization unit in the mechanical biological facility in Ruhabat. This creates an opportunity to

improve medical waste management to meet international standards, at least in the area of Ashgabat.

9.2 Institutional, policy and legal framework

Institutional framework

MoNP is responsible for conducting SEE on projects concerned with transport, the treatment and disposal of hazardous industrial waste, and implementation of the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal. CaspEcoControl conducts environmental monitoring and inspection of all activities related to waste management in the harbours.

Land for waste disposal sites is allocated by the Service of Land Issues of MoA. There is no special category for disposal sites in the land cadastre; the land is assigned to municipalities as “land for municipal use” and mayors decide on the use of land as disposal sites. There are rules for land allocation by the Service of Land Issues, but the final decision on location of disposal sites lies with the municipalities.

Collection and disposal of MSW, and street cleaning, are the responsibility of the mayors of towns, although this responsibility is defined as “sanitary services”. A town or a group of settlements has a municipal company, which performs cleaning, maintaining and repairing streets, developing parks, and collecting and disposing of municipal waste. The mayor is also responsible for storage of industrial and hazardous waste located on the municipal territory. This function of the municipality differs from international standards, where responsibility for such storage is assigned to a specialized institution or waste generators.

Industries and organizations are responsible for the waste they generate. The responsibility for clean-up of historical waste was assigned to the State Concern TurkmenChemistry, but it seems to have been an ad hoc decision, not supported by a strategy or a law.

MoHMI is responsible for the implementation of the National Programme of Safe Management of Medical

Waste in Health Facilities. The division of responsibilities is formulated in the Order of MoHMI.

The Guidelines for Cooperation between the Competent Authority for Utilization of Hydrocarbon Resources under the President and governmental institutions, for implementation of the rules of development of hydrocarbon resources, define the responsibility of MoNP for conducting ecological expertise on plans for the collection and disposal of waste generated from the hydrocarbon resources industry. MoNP is also responsible for assessing waste collection plans with regard to offshore platforms and providing necessary ecological expertise statements for issuing the relevant permits.

The control of radioactive materials and waste is assigned to several authorities. Customs authorities monitor the import of radioactive materials. The municipality is responsible for storage sites. SES, MoNP and the Ministry of Emergency Situations perform site inspections.

The Institute Turkmenkomunprojekt is responsible for planning and research relating to municipal services and infrastructure. It designed the new waste disposal site for Ashgabat.

SCS collects information on municipal solid waste annually, using a form that differentiates disposed and recycled waste from total generated municipal waste.

Policy framework

The only programme in the waste management sector is the National Programme of Safe Management of Medical Waste in Health Facilities, approved by MoHMI in 2009. Other policy documents on the environment do not have a specific chapter on waste management containing concrete, targeted actions for improving waste management in Turkmenistan. Where these documents do mention waste management, it is as one of the factors influencing air pollution, for example, and measures are formulated in broad, general terms, which do not represent a driver for improvement.

National Programme of Safe Management of Medical Waste in Health Facilities

The 2009 National Programme of Safe Management of Medical Waste in Health Facilities defines as its main goal the protection of patients and healthcare personnel from the negative impact of medical waste, and the introduction of safe methods of medical

waste management, with a view to preventing infection in hospitals. Furthermore, the Programme defines methods of collection, sorting, transportation, treatment and disposal. It takes into account the lack of suitable final disposal facilities and stresses disinfection and single-use packaging as the main methods for decreasing risks related to medical waste.

The Programme also defines the need for training all personnel involved, defines requirements for monitoring implementation, and sets indicators for measuring safe handling and disposal of medical waste.

The Programme is supported by the Methodology Guidance for Safe Management of Medical Waste, approved by a 2010 order of MoHMI. This order creates conditions for implementation of the strategy, including preparation of action plans, organization of training courses, assignment of personnel directly responsible for the implementation of the Programme, inclusion of a postgraduate study course on medical waste management in the curriculum of the State Medical Institute, and the launch of a public awareness campaign in the media. The date for commencement of the Programme implementation was set at 1 January 2011.

The Methodology Guidance presents Programme implementation details, including explanations of the medical waste classification and marking of packaging for medical waste. Requirements for sorting, temporary storage, transport, treatment and disposal are specified for individual categories of medical waste.

The implementation of the National Programme of Safe Management of Medical Waste in Health Facilities is supported via the creation of an interdepartmental committee led by MoHMI.

Oil sector waste

Companies applying for oil works must submit, in addition to other documents, a plan of measures on protection of the environment, safety and human health to the State Agency on Management and Use of Hydrocarbon Resources under the President of Turkmenistan. Waste management is part of this plan.

Municipal solid waste policy

MSW management in Turkmenistan is understood to be a municipal service which must be provided to every citizen with the goal of keeping towns and

villages clean. A lot of attention is given to street sweeping and washing, and the regular collection and transport of solid and liquid waste out of the city. However, the methods for final disposal of waste lag behind international standards, except for the recently developed mechanical biological treatment facility in Ruhabat.

Waste fees paid by the population and industry are not based on cost of service but are set as a combination of the “willingness to pay” and State subsidies. This may also be the reason why waste management as a business is not developing in Turkmenistan. Waste classification based on toxicity classes reflects the potential negative impact of waste on the population, but neglects identification of waste source or treatment options. Therefore, assessment of the actual situation regarding waste generation in Turkmenistan, and, especially, hazardous waste generation, is extremely difficult.

Legal framework

Turkmenistan does not yet have a special act on waste management. However, the Government intends to prepare a law on waste, but works are at a very early stage. The provisions defining waste management in Turkmenistan can be found in several legal documents.

The Law on Nature Protection defines general requirements aimed at minimizing the negative impact of waste on the environment. Furthermore, it defines the responsibility of municipal councils to select a waste disposal site, in coordination with MoNP, SES and other relevant bodies. Neutralization of harmful waste on specialized sites, and disposal and storage of waste are subject to approval by nature protection authorities. This Law also defines areas where disposal of waste is forbidden. Finally, the State environmental authorities and other State authorities concerned have the right to limit, interrupt or stop operations generating waste if these are not performed in line with the Law.

The 1996 Law on Protection of Atmospheric Air defines requirements on transport, and the treatment and disposal of industrial and municipal waste, stating that waste which cannot be recycled must be disposed of at a designated site. Waste treatment technologies are subject to SEE.

The Law defines the responsibility of local executive bodies for maintaining appropriate sanitary conditions in settlements, and the development of container stands and their regular servicing. In addition, The Law stipulates the duty of local

executive bodies to allocate a site for waste storage, treatment or disposal. The 1996 Regulations on State Ecological Expertise, No. 2864, stipulate in their annex that transport, treatment and disposal of hazardous industrial waste are subject to ecological expertise. This requirement was applied in the process of permitting construction of the mechanical biological treatment facility in Ruhabat. Ecological expertise for oil sector activities is also required, including for drilling and other extraction operations.

Additional legislation indirectly regulates waste management. This legislation does not use the term “waste” but, instead, uses the term “chemical substances”. The 1996 Law on Protection of Atmospheric Air requires the registration of chemical substances by State authorities in the event of their production or import. It stipulates that the use of such chemical substances must be in accordance with relevant legislation and their impact on the air must be monitored. These provisions are used for the implementation of the Basel Convention.

The 1992 Sanitary Code stipulates that all organizations and citizens must follow sanitary rules, standards and requirements for the sanitary and epidemiologic well-being of the population during the use, reuse, neutralization and disposal of chemical substances, biological agents and materials. These substances, agents and materials should pass through toxicological and hygiene assessment and be permitted by the Chief State Health Officer.

In addition to the above, the Law on Hydrocarbon Resources stipulates that environmentally appropriate clean-up and restoration should be undertaken in the event of pollution as a result of oil-related activity. The Law also prohibits dumping or storing petroleum-related waste at sea and dumping wastewater at sea without treatment to permitted levels of pollution. The Law defines that disposal of treated waste on land and sea must be permitted by special representatives of the State administration.

In general, the legislation of Turkmenistan regulates waste management indirectly, by requiring waste generators to minimize the impact of waste on the environment and human health, by issuing permissions on a case-by-case basis and by frequent inspections and monitoring.

International commitments

Turkmenistan joined the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal by accession in 1996. The country does not participate fully in the activities of

the Basel Convention, as the annual reporting was submitted only once over the period 1999-2007. Information on the movement of hazardous materials and waste was prepared in 2009. The movement of hazardous waste is registered in a journal managed by MoNP, identifying the name of waste, its volume/quantity, date of shipment and countries of origin and destination. The Basel Convention is not sufficiently implemented in the legislation of Turkmenistan, and the country is using regulations for hazardous goods transport, based on an agreement of CIS countries on Transit of Special Types of Cargo dated 1995, for the collection of information on hazardous waste transport.

9.3 Current situation

Municipal solid waste

The estimation of municipal waste generation is based on national waste generation standards, varying from 0.89 kg per person per day in April to 0.63 kg per person per day in July and 0.54 kg per person per day in November. The density of MSW is estimated at 330 kg/m³. However, these standards seem to be outdated and do not provide realistic figures. As a result, the number of containers calculated from these standards is often doubled for new locations, and containers are added to existing locations according to the observed waste generation.

The information collected by SCS shows MSW generation on the territory of Turkmenistan of 470,500 t/year (approximately 1,300 t/day) in 2000 compared with 330,500 t/year (approximately 900 t/day) in 1994. The increase in MSW generation could be explained by a better reporting system. SCS includes liquid waste (e.g. septage) generated by the population within total municipal waste.

To obtain data compatible with international practice, liquid waste was subtracted from the total and individual solid waste fractions were recalculated. MSW generation in Ashgabat was reported at 111,000 t/year (approximately 300 t/day) in 1994, and current municipal waste generation is estimated at 164,000 t/year (approximately 450 t/day). Households in the EU-27 generated an average of 444 kg of waste per inhabitant in 2008. Table 9.1 shows MSW composition for 2000.

The composition of MSW in Ashgabat is presented in table 9.2. The data were collected under the Project on the Management of Environmental Risks Associated with Landfills in Seismically Active Regions in the New Independent States of Central Asia.

Table 9.1: Composition of municipal solid waste, 2000

	%
Food waste	16.18
Glass	4.64
Textiles	2.09
Plastics	2.19
Metal	11.44
Wood	3.01
Other	60.45

Source: National Environmental Action Plan, 2002.

Containers are emptied once a day, as a rule, but where there is overfilling the service is provided twice a day. Areas with lower population density are served as needed, but at least once a week. Containers (approximately 1 m³ on wheels or approximately 0.6 m³ standing on the ground) are placed in densely inhabited areas. In rural areas, residents are called to the servicing vehicles by the sound of a horn and dispose of their waste directly into the collection vehicle.

Table 9.2: Composition of municipal solid waste in Ashgabat

	per cent
Food waste	19
Glass	4
Textiles	4
Plastics	3
Metal	3
Wood	1
Other	66
<i>of which</i>	
Manure	14
Sand	27
Foliage	14
Paper	7
Bones	2
Leather	1
Stones	1

Source: Project on the Management of Environmental Risks Associated with Landfills in Seismically Active Regions in the New Independent States of Central Asia, 2008.

MSW collection is organized at the level of towns and districts which include several villages. Collection areas are larger than a single municipality, for example the Municipal Company for City Beautification and Cleaning of Ashgabat also services four neighbouring districts, serving approximately 1.5 million people in total. The Municipal Company seems to be sufficiently equipped to perform this task, and is using a fleet of new and older vehicles.

Companies are required to sign contracts with the municipal company on collection of their waste, but individual transport of waste by their own vehicles to disposal sites is possible, based on permits issued by the mayor. These permits are also issued for private truck drivers. Police controls on the roads are frequent, thus the risk of illegal transport and dumping of waste is considered minimal.

Separation at source has not yet been introduced in Ashgabat. However, experience with the operation of the mechanical biological treatment facility indicates that it could be useful to start separate collection of glass, as it cannot be fully sorted out and its presence in compost limits the possibility of using this compost as a fertiliser. In addition, unofficial schemes for the collection of paper, glass, plastics and food residues (mainly bread) seem to be used in Turkmenistan.

MSW disposal at dump sites is not compliant with international practice. Co-disposal of industrial or medical waste with municipal solid waste is frequent. Hazardous (toxic and radioactive) waste is disposed of at specialized disposal sites. Animal waste is first burned then buried in separate places.

It was indicated in discussions that there is control of access to disposal sites. A disposal site usually consists of a guardhouse in a combination of ditch and earth barrier. Land for MSW disposal is allocated within a maximum distance of 15 km from the centre of nearly every big town. However, this allocation is within the category of "municipal land". There is no centralized register of disposal sites, but this information might be available on the provincial level.

Although there are rules for the development of disposal sites based on former Soviet standards, these do not seem to be followed. The only disposal site development project over the last 15-20 years was prepared by Turkmenkomunprojekt for the new MSW disposal site of Ashgabat, which was put into operation after 2004. Thus, it is expected that MSW disposal at currently available disposal sites will become problematic as disposal sites come close to the end of their lifetime and therefore the number of unauthorized landfill sites may increase.

Growing residential areas are coming close to disposal sites, exposing the population to nuisance and danger.

Photos 9.1 and 9.2 document the situation with regard to disposal of MSW on the two sites near

Ashgabat. The new disposal site (photo 9.2) was prepared for operation simply by bulldozing sand away, and there is a risk that waste will pollute the stream on the site boundary. The old site (photo 9.1) has not been in operation since 2009, and is starting to be covered by sand.

Information on the total number of disposal sites or collection coverage in Turkmenistan is not available at the central level. Current statistics do not report these figures. However, this information might exist at the level of municipalities.

Medical waste

Management of waste originating from hospitals and other healthcare facilities receives significantly more attention in Turkmenistan than other waste types, and the situation was analysed as part of preparation of the National Programme of Safe Management of Medical Waste in Health Facilities. Analysis of the situation included 75 healthcare facilities of various types, representing about 30 per cent of all healthcare facilities in the country, and was performed in 2006. Table 9.3 presents average daily generation of medical waste per bed.

Generated medical waste is sorted by the following categories: Sharp, Infectious, Anatomic, Chemical and Similar to MSW. The waste is disinfected using bleaching powder, chloramines or sodium hypochloride. Controlled temporary storage areas for medical waste are used by hospitals in Ashgabat and by national health centres; in other places, medical waste is accumulated prior to transport, without any access control.

Waste is transported by municipal companies collecting MSW, using the hospital's own vehicles or those of private carriers. There are no specialized vehicles for the transport of medical waste.

In most cases, the final destination of medical waste is disposal sites for MSW. A specific area for medical waste disposal is not allocated, and this waste is mixed with MSW.

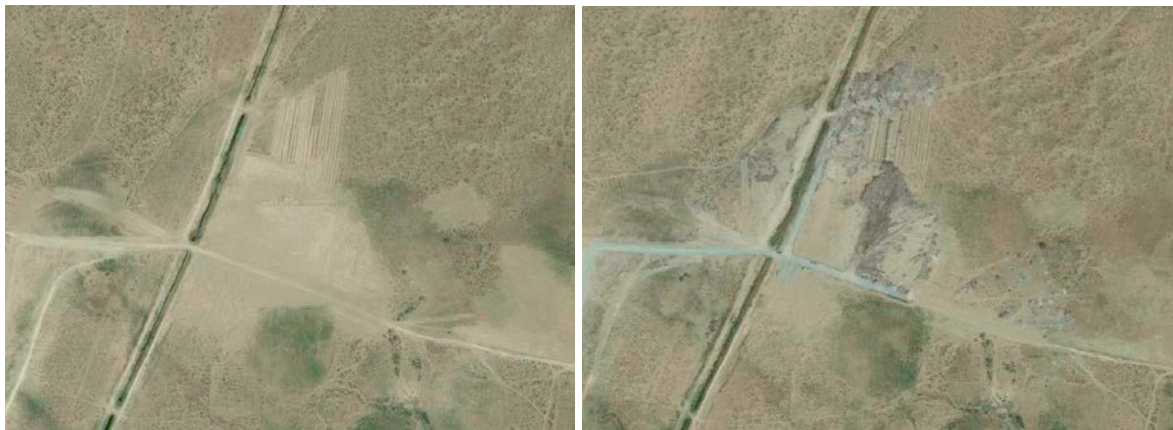
There is an incinerator for medical waste in Dashoguz, incineration of medical waste in simple furnaces is taking place in Ahal and Mary Provinces, burning at designated areas out of town in the Dashoguz and Balkan Provinces, and disinfection in the hospital area in Balkan Province. A sterilization unit for medical waste was developed on the territory of the mechanical biological treatment facility in Ruhabat, but is not yet in operation.

Box 9.1: Mechanical biological treatment facility in Ruhabat

MSW separation was introduced in Ashgabat in 2009 with the commencement of trial operation of a new mechanical biological treatment facility located in Ruhabat. The facility has a designed capacity of 275,000 t per year (approximately 750 t/day) and uses a combination of automated and mechanical sorting for separation of recyclables (cardboard, paper, plastic bags, PET bottles, wood). Biodegradable waste is composted and residues are sent for disposal. The facility currently receives about 100 t/day while it is operated under trial conditions, and it is expected that after commissioning it will be put into full-scale operation. The capacity of the facility is sufficient for all MSW generated in the collection area served by the Ashgabat Municipal Company.

Photo 9.1: Old municipal solid waste disposal site of Ashgabat, 2002 and 2009

Source: Google Earth maps.

Photo 9.2: New municipal solid waste disposal site of Ashgabat, July 2006 and 2009

Source: Google Earth maps.

Table 9.3: Medical waste generation

Waste type	kg per bed per day	
	Central clinics and province hospitals	City hospitals
Sharp	0,02-0,04	0.01
Infectious	0.1	0.1
Anatomic	0.02	0.01
Chemical	0,02-0,3	
Similar to MSW	0,5-0,9	0,5-0,9

Source: National Programme of Safe Management of Medical Waste in Health Facilities, 2009.

Photo 9.3: Household waste collection in Ashgabat

Industrial waste

Information on current generation and management of industrial waste is limited. NEAP stated that 32,300 t of industrial toxic waste were accumulated on the territory of Turkmenistan in 2000. Of this total, 79 per cent is oil sludge from oil fields, 15 per cent is waste containing oils, 5 per cent pesticides and 1 per cent other waste. About 1,000 t of toxic waste are generated annually. These figures are based on a classification system of four hazard classes (I = highest toxicity, IV = lowest toxicity) and inert industrial waste. This classification is the main reason why, in comparison with international hazardous waste generation statistics, these amounts are very small. They do not cover all hazardous waste generated in Turkmenistan, as they do not take into account other hazardous characteristics, as defined in the Basel Convention.

According to the Statistical Yearbook 2000-2009, the structure of industry in Turkmenistan by volume of production is dominated by the energy and oil sector (74.3 per cent), followed by the food sector (11.3 per cent), the light industry sector (9.4 per cent), the construction materials sector (2 per cent), the chemical industry (1.6 per cent), machinery (0.7 per cent) and other (0.7 per cent). Light industry is geared to textile production, and the chemical industry is mainly involved in the production of inorganic fertilizers. Building materials produced in the country include lime, cement, brick and wall stone, ferro-concrete structures, asbestos-concrete

pipes, silicate concrete, slate and glass. This allocation of industries also indicates that waste types generated in Turkmenistan are dominated by waste from the oil industry sector.

Oil industry

The main company active in the oil industry in Turkmenistan is the State Concern TurkmenNeft. Additionally, six international companies have signed PSAs with the Government. Drilling activities are extensive, reaching 166,810 m by TurkmenNeft alone in 2004. This indicates a large amount of drill cuttings which are transported to the shore, where they are treated and disposed of. Oil drilling permits include a condition requiring that exploration areas must be restored and drill cuttings safely stored after completion of drilling works at a place allocated within an oil field and developed for long-term storage.

A project implemented at the Turkmenbashi oil refinery included the following actions: construction of new water treatment facilities; reconstruction of water drain and turnaround water supply systems; cleaning of subsoil waters from oil waste; recycling of oil sludge; and implementation of complex research works on restoration of natural resources in a bay adjoining the refinery. It was implemented in the period 2002-2003.

International companies active in Turkmenistan are using modern technologies for the treatment of drill

cuttings. For example, the Malaysian oilfield services company Scomi Oiltools performed drilling works for Petronas in Turkmenistan. The contract included treatment of drilling waste and, for that purpose, a thermo-mechanical cuttings cleaner unit was installed around mid-2008.

The port of Turkmenbashi is the key port of Turkmenistan on the Caspian Sea, receiving about 2,000 ships per year. A recent report on Final Assessment of Port Reception Facilities and Ship Waste Handling Procedures – Turkmenbashi Port, financed by the EU, estimates that, annually, about 1,000 m³ of oil waste, 1,000 m³ of sewage and 100 t of garbage are delivered to the port from offshore activities. The Turkmenbashi Port Authority has established its own waste handling system with a waste notification system and collection and treatment of the various waste types by both itself (vessel and oil terminal) and municipality operators.

The Port Authority owns one vessel collecting oily waste and sewage from ships arriving at the port. The capacity of this vessel is 100 m³ of oily water and 15 m³ of sewage. The vessel can take 10 m³ of garbage, but this is usually collected in waste bins on the berth. Municipal services are responsible for treatment and disposal of delivered sewage and garbage. Oily waste is transported to the oil terminal for further treatment.

The company GAC Marine operates about 20 ships on the Caspian Sea and provides collection of waste from offshore operations by its own ships, based on an agreement with the port. The waste is then included in the port waste management system.

Radioactive waste

The Special Site for Storage of Radioactive Waste is located near Ashgabat, on the 27th km of the road to Mary. This facility is outdated and requires modernization, but does not present an immediate risk for the local employees or environment according to the investigation conducted by the Russian company Radon.

The Cheleken Chemical Plant in Khazar and the Nebitdag Iodine Plant in Balkanabat produce iodine and bromine. Active coal used as sorbent accumulates natural radionuclides and becomes radioactive waste. Up until 2009, these two plants together accumulated about 21,000 t of radioactive waste with a specific activity of approximately 80,000 Bq/kg. This waste was stockpiled near the plants and presented a risk for the environment, increased by the rising level of the Caspian Sea,

which moved the shoreline to less than 200 m from the waste storage site of the Cheleken Chemical Plant.

The State Concern TurkmenChemistry contracted a Russian company in 2009 to transport and safely store this waste. Currently, about 80 per cent of this waste has been transported to a new site which is approximately 20 km from the old location. The contract value is US\$ 12.4 million.

Historical waste

Turkmenistan is facing a problem of obsolete pesticides and toxic waste. The State Concern TurkmenChemistry was responsible for collecting this waste at abandoned factories and storage sites from the entire territory of Turkmenistan and disposing of it in safe storage. Three sites were developed for long-term storage of obsolete pesticides and toxic chemical materials. These are located in:

- Karipata in Mary Province;
- Zerger in Lebap Province;
- Takhta in Dashoguz Province.

These storage sites were rehabilitated by TurkmenChemistry during the territory clean-up and currently are fenced, guarded and regularly inspected. It is estimated that these sites contain about 1,671 t of obsolete pesticides besides other toxic waste.

International projects

The level of involvement of foreign donors in waste management in Turkmenistan is small. The following two projects were identified in the course of this EPR.

In 2002, the North Atlantic Treaty Organization (NATO), under the Science for Peace and Security Programme, implemented the project entitled Safe Management of Radioactive Sites in Turkmenistan, investigating radioactive pollution at the Cheleken Chemical Plant in Khazar. The results of this project include the procurement of radioprotection equipment, training of personnel to run radioprotection campaigns with suitable procedures for long-term monitoring, and procurement of a modern gamma spectrometer to start a radiochemistry laboratory in Ashgabat, along with the training of operators.

The Project on the Management of Environmental Risks Associated with Landfills in Seismically Active Regions in the New Independent States of Central Asia focused on assessment of risk and

development of remedial recommendations for landfills (municipal dumps) located in highly active seismic regions of the Newly Independent States (NIS). The NIS countries involved in this project were Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan. The full consortium included partners from France, Germany and the Russian Federation, with the project being coordinated from Austria. The project was implemented in the period 2005-2008 and funded by the EU. Results of this project include:

- Development of a GIS database and classification catalogue for landfills in the participating NIS countries;
- Dynamic analysis of the seismic hazard of landfills;
- Analysis of the emission potential of landfills;
- Risk analyses of landfills to investigate the potential environmental and associated socioeconomic impact of contaminant release, transport, dilution and fate;
- Recommendations for remediation measures to reduce the risk of existing landfills and guidance for site selection and for the design of future landfills.

9.4 Conclusions and recommendations

Waste management in Turkmenistan is underdeveloped in general. On the other hand, there are financial and human resources available for the necessary modernization of waste management.

The key issue for the improvement of waste management in Turkmenistan is defining waste management on a level equal to air pollution control or water management. In addition, it is necessary to stress that there is in-country expertise which was used in the formulation of a very good medical waste programme, and there is capacity for action, as was proven by TurkmenChemistry in the clean-up of toxic waste throughout the country.

Recommendation 9.1:

The Ministry of Nature Protection, in cooperation with the Ministry of Communal Services, the Ministry of Health and Medical Industry and other relevant bodies, taking into consideration international waste management practices, instruments and agreements, should develop:

- (a) Draft legislation on waste management and on a waste classification system;
- (b) A national waste management programme.

Following the example of the National Programme of Safe Management of Medical Waste in Health

Facilities, other sectors would also need to consider developing sectoral programmes on waste management. Priority could be given to the oil industry as the key industrial sector and to MSW, as it is the most common waste generated in the country.

Recommendation 9.2:

The Ministry of Oil and Gas Industry and Mineral Resources, the State Concern TurkmenNeft, and all relevant oil and gas sector agencies, together with the Ministry of Nature Protection, and preferably in cooperation with international companies active in Turkmenistan, should prepare an action plan on management of waste from the oil and gas sector.

Recommendation 9.3:

The Ministry of Nature Protection, on the basis of the national waste management programme to be developed and together with other relevant institutions, should:

- (a) Identify priorities where international expertise can be effectively utilized for the programme implementation;
- (b) Include waste management components in projects aimed at the development of municipal infrastructure, water protection and industry modernization.

Recommendation 9.4:

The Ministry of Health and Medical Industry should continue implementing the Programme of Safe Management of Medical Waste in Health Facilities and monitor progress made in its implementation.

The current practice of waste disposal does not fully consider the application of modern technology in this area. New waste disposal sites are planned. The situation is critical, especially with regard to the disposal of MSW and industrial waste. Information on disposal sites exists at the local level only.

Recommendation 9.5:

The Ministry of Nature Protection should:

- (a) Develop, in cooperation with the State Committee on Statistics, for the municipalities of Ashgabat, and other main cities, provinces and relevant ministries and agencies, a register of disposal sites for municipal solid waste and for industrial solid waste;
- (b) Apply risk assessment methodology for the estimation of risks resulting from industrial waste disposal to ensure the development of safe disposal methods and replacement of old dumps by modern facilities.

Chapter 10

BIODIVERSITY AND PROTECTED AREAS

10.1 Description of general situation concerning biodiversity

The landscapes of Turkmenistan are dominated by the lowland deserts and xeric shrublands of the Karakum Desert, which account for some 79 per cent of the country's area (Figure 10.1). Although the medium-height mountainous areas of Kopetdag, Badkhyz, Balkhan and Kugitang occupy only 2 per cent of the territory, they harbour two thirds of the country's species. The alluvial plain of the Amu Darya River in the north-east includes significant *tugai* forests. There are also lakes (many temporary) and smaller rivers, most of which end blindly in the Karakum Desert or are entirely used for irrigation. Anthropogenic landscapes include oases and the 1,445 km Karakum Canal. All of the landscape types comprise a variety of ecosystems with their specific flora and fauna (Map 10.1).

The diversity of Turkmenistan's ecosystems is reflected by its flora and fauna. About 7,100 species of plants and about 13,000 species of animals (718 of vertebrates) have been found. A total of 153 endemic plant species have been reported from the Kopetdag Mountains alone. There are 92 endemic and near-endemic vertebrate species.

Turkmenistan's biodiversity is well studied, owing to a strong tradition of faunistic and floristic research. Important fauna of global conservation concern include the sturgeon of the Caspian coast and Amu Darya, birds, ungulates and other large mammals (Table 10.1). There are significant populations of ungulates in Turkmenistan, such as the globally endangered Asiatic wild ass (*Equiinus hemionus*) and three subspecies of the vulnerable urial (*Ovis urial*). Saiga antelopes (*Saiga tatarica*) occasionally winter in northern areas. Turkmenistan is of global importance for migratory waterbirds, and of high importance for breeding waterbirds and raptors.

According to a 2009 IUCN Red List assessment of trees and shrubs of Central Asia, plant species of global conservation concern growing in Turkmenistan include the wild almond (*Amygdalus bucharica*) and the apple (*Malus sieversii*), as well as

two species of the genus *Calligonum*. There are certainly more globally threatened plant species in Turkmenistan. Most endemic species and threatened species occur in the *Asteraceae*, *Fabaceae* and *Rosaceae*. Parts of the country belong to the Central Asian "Vavilov Centre" of crop species origin. The wild crop relatives occurring there are important genetic resources.

The considerable biodiversity of parts of Turkmenistan, particularly of mountainous areas such as the Kopetdag and Kugitang Mountains, has resulted in the inclusion of these areas in Conservation International's Irano-Anatolian and Mountains of Central Asia global biodiversity hotspots. Fifty Important Bird Areas (IBAs) of international rank have been identified in the country. Following Turkmenistan's accession to the Ramsar Convention, Turkmenbashi Bay was the first area of Turkmenistan to be designated as a wetland of international importance, in 2009.

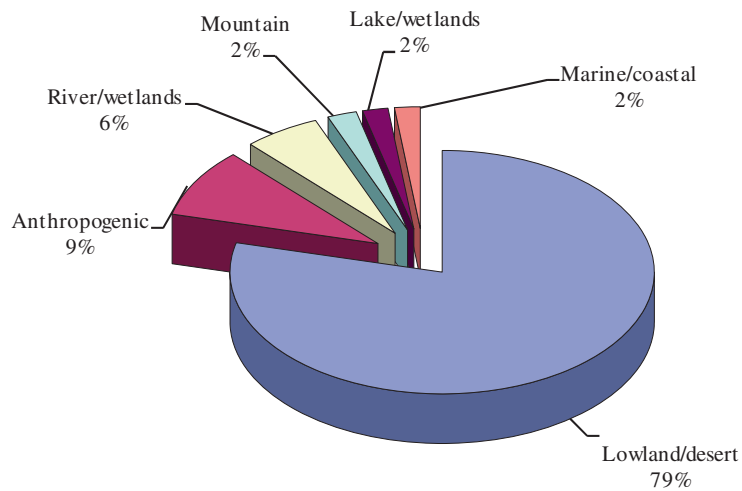
Turkmenistan's biodiversity is tightly linked to that of other Eurasian countries; many key biodiversity areas are to be found along its borders. The country, including its coastal waters, is located on major flyways of migratory birds, and is used as a wintering area by migratory fish (e.g. *Acipenser spp.*) and ungulates (e.g. *Saiga tatarica*). Up to 520,000 waterbirds were counted during the International Waterbird Count in Turkmenistan.

10.2 Institutional framework

Ministry of Nature Protection

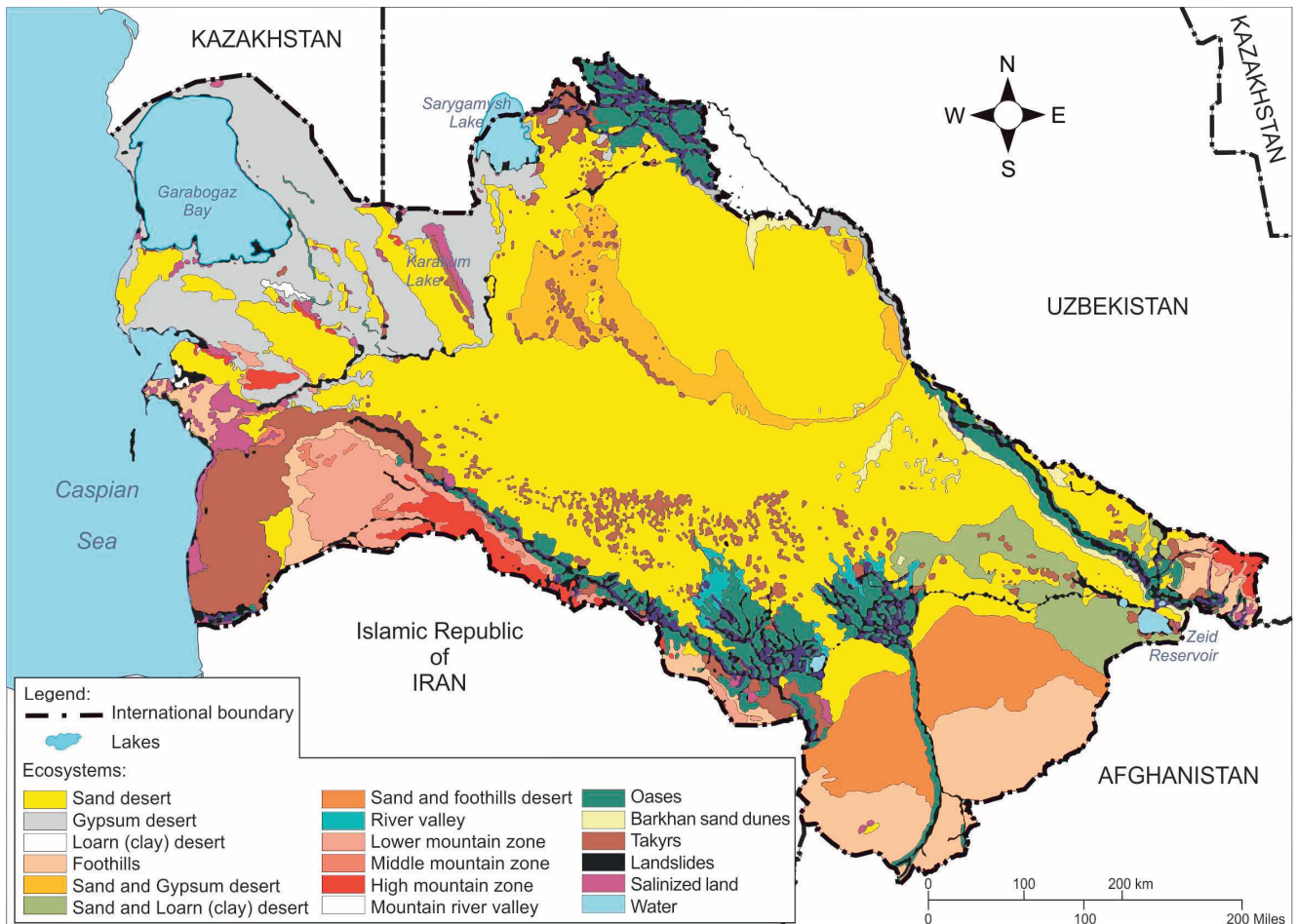
Based on the 2000 Regulation on the Ministry of Nature Protection, the Ministry is the authorized institution for the development of policy, exercise of State control, and coordination of government activities on conservation and sustainable use of nature. One of the Deputy Ministers is responsible for biodiversity conservation and PAs, among other issues. Among MoNP departments and subordinate institutions (Figure 1.1), the following are of particular relevance to biodiversity and PA management.

Figure 10.1: Distribution of major landscape types



Source: Ministry of Nature Protection, 2002.

Map 10.1: Ecosystem distribution



Source: Ministry of Nature Protection, 2002.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

Table 10.1: Globally threatened species

	Species	Global IUCN Red List	Red Data Book - 1999
Plants	Wild Almond <i>Amygdalus bucharica</i>	VU B2ab(iii,v)	-
	<i>Calligonum molle</i>	EN B2ab(iii,v)	-
	<i>Calligonum paletzkianum</i>	VU B2ab(iii,v)	-
	<i>Calligonum triste</i>	CR B1ab(III)+2ab(III)*	TE
	Wild Apple <i>Malus sieversii</i>	VU A2acde*	TE
	<i>Malacocarpus crithmifolius</i>	DD*	DE
Invertebrates	Thick-clawed Crayfish <i>Astacus pachypus</i>	DD	-
	<i>Chalepoxenus zabelini</i>	VU D2 (ver 2.3)	-
	<i>Graphoderus bilineatus</i>	VU B1+2ac (ver 2.3)	-
	Dark Pincertail <i>Onychogomphus assimilis</i>	VU A2ac+3c	-
	Willowherb Hawkmoth <i>Proserpinus proserpina</i>	DD (ver 2.3)	-
	Predatory Bush Cricket <i>Saga pedo</i>	VU B1+2bd (ver 2.3)	DE
<i>Strongylognathus minutus</i>	VU D2 (ver 2.3)	-	
Cartilaginous fish	Russian Sturgeon <i>Acipenser gueldenstaedtii</i>	CR A2bcde	-
	Persian Sturgeon <i>Acipenser persicus</i>	CR A2cde	-
	Stellate Sturgeon <i>Acipenser stellatus</i>	CR A2cde	-
	Dwarf Sturgeon	CR A2c	TE
	<i>Pseudoscaphirhynchus hermanni</i>		
	False Shovelnose Sturgeon <i>Pseudoscaphirhynchus kaufmanni</i>	CR A2c	DE
Beluga <i>Huso huso</i>	CR A2bcd	-	
Bony fish	Pike Asp <i>Aspiolucius esocinus</i>	VU A1acde (ver 2.3)	DE
	Volga Shad <i>Alosa volgensis</i>	EN B2ab(iii,v)	DE
	Common Carp <i>Cyprinus carpio</i>	VU A2ce	-
	Shorthead Barbel <i>Luciobarbus brachycephalus</i>	VU A2cd	-
	Bulatmai Barbel <i>Luciobarbus capito</i>	VU A2cd	-
	Starostin's Loach <i>Nemacheilus starostini</i>	VU D2 (ver 2.3)	RA
	Golden Spined Loach <i>Sabanejewia aurata</i>	DD (ver 2.3)	-
	Estuarine Perch <i>Sander marinus</i>	DD (ver 2.3)	-
	Belobirtsa <i>Stenodus leucichthys</i>	EX	RA
Amphibians	<i>Hyles hippophaes</i>	DD (ver 2.3)	-
Reptiles	Central Asian Cobra <i>Naja oxiana</i>	DD (ver 2.3)	DE
	Toadhead agama <i>Phrynocephalus golubewii</i>	CR B1ab(i,ii,iii,v)	-
	Central Asian Tortoise <i>Testudo horsfieldii</i>	VU A2d (ver 2.3)	-
Birds	Lesser White-fronted Goose <i>Anser erythropus</i>	VU A2bcd+3bcd+4bcd	DD
	Eastern Imperial Eagle <i>Aquila heliaca</i>	VU C2a(ii)	DE
	Houbara Bustard <i>Chlamydotis undulata</i>	VU A2bcd+3bcd+4bcd	TE
	Pale-backed Pigeon <i>Columba eversmanni</i>	VU A2bcd+3bcd+4bcd	-
	Saker Falcon <i>Falco cherrug</i>	VU A2bcd+3cd+4bcd	RA
	Lesser Kestrel <i>Falco naumanni</i>	VU A2bce+3bce+4bce	RA
	Siberian Crane <i>Grus leucogeranus</i>	CR A3bcd+4bcd	TE
	Pallas's Fish-eagle <i>Haliaeetus leucoryphus</i>	VU C2a(ii)	DE
	Marbled Teal <i>Marmaronetta angustirostris</i>	VU A2cd+3cd+4cd	RA
	Egyptian Vulture <i>Neophron percnopterus</i>	EN A2bcde+3bcde+4bcde	-
	Slender-billed Curlew <i>Numenius tenuirostris</i>	CR C2a(ii); D1	-
	Great Bustard <i>Otis tarda</i>	VU A2c+3c+4c	TE
	White-headed Duck <i>Oxyura leucocephala</i>	EN A2bcde+4bcde	DE
	Dalmatian Pelican <i>Pelecanus crispus</i>	VU A2ce+3ce+4ce	RA
Sociable Lapwing <i>Vanellus gregarius</i>	CR A3bcd+4bcd	RA	
Mammals	Wild Goat <i>Capra aegagrus</i>	VU A2cd	DE
	Asiatic Wild Ass <i>Equus hemionus</i>	EN A2abc+3bd	DE
	Goitered Gazelle <i>Gazella subgutturosa</i>	VU A2ad	DE
	Zarudny's Jird <i>Meriones zarudnyi</i>	DD	RA
	Masked Mouse-tailed Dormouse	DD	RA
	<i>Myomimus personatus</i>		
	Urial <i>Ovis orientalis</i>	VU A2cde	DE
	Caspian Seal <i>Pusa caspica</i>	EN A2abd+3bd+4abd	-
	Mongolian Saiga <i>Saiga tatarica</i>	CR A2acd	DE
	Marbled Polecat <i>Vormela peregusna</i>	VU A2c	-

Source: International Union for Conservation of Nature, 2009. Red Data Book Status, 1999.

Notes: IUCN threat categories "vulnerable" and higher: CR = critically endangered; EN = endangered; EX = extinct in the wild; VU = vulnerable; DD = data deficient. Red Data Book of Turkmenistan categories: DE = declining; RA = rare; TE = threatened with extinction.

* Evaluated during Central Asian trees assessment, 2009.

Department of Protection of Flora and Fauna

The Department is responsible for the development and implementation of policy related to the protection and sustainable use of terrestrial biodiversity and PAs. It also drafts legislation and oversees the regulatory framework for the sustainable use of biodiversity resources and the development of the PA system. The Department is responsible for all State Reserves and all other PAs of international or national importance, as well as the Red Data Book of Turkmenistan. It fulfils a function in terms of Government control related to natural resources management and PAs. The relevant unit consists of seven persons at the Ministry in Ashgabat and around 70 staff in MoNP provincial representations. The combined staff of all eight State reserves reporting to the Department is 391, including 176 management staff, 173 enforcement staff and 42 scientific staff.

Caspian Ecological Service CaspEcoControl

CaspEcoControl is the body responsible for conservation of the environment, including biodiversity, in the Turkmen sector of the Caspian Sea. This includes policy implementation and the State inspection function in relation to the Caspian Sea (Chapters 2 and 7).

National Institute of Deserts, Flora and Fauna

NIDFF was established from several institutes formerly under the umbrella of the National Academy of Sciences. It supports the Ministry by providing expertise on biodiversity and nature conservation. NIDFF has a staff of 126, including three holders of the degree of doctor of science and 16 candidates of science. The NIDFF laboratories (departments) most relevant to biodiversity management are the Laboratories of Invertebrate Biology, Vertebrate Biology and Special Protected Areas.

State institutions involved in biodiversity and protected areas management

Apart from MoNP, key national State institutions involved in biodiversity management are the State Committee for Fisheries, which deals with all aspects of commercial fisheries management; the State Tourism and Sports Committee; the Public Limited Company Geok Gushak (State Forestry Enterprise); the Institute of Botany of the Academy of Sciences; and the National Institute of Raw Drug Materials under MoHMI, which is relevant to the management of medicinal plant resources. State universities with relevant courses include the Turkmen State

University named after Magtymguly and the Turkmen University of Agriculture.

State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes

This body, which meets once a year, coordinates implementation of biodiversity-related conventions such as the CBD, Ramsar Convention and WHC. There are working groups for individual conventions which meet more frequently (Chapter 4).

Non-governmental organizations involved in biodiversity and protected areas management

NGOs that support MoNP include the Society for Nature Protection (an IUCN member), and the Society of Hunters and Fishermen, which is directly involved in the management of the 43 hunting reserves (area: 2.76 million ha). Several international development cooperation bodies and conservation organizations have been active on biodiversity conservation and PA system development in Turkmenistan, including GEF, UNDP, WWF, BirdLife International and its UK partner the Royal Society for the Protection of Birds (RSPB), GIZ and the Michael Succow Foundation. Only UNDP and GIZ maintain a permanent presence in Turkmenistan.

Intersectoral cooperation related to management of biodiversity and PAs

Apart from MoNP and related State institutions, there are additional ministries whose activities strongly affect biodiversity and PAs. Among them are the Ministries for Energy and Industry, Oil and Gas and Mineral Resources, Agriculture, Construction, and Water Economy. According to the country's Fourth National Report on implementation of the CBD, intersectoral cooperation in relation to biodiversity management has been relatively weak in the recent past: "However, for many sectors of national economy, implementation of BSAP did not become a priority and has not been integrated into their national plans and strategies. Weak coordination or integration between MoNP's actions and the institutions, directly influencing biological resources, has created certain difficulties".

Inspectorates and compliance

The Department of Protection of Flora and Fauna leads the exercise of the State inspection function in the forestry and PA fields. Statistics on violations (approximately 11,000 cases in PAs alone over the

last five years) indicate that there is still a high incidence of illegal natural resource use.

Distribution of authority among the centre, provinces and municipalities

The Ministry operates at the level of the five provinces, where the Department of Protection of Flora and Fauna is represented. The administrations of the eight State reserves also report to the Department. The institutional structure is essentially centralized and based on a top-down approach. Little authority is devolved to the provincial, local or State reserve level.

The municipalities have jurisdiction over the use of their lands (apart from lands designated as State reserves and other special land use categories), and have a veto power in relation to the designation of new PAs on these lands. Provincial and local administrations have objected to some plans for the establishment of new PAs in the past, leading to delays at least (e.g. the planned Balkhan State Reserve). Communications between the administrations of existing State reserves and municipalities take place in an ad hoc manner, without formal arrangements.

Institutional capacity of institutions in biodiversity and PA management

A self-assessment of the capacity of MoNP and its subordinate structures to implement the United Nations global environmental conventions and a capacity-building strategy were elaborated in 2007. According to this assessment, priority areas for improvement of capacity are management, monitoring and information systems, international cooperation, coordination between State agencies, scientific and technical capacity, and staff training. Capacity development needs at the subnational (provincial) level were particularly emphasized.

Limitations of the systemic, institutional and individual capacities for PA planning, management and financing were identified as one of the root constraints on the Turkmen PA system's effectiveness. It was noted that the Department of Protection of Flora and Fauna has very few staff. Excess bureaucratic procedures, poor coordination and limited financial planning capacity were also highlighted, and a lack of technically qualified PA staff (particularly among younger staff) was noted. The capacity of State sanctuaries, which have no administrations of their own, was assessed as being much lower than that of the State reserves. Capacity constraints like these affect not only the PA system

but also other areas of work of the Department of Protection of Flora and Fauna.

Institutional capacity differs between PAs. Some reserves appear relatively well developed. For instance, the Kopetdag State Reserve (50,000 ha) has a staff of 43, including seven qualified and competent scientific staff, a newly constructed administration building and smaller huts in the four component strict reserves, as well as – reportedly – sufficient equipment. Other State reserves, and particularly all the State sanctuaries (*zakazniks*), which have no staff of their own, are much more poorly equipped. Such differences need to be taken into account when planning capacity development measures in the future.

Assessment

The institutional framework for biodiversity and PA management is provided mainly by the MoNP Department of Protection of Flora and Fauna and its subordinate structures. The overall institutional set-up is viable. The following shortcomings regarding the institutional framework have been identified:

- Lack of capacity for effective biodiversity management at all levels (systemic, institutional and individual);
- Need for stronger decentralization and devolvement of decision-making authority to the level of the PAs and provinces, in order to facilitate informed adaptive management. Local PA managers are usually the first to notice changes in the state of their reserves which call for management interventions. They have the best local knowledge and networks to devise an effective management strategy. The more management responsibility is devolved to them, the more effectively this local knowledge will be utilized for the benefit of the PAs;
- Limited coordination among governmental institutions and mainstreaming of the biodiversity agenda across sectors.

These institutional constraints continue to weaken the governance of the biodiversity management and PA system of Turkmenistan and call for targeted capacity-development measures.

10.3 Policy framework and priorities concerning biodiversity and protected areas

Identification of the policy framework

The 2002 NEAP and BSAP have been the fundamental policy and planning documents of

Turkmenistan in the field of biodiversity management and PAs. Both plans expired in 2010 and have not been replaced by new plans thus far.

NEAP, which was approved by Presidential Order, ranked biodiversity loss as the sixth of seven priority problems. Eight actions (about 8.5 per cent of all actions) and about US\$ 721,000 (approximately 0.13 per cent of all environmental investments) were earmarked for biodiversity conservation. These investments equaled 23 per cent of the absolute minimum estimated funding needs for biodiversity management over approximately the same period, as indicated in BSAP. The biodiversity actions listed in NEAP appeared selective: for instance, two of eight actions focused on the conservation of one species (*Macrovipera lebedina*) that is of little conservation concern.

BSAP specifically addressed biodiversity conservation and the development of the PA system of Turkmenistan. It was developed with the participation of a wide range of national experts and the support of the international NGO FFI, based on an in-depth country study of the biodiversity of Turkmenistan. BSAP aimed at contributing to the commitments of Turkmenistan to the CBD and at guiding national planning. Its overall aim was to “conserve, restore and sustainably use the biological diversity of Turkmenistan for present and future generations”. Twelve objectives were set to meet this aim, including:

- To integrate biodiversity conservation into all levels of governmental programmes by 2005;
- To revise and develop nature protection laws in accordance with the CBD, eliminating gaps in the legislation by the end of 2006;
- To halt the process of degradation of natural landscapes on 30 per cent of Turkmenistan’s territory by the end of 2010;
- To develop and introduce economic incentives to increase local people’s interest in biodiversity conservation by 2010;
- To increase investments for supporting the scientific potential of existing institutions relating to biodiversity conservation by 30 per cent by the end of 2010.

Since most of the above objectives required multiple actions, and many actions would contribute to fulfilling multiple objectives, the 55 actions and 253 activities in BSAP were not grouped under individual objectives but under 14 interrelated strategic components that reflected CBD articles. The Plan was not formally approved by the President or Government, which reduced its overall policy impact.

Since Turkmenistan has not reported on BSAP implementation by individual objectives/activities, it is not possible to assess precisely the implementation of the above objectives of particular relevance. However, based on Turkmenistan’s 2009 Fourth Report on implementation of CBD, and ongoing legislative and institutional development processes, it would appear that most of the activities towards these objectives are still in progress. BSAP also envisaged the creation of a dedicated BSAP Coordination Unit, which has not been established.

In addition to NEAP and BSAP, important policy and planning documents of Turkmenistan in the biodiversity sphere include the 2007 National Caspian Sea Action Plan and the document entitled Main Trends of Development of Protected Area System up to 2020, which is currently in preparation.

Policy implementation

No report on NEAP implementation has been published. According to generally available information, five of the eight NEAP biodiversity-related objectives were partly or fully met by 2010. Activities aimed at meeting the remaining three objectives (establishment of the Balkhan State Reserve; preparation of the third edition of the Red Data Book of Turkmenistan; and establishment of various national parks) are currently at various stages of implementation.

BSAP foresaw preparation of a final report on progress at the end of the plan’s lifespan. This report has not been published to date. The latest document containing detailed information on BSAP implementation is the analytical report, “Monitoring and Assessment of Efficiency of the Biodiversity Strategy and Action Plan”. According to this report, Turkmenistan had fulfilled around 49 per cent of all BSAP actions by 2007. The report did not say which actions and activities had been fulfilled. It identified 23 additional activities that would have to be fulfilled by 2010 (one by 2015) in order to meet overall BSAP goals.

The Fourth National Report on implementation of the CBD further commented that the incomplete implementation of BSAP objectives had been caused by insufficient intersectoral support, lack of endorsement by the Head of State, and failure to establish an information centre on BSAP implementation. The report listed projects that contributed to fulfilling some objectives during the period 2002-2009 in the fields of PA system development and species conservation.

MoNP representatives have characterized the 2002 BSAP as ambitious and have noted the strong involvement of international NGO representatives and national conservation experts in the planning process. They also explained that the first plan to be renewed, given the expiry of NEAP and BSAP in 2010, will be NEAP. More specific planning efforts in the biodiversity field – be they in the format of a new BSAP or another appropriate format – will flow from the general priorities identified by that plan.

Assessment

Since both the 2002 NEAP and the 2002 BSAP expired in 2010, the Government, and specifically MoNP, currently has no central policy and strategic planning document for the conservation and sustainable use of biodiversity, and for CBD implementation. This is a significant policy gap, which calls for concerted planning efforts. At the same time, the expiry of the old plans offers an opportunity to look back at both plans and their implementation and to identify lessons learned and areas for improvement.

On the one hand, the eight biodiversity-related actions prescribed by the 2002 NEAP were selective and lacked strategic coherence. They appeared inadequate to address the pressures and threats that affect biodiversity in Turkmenistan. Three of the eight NEAP actions had not been implemented by 2010, while information about the extent and impact of the implementation of the remaining objectives was lacking.

On the other hand, the 2002 BSAP offered a complex strategic framework of 12 objectives, 14 strategic components, 55 actions and 253 activities on biodiversity conservation, but did not receive the endorsement or funding that full implementation of such an ambitious plan would have required. Against this background, the reported implementation rate of 49 per cent appears surprisingly high. The reasons for this apparent success cannot be analysed further, as no final report on progress with implementation data by action/activity is available.

In terms of complexity, an effective national planning framework for the conservation and sustainable use of biodiversity would probably fall between the old NEAP and the old BSAP. Even a limited number of overall policy objectives could be effective if they were based on a thorough problem analysis, and achievable with the projected funding and capacity, and if there were room for adaptive management at multiple levels to turn strategic objectives into

meaningful action on the ground. The mainstreaming of conservation goals among governmental agencies and decision-makers beyond MoNP remains an important challenge in terms of successful policy development and implementation in the future.

10.4 Legal framework

General legal framework

According to legislation, international conventions ratified by the country supersede national law unless the latter imposes stricter rules. Turkmenistan ratified the CBD in 1996, the Ramsar Convention on Wetlands in 2009, the World Heritage Convention in 1994, and the Tehran Convention in 2004. The country has designated one Ramsar site (although five additional Ramsar sites existed before independence) but no natural World Heritage site to date. Efforts to nominate the latter are underway. Turkmenistan has not yet acceded to the CMS, AEWa or CITES. However, MoNP and other national stakeholders participate in several specific activities relating to these conventions.

The main instrument regarding biodiversity conservation and PAs in Turkmenistan is the Law on Nature Protection, which focuses on environmental protection in general rather than concentrating exclusively on nature protection. It defines protected natural territories and objects (among them, PAs), and defines the responsibilities of the Government regarding the establishment of State reserves and other PAs, and the maintenance of the Red Data Book of Turkmenistan. More detailed guidance is contained in other laws.

Legislation on the conservation and sustainable use of biodiversity

The 1993 Law on Protection and Rational Use of Flora and the 1997 Law on Protection and Rational Use of Fauna clarify the responsibilities of State institutions and land users in relation to the use of flora and fauna and the corresponding State control, and define types of plant and animal resource use and procedures for the determination of fees and rents for that use. They further lay out the rights and duties of contractual users of wild plant and animal resources. Liabilities for infringements are also set out. In addition, the conservation of fauna and flora, including in the context of construction and infrastructure projects, is regulated. Conservation measures include in situ and ex situ conservation methods. Species on the Red List are exempt from use (apart from tightly controlled exceptions). The

two Laws also prescribe the monitoring of wild flora and fauna but do not give detailed guidance on monitoring.

According to the 1998 Law on Hunting and Hunting Management, hunting can be conducted as a leisure or economic activity; the latter is not being carried out currently. The Law defines hunting resources and areas as well as the manner in which they can be used, the responsibilities of the various State institutions in relation to hunting management (e.g. opening of seasons, Government control, monitoring) and the use of hunted products (e.g. mechanisms for setting fees). It prescribes the use of sustainable hunting techniques, and defines various types of poaching and corresponding liabilities and penalties.

Under the overall umbrella of the above Laws, the use of biodiversity of particular economic interest is regulated by a range of regulations and normative-technical documents, such as the 1992 Measures for Protection of Wild Licorice, Poisonous Snakes and Products of their Life Activity; the 1998 Regulations on Fish Stocks Protection and Fishery Management in Territorial and Internal Waters of Turkmenistan; and the 2001 State Standards on Environmental Impact Assessment. There is also a 1997 regulation on the Red Data Book of Turkmenistan.

Protected area legislation

The specific legal basis of the PA system is the 1992 Law on State Protected Natural Areas. The Law defines the general functions of PAs, as well as the related responsibilities and jurisdictions of State institutions. It states that PAs can have international, national or local importance, and provides more detail on the status and regime of PA categories (State reserve, historical/memorial park, sanctuary, natural monument, botanical/zoological garden, arboretum, natural spa), as well as rules and responsibilities for zoning, management and monitoring. Public participation and liability for infringements are also addressed. No explicit requirement to develop management plans is included. The category system used reflects the system of the former USSR rather than the IUCN PA categories. There is no PA category of national park. No guidance on the economic activity of PAs is provided. The only governance type foreseen is State management.

The implementation of the Law is guided by normative-technical regulations for the main PA categories adopted in 1995: Typical Regulations on State Reserves, Typical Regulations on Protected Zones of State Reserves, Typical Regulations on

State Sanctuaries, and Typical Regulations on State Natural Monuments.

Implementation of legislation

The BSAP, the Fourth National Report on implementation of the CBD and other documents show that, similarly to the situation in other countries in transition, there remain some implementation gaps with regard to biodiversity-related legislation. Illegal hunting and trapping of animals – there were 1,104 cases in 2010, including the goitered gazelle (*Gazella subgutturosa*), urial (*Ovis vignei*), houbara bustard (*Chamidotis undulate*) and little bustard (*Tetrax tetrax*) – fishing (1,121 cases), logging and fuelwood collection, grazing, and collection of plant resources (1,288 cases) have been reported from Turkmen PAs.

These failures in the implementation law enforcement are caused by the lack of implementation capacity, particularly at the local level, and unclear institutional responsibilities of State institutions. Weaknesses in the legislation itself also contribute to its limited effectiveness.

Ongoing development of legislation on biodiversity management and PAs

The legislative framework for biodiversity conservation and PAs has been assessed, partly within the UNDP project entitled Strengthening the Management Effectiveness of the Protected Area System of Turkmenistan. Steps for its revision and modernization, and better alignment of laws with international standards, are being prepared. These focus particularly on the Law on State Protected Natural Areas, the Law on Protection and Rational Use of Flora, the Law on Protection and Rational Use of Fauna, and the Law on Hunting and Hunting Management. With regard to the latter, the main innovations aim at a clearer definition of use classes of flora and fauna, a clearer definition of the responsibilities of MoNP and municipalities in relation to biodiversity management, and the introduction of a cadastre of plant resources. With regard to PAs, planned amendments focus in particular on:

- Better alignment of the classification of PA categories with international good practice;
- Development or strengthening of new types of income and economic autonomy, and economic incentives and instruments which support the establishment and management of PAs;
- Harmonization of PA legislation with other national legislation and policies, for example, Forestry Code, Water Code and Land Code;

- Reforms and standardization of procedures for the establishment, planning, management and monitoring of PAs.

One development of particular relevance is the establishment of the legislative basis for national parks (IUCN PA Category II). Specific recommendations for amendments of legislation and normative-technical documents to facilitate the creation of national parks have been made by national and international experts.

Assessment

The core legislation on biodiversity management and PAs in Turkmenistan dates from the 1990s and is in need of revision. The laws on the protection and sustainable use of flora and fauna could be significantly improved by creating a basis for resource monitoring, as well as a clearer definition of use classes of biodiversity resources and institutional responsibilities.

The Law on State Protected Natural Areas reflects a centralized, top-down approach to PAs and an emphasis on State ownership and governance. This approach is not consistent with current international good practice. It also appears ineffective since it does not support a functional governance framework aimed at the conservation and sustainable use of biodiversity. The Law supports a PA system that is centered round State reserves (IUCN Category Ia), some of which are surrounded by IUCN Category IV/V PAs.

These reserves may be insufficient to form a functional PA system, as they are often too small to safeguard ecosystem processes. They also exclude local resource users and hence cannot be strengthened through the introduction of economic incentives to sustainable natural resource use.

Against this background, ongoing legislative efforts aimed at revision of the laws on the protection and sustainable use of flora and fauna, as well as diversification of PA categories, and the strengthening of public participation and economic incentives in PA management, appear very timely. It will be important to ensure that these are not narrowly focused on the introduction of one new PA category (national parks) but, rather, aim at the development of the PA system of Turkmenistan as a whole. There are also promising tendencies to integrate the country's PA system more closely with the framework of MEAs, such as the Ramsar Convention and WHC.

10.5 Current state of and trends in biodiversity

As in most countries, the biodiversity of Turkmenistan has declined significantly over the last 100 years. High-value ecosystems continue to shrink because of desertification and land degradation. Natural forests of juniper (e.g. in the Kopetdag Mountains) and pistachio (e.g. at Badkhyz) have been negatively affected by overexploitation.

Turkmenistan's Fourth National Report on implementation of the CBD has highlighted the decline in Turkmenistan of sturgeons (*Huso huso*, *Acipenser spp.* and *Pseudoscaphirhynchus spp.*), the Caspian seal (*Pusa caspica*), leopard (*Panthera pardus*) and urial (*Ovis orientalis*). The ranges of both sturgeon species of the Amu Darya River (*Pseudoscaphirhynchus spp.*) have shrunk. They were restricted to upstream of Turkmenabad and the Karakum Canal in the 1990s. Four bird species (marbled teal (*Anas angustirostris*), lesser kestrel (*Falco naumanni*), Siberian white crane (*Grus leucogeranus*) and great bustard (*Otis tarda*)) were listed as endangered in the 1999 Red Data Book of Turkmenistan, and others have declined strongly.

The cheetah (*Acinonyx jubatus*) and the Turanian tiger (*Panthera tigris "virgata"*) became extinct in Turkmenistan during the 20th century. The leopard (*Panthera pardus*) used to be widespread until the 1950s but is now restricted in distribution and less numerous, with only 30-40 individuals reported in 1994. The Turkmen population of the Asiatic wild ass (*Equus hemionus*) was estimated at 6,000 in 1996 but at little more than 600 in 2001. Other important ungulate populations have reportedly also declined over the last 20 years, such as those of the urial (*Ovis urial spp.*), markhor (*Capra falconeri*), bezoar goat (*C. aegagrus*) and goitered gazelle (*Gazella subgutturosa*). There were about 40-45 Bukhara deer (*Cervus elaphus bactrianus*) remaining in Amu Darya State Reserve in the 1990s. Since many plant habitats (e.g. saxaul, *tugai*, pistachio and juniper forests) have been significantly reduced and degraded in the recent past, it is likely that the conservation status of their flora has also deteriorated in the medium term.

A trend towards stabilization, albeit at a comparatively low level, of the populations of several large vertebrate species over the last five years has been reported recently. The Asiatic wild ass, for example, has apparently not declined further since 2001. Reptile populations have also recovered, following the closing of serpentaria. However, a comprehensive up-to-date assessment of the

conservation state of ecosystems and species throughout Turkmenistan is impossible, because of the incomplete system of biodiversity monitoring. Many of the 50 IBAs in the country are subject to anthropogenic pressures (e.g. overexploitation, agricultural expansion and pollution). This may negatively affect bird populations and other biodiversity in these areas.

10.6 Pressures and threats to biodiversity

Some, but not all, pressures and threats to biodiversity and natural resources in Turkmenistan are caused by unsustainable resource use. In this chapter, pressures are defined as factors which negatively affect the conservation status of identified biodiversity values or natural resources, while threats are defined as factors which may turn into pressures.

Habitat destruction as a consequence of infrastructure and agricultural development

Ecosystems and habitats of Turkmenistan are being destroyed or degraded as a consequence of the ongoing rapid infrastructure development and planned hydrological management. The discharge of some rivers (e.g. the Sumbar and Murghab Rivers) has been greatly reduced due to water use for irrigation, and *tugai* forests along the Amu Darya River are flooded much less frequently than 100 years ago. Some ecologically important wetlands have dried up as a result, while others (e.g. along the Karakum Canal) have been created. The development of extensive irrigated farming areas has led to the destruction of desert ecosystems. A current example of habitat alteration is the ongoing creation of the artificial Lake Altyn Asyr in the Karakum Desert, which may turn into a valuable wetland habitat, again at the expense of desert habitats. The development of transport and oil and gas infrastructure has also impacted upon fragile desert ecosystems. For example, dragging oil equipment between wells results in deep surface scars. UNDP and MoNP are currently planning a project to quantify and manage the impact of this type of habitat destruction and/or degradation on the ecosystems and biodiversity of Turkmenistan.

Overgrazing

Overgrazing places great pressure on flora, vegetation cover and ecosystem integrity. For example, it has degraded the vegetation cover of the southern Karakum, the pistachio woodlands of southern Turkmenistan, and juniper forests in the Kopetdag Mountains. Agricultural expansion (including grazing) has been ranked second among

the pressures on IBAs. It reduces the integrity of some of Turkmenistan's PAs, and can threaten wild ungulates which compete for food with livestock. Grazing pressure on Turkmen ecosystems is increasing at a dramatic rate: livestock numbers in Turkmenistan have grown by 80 per cent between 2001 and 2010, and there are plans to increase them further (Chapter 8).

In the Karakum Desert, average livestock density suggests that there might be sufficient pastures for existing livestock. However, degradation of vegetation, ecosystems and biodiversity also arises from an uneven distribution of livestock (often due to patchy water availability), not only from excessive livestock numbers alone. This assessment is consistent with remote sensing data on land degradation. It suggests that improved livestock management may be necessary to keep livestock development sustainable (Chapter 8).

Unsustainable hunting and collection of wild animals

There is a tradition of hunting for meat and furs in Turkmenistan. Since independence, the official hunting economy has ceased to exist. Legal amateur hunting appears to be sustainable. However, illegal hunting continues to exert pressure on some species of mammals and birds. It has caused alarming damage to the populations of Asiatic wild ass, goitered gazelle, urial and bezoar goat until recently. Leopards have been persecuted in retribution for damage to livestock, at least until the 1990s.

Illegal hunting of birds continues near the Caspian Sea coast and in the Karakum Desert. Overexploitation, which is mainly through illegal hunting, affects more than 75 per cent of the IBAs of Turkmenistan, so that it is a major pressure on wild birds in the country. There have been reports of falconers from Arab countries hunting large numbers of globally threatened bustards, during the 1990s and also more recently. It is not clear whether this is still a significant pressure but it clearly warrants continued attention.

The collection of poisonous snakes (*Macrovipera lebedina*, *Naja oxiana* and *Echis carinatus*) for serpentaria no longer threatens these species, as all commercial serpentaria have been closed.

International trade appears to play a limited but significant role in connection with animal collection. Turkmenistan granted export licences for 100 Asiatic wild ass and two leopards in 1993/1994. Since Turkmenistan is not a party to CITES, the country

has no reporting requirement to CITES on its wildlife trade. Information about exports of endangered fauna from Turkmenistan can only be retrieved from reported imports to CITES parties. Since 2000, around 40 hunting trophies (mainly argali, to the USA) and 15 live falcons (mainly saker, to Saudi Arabia) have been exported from Turkmenistan according to these data. About 129 saiga horns were exported to the USA in 2000, and two live leopards were exported to the Russian Federation (in support of a reintroduction programme there) in 2009.

Unsustainable plant and fuelwood collection

Wild plants are used both by the industrial sector and for household use or small-scale marketing. About 53 species of wild and cultivated plants, including medicinal, ornamental and food plants as well as dyes, are used by industry.

The most important commercially used plants are liquorice (*Glycyrrhiza glabra*) and the introduced senna (*Cassia senna*). BSAP reports that liquorice sales totalled the astonishing amount of US\$ 923 million in 2002. A processing factory with an annual capacity of 1,000 t of liquorice extract was opened in 2008, requiring a much larger amount of raw material. Liquorice is exclusively collected in the wild in Turkmenistan, including from some State sanctuaries. There are no quotas, merely fees, which are expressed as a proportion of the realized harvest. There is a need to determine a sustainable production quota for liquorice.

The same may be true for other wild plants about which relatively little is known. Fuelwood harvesting without official permits used to be practised throughout Turkmenistan. It is reportedly declining as natural gas is made available to an increasing number of households. Fuelwood collection has led to land degradation and biodiversity loss in most ecosystems of the country, often going hand in hand with unsustainable grazing.

Climate change

Climate change increasingly affects the status of biodiversity and availability of natural resources in Turkmenistan. It also challenges the regulatory capacity of the country's natural ecosystems (e.g. regarding desertification and land degradation). An upward shift of vegetation belts (i.e. to higher altitudes), increased pressure on mountain species and species occurring in already fragmented habitats, and a higher incidence of alien and invasive species have been predicted for comparable systems undergoing climate change. This would also affect

natural-resource-based rural livelihoods and economies.

Invasive alien species

The flora and fauna of Turkmenistan have been changed by invasive alien species (IAS). Some were introduced intentionally, while others escaped or invaded accidentally. Examples of the first group include herbivorous cyprinid fishes that were introduced to control aquatic plants in the Karakum Canal and other waterways. An example of the second group is nutria (*Myocastor coypus*), which escaped from commercial farms. Among the plants, conspicuous introductions are osage-orange (*Maclura pomifera*), honey locust (*Gleditsia triacanthos*) and ailanthus (*Ailanthus altissima*) from China. The importance of IAS is likely to increase in the future if climate change predictions hold true.

10.7 Protected areas system

The PA system of Turkmenistan currently consists of eight State reserves (*zapovedniks*, IUCN PA Category Ia), some of which are surrounded by State sanctuaries (*zakazniks*, IUCN PA Category IV) and protected zones (cf. IUCN PA Category V) as part of the same management unit (Table 10.2). There are also 17 officially designated natural monuments (IUCN Category III), but no independent sanctuaries or protected landscapes, no national parks (IUCN PA Category II) and no sustainable use zones (IUCN PA Category VI). PAs currently cover approximately 4 per cent of the country's area; 1.6 per cent of the territory is covered by the core State reserves.

The eight State reserves with their sanctuaries form the backbone of Turkmenistan's PA system. A UNESCO biosphere reserve (Repetek State Biosphere Reserve) was designated in 1978. The State reserves have a strict protection regime and exclude natural resource use by local inhabitants, with very few exceptions. All have management authorities, which report to the Department of Protection of Flora and Fauna under MoNP. Most are important not only for biodiversity conservation, but also for research and for the conservation of genetic resources. The 17 officially designated natural monuments of the country include caves, geological sites, and groves of pistachio and walnut.

Ecosystem and species coverage of protected areas

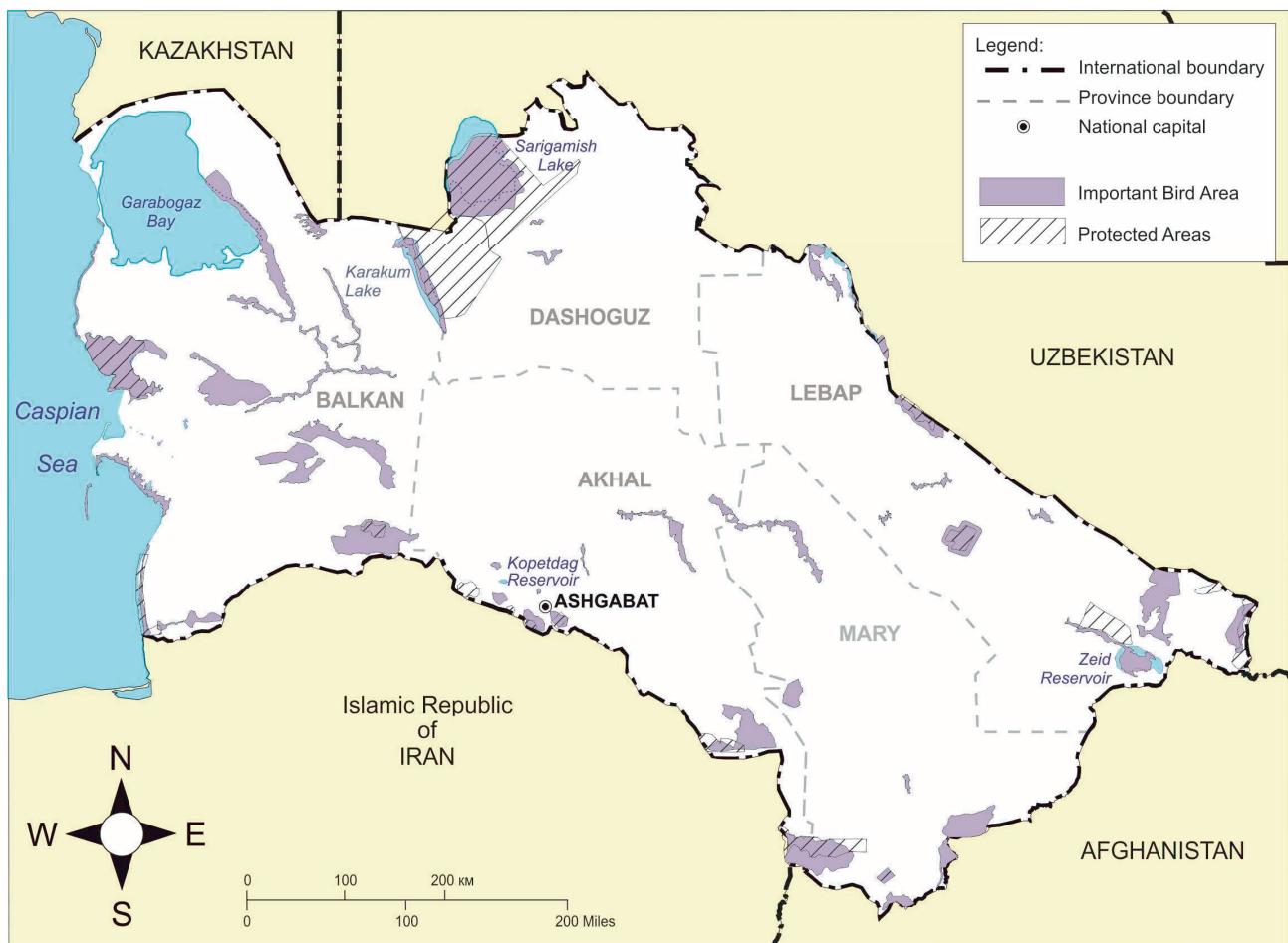
A comparison of ecosystem and PA distribution reveals that nine of the 17 main ecosystem types of Turkmenistan are represented by PAs, including the

Table 10.2: State reserves

Name	Area (ha)	Year of establishment	Objective	Remarks
Amu Darya	49,514	1982	Conservation of Amu Darya and its flood plain including Tugai forests and their biodiversity	3 component reserves
Badkhyz	87,680	1941	Conservation of pistachio savannah ecosystems and their biodiversity, particularly Asian wild ass, goitered gazelle	3 State sanctuaries included in management unit; UNESCO World Heritage application
Kaplankyr	282,800	1979	Conservation of lake and desert ecosystems and their biodiversity, particularly migratory waterbirds	1 State sanctuary included in management unit
Khazar	226,589	1932	Conservation of coastal and desert ecosystems along the Caspian Sea and their biodiversity, including migratory waterbirds and Caspian seals	2 component reserves; 1 State sanctuary and 1 Ramsar site included in management unit
Kopetdag	49,793	1976	Conservation of mountain ecosystems of central Kopetdag and their biodiversity, including endemic plants, ungulates	4 component reserves, 2 State sanctuaries
Kugitang	27,139	1986	Conservation of mountain ecosystems of western Pamir-Alai range and their biodiversity	4 State sanctuaries
Repetek	34,600	1928	Conservation of central/south-eastern Kara Kum Desert ecosystems, including black saxaul	UNESCO biosphere reserve
Syunt-Hasardag	26,461	1978	Conservation of mountain ecosystems of western Kopetdag and their biodiversity, including endemic plants, leopard	3 component reserves, 1 State sanctuary

Source: Ministry of Nature Protection, 2011.

Map 10.2: Important Bird Areas and Protected Areas



Source: Ministry of Nature Protection, 2011.

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

most important ones (Map 10.2). It has been estimated that about 80 per cent of the biodiversity of the country is represented in PAs. This suggests that ecosystem and species coverage of the current system is satisfactory.

However, it is not clear how these percentages were estimated and how they account for extensive high biodiversity value areas outside the PA system (e.g. border areas). Even if a high percentage of species and ecosystems is represented (i.e. occurs) within PAs, this does not ensure that they are effectively conserved there. Therefore, percentage estimates of ecosystem or species cover may convey a false sense of completeness of the PA system. For instance, there is clearly room for improvement as regards the PA system's species coverage. Only 1.6 per cent of the IBAs are fully protected inside PAs, while 76 per cent are not protected.

Another gap analysis identified several desert (e.g. the Karakum Desert), mountain (e.g. Balkhan) and lake (e.g. the Sarygaysh Lake, Zeyit-Kalif and Uzboy) ecosystems as gaps in the PA system. It also noted that the size of some PAs was inadequate for reaching their conservation objectives because they did not contain large enough areas of target species' habitats.

Protected Areas management effectiveness

The effectiveness of the management of existing PAs is as important as their area. The same pressures and threats as those generally observed in Turkmenistan apply to the PAs. A recent UNDP assessment revealed unauthorized livestock farming and grazing, illegal hunting and plant collection, and infrastructure development as major threats to State reserves. BSAP highlighted the need for improved management to minimize their effects.

The management effectiveness of most of the State reserves of Turkmenistan is reasonably high, as staffing levels and financing (around \$ 2.5 million annually for all State reserves combined) appear satisfactory. In some State reserves, the protection regime also benefits from their relative inaccessibility and direct proximity to the State border. A management effectiveness assessment of the State reserves using the PA Management Effectiveness Tracking Tool was conducted in 2009. It identified the following areas for possible improvement of the management effectiveness of PAs:

- Development and implementation of management plans: only half of the State reserves (Khazar, Syunt-Hasardag, Amu Darya and Repetek) currently have approved

management plans, and those that have them do not always use them to guide management;

- Improvement of protection systems: almost 1,900 cases of illegal natural resource use were reported from Turkmenistan's PAs in 2010. There are not enough regular patrols to stop illegal resource use inside the State reserves;
- Closer feedback between monitoring and management: all State reserves regularly report to the Department of Protection of Flora and Fauna and compile annual monitoring reports (*Nature Chronicles*), but the results of this monitoring are only passed up through the reporting chain, rather than being used to adapt management at the PA level;
- Strengthened participation of local communities: local communities are not directly involved in decision-making for PA management in their vicinity, which may reduce local support and ownership in terms of PA management.

Sanctuaries, which comprise 58 per cent of the PA area of Turkmenistan, have much more limited management than do State reserves. None of them has a management plan, on-site administration or infrastructure and equipment of their own. Natural resources (e.g. pistachio, liquorice) are extracted from some of them, but no quotas or sustainable management regimes for such activities exist.

Ongoing development of the protected areas system

In order to increase the completeness and effectiveness of the PA system of Turkmenistan, MoNP is drafting the document, Main Trends of Development of the Protected Area System of Turkmenistan to 2020. In accordance with the directions set out in this document, several projects and initiatives have been implemented or are being implemented at the moment.

MoNP plans to establish new State reserves in the Karakum Desert and in the Greater Balkhan Mountains in western Turkmenistan, which will increase both the representativeness and the area coverage of the national PA system.

A UNESCO World Heritage nomination file for the Badkhyz State Reserve has been compiled in a participatory manner by MoNP, with the assistance of RSPB and in accordance with an IUCN recommendation. It is being considered for official

submission by the Cabinet of Ministers. A management plan for the prospective World Heritage site has been elaborated jointly with local stakeholders. Adjustments to the Reserve's area, that are necessary to meet the integrity preconditions for natural World Heritage, have been mapped.

The UNDP project Strengthening the Management Effectiveness of the PA System of Turkmenistan aims to develop a reconfigured system of PAs that is designed to protect a representative sample of Turkmenistan's biodiversity under an effective and adaptive management regime. This is to be achieved through expansion of the representation and coverage of the PA system and through the development of adequate institutional and individual capacity. Some of the outputs are related to the establishment of national parks.

The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety supported the creation of national parks until 2009. The Michael Succow Foundation, as implementing agency, chose the existing Kopetdag and Syunt-Khasardag State Reserves as pilot areas. Plans to establish national parks will only be implemented once the necessary adjustments to the PA legislation (primarily the establishment of national parks as a legal PA category) have been made.

The GEF-UNEP-WWF project entitled Econet Central Asia (2003-2006) promoted the establishment of a regional ecological network that consolidates existing PAs in all Central Asian countries into a functional unit. WWF Russia is continuing this development, aiming to establish a functional econet in core conservation areas by 2020.

10.8 Ex situ conservation

PAs are an important instrument but not the only one for biodiversity conservation. Ex situ conservation activities can complement PA system development. Existing activities of Turkmenistan in the field of ex situ conservation include the collection of genetic material of wild crop relatives at the Magtymguly Scientific and Experimental Centre of Plant Genetic Resources of MoA, collections of autochthonous plant species at the Ashgabat Botanical Garden, and efforts aimed at the captive breeding of mammal species by several State reserves.

These efforts suggest that ex situ conservation is justified in some cases, although PAs and other in situ measures offer more effective and cost-efficient ways of supporting large mammals in particular.

10.9 Biodiversity of the Caspian Sea, its protection and sustainable use

The Caspian Sea coast of Turkmenistan comprises a wide range of coastal and aquatic ecosystems. There are nine IBAs, key fish wintering grounds and habitats of the Caspian seal in this region. The area also contains major fishing grounds (predominantly for kilka, *Clupeonella spp.*).

Biodiversity values of the Turkmen part of the Caspian Sea

Caspian fauna of global conservation concern include several sturgeon species (*Huso huso* and *Acipenser spp.*), globally threatened migratory waterbirds such as the lesser white-fronted goose (*Anser erythropus*), the marbled teal (*Marmaronetta angustirostris*), the white-headed duck (*Oxyura leucocephala*) and the Caspian seal (*Pusa caspica*) (Table 10.1). The few rivers discharging into the Caspian Sea from Turkmenistan are not major sturgeon spawning areas, but the Turkmen coast between Esenguly and Ogurchinsky Island is a key wintering area for them and other fish, as well as a regular habitat of the Caspian seal.

Conservation status, trends and threats

The status of the globally endangered sturgeon in the Turkmen part of the Caspian Sea has not been assessed recently, but it is likely that assessment would reflect their generally poor status. Annual sturgeon catches throughout the Caspian declined from > 25,000 t in the 1970s to 470 t in 2000. Sturgeon fishing in the Caspian Sea is now forbidden and there are no significant sturgeon spawning rivers in Turkmenistan, so there is no official sturgeon fishery there. Turkmenistan has had zero CITES export quotas for sturgeon products since 2007. However, sturgeon and sturgeon products are widely available in restaurants and on markets in Ashgabat and other Turkmen cities, at prices that are lower than, for instance, in Kazakhstan. It is unlikely that these are imported. National experts confirmed that illegal sturgeon fishing in the Turkmen part of the coastal Caspian Sea continues to threaten stocks there, as it did in the 1990s. It is unclear why Caspian sturgeons have not been included in the 1999 Red Data Book of Turkmenistan, and why they reportedly will not be included in the upcoming edition.

Wintering and migrating waterbirds along the Caspian coast are threatened by poaching, infrastructure development and pollution, but most sites are currently considered relatively unaffected.

The amount of poaching fishery is at least 10-13 times more than the officially permitted fishing quota.

Following a catastrophic collapse in the Caspian seal population in the 1990s and 2000s, the global IUCN threat assessment of the Caspian seal was upgraded from “Vulnerable” to “Endangered” in 2008. Numbers at the four strategically important haul-out sites along the Turkmen coast (Kara-Ada Island, Tyuleni Islands, Oshushnoy Island and southern Ogurchinsky Island), which are outside the core reproduction range of the species, used to be in the order of several thousands but had shrunk to a maximum of a few hundred in 2008/2009. Current threats in Turkmenistan reportedly include disturbance, poaching and by-catch in illegal sturgeon nets. The species will be listed as endangered in the upcoming edition of the Red Data Book of Turkmenistan.

The invasion of the planktivorous comb jellyfish (*Mnemiopsis leidyi*) has led to a collapse in zooplankton abundance and to a strong decrease in kilka, which depend on zooplankton for food. Other fish species have also declined, and the piscivorous Caspian seal may be affected as a result.

Conservation and sustainable use of Caspian Sea biodiversity

The Government approved NCAP in 2008. This instrument includes a section on the conservation of Caspian biodiversity with the general intention to reduce pollution of the Caspian, manage fisheries sustainably, fight poaching (particularly of sturgeon) and develop PAs along the Caspian coast. It is not clear what implementation mechanisms for this part of the action plan have been created since.

In 2006, Turkmenistan acceded to the Tehran Convention, which contains 17 activities relevant to biodiversity conservation. Implementation of its commitments appears to be primarily through CEP, in which Turkmenistan participates actively. CEP’s mission is to assist the Caspian littoral States in achieving the goal of environmentally sustainable development and management of the Caspian environment.

The programme is a partnership of the Caspian littoral States and organizations such as GEF, UNDP and UNEP. It has included a number of projects relevant to biodiversity, for example, on fisheries management, eco-toxicology, coastal site inventory, Caspian seal conservation action planning and ballast water management.

The Khazar State Reserve is located on the Caspian Sea coast of Turkmenistan and it was supported through the UNDP project Conservation and Sustainable Use of Globally Significant Biological Diversity in Khazar State Reserve on the Caspian Sea Coast, between 2006 and 2010. A part of the PA has been designated as a Ramsar site.

Turkmenistan’s fish stocks in both Caspian and inland waters are among its major biodiversity resources. Total catches declined from about 40,000 t in 1991 to 8,500 t in 1997 and have partly recovered since, to an estimated 15,000 t in 2008. Because of the limited data available, it is impossible to assess whether fisheries management in the Turkmen sector of the Caspian is currently sustainable. Overfishing of kilka and other bony fish in the Caspian Sea has been a problem since at least the 1970s; its effect on stocks may be aggravated by pollution. Throughout the Caspian Sea, catches of the species declined by more than 58 per cent between 1993 and 2006. Several activities aimed at sustainable fisheries management are being conducted within the project The Caspian Sea: Restoring Depleted Fisheries and Consolidation of a Permanent Regional Environmental Governance Framework, under CEP, with mixed success thus far. Sustainable fisheries management is particularly dependent on international cooperation.

10.10 Information systems concerning biodiversity

Reliable up-to-date information on the status of and trends in biodiversity, as well as pressures, threats and the effectiveness of conservation actions, is an indispensable prerequisite for proper decision-making in relation to biodiversity management. National Red Lists and biodiversity monitoring systems are particularly important information tools.

Red Data Book of Turkmenistan

Red Lists and Red Data Books facilitate assessment of threats and pressures, prioritization of conservation actions and allocation of funds, and an understanding of long-term biodiversity trends (e.g. between editions). *The Red Data Book of Turkmenistan* was last published in 1999. That edition included 261 species (152 of animals and 109 of fungi and plants), including 45 species (17 animals and 28 plants) endangered or threatened with extinction. The 1999 Red Data Book used the categories “vanishing”, “declining”, “rare” and “poorly known”, which are not fully consistent with the modern IUCN Red List system. Many globally threatened species occurring in Turkmenistan are not

included in the 1999 national Red Data Book, particularly Caspian species and some globally threatened birds (Table 10.1). Caspian sturgeons will still not be included in the 2011 edition of the Red Data Book of Turkmenistan.

The third edition of the Red Data Book of Turkmenistan is planned for autumn 2011. The assessment of species to be included has already been conducted by national experts, and has been confirmed by the Minister of Nature Protection. The new edition, which is an important achievement in itself, will reportedly use the current IUCN threat categories. However, these categories have been assigned based on expert opinion rather than the internationally established IUCN assessment criteria, a factor which reduces the objectiveness, transparency and hence usefulness of the resulting edition of the Red Data Book. National experts have explained their approach with the assertion that they have a better understanding than do international organizations of trends in species status in Turkmenistan, and/or that the international system needs to be adapted to the peculiarities there. Both arguments are unconvincing: IUCN assessment criteria have not been developed to replace existing national expertise, but rather to ensure that threat categories are applied in an objective and consistent manner. Furthermore, rigorous application of the globally accepted assessment criteria would highlight rather than ignore peculiarities of Turkmen biodiversity. Therefore, the use of IUCN assessment criteria promises considerable added value for future editions of the Red Data Book of Turkmenistan.

National biodiversity monitoring system

Biodiversity monitoring in Turkmenistan is currently concentrated on the country's State reserves. Research and monitoring staff patrol their reserves on an ad hoc basis and record observations on biodiversity, based on a methodological handbook. Their records (usually in tabular format) are compiled in the annual *Nature Chronicles* of each State reserve, and are also used to estimate the abundance of key species (typically as individuals per km of linear survey or per unit area). Results are reported regularly to the Department of Protection of Flora and Fauna. An initiative to improve the quality of the *Nature Chronicles* consisting of more detailed written guidance and training courses for scientific staff of State reserves was launched by the Department of Protection of Flora and Fauna in 2010.

While there is a functional, if simple, monitoring system for the biodiversity of individual State reserves, the results are not compiled, analysed,

published and adequately used at the national level (e.g. through an online database). A comprehensive State biodiversity monitoring system for the entire country (e.g. following the pressure–state–response (PSR) model) has not been established to date. The exclusive focus on monitoring PAs has been explained by the reported high concentration of Turkmenistan's biodiversity in its State reserves. However, estimates of biodiversity concentration inside the PA system are not sufficiently reliable to be used as a planning basis.

Monitoring of biodiversity resources and quota-setting

The 1993 Law on Protection and Rational Use of Flora, the 1997 Law on Protection and Rational Use of Fauna and the 1998 Law on Hunting and Hunting Management generally prescribe resource monitoring, as well as the setting of quotas and limitations of use (either by MoNP or local authorities). However, no detailed guidance is given. It is unclear whether and how biodiversity resources outside PAs are monitored. Annual species-specific quotas based on systematic resource monitoring are not in use currently.

For example, contracts between the MoNP Department of Protection of Flora and Fauna and a State enterprise engaged in liquorice (*Glycyrrhiza glabra*) harvesting in one of the State sanctuaries defined a user fee (expressed as a percentage of the yield) but no absolute yield quota per area or time. Similarly, orders on the opening of the hunting season define quotas per hunter per day, and additional regulations define fees per hunted individual, but no species-specific annual hunting quotas for individual hunting areas or the country as a whole have been defined.

Raising public awareness and enhancing NGO involvement in biodiversity conservation

Important laws, videos about PAs and similar information in Turkmen and Russian can be retrieved from the MoNP website. NIDFF issues the Russian-language journal, *Problems of Desert Development*. An information centre on BSAP implementation, one of the Plan's institutional goals, has not yet been established. Nor is there any publicly available website or other online resource offering more in-depth biodiversity-related information. Of the few environmental NGOs active in Turkmenistan, the Society for Nature Protection and the Society of Hunters and Fishermen supports MoNP and local authorities in fulfilling their functions, for example, through public inspectors (Chapter 2).

Photo 10.1: Natural pistachio stands*Assessment*

The area occupied by the current PA system (approximately 4 per cent of Turkmenistan's territory) falls short of the non-binding CBD target of 10 per cent PA coverage by ecosystem. This discrepancy would be even larger if only the State reserves (the only PAs which have a management regime at the moment) were counted (1.7 per cent of the country's area). Detailed aspects of the PA system are assessed as follows:

- The recent activities of MoNP and its cooperation partners in the PA field show that the political will and the initiative for an extension, diversification, functional improvement and international integration of its PA system exist. There is hence an opportunity to continue this development, building on ongoing projects and initiatives;
- Considering its small total area, the existing PA system includes a representative range of the main ecosystems and species of Turkmenistan. Recent gap analyses have identified additional areas of high biodiversity value which would increase the extent, representativeness and functionality of the system. This information offers valuable guidance for MoNP;
- The management effectiveness of the State reserves of Turkmenistan offers a starting point for the further strengthening of the functionality of the overall PA system, including its sanctuaries and additional new PA categories. The PA performance aspects which leave most room for improvement

were identified recently. This analysis offers guidance for improving the management effectiveness of all PAs in Turkmenistan;

- National policies, plans and programmes, and international donor projects aim at strengthening the national PA system as a whole. Supporting existing State reserves and establishing an enabling framework for new PA categories (e.g. national parks and independent PAs of Category IV/V) and governance types contribute to this development;
- Most ongoing MoNP international cooperation projects aim at the improved implementation of Turkmenistan's commitments under international conventions (e.g. nomination of World Heritage sites, and, potentially, additional Ramsar sites among identified IBAs) and/or the adoption of international good practice (e.g. diversification of PA management following the IUCN categories). Both directions promise considerable added value at the technical level and synergies with trends towards stronger participation by Turkmenistan in international processes;
- There have been proposals to develop a regional ecological network that includes and builds on national PA systems, including that of Turkmenistan. Although improvement of the management of core PAs may have higher priority at the moment, the expected extension of the national PA system and the expected significant infrastructure development in Turkmenistan over the

coming decades suggest that there may now be an opportunity to conceptualize a potential future ecological network and to base planning decisions on the resulting map.

The conservation and sustainable management of the biodiversity in the Turkmen part of the Caspian Sea continue to face significant challenges from unsustainable fishing (particularly illegal fishing of sturgeon), alien and invasive species and pollution. Most of these challenges require strong cooperation among Caspian littoral States. By joining the Tehran Convention and actively participating in CEP, Turkmenistan has taken important steps in this direction. There is still room for technical improvement regarding the implementation of specific CEP components.

There is considerable scientific expertise relevant to biodiversity monitoring among senior scientific staff of MoNP, NIDFF and some of the State reserves. This expertise may offer an opportunity to develop a functional countrywide system of biodiversity monitoring in the near future, building on the ongoing basic monitoring of State Reserves. The development of such a monitoring system would benefit from the application of international good practice in biodiversity monitoring, and from a clear definition of the way in which monitoring results are published and used to support conservation decision-making. The lack of systematic biodiversity resource monitoring and local or national quota-setting (e.g. for wild plant and hunting resources) constitutes a serious gap in the regulation of natural resource use in Turkmenistan.

In general, MoNP and its subordinate institutions do publish information about biodiversity and its management and do engage in some public awareness-raising. What appears to be lacking is a publicly accessible, on-demand source of relevant, in-depth, biodiversity-related information, such as a national biodiversity clearing-house mechanism. Since there are only a few environmental NGOs in Turkmenistan at present, the first step towards stronger participation of NGOs in biodiversity management would be supporting the growth of an active and diverse NGO scene there.

10.11 Conclusions and recommendations

Both NEAP and BSAP expired in 2010. This creates both the need and the opportunity to fundamentally improve the practice of national action planning on biodiversity and to arrive at new planning documents which are both realistic and sufficiently supported.

Recommendation 10.1:

The Ministry of Nature Protection should:

- (a) *Analyse the results of the implementation of the 2002 National Environmental Action Plan of Turkmenistan until 2010 and the Biodiversity Strategy and Action Plan for Turkmenistan for the Period 2002-2010, including challenges and constraints;*
- (b) *Use lessons learned to develop a new, realistic and focused strategy and action plan in accordance with the Aichi Biodiversity Targets under the Convention on Biological Diversity, and submit them to the Cabinet of Ministers for adoption.*

The effectiveness of Turkmenistan's PA system is limited by its small area coverage, restricted range of PA categories and governance types, insufficient devolvement of decision-making and attraction of financial resources, and restricted participation of local stakeholders and resource users. At the same time, there is now a critical mass of know-how and information to draw upon to enlarge and diversify the PA system, which creates a unique opportunity to improve its overall effectiveness.

Recommendation 10.2:

The Ministry of Nature Protection should:

- (a) *Strengthen the protected nature areas system, through the creation of new protected areas in identified high-value areas and the introduction of internationally established protected areas categories;*
- (b) *Improve the protected areas' activities in order to attract additional financial resources;*
- (c) *Involve the public, particularly local resource users, actively in protected areas governance.*

Regularly updated, reliable information on the state of biodiversity and natural resources is an indispensable prerequisite for effective biodiversity management. However, MoNP and its NIDFF lack sufficient capacity to establish a viable countrywide monitoring system for biodiversity and natural resources that is based on international good practice. Therefore, a concerted effort by MoNP, NIDFF and all relevant national institutions – possibly with international donor support – is needed to collaboratively establish a national biodiversity monitoring system, based on existing monitoring schemes in State reserves. To achieve these goals, MoNP could seek assistance from international donors.

Recommendation 10.3:

The Ministry of Nature Protection, in cooperation with academia and non-governmental organizations, should:

- (a) Improve the national biodiversity monitoring system based on international good practices;*
- (b) Use monitoring results to improve the system of quotas for key biodiversity resources that are currently used in Turkmenistan;*
- (c) Use results of scientific research in decision-making regarding biodiversity conservation;*
- (d) Raise awareness of the value of ecosystems services in order to promote biodiversity conservation.*

Recent assessments have identified a lack of capacity at the individual, institutional and systemic levels as a limiting factor of biodiversity and PA management in Turkmenistan, including within the MoNP

Department of Protection of Flora and Fauna. This could be improved by continued capacity-building efforts at all levels of the administration as well as among local PA stakeholders, and improving simple training courses and university courses on ecology, nature conservation and natural resources management.

Recommendation 10.4:

The Ministry of Nature Protection should

- (a) Continue implementing capacity-building programmes at the institutional and systemic levels to address the limitations of biodiversity and protected areas management;*
- (b) Collaborate more intensively with academic institutions in order to improve academic training on biodiversity conservation and natural resources management.*

Chapter 11

FORESTRY AND FOREST MANAGEMENT

11.1 Introduction

Forests grow in severe climatic conditions on the territory of Turkmenistan, which is a part of the geographical zone of extended deserts in the northern hemisphere. The deserts of central, Zaunguzskij and south-eastern Karakum, as well as other deserted lands, occupy more than 80 per cent of the country. Almost 20 per cent of the country's territory is covered by mountains: the Kopetdag Mountains and, to the north, the separated mountain ridges of Small and Grand Balkhany. The Koytendag Mountains are located to the east, as well as the highest peaks of the country, up to 3,140 m above sea level.

Turkmenistan has a harsh continental and exceptionally dry climate. A high humidity deficit and intensive evaporation, accompanied by periodic dusty winds, are the main features of the country's climatic conditions. Evaporation exceeds precipitation by more than 20 times. Because of the droughts and high air temperatures, agricultural works as well as the planting and growing of trees, bushes and woody vegetation, rely only on artificial irrigation. Growing indigenous (local) tree species (pistachio, juniper, saxaul, almond and others), which are resistant to droughts and high air temperatures, deserves special attention. In the areas where there is a shortage of water for irrigation, planting indigenous species of trees and bushes is the advisable solution.

Wildlife in the forests and other wooded lands has increased during recent years, since the food supply has improved as a result of regular watering. As a consequence, the potential for preservation of biodiversity was further enhanced within the forest ecosystems.

11.2 Institutional, policy and legal framework

The creation of conditions for the rational use of forest resources, their regeneration, protection and preservation, and the enhancement of the ecological and economic potential of forests and other wooded lands have been defined as the main responsibilities of governmental bodies and organizations.

The Government and the President pay special attention to the protection of lands covered by trees

with a view to establishing new PAs and planting new trees.

Institutional framework forest management activities

The Cabinet of Ministers has supreme authority over forestry and forests management. The main governmental institution responsible for forestry, forestry-related activities and forest management is MoNP and its subordinated bodies, the Department of Forestry, NIDFF, and the Service for Forest-Seed Farming and Natural Parks Protection.

Other bodies are involved in particular in planting trees and tending seedlings and young plantations. They include:

- MoA and its Service of Land Resources;
- MoWE;
- Ministry of Energy and Industry;
- MED;
- Ministry of Oil and Gas Industry and Mineral Resources;
- Ministry of Domestic Affairs;
- Academy of Sciences and its Institute of Botany;
- SCS;
- National Committee on Hydrometeorology under the Cabinet of Ministers;
- Turkmen State University named after Magtymguly;
- Scientific and Research Institute of Agriculture.

Ministry of Nature Protection

Before 1999, forestry and forest-growing activities were executed by the Department of Forestry of the former Ministry of Environmental Protection, and forestry work and related activities were financed out of the State budget. During that period, the Department of Forestry had 29 forestry companies and organizations.

In 1999, in the process of restructuring, its functions were passed to the Joint Stock Company (JSC) Gok Gushak, which was established for the implementation of these specific functions. Up until 2008 Gok Gushak was running 20 forestry enterprises, which were then restructured into the

system comprising 14 forestry organizations with some 800 employees. Among engineering and technical personnel, there were specialists specifically qualified in forestry, as well as agronomists, geographers, biologists and others. At the provincial level there were also forest nurseries and 13 foresters: one in Balkan Province, four in Akhal Province, one in Mary Province, four in Lebap Province and three in Dashoguz Province. Gok Gushak established and extended the forest park zone in the foothills of the Kopetdag Mountains (see below), planted drought-resistant plants along roads and highways and on the banks of the Karakum Canal and in the Circum-Aral area, provided seedlings for forest and horticultural crops, and ensured control over sanitary felling and rehabilitation of mountain forests.

Gok Gushak was self-financed. This was based on its cotton, cattle growing and other activities not directly linked to forest management, and thereby reduced the effectiveness of its forestry operations and forest management. The transition from State budget support of forestry to self-financing brought various problems to forest management in general. Of course, there were reasons for the shift to self-financing. During the previous period, activities within the forestry sector were centrally planned and financed by the Government. After independence, the situation in the forestry sector became very difficult since the forests were declared State property but, at the same time, the State system of financial provision was no longer functioning.

After 2009, Gok Gushak was abolished and its functions were transferred to the recently established Department of Forestry under MoNP. According to its regulations, it consists of four departments: forestry, agriculture,¹⁶ mechanization and finance. Under the current structure, the key role in forest management is played by the Department of Forestry and its 14 forest enterprises, whose activities on the ground are implemented under the Department of Forestry's supervision. The Department of Forestry realizes and coordinates all actions in the sphere of rational forest management, organization of forest nurseries, forest planting and growing, and the planting of other greenery. Staffing has been reduced.

The other key institutions under MoNP that contribute to forest and other wooded land (OWL) management are:

- NIDFF, with scientific and research activities linked to forestry (undertaken in its two laboratories);

- The Service for Forest-Seed Farming and Natural Parks Protection, by implementing and controlling tree planting, and seedling growing (in its nursery).

Other institutions involved in forest and wooded land management

Several ministries and organizations have formed their own forestry departments for the successful realization of specific tasks in the forest park zone. They are all involved, by decisions of the President and/or the Government, in the work of planting trees and tending seedlings and young plantations, mainly in their respective forest park zone. An increase in wildlife population can be observed in some areas of forest park zone. Regular irrigation has improved watering places and feed stock for wildlife, enhancing the potential for diversity preservation in forest ecosystems. Such a wide-scale effort at the State level requires the realization of a series of preparatory measures. Some difficulties arose at the beginning of forest planting works, including a lack of irrigation water, necessary technical equipment and forestry specialists. Methodical support, control and instruction have been carried out by the Department of Forestry.

Coordination

Greater coordination between key stakeholders would be beneficial to forestry. The new Forest Code, which was adopted by the Turkmen Parliament in April 2011 and came into force in July 2011, defines the responsibilities of State bodies in terms of forestry and forest management. This will provide an important basis and a good start for better coordination of works and activities aimed at sustainable forest management, if training and capacity-building is consistent with the requirements of the new Forest Code.

Among key initiatives should be noted the planting of trees on irrigated land to help protect fields belonging to farmers' organizations and to improve distant pastures on the edge of desert areas. Forest management in the mountains has mainly taken the form of planting pistachio trees over a total area of over 35,000 ha.

In Turkmenistan, specialists have gained considerable experience in reforestation and forest planting in desert zones. For example, NIDFF has put together a set of recommendations stemming from efforts to stabilize sands and plant trees. These recommendations are also being applied in other countries. The enormous areas of sandy and desert

¹⁶ For example, pastures or cotton growing on forest lands.

pastures, where millions of sheep and camels are taken to graze, are currently leased from forestry authorities to local farmers and stock holders (for animal husbandry).

Policy and legal framework

Besides the Forest Code, a number of governmental decisions and resolutions have a bearing on the development of the forest potential in the country. Although there is no national forest programme, the number of governmental decisions and/or resolutions and programmes indicate that measures are being taken aimed at the protection of forests, afforestation and reforestation.

The principal objectives and trends in the current forest policy, which is mostly based on forest-related legislation, can be summarized as follows:

- Effectively protecting existing forests, OWL and woody vegetation;
- Restoring degraded wooded areas through the use of current silvicultural methods, and protection of biodiversity;
- Planting trees for many different purposes all over the country, with the aim of extending areas covered by forests;
- Ensuring that State, commercial, public and other bodies, as well as local authorities, participate in the organization of and technical support for tree planting; they are encouraged to take measures to ensure that newly planted trees take root, show good vitality and are properly maintained;
- Improving methods of operating forest nurseries, raising quality and productivity in the cultivation of seedlings and saplings, in both nurseries and arboreta;
- Raising public awareness and improving State education and practical training with regard to sustainable management of forest resources;
- Promoting forestry-related institutions and the professional development of their personnel;
- Encouraging the participation of institutions and organizations, particularly those engaged in forestry issues, in the relevant international programmes and projects.

Until July 2011, the 1993 Forest Code regulated the forests and forestry-related activities, and relationships both within the forestry sector and with other, related sectors of the national economy. The new Forest Code has now become the main regulatory document in the sphere of forestry, determining the principles and measures of the

rational use of forests and their protection, as well as determining the plenipotentiary bodies (institutions) responsible for forestry and sustainable forest management in the country.

According to the new Forest Code, all forests are considered to be the national treasure of the country, contributing to the ecological balance. All forests are in State hands, including those forming the State Forest Fund (SFF). The SFF consists of forests, urban forests and other wooded lands of national importance, which are managed by the State forestry authorities. The Forest Code defines the functions of authorities in forest management as well as the rights and obligations of forest owners and SFF users, and lays down basic regulations with regard to the recording and monitoring of forests.

The Forest Code also defines the three categories of forests in Turkmenistan: (1) forests for protection purposes; (2) forests for special purposes; and (3) forests for production purposes. All national forests belong to Category 1. They include riparian forests along water bodies; protective forest belts along roads, railways and other transportation and communication lines; forests and semi-arid zones; forests of green zones around cities and other settlements; mountain forests; and forest zones of sanitary protection of water sources. Cuttings are not allowed in any forests falling under Category 1. The Forest Code also has provisions of tasks of the State bodies engaged in public management of forests: the Cabinet of Ministers, the authority of State forest management (MoNP and its Department of Forestry), local executive authorities and local self-government in accordance with the relevant legislation.

Environmental legislation contains some provisions that are indirectly related to forest protection or management. These include the 1991 Law on Nature Protection, the 1992 Law on State Protected Natural Areas, the 1993 Law on Protection and Rational Use of Flora, the 1996 Law on Protection of Atmospheric Air, the 1997 Law on Protection and Rational Use of Fauna, the 1997 Criminal Code, the 1998 Law on Hunting and Hunting Management, the 2004 Land Code, the 2004 Water Code, and the 2009 regulations of the MoNP Department of Forestry. The latter will have to be amended to bring them into line with the new Forest Code.

The 1992 Presidential Resolution on the Development of Horticulture and Planting of Greenery, and the 1998 Presidential Resolution on the Formation and Development of a Park Zone at the Foothills of Kopetdag (No. 3784) are of special importance to forestry-related activities in the

country. Since 1998, a series of resolutions has been adopted in order to continue work related to this park zone. The last one, issued in 2010, covers the period from 2011 to 2030.

The 1992 Presidential Resolution was aimed at the implementation of the large-scale programme of tree planting around towns and villages. The document instructed the ministries, the economic sector departments and Ashgabat City Administration to plant three million ornamental and fruit trees annually on the territory between Annau and Geoktepe villages during the period 2007-2009. Further, it approved the order by which the quantity of trees to be planted annually by each ministry should be defined. In particular, the 1992 Presidential Resolution provided the impetus to launch the State Programme entitled Green Construction, in 1998. This Programme foresees planting trees in the countryside (*velojats*), in cities and around settlements, and establishing green zones for the amelioration of climatic conditions and prevention of land degradation.

As living conditions improve in the country, the need for forests and other wooded lands as recreation areas also grows. This is why a zone consisting of forests and parks is being developed in the foothills of the Kopetdag Mountains. Starting in 1998, trees have been planted within a total area of over 43,000 ha. According to recent presidential resolutions and decisions, work is scheduled to continue until 2020.

To implement one of the main objectives of NEAP, Management of Wild Nature, concrete measures were planned for the protection of juniper trees and wild-growing fruit trees and bushes. One of the objectives of BSAP, namely preserving the current state of tracts of forest and restoring 10 per cent of the area in question by the end of 2010, involved 35 types of initiatives and 110 measures. One goal was to preserve and restore the most valuable forests, from both an environmental and economic point of view, formed of saxaul, juniper and fruit and nut trees (pistachio and walnut).

However, at present, specific and comprehensive documents such as a national forest programme and an action plan to further develop forestry and forest management, taking into account the new Forest Code, the realities of the national economy and the demands of society, are lacking. The environmental and climatic conditions, which endanger the investments in the tree planting programme, should also be taken into account when developing a national forest programme and action plan.

11.3 Role and importance of forests and other wooded land

The role of forests, OWL and woody vegetation in general in such harsh natural conditions in the arid zone is difficult to overestimate. The low forest cover throughout the territory, along with the extended deserts and mountain areas, underscores the vital importance of trees and forests for ecological balance, the maintenance of biodiversity of flora and fauna, and the well-being of the country's population. The contribution of forests to environmental protection and maintenance of the ecological balance is widely recognized in the country.

The forests and woody vegetation perform an exclusive protective function. They are a key factor for mitigation of the land degradation processes, especially taking into account the greatest risk of desertification, due inter alia to anthropogenic causes. This role of forests is of vital importance for the country's population. The active participation of the local population in forest management would be of great importance for the protection of forests and extending the forest areas.

Although the share of the forest sector in the national economy is modest, its protective and recreational role is very high. The forests and OWL are especially remarkable in terms of vegetation diversity. The biodiversity of Turkmenistan is not only rich but also unique due to the country's geographical position and relief, and the specific evolution of its flora and fauna. The higher plants are currently represented by 3,140 species, of which 47 are tree species and 88 are shrubs. The 1999 Red Data Book lists 109 plant species, including 15 species of trees and bushes (Chapter 10). Plants differ in their resource significance, range of useful features and possibilities for practical use. The vegetation of the Kopetdag Mountains is especially rich, as it is represented by some 1,900 species of wild plants, 322 of which are endemic. A great number of the plants of the plains and hills provide full value nutrition to livestock. Among 600 plant species in the Karakum area, some 100 plants form the basis of the pasture ration.

Forest ecosystems and other wooded lands are well known to be: (a) important carbon sequestration pools (carbon sinks); (b) indispensable tools for combating desertification; and (c) vital cradles of biodiversity. Thus, proper sustainable management of forest ecosystems is key to the implementation by Turkmenistan, as a party, of all three Rio global conventions, namely the CBD, UNFCCC and UNCCD (Chapter 4).

11.4 Forest status

In line with the 2011 Forest Code, all forests belong to Category 1. Forests under Category 1 are used for implementing exclusively protective functions. This is why main cuttings are not allowed and are not being implemented.

According to SCS, the total land area of the country is 49,120,900 ha, of which SFF land constitutes some 2,204,200 ha, or about 4.5 per cent of the country's territory. Some 1,482,800 ha, or 67.3 per cent of the SFF, are being used for agricultural purposes; 99.5 per cent of this is in pasture. Map 11.1 presents the location of specific forest types on the territory of Turkmenistan.

With the SFF covering some 4.5 per cent of its territory, and the areas actually covered with forests about 8.8 per cent, Turkmenistan belongs to the group of Low Forest Cover Countries (LFCCs). As defined by FAO, this group of some 55 countries includes those with less than 10 per cent of their land under forests. These countries require special attention regarding forestry and forest management, and the significance and importance of their forests, OWL and woody vegetation should not be underestimated.

It is important to keep these official figures in mind when referring to other different sources of information related to the SFF, forest cover, or forest and other wooded land areas. Other publications are often based (for analytical purposes) on different classifications, and are not directly comparable with the official data. Data reported in a variety of publications might refer to (or include) SFF areas, or to SFF areas covered by forests, or areas covered by forests beyond the SFF lands, or forest cover areas in the State-protected natural reserves, or "green belt" tree-planting areas, or SFF wooded lands transferred or leased on a long-term basis to other users, etc. (The transfer, through leasing, of open woodlands for private agricultural use as pasture takes place under strict State control.)

This is really a very important point and issue with regard to present-day forestry in Turkmenistan. It is extremely difficult to provide a comprehensive and consistent classification of forests and OWL without recent data and information. At the same time, the most recent forest inventory was carried out only in 1988-1989, and significant changes have definitely taken place since that time.

The FAO Global Forest Resources Assessment 2010 (FRA 2010) estimated that, at that date, areas set

aside in Turkmenistan for forest management totalled some 7,415,000 ha. As more recent (fresh) data could not be found, the figures reported by FAO in 2010 were the same as those presented in its previous Global Forest Resources Assessments, i.e. they do not show any changes in areas classified Forest and OWL since the year 2000. According to FRA 2010, the area of forests and OWL in Turkmenistan (according to the FAO definition) is 4,127,000 ha. As the areas of OWL were shown as "0", this means that there was no such category in the national forest classification and all areas of Forest and OWL were included in the category of Forest.

According to FRA 2010, the dominant species in the areas classified as Forest are saxauls (*Haloxylon spp.*) with very low growing stock per ha. This confirms that part of the area classified as Forest may actually be OWL, according to the FRA definitions. However, as no information is available that would allow a subdivision of the area into Forest and OWL, all of this area was classified as Forest. As mentioned earlier, FAO reported that forests of Turkmenistan are in "public ownership".

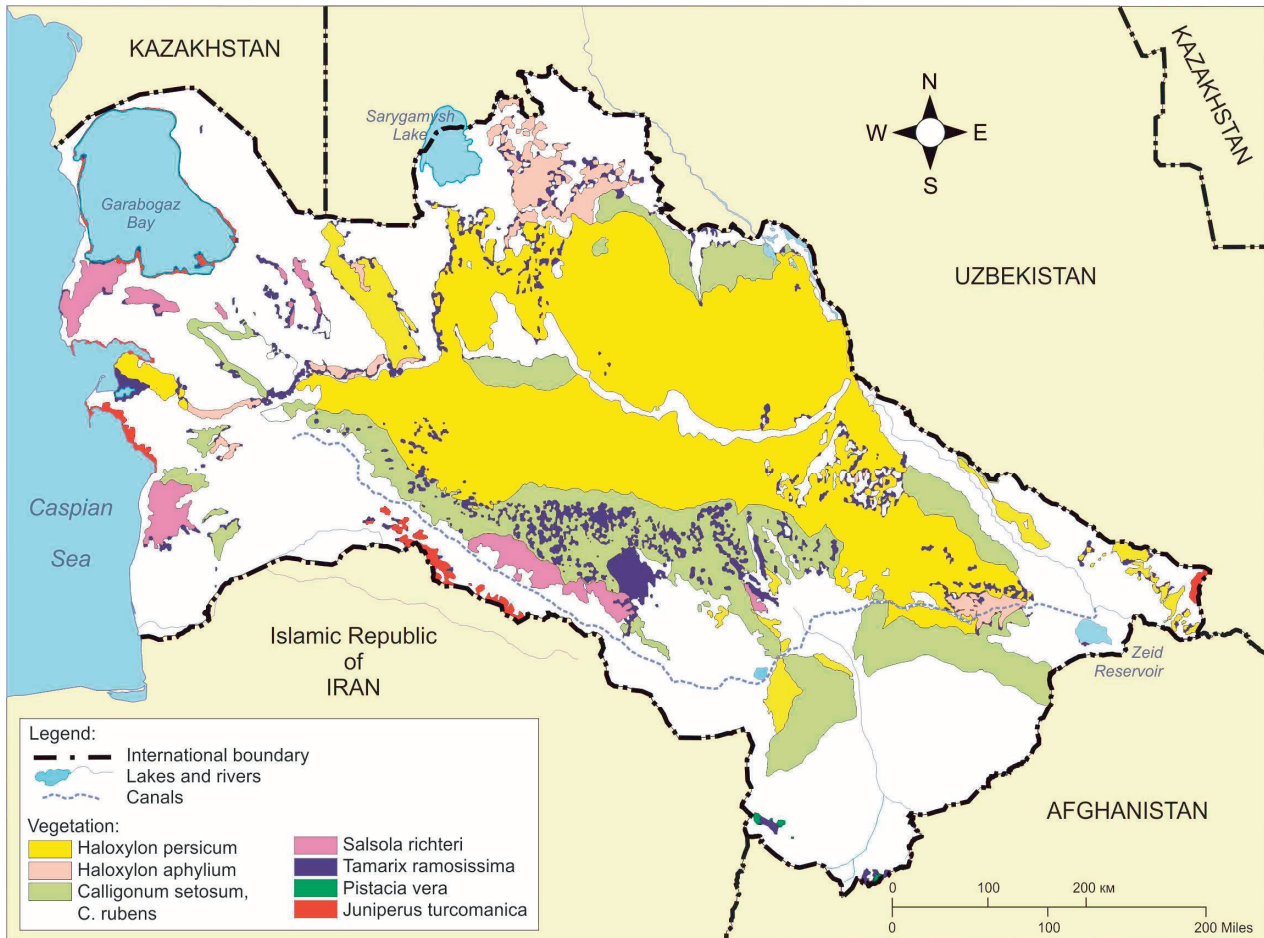
In the absence of a comprehensive countrywide forest inventory and accounting since that implemented in 1988-1989, the currently published data are based on different national surveys and research and scientific analyses. According to these, the total area of land actually covered with forests is 4,126,800 ha or 41 per cent of the lands administered by the forestry authorities, which constitutes 8.8 per cent of the total area of the country. Turkmenistan's forests and OWL perform mainly protective functions, which is why they have been categorized as belonging to Category I under the new Forest Code. The areas of forest and OWL (some 4,127,000 ha) are divided into the following categories:

- Lands set aside to protect water courses (i.e. along the banks of rivers) – 26,200 ha;
- Lands with protection of soils usage – 3,081,600 ha;
- Lands providing green areas for health and recreation – 3,800 ha;
- Special areas set aside for the protection of nature – 789,200 ha;
- Other – 226,000 ha.

11.5 Forest characteristics

Despite its relatively small area of forest and woodland cover, Turkmenistan supports a diverse range of forest and woodland types, some of them unique to the region. The three main and most notable forest and woodland types are: mountainous or hilly, desert and *tugai* forests.

Map 11.1: Forests and other wooded land



Source: Atamuradov, N., A. Kuliev, and others, *Forest Resources Management in Turkmenistan in the Climate Change Context*, Ashgabat, February 2011 (based on the State forest inventory data of 1988-1989).

Note: The boundaries and names shown on this map do not imply official endorsement or acceptance by the United Nations.

Mountain forests occupy a total territory of about 146,200 ha. They are rich in wood species and represent high potential as a source of valuable rough timber, such as juniper (*Juniperus turkomanica*), Turkmen maple, hackberry, pistachio and walnut, hawthorn, almond, barberry, dog-rose and *Zizyphus*.

The vegetation of sandy desert territories of Turkmenistan is typical *xerophilous* with wide endemic diversity of species. The main areas of desert forests are located in the south-eastern, central and Zaunguzskij Karakum. Most of the territory in sandy or desert areas, up to 3.95 million ha in all, is covered with saxaul, cherkez and kandym. Saxaul is a deep-rooted, practically leafless tree, typical of desert areas in Central Asia. Some 95 per cent of forests within the SFF are made up of saxaul (Box 8.3).

White saxaul (*Haloxylon persicum*) is typical in high altitude (relief) territories with fine-grained soil. The density of the stands of white saxaul is less than those

of black saxaul (*Haloxylon aphyllum*), reaching 400-500 trees per ha (on average). Black saxaul prefers dense sandy soils and tends to occupy positive relief land forms. Some samples of old black saxaul can reach 6-7 m high and weigh up to 1 t. The maximum overall weight of biomass reaches 40 t per ha. Besides the white saxaul (*Haloxylon persicum*) and black saxaul (*Haloxylon aphyllum*), the main wood and shrubby species in desert areas are *Salsola richteri*, several types of *Calligonum*, *Ephedra*, *Halothamnus*, *Ammodendron* and *Astragalus*.

Tugai forests are mainly found in river valleys, and cover strips 50-500 m wide along the Amu Darya, Murgap, Tejen and Atrek Rivers. The key forest-forming species are poplar, oleaster, willow, tamarisk and others. At present, the overall area of *tugai* forests in Turkmenistan is 26,200 ha, not including the territory of the Amu Darya State Reserve (5,000 ha). Biocoenosis of *tugai* forests is constituted by such typical wood species as poplar (*Populus pruinosa*), sometimes willow (*Salix songarica*) and

oleaster (*Eleagnus orientalis*). However, those species most characteristic of salt soils are *Tamarix* and specifically *Tamarix meyerii*. High *mesophile* grass species, such as *Arunda donax*, *Imperata cylindrical* and *Erianthus ravennae*, comprise complexes with hygrophilous biocoenosis.

The basic species of mountainous forest is juniper (*Juniperus turkomanica*), which is the main component of the biocoenosis and hilly ecosystem of the Kopetdag area, on the whole. The overall area occupied by juniper is 66,200 ha, including 400 ha of young growths, 6,900 ha of middle-aged stands, 15,100 ha of maturing forests and 43,800 ha of mature and over-mature stands. Forestry reserves are 1.32 million m³, of which 1.01 million m³, are middle aged and maturing. The overall area with pistachio trees exceeds 100,000 ha, 36,400 ha of which are forest stands. Circassian walnut (*Juglans regia*), occupies a mere 100 ha in hilly forests mainly in western Kopetdag and in the valleys of the Sumbar and Arvaz Rivers.

Perennial herbs account for a significant share of desert vegetation. They preserve an important stock of nutrition supply and represent high potential reserves for livestock breeding. The general area of saxaul stands is 688,100 ha, which includes 15,000 ha of young growths, 284,100 ha of middle-aged stands, 320,700 ha of maturing stands and 67,900 ha of mature and over-mature stands. The wood volume of growing stock reaches 2 million m³, 1,720,000 m³ of which are of middle age or mature. The resources of *tugai* could be differentiated into woody, bushy/shrubs and grass/herbs areas. During the period preceding the country's independence, the *tugai* lands were ploughed up and turned into agricultural cotton fields. The area occupied by forests and woody vegetation on irrigated land totals some 2,900 ha. The forest-forming species found there include mulberry, poplar, ash, maple, elm and white willow.

Of the total volume of growing stock in forests, estimated currently at about 13.7 million m³, mature and over-mature stands constitute some 4.2 million m³, or 30.7 per cent. The volume of wood harvesting has been declining in recent years due to the centralized supply of gas and other fuel to remote settlements. At present, sanitary cuttings are the only source of wood, a development which is very favourable to the natural regeneration of forest resources.

As wood-based products from Turkmenistan forests are not of any industrial and commercial importance, they are not an item of international trade. The deficit

of commercial wood is covered by imports from other countries, mainly the Russian Federation. The volume of annual cutting in Turkmenistan is not higher than 5,000-10,000 m³ of wood, and illegal logging is estimated at less than 10 per cent of that volume. These figures do not include fuelwood. On the basis of analysis of the wood products trade, Turkmenistan has practically no domestic wood industry, and is thus totally dependent on imports of wood-based products.

Non-wood forest products

Although the main function of forests in Turkmenistan is the protection of soil and water, they also provide such important non-wood forest products (NWFPs) as pistachios (*Pistacia vera*), walnuts (*Juglans regia*) and almonds (*Amygdalus spp.*) (Table 11.1). In 1989, 15,981 animal skins were harvested, but skins have not been harvested since 1990. Raw materials for dyestuffs and paints are still being researched.

Living animals are caught only with a view to their resettlement at new sites. Only insignificant volumes of wood are used for producing tableware, dishes and folkloric musical instruments, and there is no accounting of these volumes. Medical raw materials are mainly roots of specific plants and different herbs. Total volumes of harvested hay include reserve stocks of hay for wildlife. Decorative plants are mostly seedlings of coniferous and broad-leaved species, which have been raised in nurseries for the purpose of planting greenery. Seeds from trees, and bushes and shrubs, are mainly harvested for growing the planting material (seedlings).

During individual high production years, the harvest and collection of pistachios throughout the country amounts to up to 20 t, and walnuts up to 2-3 t. The population is allowed to gather fruits, berries (haw, blackberries) and mushrooms free of charge. Moreover, some wood resources from sanitary felling are also used by the population. Urban forests and wooded areas near cities and towns are in great demand for recreational purposes, especially during the summer. Collection of NWFP is not allowed in PAs, which are designated for conservation purposes only.

The principal fructiferous stands are situated in the Serkhetabad Forest, the Badkhyz State Reserve and on an insignificant area in the Magtymguly Forest. Pistachio also plays an important role in conservation of biodiversity, since it represents a feed source for many herbivorous and predatory animals.

Table 11.1: Production of non-wood forest products, 1995-2005

Type of product and measurement units	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Food, total (ton)	19.7	9.7	3.6	18.0	2.5	3.5	9.2	20.3	3.4	3.0	5.0
<i>of which</i>											
Walnut	1.0	1.7	1.6	1.5	1.0	1.5	1.7	1.5	1.4	..	1.5
Pistachio	17.0	6.0	..	15.0	..	..	5.0	16.0	..	1.0	1.5
Fruits	1.7	2.0	2.0	1.5	1.5	2.0	2.5	2.8	2.0	2.0	2.0
Other products											
Hay (ton)	385.0	360.0	370.0	266.0	245.0	200.0	140.0	260.0	552.0	365.0	906.0
Medical materials (1,000 tons)	21.0	20.0	19.0	18.0	21.0	20.5	20.0	21.0	22.0	21.0	22.5
Material for dyestuffs and paints (ton)	..	..	..	..	..	..	0.0	0.0	0.0	0.0	0.1
Decorative plants (1,000 pce), total	2,816	2,521	1,988	3,273	926	2,816	4,499	6,085	5,319	5,882	6,067
<i>of which</i>											
coniferous	182	78	125	211	44	633	519	1,216	1,343	2,347	2,471
Other vegetable products, seeds, (ton)	10.0	9.0	8.0	9.0	9.0	9.0	8.0	7.0	9.0	8.0	9.0
Living animals (1,000 pce)	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1

Source: Atamuradov, N., A. Kuliev, and others, *Forest Resources Management in Turkmenistan in the Climate Change Context*, Ashgabat, February 2011.

It is an extremely valuable nuciferous wood species for the dry horticulture of Turkmenistan. Pistachio can prove very profitable for organizations and farmers who choose to cultivate this species and sell its products. However, the density of forest stands of pistachio results in poor harvests. Forest stands are in dire need of reconstruction. A significant part of the harvest is lost due to ineffective protection. Insects (vermin) and diseases also add to harvest losses.

Combating desertification and preventing land and pasture degradation

Since independence, more than 600 km of railroads have been built and more than 20 million head of livestock (sheep, goats, camels and cows) are currently brought to pasture. Trees and bushes/shrubs (woody vegetation) areas are used for both livestock farming and firewood collection, causing certain disturbances on the affected lands. Grazing prevents natural forest regeneration from taking place. For this reason, livestock management and sustainable forest management are interrelated, and trees and vegetation need to be protected from excessive grazing. The fixation of moving and advancing sands relies mainly on the application of mechanical means of protection and the planting of shrubs and bushes.

The degraded pastures of sandy deserts are being rehabilitated after the planting of shrubs and bushes. Mountain pastures have been degraded as the result of cuttings of trees for firewood and local construction materials, as well as livestock pasturing

without any control. If forests and OWL or woody vegetation are left unprotected, overgrazing might destroy their vitality and capacity to regenerate, and desertification would most likely increase as a result. Additionally, during the season of the spring-summer rains in the mountain ecosystems, soil erosion is accompanied by the destruction of vegetation.

One of the results of the programme providing natural gas to all settlements is reduced pressure on forest resources for cooking and heating. The wide-scale use of free natural gas in ordinary households has led to a reduction in illegal logging. Restrictions have been placed on the grazing of livestock in places where this might have a negative impact on the growth and development of forests, particularly young trees and bushes.

The 2002 NEAP was the first strategic document responding to the demands of UNCCD implementation. Currently, with regard to forest management, in the processes of the rehabilitation of degraded forest areas, special attention is paid to advanced technologies.

State-protected areas

The tree and woody vegetation of State reserves is represented in particular by the following species:

- Mountain forests formed by maple (*Acer turcomanicum*), juniper (*Juniperus turcomanica*), as well as fruits and barrier-bearing trees such as hackberry, pistachio

and walnut, hawthorn, almond, barberry, dog-rose and others in Syunt-Khasardag State Reserve;

- Unique forests of juniper (*Juniperus turcomanica*) in Kopetdag State Reserve;
- Pistachio forests and stands in Badkhyz State Reserve;
- Model (best specimens/elite) black saxaul forests (*Haloxylon aphyllum*) in Repetek State Reserve;
- Tugai forests (poplar, oleaster, tamarisk and others) in river valleys in Amu Darya State Reserve;
- Juniper forests (*Juniperus seravschanica*) in Köýtendag (formely Kugitang) State Reserve.

Tree planting and the creation of green belts

Data on reforestation, officially reported by SCS (Table 11.2), refer mainly to the planting of trees around cities and settlements, and possibly some natural regeneration areas within the SFF.

The forest park zone near the capital in the foothills of the Kopetdag Mountains deserves special mention. Works on the foundation of this unique forest stand began in 1998 on the basis of the Presidential Resolution mentioned above. This document proved a logical continuation of the 1992 Presidential Resolution on the Development of Horticulture and Planting of Greenery. Organizations and institutions from all sectors of the national economy were mobilized to lay out and plant the forest park zone, and participated in its foundation by buying planting material from their own funds and organizing their planting according to MoNP recommendations. All of the sapling-tending measures were also paid from out of their internal funds.

At present, the area occupied by the forest park zone amounts to more than 68,000 ha. Altogether, 43 million trees and bushes have been planted and more than 100 different coniferous and broadleaf/deciduous species and shrubs have been used.

An analysis of the growth and development of young plants demonstrates that land improvement is significant, and is definitely positive for the environment and climate, but that more long observations and monitoring of their vitality and conditions would be helpful. During the planting works, innovative land treatment methods were applied, for example, spraying techniques for irrigation, which is very useful in the context of climate change. These methods made it possible to

use water resources more rationally (economically). The highly effective method of drip irrigation, which is widely used on the territory of the forest park, results in significant water savings. Fire prevention methods and measures were also improved, as well as protective methods against forest-related diseases and insects and other pests affecting trees and bushes. It is an impressive afforestation programme, but it is a tremendous logistical and financial effort to maintain these plantations because they always need irrigation. For this reason, the use of indigenous species should be increasingly considered.

The Department of Forestry is also tasked with the implementation and coordination of work on the planting and care (irrigation) of trees planted around Ashgabat and other settlements. This includes the supply of trees, and control and care of plantations.

A number of Government decisions and resolutions reflect measures which need to be taken for the protection of forests, afforestation and reforestation. Among the key priorities of tree planting are the creation of “tree belts” around cities, large towns and populated centres; the protection of installations, infrastructure and agricultural lands from advancing sands; the struggle against the destruction of river banks and against mud flows; and efforts to check the salinization of soils. From a silvicultural point of view, planting areas are being landscaped, soil is being prepared, and water wells for the irrigation of trees are being drilled. The vegetation density on planted areas is some 625 trees per ha.

11.6 Forest and other wooded land management

In the past, forests and OWL were created in the form of small woods in oases, mountain gulleys and along irrigation ditches. In the valleys of the Kopetdag Mountains, for instance, specially planted oaks can be found, which are 100 years old (and more), and there is also evidence that oriental plane, mulberry, walnut and other trees were planted. It was in 1968 that planned and systematic work aimed at creating artificial (human-made) plantations really began on a full scale. These efforts involved planting trees in mountain areas, in the desert and on irrigated land specially created within the confines of the territory owned by the State forestry authorities.

Main activities

Turkmenistan has a wealth of experience in afforestation of desert areas, which is used for the prevention of further desertification and putting these areas into economic development as pastures. Forest

Photo 11.1: Plantation at the foothills of Kopetdag Mountains**Table 11.2: Reforestation, 1995-2009**

Reforestation	thousand ha							
	1995	1996	1997	1998	2000	2007	2008	2009
Total area (planting, seeding and facilitating natural regeneration)	30.3	30.1	19.1	19.8	24.0	35.0	35.3	35.2

Sources: *Statistical Yearbook 1995-1998* ("Natural Resources and Environment"); *Statistical Yearbook 2000-2008, 2009*; *Statistical Yearbook 2000-2009, 2010*.

amelioration is widely used in the construction of the Ashgabat-Dashoguz railway and highway (over 600 km long). Desert forests are of great significance to the inhabitants of sandy regions (*koomly*), as they supply them with pastures, firewood and, on a small scale, household construction materials.

Currently, the artificially established forests include wood stands on mountainous, sandy and irrigated areas within the territory of the SFF, field protection forests and pasture protection forests. As for sandy areas, continuous sowing and planting have resulted in 680,000 ha of woods and pasture-protection forests.

There are no official countrywide data on any type of cuttings or felling since 1998. According to non-official sources, including experts' estimates, the annual supply of wood from sanitary cuttings does not currently exceed some 10,000 m³, while demand is estimated at about 50,000-55,000 m³. The provision of free natural gas to the population has proved to be an important means of preventing illegal logging. The pulp and paper enterprise that was launched in 2004 with a capacity of some 50,000 t of paper per year, processes straw from the cotton and grain fields as raw materials.

Among other activities, forest management is being focused on establishing protective forest shelter belts, fixing moving sands, selecting and introducing appropriate steady or resistant species, introducing advanced technology and agrotechnology, and applying more advanced methods to the organization of forestry work.

The forestry activities which are being implemented in the country as a whole are mainly on a local scale, and do not sufficiently cover countrywide needs with regard to the afforestation, reforestation and fixation of moving sands, as well as the creation of agricultural shelter belts.

Forest planting is also important for climate change mitigation and adaptation, and improvement of the ecological and social aspects of forest management (forest park recreational stands) over a wider area. For example, the need for recreational forests increases every year. Currently, there are only 5,700 ha of sanitary zones and recreational forests in the country. As a result, the question arises as to reconsideration of the protection categories of forests and possible allocation of forests available for recreational purposes within protected forest zones.

Current status of the forest inventory, accounting and monitoring

According to the new Forest Code, the structure, content and order of the implementation of forest monitoring is defined by the plenipotentiary body (agency, institution) of the State Forestry. Currently, MoNP is responsible for forest monitoring. Taking into account the fact that the forest enterprises, subordinated during the period 1999-2009 to the JSC Gok Gushak, were self-financing, the available financial means allowed only for the protection of forests from forest fires and illegal logging. The current situation, with the forest enterprises included in the structure of the Department of Forestry, has not changed yet in terms of funding procedures, despite the fact that the new Forest Code creates room for State budgetary funding to be available for forest management.

The lack of appropriate funding and insufficient qualified specialists preclude proper forest and ecological monitoring, which would make it possible to evaluate the status and dynamics of forests and OWL, as well as evidence-based planning of forest management for the future. The forest inventory and planning materials provided in 1988-1989 are still being used for forest management purposes. Monitoring is done only on the territories of State reserves.

Monitoring of forest ecosystems in the PAs is being implemented by their own research departments. The collected data and information have been analysed in the annual *Nature Chronicles*, which are not published. Still, the collected and processed information, even if it is based on scientific methods, does not meet the demands of fully fledged, comprehensive forest monitoring, and does not provide an in-depth analysis of the state of forests and prospects for their development. Updating of the cartographic material related to forest management would be very helpful and is sorely needed. The forest maps currently in use are based on the 1988-1989 forest inventory data and expert estimates based on this out-of-date data and information.

Other challenges to be addressed and difficulties to be overcome

The natural forests are subject to heavy degradation: low incomes limit people's ability to purchase commercialized wood products, and alternative timber production (from poplar plantations) is not yet sufficient to cover needs. Some communities have no access to alternative energy sources and depend entirely on fuelwood, although the State programme

of providing gas to settlements has been successfully implemented. The energy efficiency of households is low. Insufficient insulation of buildings increases fuel consumption considerably. There is no strategy for promoting the use of alternative energy sources.

The technical equipment of forestry departments is insufficient. The lack of transport and communication vehicles results in poor guarding of forest territories. Foresters do not possess enough fire equipment and means to prevent and protect forests against diseases and vermin. As for office equipment, only 50 per cent of the cost is provided by the State. As mentioned above, forestry organizations are self-financed, and this has proved to be a crucial negative factor as it slows down the development of forestry. Nonetheless, forest parks have been developed in recent years.

Some ministries have formed their own forestry units to deal with tree planting. For example, the forestry unit for oil and gas employs some 600 workers. The forestry unit is responsible for 2,323 ha of the SFF.

Regarding illegal logging, in Turkmenistan, this could be defined or understood simply as unauthorised self-consumption of firewood by the local population in the remote desert and mountainous regions, where there is no supply of gas. In the desert areas, this might lead to desertification (moving sands), and in the mountains to the degradation of soils and the danger of mud flows (*sel*).

Taking into account the fact that the main forest-forming species in Turkmenistan do not provide commercial wood, illegal (unauthorised) cuttings might occur mainly for household purposes, and only for fuelwood or firewood, especially from such species as saxaul, tamarisk and maple. An exception could be juniper and the *tugai* forest species, growing in areas which could be difficult to reach. Still, the negative anthropogenic influence on other nature components could be noticed even in undisturbed ("untouched") forests. For example, the decreasing population of hoofed animals leads to the coverage of soils by moss, preventing natural regeneration and thus oppressing even some desert species.

11.7 International cooperation

Notable among international cooperation activities in relation to the Turkmenistan forestry are the following:

- Memorandum on mutual cooperation between the Ministry of Nature Protection of

Turkmenistan and the Ministry of Environment and Forestry of Turkey, 1997;

- Afforestation activities with the participation of the local population in the framework of the GTZ-CCD-NIDFF project, 1998;
- Establishment of the Forest Park of Turkmen-Turkish Friendship (50 ha), 2004;
- Establishment, together with the Turkish International Cooperation and Development Agency, of high-yielding pistachio forests-orchards, 2006;
- Cooperation on Sustainable Forest Management in Turkmenistan between MoNP and SFM/GIZ, 2009-2011.

The last of these, the technical cooperation on sustainable forest management (SFM) in Turkmenistan between MoNP and the German Federal Ministry of the Environment, Nature Conservation and Nuclear Safety, should be noted specifically. The implementation is carried out by GIZ. This joint project is aimed at encouraging sustainable forest management in order to mitigate the negative impact of climate change in the country, and facilitating adaptation to changing environmental conditions. This cooperation is in harmony with the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD Programme), especially in terms of increasing the carbon sequestration capacity of Turkmen forests and OWL.

The project contributes to the rehabilitation of degraded forest lands and improvement of the capacities of national and local stakeholders in terms of sustainable forest management. The practical work on the ground is being done in three pilot areas, where afforestation activities are being implemented jointly with the local population, including work on upgrading the qualitative and quantitative production of tree nurseries. The total area to be planted under the project is about 200 ha, and the direct costs of this work are shared by the two above-mentioned ministries.

The local plans for sustainable forest management, which are being formulated within the project, aim to manage and protect existing forest resources, and provide practical recommendations for actions to increase forest area and boost forest vitality for the benefit of the corresponding communities and the country as a whole. In addition to the afforestation work, the project supported the elaboration of a new Forest Code.

11.8 Conclusions and recommendations

Turkmenistan has extended areas of planted forests, including the green belts around cities, towns and other settlements. The planting and growing of indigenous tree species resistant to droughts and high air temperatures allows irrigation intensity to be reduced and, at the same time, increases the vitality of trees and further development of plants.

These are needed for the protection of water and soil, in addition to providing recreation opportunities for the population and contributing significantly to the mitigation of climate change effects and the adaptation of natural ecosystems to present-day environmental conditions.

Properly protected natural sandy desert forests and OWL prevent the degradation of desert ecosystems, and provide excellent areas for distant pastures. The same holds true for juniper forests with their key ecological and protective function; the rich genetic fund of natural pistachio trees and stands, offering major potential for selection work; wild/natural fructiferous stands, which are important for the national economy; and *tugai* forests – ecosystems with an indispensable water protection and anti-erosion function.

For sustainable forest management, accurate, comprehensive, reliable and up-to-date information is badly needed but is currently not readily available. Currently available data are based on various ad hoc surveys, research and scientific analyses. The latest countrywide forest inventory was implemented in 1988-1989.

Recommendation 11.1:

The Cabinet of Ministers should:

- (a) *Expand afforestation/reforestation activities to address country needs with regard to afforestation/reforestation, the fixation of moving sands, combating soil erosion and salinization, and the creation of agricultural shelter belts, by adopting new and implementing existing local plans for sustainable forest management;*
- (b) *Explore funding opportunities with international and donor organizations.*

Recommendation 11.2:

The Cabinet of Ministers should

- (a) *Carry out a countrywide comprehensive forest inventory, forest accounting and the State forest cadastre in order to:*
 - (i) *Facilitate the decision-making process;*

- (ii) *Elaborate, on the basis of results, detailed forest management plans for all forest enterprises and a map of key forest ecosystems;*
- (b) *Prepare cartographic materials for various types of wooded lands.*

The priorities regarding forestry and forest management are well understood by the Government, and the key components required to draw up a forest programme aimed at the protection, restoration and rational utilization of forests and other wooded lands are, in fact, available. Despite the fact that the programme of tree planting and establishing “green belts” has been given the rank of a State programme, the absence of a national forest programme and an action plan is one of the main obstacles to the development of sustainable forest management in the country.

All of the measures undertaken by the Government so far have not yet been sufficient to raise the forestry profile to the level of genuine sustainable forest management. To move further along these lines, there is a need to elaborate a coherent forest policy system and a properly coordinated, legal, institutional and financial framework for national forestry. The first steps in this direction have already been taken. The direct involvement of local communities, public associations and individuals is also an important aspect to raise the profile of forestry and to achieve Government objectives.

Yet political will is not sufficiently effective without budgetary provisions for the development of forestry, especially for the preservation and re-establishment of the natural forests because the SFF is exclusively State owned and is subject to protection and rational use by the State.

At present, this is one of the most serious constraints preventing proper organization and development of the forestry, including forest monitoring and forest inventory, forest administration and management at the national and local levels.

Recommendation 11.3:

The Ministry of Nature Protection, in cooperation with relevant stakeholders, should develop a national forest programme and action plan based on a new forest inventory, and submit them to the Cabinet of Ministers for adoption.

Recommendation 11.4:

The Cabinet of Ministers should gradually reform and further develop the forestry funding system in order to promote sustainable forest management and protection.

Recommendation 11.5:

The Ministry of Nature Protection, in cooperation with local authorities, should develop and implement local programmes or projects aimed at the restoration of degraded forest lands.

PART III: SECTORAL INTEGRATION

Chapter 12

CLIMATE CHANGE

12.1 Introduction

Turkmenistan ratified the UNFCCC in 1995 and the Kyoto Protocol in 1998 (Chapter 4). It submitted its Initial National Communication to the UNFCCC in 2000 and the Second National Communication in 2010.

The major sources of GHG emissions into the atmosphere in Turkmenistan are the oil and gas industry, the electricity subsector, and the transport sector. The tendency towards an increase in total GHG emissions in Turkmenistan is expected to continue, and is closely linked to the increase in the exploration and processing of hydrocarbons.

In 2007, the value of exports (mostly oil and gas) reached US\$ 8.9 billion, which represented 3.6-fold growth compared with 2000. In the period 2000-2007, average annual GDP growth (in comparable prices) reached 15.2 per cent, much higher than the rate of population growth.

However, a large proportion of GHG emissions is due to non-efficient management of fuel and energy resources and the use of obsolete technologies in various sectors. Thus, energy efficiency is the determining factor in climate change mitigation in Turkmenistan. Experts' estimates prepared for the Second National Communication indicate a potential for energy saving in the period 2010-2030 ranging from 35 to 40 billion m³ of natural gas, which can be exported. The total decline in the country's GHG emissions due to energy efficiency could reach 65-75 million t of CO₂ for the entire period.

12.2 Institutional framework

Climate change issues are addressed by two inter-agency bodies. The first body is the State Commission to Guarantee the Implementation of Commitments of Turkmenistan Arising from UN Environmental Conventions and Programmes (Chapter 4). The State Commission is formed by eight working groups. MoNP is vested with the power to coordinate the operational work and it is the UNFCCC focal point. One of the groups is dedicated to the UNFCCC. It is composed of experts from MoNP, the Ministry of Energy and Industry, and Hydromet. Chaired by MoNP, it deals with UNFCCC

obligations, such as national communications, and adaptation and mitigation policy in general.

The second body is the Interdepartmental Commission on the Clean Development Mechanism (CDM), established in 2009. It is also the Designated National Authority (DNA), and the UNFCCC focal point serves as the Secretariat of the DNA. The DNA has a working group of about 11 experts from relevant ministries interested in the CDM. The procedures for the DNA were approved in 2011. The enterprises willing to apply for CDM apply to the Secretariat. Once approved by the Secretariat, documentation is submitted to the Cabinet of Ministers. The international entities apply to the Ministry of Foreign Affairs, with a copy to MoNP.

According to the 1999 Law on Hydrometeorological Activity, the Cabinet of Ministers defines national policy in the hydrometeorology sphere, while Hydromet directly implements this policy, administering and regulating activity. In this way, Hydromet is the main organization engaged in systematic climate observation. Hydromet ensures the development and functioning of the observation network system for the atmosphere and the monitoring of the marine environment, surface waters, agricultural crops and pastures, and radiation on the surface of the earth. It also ensures fulfilment of systematic climate land observations for the World Meteorological Organization, through the CIS Interstate Board on Hydrometeorology, with the support of the International Fund for the Aral Sea. The country cannot yet receive data directly from satellites. Satellite data are provided by Uzbekistan. In the event of forecasting heavy rains or high probability of other hazards, Hydromet either contacts the Cabinet of Ministers or the Emergency Response and Civil Defence Department of the Ministry of Defence, or contacts the provinces concerned directly.

Hydromet undertakes hindcasts and forecasts of up to a month, and agriculture forecasts by quarter. The existing scenarios for Turkmenistan result from coarse (5°x5°) models Magic Scengen run by the UNFCCC focal point jointly with Hydromet.

The Ministry of Oil and Gas Industry and Mineral Resources, Ministry of Energy and Industry, and the

different bodies dealing with oil and gas, such as the State Concern TurkmenGas, and State Concern TurkmenChemicals, are aware of climate change issues as well as CDM. However, there is a general need to increase capacity.

MoNP has been entrusted, through its Statute Law, with the responsibility of coordinating the activities of ministries and departments in order to meet the obligations arising from international conventions, including those relating to climate change. The MoNP Minister is often vested with power to coordinate the operational issues of the two bodies addressing climate change in the country. MoNP also conducts some regional actions on climate-change-related issues. One MoNP body, NIDFF, which hosts the UNFCCC focal point and the DNA Secretariat, has been the coordinator for national communications to the UNFCCC. The team working on climate change issues is quite small, consisting of the UNFCCC focal point and one, or sometimes two, assistants. The national communications are prepared by ad hoc working groups.

The main role of the Academy of Sciences is scientific research in such areas as observation of the state of the environment; informational technologies on gathering, disseminating and managing observational data; modelling and projecting methods while studying natural resources under conditions of arid climate; and physical processes in the Sun–Earth system.

The Turkmen Research Educational Network Association hosted by the Turkmenistan Supreme Council of Science and Technology under the President of Turkmenistan, is composed of universities and ministerial research institutes. The Association networks have, by themselves or jointly, been conducting studies on climate change issues, but still not in a structured and broad (multi-institutional) way.

At the local level, the authorities also have a role to play in planning and implementing adaptation measures, participating in the maintenance of risk prevention infrastructures, contingency planning, and awareness-raising on water saving and forest protection. The level of awareness of local authorities regarding climate change issues is still low and needs to be increased.

12.3 Policies and strategies

The country has not prepared a programme of adaptation to climate change or a low emission development strategy. A national environmental

programme for the period 2012-2016 is under development and is to include a chapter on climate change and another on renewable energy. The central structural document for the definition of the country's policy and implementation approach to sustainable development is Strategy 2030. The document does not directly address climate change, but there is a chance to include climate change issues in the interim strategies or action plans which stem from it.

Given the extremely tight bioclimatic features of Turkmenistan, key concerns for the social and economic welfare of the population are the protection of public health and the preservation of usable land and water resources. For this purpose, the policy foresees the reform and improvement of legislation regulating the use of land, water and forests (including a significant increase in the area planted in forest). Currently, water, electricity up to a certain limit, gas, and a significant amount of fuel are available free of charge to the population, causing non-efficient use (Chapter 3).

Within a context of water scarcity expected to worsen with climate change, under a scenario of increasing water needs crucial for agricultural development, and given the fact that in many parts of the country the groundwater is quite shallow and is salty, Turkmenistan has given priority to adaptation measures. These are, among others:

- Shifting to IWRM;
- Improving use of advanced irrigation techniques (drip, micro-spray) and enhancing existing (traditional) ones to increase the efficiency of irrigation systems;
- Reconstructing and improving irrigation complexes and hydrotechnical sites, aiming to reduce water losses;
- Building new water reservoirs;
- Optimizing agricultural production planning to achieve the country's needs with regard to agriculture outputs, while minimizing the use of water resources;
- Realizing selective works on developing drought-tolerant crops;
- Improving farmers' awareness of efficient water use and pre-season planning of crops.

It is worth mentioning that Turkmenistan has started to build a system that collects drainage water from irrigation and directs it to a large reservoir, Lake Altyn Asyr at the natural Karashor depression, which will hold over 130 billion m³ of water, from where it can be purified and recycled for irrigation. There are questions regarding the possible impact this further channelling will have on the land beyond the

irrigated areas (which currently benefit from this drainage water), regarding the quality of the water (salinity, contamination with fertilizers and pesticides) and the effectiveness of the solution due to expected high evaporation from the lake.

Since independence, the country has been promoting agriculture. Since 2000, the development of agriculture has been defined in all major strategic government programmes. While maintaining the importance of cotton production, other activities and products have been virtually recreated, such as the grain industry, the production of vegetables and melons, fruits and berries and, very importantly, livestock, whose numbers have increased dramatically (16.6 million head in 2009). A significant step forward in acceleration of the processes of agriculture transformation was the adoption of the Presidential Decree on Land Ownership and Usage Right in Turkmenistan, which

laid out the legal norms for the transfer of land into ownership and long-term usage, reassuring rural producers. By 1 January 2006, there were 52,100 farms producing agricultural output. In one year, this number grew by 9,700. In 2009, the share of agriculture was about 11.5 per cent of GDP. In 2009, the total irrigated area was about 1.7 million ha, and the national goal is to have the irrigated area reach 2 million ha.

Strategy 2030 states that economic development policy aims to optimize the structure of both production and exports, by improving product sales in foreign markets while replacing imports by national production. In order to increase the competitiveness of export commodities – gas, oil and chemicals, and the emerging electricity sector – the country would need to achieve world standards, expand the range of products and decrease production costs.

Box 12.1: Natural hazards and contingency planning in Turkmenistan

Although data for Turkmenistan are very scarce, it is possible to draw a draft picture. Earthquakes are the dominant risk in Turkmenistan resulting in an annual average economic loss of US\$ 72 million, followed by floods at US\$ 7 million. The 20-year return period loss for all hazards is US\$ 433 million (1-3 per cent of annual GDP), while the 200-year return period loss is US\$ 1.564 billion (4-12 per cent of GDP). Turkmenistan is also vulnerable to droughts, since more than 10 per cent of the population lives in high vulnerability zones, and another 10 per cent in moderate vulnerability zones. Moreover, the country is highly dependent on the Amu Darya River, which itself has very high vulnerability.

There are two primary seismic zones in the country, located under the Turkmenbashi and Ashgabat regions. An earthquake of magnitude 7.2 in the Ashgabat region on 5 October 1948 reportedly killed 110,000 people and caused an economic loss of US\$ 25 million. An earthquake of magnitude 7.1 struck on 5 January 1929, killing 3,257 people. The only recorded flood disaster was in January 1993, when 420 people were affected, and reported economic loss amounted to US\$ 100 million. Landslides are not a significant hazard, and occur mostly in sparsely populated mountain areas. Reportedly, mudslides have not been registered for more than 60 years, and there are no records of snow avalanches affecting the population. Usually channels have been built in population settlements, towns and cities that can withstand water hazards. The only reported disaster caused by a technological hazard was a transport accident in the Vatutino region, which killed 40 people on 18 September 1998.

The Emergency Response and Civil Defence Department under the Ministry of Defence, is the Government body coordinating this sector in the country. As vulnerability to disasters is not high, only Magdany, Ashgabat and the western part of the country have population evacuation plans.

A system of early warning has been set up in the country for the different hazards. There is a network of meteorological and seismological stations, as well as laboratories for environmental quality control, connected to the Emergency Response and Civil Defence Department, which in turn are connected to the provinces. Other ministries, State authorities and industrial installations are also connected. In case of accident, they have to notify the province, and the State authority, or the Department directly.

Existing contingency plans have included different natural disasters and fires, as well as anthropogenic accidents such as explosions, oil spills and accidents at coastal facilities. The plans contain available equipment and resources to respond to accidents, information on the country's reserves of food and other goods, locations and human resources. At the end of the year, all ministries, agencies and provinces have to provide inputs for the national contingency plan for the following year. After round table discussions, the plan is distributed at State level and ministries and agencies have to develop their own plan, based on the national plan. Similarly, the provincial authorities and agencies, as well as companies, have to develop their own plans. The entities report quarterly to the Emergency Response and Civil Defence Department on the implementation of the plans, namely, on preparations for the summer or winter season, on activities such as workshops and seminars, and on public preparedness to respond to emergencies.

Each line ministry has to report on and programme contingencies in its sector. In this way, MoNP can address climate change at this level, as Hydromet can provide data on a few months' forecasting, and the Ministry of Communication has to report or plan on how to ensure communication in case of emergency. The Emergency Response and Civil Defence Department is not involved in forecasting scenarios on climate change.

Thus, in 2001, the country started to attract foreign investment, which would bring state-of-the-art (more environmentally sound and energy efficient) technology. The investment in updating technology amounts to hundreds of millions of US dollars. In this context, the Turkmenbashi refinery was completely rebuilt and new and reconstructed factories were equipped with enhanced, environmentally safe technologies. Further steps include building infrastructure for primary processing and transportation in the areas of development of new deposits of mineral resources, creating a unified system of accounting and valuation of natural resources to promote rational and efficient use, and improving the regulatory framework.

Particularly in terms of mitigation, there are numerous opportunities. As the trend is to proceed with increasing production, there is a real need to modernize technology – not only to comply with international standards requested in some markets by conscious consumers – to reduce the increase in emissions. Companies from, for example, Austria, France, Germany, Japan, the Republic of Korea, the Russian Federation, Switzerland, the UK and Ukraine are interested in developing CDM projects in Turkmenistan, particularly on shifting to combined-cycle turbines for electricity production, and energy efficiency. In theory, CDM projects could, over time, account for the majority of investment in oil and gas modernization and about 50 per cent of electricity production modernization projects.

In practice, with adequately designed projects and monitoring schemes, and rigorous contracts with involved stakeholders, it is possible to recover quite a substantial amount of investment. In the case of investment in urea factories (the production of which requires gas, whose cost for companies is about US\$ 1.26/1,000 per m³), CDM may also be very attractive. However, no CDM projects have been implemented in Turkmenistan.

Still, in the area of awareness-raising and education, MoNP, in conjunction with the Ministry for Education, has been organizing seminars for secondary school teachers. Some of the seminars deal with climate change and provide information on the UNFCCC, on Turkmenistan's obligations under it, and on the related projects and programmes being implemented in the country.

12.4 Legal framework

Mitigation and adaptation measures are not explicitly mentioned in legal acts, but some laws contain provisions that facilitate the implementation of

climate-change-related measures. A major gap overall at present is that the methodology used to conduct ecological expertise does not address CO₂, as these gases are not considered pollutants.

The 1996 Law on Protection of Atmospheric Air establishes that among the main activities of the State on air protection are prevention, reduction and cessation of GHG emissions into the atmosphere. The Law also sets requirements for several specific areas, with a potential impact on GHG emissions: air protection for the placement and development of cities and towns (emissions from traffic); and air protection when processing and disposing of industrial and household waste (emissions from waste).

Actions aimed at artificial changes in the state of the atmosphere and atmospheric phenomena can be carried out by legal entities specially authorized by State bodies, and only on the condition that they will not cause adverse effects on weather and climate. The Law establishes that the study (data collection, storage, retrieval and processing of information) and monitoring of atmospheric air, changes in the ozone layer and climate is conducted through a single system for which MoNP has responsibility.

The 2008 Law on Hydrocarbon Resources contains the legal basis for hydrocarbon-related operations. As a very important mitigation measure, the contractor is required to take all necessary measures, including the use of modern technology, to prevent emissions into the atmosphere of burning natural gas. Only in exceptional cases, and in order to avoid creating a danger for the environment, health and life, can the contractor temporarily burn (discard) the associated gas into the atmosphere, on the condition that it is properly pretreated.

The 2011 Forest Code establishes that the use of forests should take into account their global environmental significance, which includes climate change. Afforestation is to be carried out on non-forest lands in order to increase forest cover areas with a view to preventing erosion and improving the ecological environment and agroforestry. The activities will be undertaken by State forestry enterprises and funded through the State budget.

The draft Law on Pastures takes a precautionary approach that would contribute to adaptation to climate change. The State Grazing Fund is composed of all pastures intended for livestock needs, with the exception of specially protected natural territories and objects. The maximum permissible standards for cattle rangeland are established by the Cabinet of

Ministers based on inventory and geobotanical studies of pastures, undertaken periodically every 10-12 years. The State authorities develop proposals with predictions of future uses for grazing pastures for cattle grazing, besides enforcing State control on their sustainable use.

Users of rangelands have an active role to play in their management by participating in the accounting and inventory of rangelands; detecting, preventing, and terminating violations of the use of rangeland by their peers or third parties; implementing measures to prevent fires; coordinating activities to combat fires, pests and diseases of pasture plants; taking measures to improve productivity and prevent pasture degradation; and ensuring environmental and sanitary conditions of pastures and water points. Environmental degradation resulting from economic activities will lead to the termination of the right to use pasture.

12.5 Current situation

The national GHG inventory was coordinated by MoNP within the project of the Second National Communication to the UNFCCC. The National GHG Inventory Group was subdivided into seven target groups, of which three dealt with the energy sector: Stationary Combustion, Mobile Combustion and Fugitive Emissions. Several economic sectors were involved in the elaboration of the inventory. Statistical data were provided by different ministries and departments, and large industrial enterprises.

Total GHG emissions in 2004, excluding the Land Use and Land Use Change and Forestry (LULUCF) sector, reached 60,569.92 Gg of CO₂-equivalent, nearly double the 1994 value of 34,901.31 Gg (Table 12.1). This places the country among the top 50 emitters, but the tendency is towards an increase in GHG emissions and there are strong arguments to state that, in 2011, values are higher than in 2004. Significant methane emissions occur during extraction of hydrocarbon materials, and the increase in production is to be continued. Greater production and increased consumption lead to an increase in GHG emissions, in particular methane from the oil and gas industry, agriculture and waste.

GHG emissions decreased in the period 1997-1999 due to the decline in the production and processing of fossil hydrocarbon during that period. The decrease was mostly due to a reduction in methane emissions (Figure 12.1), although the slump reached agriculture and other industry sectors, inducing a reduction of N₂O emissions in the period 1995-1999. During this period, however, CO₂ emissions increased steadily.

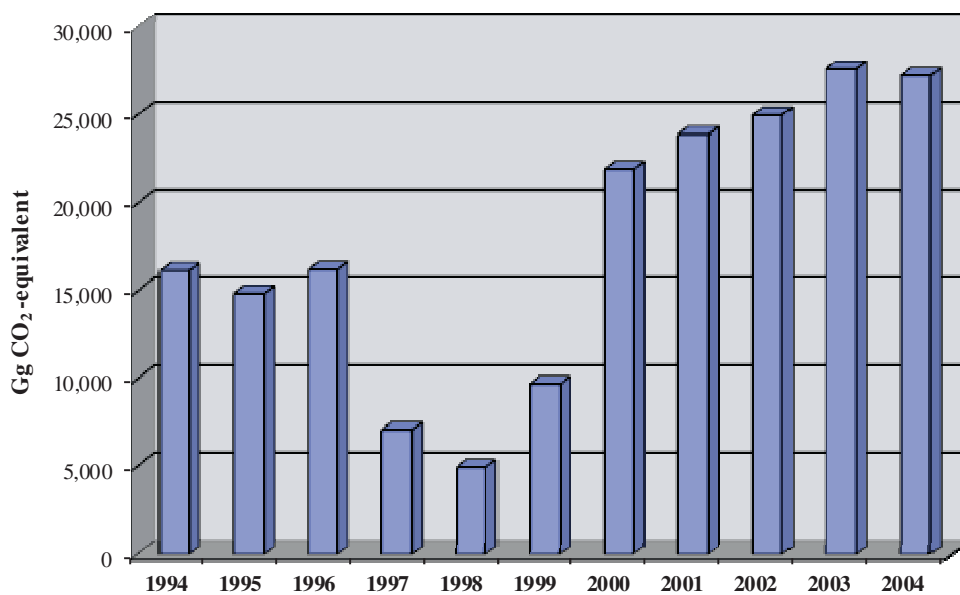
This was due to the countrywide gasification programme, which has led to a sharp increase in the amount of natural gas consumed by the population. In 2000, GHG started to increase again. The composition of direct GHG was practically identical between 1994 and 2004. The growth of the methane fraction (2 per cent) reached 55 per cent of total GHG emissions, at the expense of CO₂.

Table 12.1: Greenhouse gas emissions and sinks, gigagrams of CO₂-equivalent

		Gg of CO ₂ -equivalent				
		CO ₂	CH ₄	N ₂ O	HFCs	Total
Energy	1994	15,197.7	16,140.2	20.4	..	31,358.2
	2000	23,425.7	21,886.4	53.0	..	45,365.1
	2004	25,181.2	27,235.9	90.4	..	52,507.5
Industrial processes	1994	496.0	1.5	349.2	..	846.7
	2000	397.2	0.3	401.4	1.1	798.9
	2004	344.9	0.5	400.9	11.4	746.3
Agriculture	1994	..	2,331.6	539.4	..	2,871.0
	2000	..	2,261.9	616.9	..	2,878.8
	2004	..	5,515.9	1,289.6	..	6,805.5
LULUCF	1994	..	..	..	..	0.0
	2000	-714.3	..	..	..	-714.3
	2004	-830.0	..	..	..	-830.0
Waste	1994	..	321.3	..	..	321.3
	2000	..	383.3	..	..	383.3
	2004	..	510.7	..	..	510.7

Source: Second National Communication of Turkmenistan under the UNFCCC, 2010.

Memorandum item: Total in 1994, 35,397.2 Gg; total in 2000, 48,711.8 Gg; total in 2004, 59,739.9 Gg.

Figure 12.1: Methane emissions from the oil and gas sector, 1994-2004

Source: *Second National Communication of Turkmenistan under the UNFCCC*, 2010.

Hydrofluorocarbons (HFCs) are imported in a pure state and as parts of products. Emissions of HFC are insignificant, but showed a 10-fold increase between 2000 and 2004, reaching almost 11.5 Gg. Indirect GHG have all increased twofold in the period 1994-2004; in 2004, these gases, respectively, reached the following levels: SO₂=2.4 Gg, NO_x=90 Gg, CO=238 Gg, NMVOC=38 Gg. The energy and industrial processing sectors make a significant contribution to total national emissions.

The contribution of the energy sector to GHG emissions in Turkmenistan in 2004 was 86.68 per cent. The largest contribution in the energy sector in 2004 was related to the oil and natural gas industry (51.8 per cent), followed by population¹⁷ (19.4 per cent), the electric power industry (15.4 per cent), the residential (municipal) sector¹⁸ (5.3 per cent) and transport (4.5 per cent) (Figure 12.2). Emissions from the oil and gas industry consist mostly of methane. Road transport accounts for more than 90 per cent of GHG emissions in the transport sector, and reached 2,371 Gg CO₂-equivalent in 2004, nearly three times as much as in 1994, due to the increased number of road vehicles. It is expected that, in the future, the oil and gas industry will continue to account for the lion's share of GHG emissions, followed by the electricity industry as the installed power for electricity production in Turkmenistan is being developed¹⁹ (all electricity consumed in the country

is produced nationally with Turkmen natural gas). The population's share of this sector is expected to decrease since growth in the amount of fuel consumed by the population has been low in recent years. The excess electricity that is produced is exported: in 2007, 1.9 billion kWh was exported.

The intensive development of agricultural production in the period 1994-2004 led to a 3 per cent increase in agriculture's share of GHG emissions, reaching 11 per cent. GHG emissions in the agricultural sector increased from 2871.03 Gg CO₂-equivalent in 1994 to 6805.46 Gg CO₂-equivalent in 2004. From 2000 to 2007, agricultural output increased more than fourfold. This met 80 per cent of the country's food needs. Methane is the major component of emissions (on average about 80 per cent), while nitrous oxide (N₂O) accounts for the rest. Methane and N₂O emissions were estimated from domestic livestock (mainly sheep, goats, camels, horses, swine and poultry), namely, enteric fermentation and manure management; rice cultivation – the flooded rice fields; and agricultural soils.

According to the data for 2004, the bulk of emissions were emitted by animal intestinal fermentation (80 per cent) and utilization of agricultural land (19 per cent); only 1 per cent was by cultivation of rice. The proportion by intestinal fermentation has decreased due to the change in livestock structure. Nevertheless, livestock emissions increased threefold

¹⁷ Household consumption of gas and electricity.

¹⁸ Public buildings.

¹⁹ Compared with 2000, power production increased by 49

per cent in 2007, reaching 14.8 billion kWh.

between 1994 and 2004. In 2004, the bulk of emissions came from activity related to dairy cattle breeding (31 per cent), followed by sheep and goats (28 per cent), camels (23 per cent) and non-dairy cattle (18 per cent), with swine, horses and mules, and poultry accounting for less than 1 per cent. In 1994, dairy cattle accounted for 38 per cent and non-dairy cattle 27 per cent. The tendency is towards an increase in these emissions, since livestock numbers have continued to grow, reaching some 16.6 million head in 2009 (Table 12.2).

The proportion of emissions from industrial processes other than energy-related processes decreased from 2 per cent of total GHG emissions in 1994 to 1.2 per cent in 2004. These activities are related to mineral raw materials processing, the chemical industry and food production. The main components of industrial emissions in Turkmenistan are N₂O from nitric acid and ammonia production, CH₄ from technical carbon and coke, and CO₂ from mineral production (cement and limestone) and chemical production (ammonia). Nitrous oxide (N₂O) is the main constituent of total GHG emissions from this sector, while methane emissions occur in much smaller quantities.

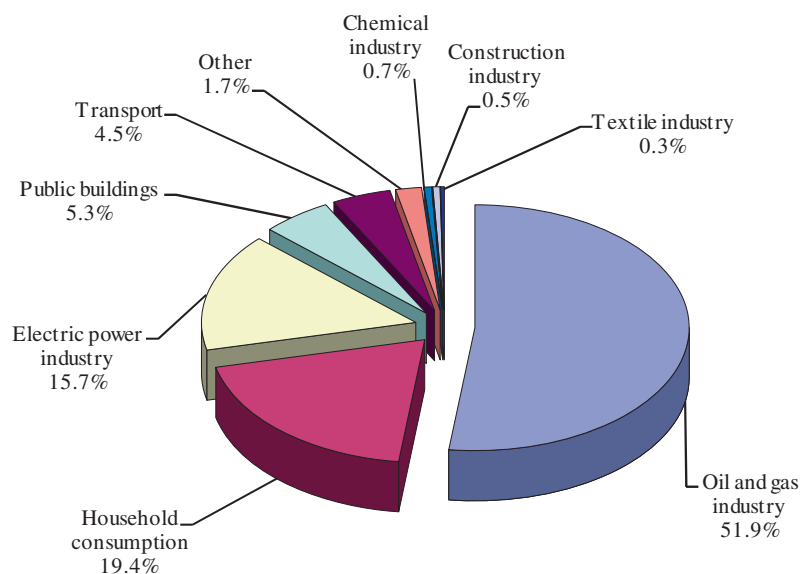
The proportion of GHG emissions from industry represented by the chemical industry increased from 59 per cent in 1994 to 82 per cent in 2004. There are also large inter-annual variations in the composition of these emissions, with the proportion represented by mineral production ranging from 18 to 66 per cent

of emissions, while the chemical industry ranges from 34 to 72 per cent. Non-methane volatile organic compounds (NMVOCs) prevail among the gases with indirect greenhouse effect in industrial processes. It is predicted that production capacities for the most important kinds of chemical output will be significantly increased compared with 2000: mineral fertilizers – 20.1-fold, including nitric fertilizer 18.1-fold and phosphate threefold. It is expected that the production of potash (a powdery salt used primarily in fertilizers) will reach 2.5 million t per year. Technical iodine production will grow 4.6-fold, and sodium sulfate 20.4-fold. An increase in urea factories is also expected; there will probably be three plants. However, it is expected that new plants will be constructed based on up-to-date technologies; some existing plants will be upgraded and outdated ones will be closed. Upgrading and closing down would have the potential to save about 350 million m³ of natural gas and 1 million kW/h of electricity per year.

The proportion of emissions represented by waste remained constant at 0.85 per cent, although absolute emission values increased by 59 per cent over the period 1994–2004. The estimation of GHG emissions deriving from waste was conducted only on data on solid waste disposal sites, and is composed exclusively of methane. Hence, it is possible that real GHG emissions are greater.

The volume of GHG emissions by sector in 2004 is presented in Table 12.3.

Figure 12.2: Greenhouse gas emissions from energy sector (consumption and production), 2004



Source: Second National Communication of Turkmenistan under the UNFCCC, 2010.

Table 12.2: Composition of greenhouse gas emissions from livestock, 1994 and 2004

	%	
	1994	2004
Dairy cattle	36.7	30.8
Sheep and goats	30.4	27.8
Camels	4.5	23.3
Non-dairy cattle	26.6	17.7
Horses and mules	0.4	0.2
Swine	1.2	0.1
Poultry	0.1	0.1

Source: Second National Communication of Turkmenistan under the UNFCCC, 2010.

Table 12.3: Emission of direct and indirect greenhouse gas emissions in 2004

	gigagrams						
	CO ₂	CH ₄	N ₂ O	NO _x	CO	NM VOC	SO ₂
Energy	25,181.2	1,296.9	0.3	87.9	237.2	27.7	..
<i>of which</i>							
Fuel combustion	25,181.2	0.8	0.3	87.9	237.2	27.7	..
Methane emissions from oil and gas	..	1,296.1	..	..	..	..	..
Industrial processes	344.9	0.0	1.3	2.3	1.1	10.8	2.4
Agriculture	..	262.7	4.2	..	..	..	..
LULUCF	-830.0	..	..	..	..	..	..
Waste	..	24.3	..	..	..	..	..
Total	24,696.1	1,584.0	5.7	90.2	238.3	38.5	2.4

Source: Second National Communication of Turkmenistan under the UNFCCC, 2010.

The LULUCF sector in Turkmenistan was reflected for the first time in the Second National Communication to the UNFCCC, in accordance with the 2003 IPCC document entitled Good Practice Guidance for Land Use, Land-use Change and Forestry. The values are based on approximations due to uncertainties in activity data and emission factors. Changes in carbon stocks and GHG emissions/removals were estimated for the following three categories: (i) forest land remaining forest land; (ii) lands converted to forest lands; (iii) burnt biomass at fires. Carbon stock changes were considered in both above- and below-ground living biomass. The conclusion was that, in Turkmenistan, overall removals in the LULUCF sector were approximately 800 Gg CO₂ more than the emissions from this sector.

Expected impacts on priority areas

Weather in Turkmenistan is influenced by the Siberian anticyclone and intensive radiation in clear anticyclone weather conditions, and by a cyclone in the southern part of the country. It is a continental climate with cold winters, hot summers and a small amount of precipitation. In July (the hottest month), the average temperature is 31.4°C, but may rise up to 40-45°C on some days. In winter, sudden short-range falls in temperature occur down to -28°C in the east

and to -35°C in the north; moreover, under the significant radiation inflow, increases of up to 12-16°C (above zero) occur. In the north, the winter is relatively severe with low temperatures and infrequent thaw. Snow precipitation can be observed and the snow cover is stable. Although low in quantity, rain occurs mostly from March to May (e.g. 18.7 mm on average in April) and can also occur from October to February. In the east and south, much of the precipitation is observed from December to April – 87.8 per cent of the annual amount. Maximum precipitation (64.3 mm) is observed in March. The amount of precipitation during the whole summer is 3.4 mm in the north and less than 5.0 mm in the south.

In the semi-arid zone, atmospheric droughts and hot dry winds are most frequent. In the desert, evaporation exceeds precipitation tenfold (yearly average), and during the summer evaporation can be 20-70 times in excess of precipitation. Precipitation occurs 5-8 days per each winter month, while in summer it very seldom rains. The summers in the desert are long, hot, dry, dusty and cloudy, with high daily variations in temperature of air and soil. In the daytime, the soil surface may be heated up to 78°C. Dust storms are usually observed in the period of cold fronts.

All mountainous regions are characterized by high frequency of precipitation during the entire year. Often, rainfall in the mountains causes mud torrents of great destructive power. Heavy precipitation events are observed in the foothill areas. In the foothill areas and the southern regions there are between three and eight days per year with precipitation greater than 20 mm, and about three days with precipitation greater than 30 mm. Throughout the country, most cases of heavy precipitation reaching the criteria of “dangerous” or “force majeure” are observed in the period from March to May.

Under these severe weather conditions, the country’s vulnerability and adaptation to climate change focuses on the following aspects, in order of priority:

- Public health – preliminary estimates indicate that, by 2100, the temperature is likely to increase by 2-3° C (optimistic scenario) or by 6-7° C (pessimistic scenario). This, together with sudden variations and increased frequency of extreme weather events, could have negative consequences;
- Agriculture – about 90 per cent of agriculture in the country is irrigated, and can only take place along rivers. Increased evapotranspiration, accompanied by a possible decrease in water availability, will affect production. Precipitation is expected to decrease by 8-16 mm by 2100, which will induce a grassland productivity decline of 10-15 per cent, due to the moisture stock decrease in the top 0-20 cm soil layer;
- Water resources – the central problem is increased water scarcity; climate change will reduce the amount of water available in Central Asia while at the same time increasing water demand;
- Coastal zones – the Caspian Sea is an economically important zone, where about 70-80 per cent of the oil reserves are concentrated; the oil refinery, and other large infrastructures, such as ports, is located there. Besides, the country intends to develop tourist resorts in the area. Hence, the concerns relate mostly to sea-level variations (which have already occurred up to 2003);
- Preservation of soil and land resources, and natural ecosystems: flora, fauna and forests – forests provide crucial environmental services, by helping with the regulation of several ecosystems. Forest conservation and additional afforestation efforts would thus contribute to climate change adaptation and mitigation;

- According to Hydromet, the number of hot days is projected to increase under global warming, in a country that already registers maximum temperatures of 50°C in the shade and 60-65°C in the sun. Turkmenistan also registers a high soil surface absolute maximum temperature of 77°C, and the temperature of sand in the Karakum Desert may reach 80°C.

To understand the possible climatic changes and their impacts, research on climate change is being conducted at academic institutions such as the Turkmen State University named after Magtymguly, the Turkmen University of Agriculture, the Turkmen Medical Institute, the former Turkmen State Polytechnic Institute,²⁰ and at branch research institutes such as NIDFF, the Scientific Research Institute of MoWE, the Service of Land Resources of MoA, and others. Up until now, research has been conducted on a limited scope. Studies have been undertaken of climatic system processes, monitoring and model analysis of climate, vulnerability and adaptation, and climate change mitigation.

Agriculture

With current edaphoclimatic conditions, crops in Turkmenistan include cotton, cereals, vegetables, fruits, grapes and forage almost over all the territory. In the south-west, it is possible to grow subtropical crops such as olives, pomegranates and persimmons.

There are three natural climatic zones – the Kopetdag area and Murgab River basin, the downstream Amu Darya River and the mid-stream Amu Darya River. Studies undertaken in the country have made it possible to determine changes in the physiological demands of plants for water considering their yield capacity.

The main effects of climate change will be on water demand due to transpiration intensity. The water demand of plants is likely to increase by 12.57 per cent by 2020, for all crops in all irrigated zones. With the projected growth in water demand for irrigation, water scarcity is set to become a huge problem (Table 12.4).

²⁰ Turkmenistan has formed two new institutes: the Turkmen State Institute of Architecture and Construction, which became the legal successor of the abolished Turkmen Polytechnic Institute, and the Turkmen State Institute of Oil and Gas.

Table 12.4: Average water demand for crops (cotton, wheat, lucerne and vegetables) in 2020

	Situation 2009 (m ³ /ha)	Projection in 2020 (m ³ /ha)	Balance	Increase in demand 2009-2020 %
Kopetdag and Murgab	7,347	8,271	924	12.58
Downstream Amu Darya River	5,510	6,203	693	12.58
Midstream Amu Darya River	6,025	6,782	757	12.56
Total	18,882	21,256	2,374	12.57

Source: Second National Communication of Turkmenistan under the UNFCCC, 2010.

Note: Under conventional irrigation methods.

Another aspect of concern is the future decline in grasslands productivity. In the last decade, there has been a one-to-two-year drought in the desert²¹ followed by a productivity decline despite sufficient resistance of plants to drought and heat. Soil drought is caused by a water reserve decrease to 4 mm in the top soil layer of 20 cm. Projections indicate that climate-change-induced grassland productivity may decline to 10-15 per cent, due to lower accumulated annual precipitation and moisture deficit. The solution, in order not to decrease sheep breeding, will be to irrigate additional grasslands and implement grasslands protection and recovery measures.

On the other hand, studies conclude that more days with temperature above 35° C in the spring and above 40° C in the summer, as well as accumulated effective temperatures, are not likely to negatively affect agricultural production. In fact, models show that critical air temperature does not exceed allowable value for crops, and the probability of occurrence of such days is low. It is even possible that climate change will allow earlier planting and only a minor decrease in vegetation days.

In any case, different techniques of sustainable farming, including crop and grassland rotation, anti-erosion measures and replacement of chemical fertilizers and pesticides by biological ones wherever possible, will become increasingly necessary.

Water

In the Central Asia region, the transboundary nature of watercourses determines foreseeable impacts. Total water resources of Turkmenistan account for 25 km³ (Table 7.2). Less than 2 per cent of surface waters in Turkmenistan originate in the country. Water from the Amu Darya and Murgab Rivers is diverted into the Karakum Canal to supply water (13 km³ annually) to the arid southern portions of Turkmenistan, irrigating about 850,000 ha. Other

canals divert water from the Amu Darya River in the northern part of the country.

The sharing of transboundary rivers with upstream and downstream countries in the region is regulated by existing agreements. These agreements depend on droughts and other parameters that may affect water availability each year. Climate change may create conditions which will lead to conflicts of interest, and it is therefore very important to ensure that changes in the established balance of water use from transboundary rivers adhere strictly to regional and international agreements.

Caspian Sea

The Caspian Sea level has 300-year recorded fluctuations. The difference between the historical maximum and minimum is about 15 m. During 1930-1977, the level of the Caspian Sea fluctuated around -28 abs m, and in the decade of the 1990s it rose annually by 12-14 cm, reaching -26 m. Damage extended over cities, towns, farmland and pastures. In the period 2000-2006, the average sea level was nearly stable and in 2006 it was -26.5 abs m, as measured by Turkmenbashi Station (Figure 12.3). These sea-level fluctuations depend on accumulated inflow of the rivers to the sea, which also depends greatly on climatic factors at the river basins, such as precipitation and evaporation, geological factors and anthropogenic factors such as the use of water from the rivers feeding the sea.

Turkmenistan's Caspian Sea coast extends for 1,200 km in Balkan Province. Balkan Province is rich in raw material resources, including oil, gas, minerals, and various raw materials for chemical production and the building materials industry. Balkan Province accounts for some 25 per cent of the industrial production of Turkmenistan, and industrial production has increased twofold since 2000. As a result of coastal zone flooding, the sea can be polluted with oil products, pesticides and other toxic substances, with a toxic effect on the flora and fauna

²¹ Turkmenistan has a living desert, with autochthonous vegetation considered pasture land.

of the Caspian area. Fluctuations may also cause siltation of riverbeds and irrigation channels that increases the tendency towards flooding. The major vulnerable socioeconomic facilities are the Balkanabat-Khazar highway and the roads extending to the centre and around the Esenguli district; the seaport of Turkmenbashi; living facilities at Chikishlar, Esenguli and other small settlements; freshwater basins of the Atrek River (used mainly for fish breeding); the freshwater plant at Esenguli; and industrial facilities located on the coast (mainly oil and gas installations).

12.6 International cooperation

Several projects on climate change have been implemented in Turkmenistan. Besides sponsoring the Initial and Second National Communications to the UNFCCC, UNDP sponsored the Capacity Building for Improving the Quality of Greenhouse Gas Inventories and the National Capacity Self-assessment (UNDP/GEF) projects, the main goal of the latter being to develop effective methods for solving problems arising from the implementation of the three Rio environmental conventions.

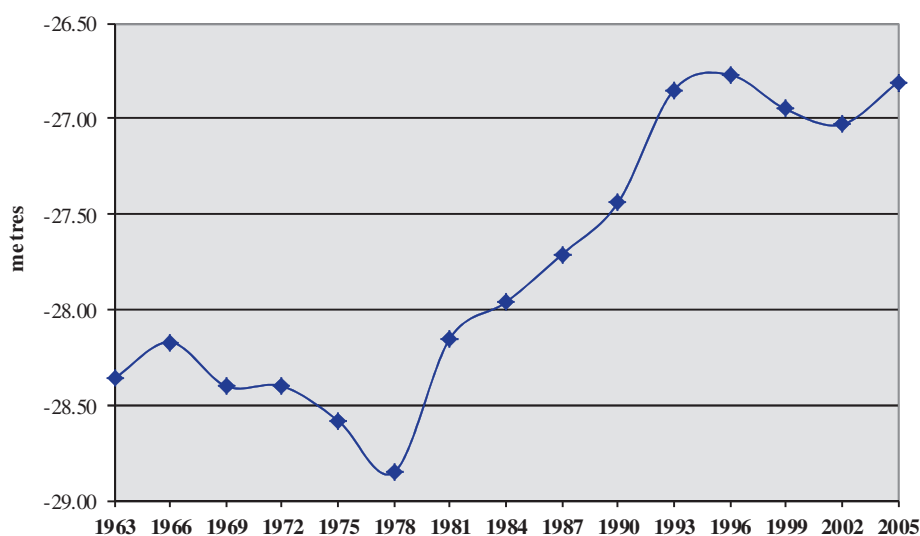
In 2011, UNDP started a four-year project on climate risk management in Turkmenistan, which is part of a Central Asian programme for Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan (US\$ 2 million for Turkmenistan). The project will help enhance the efficiency of water use in agriculture and disaster risk reduction. In addition, it will lay the foundations for interministerial cooperation that will enable key partners – Hydromet, MoA, MoWE, MoNP and the Department for Emergency Situations of the Ministry of Defence

– to factor climate change issues into their policy documents in order to take due account of possible trends in this area during the planning stage of economic projects. UNDP also has in the pipeline a project on Adaptation of Local Water Management Practices (US\$ 2 million) funded by the UNFCCC Adaptation Fund, as well as the Ecosystems Resilience project (US\$ 2 million) funded by the International Climate Initiative (ICI) of Germany.

The EU, through the TACIS programme, funded a regional project on technical assistance to Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan and Uzbekistan with respect to fulfilling their obligations to prevent global climate change (2004-2006). The main objective was to assist countries in developing the institutional infrastructure, legal framework and institutional capacity to implement the requirements of the UNFCCC and the Kyoto Protocol.

Some projects on adapting to water scarcity by improving land management are taking place. The Sustainable Land Management Project in Turkmenistan funded by the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (€1.4 million, 2009-2011) aims to improve the management of natural pastures in Turkmenistan. The University of Greifswald in Germany is sponsoring research in Turkmenistan and China to develop strategies aimed at adapting sustainable land management to climate change. The project is designed to compare natural and artificial ecosystem water needs, and water deficiency resilience (one result demonstrates that cotton needs 40 per cent more water than wheat), as well as carbon sequestration.

Figure 12.3: Caspian Sea level fluctuation 1963-2005, as measured by the Turkmenbashi station



Source: Second National Communication of Turkmenistan under the UNFCCC, 2010.

Photo 12.1: Green area in Ashgabat

In the area of education, with the support of Tempus, the EU's programme to support the modernization of higher education, some projects related to climate change or energy have been implemented since 1997. The programme sponsors teachers from leading high schools to work in Turkmenistan. Currently, the SOLar Cell Initiative in Turkmenistan is ongoing, aiming at creating a management unit and system which supports the development of a master's-level curriculum and the development of ICT-supported teaching programmes for postgraduate students in the area of solar cell technology.

12.7 Conclusions and recommendations

Beginning with an already harsh climatic situation, Turkmenistan is faced with the prospect of further increased hardship with an increase in temperature and a reduction in humidity and rainfall, as well as a reduction in available water resources and the increasing needs of countries with which it shares water resources. This calls for adequate adaptation measures on health, water and food security, in view of the high vulnerability of the population.

At the same time, Turkmenistan is going through a phase of rapid economic development fuelled by the high value of its export commodities, natural gas and oil, and further increases in production are expected with the discovery of new deposits of natural gas, which are some of the largest in the world. The tendency will be towards an increase in GHG emissions, which can, however, be offset by improvements in energy efficiency and

modernization of technology in oil, gas, electricity production and other industries.

There is political will to address climate change, as Strategy 2030 expresses concerns on sustainable development and has environmental protection as one of its three pillars. Most of the concerned line ministries understand that climate change is a threat and recognize the need to enhance their understanding of the possible impacts on their policy area. The State Commission on Climate Change and the Interdepartmental Commission on the Clean Development Mechanism focus on both adaptation and UNFCCC implementation; however, there is a need to strengthen everyday operational work on climate change, currently undertaken by a single staff member.

Recommendation 12.1:

The Cabinet of Ministers should establish an operational structure on climate change issues to coordinate and monitor adaptation and mitigation measures.

The First and Second National Communications to the UNFCCC are currently the main national documents reporting on climate change. The recent communication depicts a very clear situation. Although the GHG inventory ceases at 2004, the text provides insights on the current situation and proposes guidelines and measures to address climate change issues on both adaptation and mitigation. However, further instruments to adequately address climate change are still lacking. When developing them, it would be important to keep in mind that the

oil and gas industry, the electricity industry (production and consumption) and other industries, can contribute significantly to the improvement of national energy efficiency indicators and a reduction in GHG emissions.

Recommendation 12.2:

The Ministry of Nature Protection, in cooperation with other ministries and State agencies, should develop:

- (a) *A strategy on adaptation identifying priority areas and an action plan with a list of concrete activities;*
- (b) *A low carbon emission development strategy.*

As the recent communication to the UNFCCC reveals, there is a basic understanding of the risks associated with climate change, but understanding of the broad implications for different communities, sectors of the economy, ecosystems and development is low. Hydromet and other scientific institutions have very limited capacity to conduct meteorological and hydrological research and forecasts, and there is a lack of remote sensing capabilities. In these circumstances, the country is making a significant effort to try to produce results such as the GHG inventory and running models of climate change impacts. However, the model coarse grid resolution does not allow concrete results.

Recommendation 12.3:

The Cabinet of Ministers should:

- (a) *Strengthen the capacity of the National Committee on Hydrometeorology under the Cabinet of Ministers by expanding its observational network and types of observation in the area of climate change;*
- (b) *Improve the national statistical system with inclusion of indicators that are necessary to produce a greenhouse gas inventory.*

The level of awareness regarding climate change is low in Turkmenistan, among both rural and urban

inhabitants. This could be explained by the use of free commodities – water, gas, electricity, and subsidized fuel. Improving public awareness can increase water and energy efficiency, and also increase the climate resilience of particularly vulnerable groups, such as the rural poor, women, children and the chronically ill.

Recommendation 12.4:

The Ministry of Nature Protection, in cooperation with the Ministry of Education and other relevant stakeholders, should:

- (a) *Raise awareness of climate change issues among local governments, the mass media and school teachers;*
- (b) *Promote the inclusion of materials related to climate change problems in the educational plans and programmes of educational institutions.*

In order to adapt to climate change, some priorities are identified in the recent communication to the UNFCCC. A key aspect that should be considered in all sectoral and specific research is the close relationship between climate change and natural resources, in particular biodiversity and forests. Forest ecosystems and OWL are considered to be: (a) important carbon sequestration pools (carbon sinks); (b) indispensable tools for combating desertification; and (c) vital cradles of biodiversity. Thus, proper sustainable management of forest ecosystems is key to the implementation by Turkmenistan, as a party, of all three Rio global conventions, namely the CBD, UNFCCC and UNCCD.

Recommendation 12.5:

When undertaking decisions on climate change, the Cabinet of Ministers, in cooperation with relevant stakeholders and academia, should expand afforestation programmes making use of the natural reforestation potential and indigenous tree species, and ensure grassland protection and recovery.

ENERGY AND ENVIRONMENT**13.1 Introduction**

Turkmenistan is a landlocked, largely desert country located far from world production centres. It has considerable gas and oil resources, and its economy is based on natural gas production and export and, to a lesser extent, oil.

The development of the energy sector is related to the economic growth of the country. Since Turkmenistan is remote from world production centres and experiences severe climatic conditions, the energy sector provides virtually the only opportunity for economic development. The energy sector already possesses significant infrastructure, but could meet national development demands and hydrocarbons export targets if proper incremental investments were made.

Gas exports generate the bulk of national income and electricity generation is almost 100 per cent gas fired. Turkmen gas has high hydrogen sulfide content and therefore requires considerable processing to be marketable and more environmentally friendly.

For the first 15 years after independence, Turkmenistan concentrated on rehabilitating and replacing obsolete infrastructure rather than stimulating foreign investment in its upstream production and export potential. Apart from the southern Korepzh-Kurt Kui pipeline (a spur to the Islamic Republic of Iran, with relatively low capacity, that was constructed after independence) the only export route was an old pipeline via Kazakhstan and the Russian Federation.

Recently, Turkmenistan extended its pipeline capacity to the Islamic Republic of Iran and developed a new gas pipeline to China via Uzbekistan and Kazakhstan. Turkmenistan remains confident that it has enough gas reserves to serve all potential customers in the medium to long term. The Government is considering developing several trans-Caspian gas routes as well as the Turkmenistan-Afghanistan-Pakistan-India route. These projects will require huge investments but investors first need more geological data and assurances on long-term investment and export conditions. Critical delimitation issues with the Islamic Republic of Iran

and Azerbaijan relating to the legal status of the Caspian Sea, as well as Russian and Iranian objections to any trans-Caspian gas export routes, continue to complicate oil and gas sector development.

Turkmenistan has taken a cautious approach to economic reform, hoping to use gas exports to sustain its growing economy. Privatization goals remain limited. The investment climate is too risky for the major international oil and gas companies. There are no reliable data on hydrocarbon reserves and production potential. As a result, companies are reluctant to invest in the Turkmenistan energy sector. The Government has declared that it wants to overhaul the gas producers' constitution to reflect its commitment to market economics. Together with an invitation to foreign experts to calculate natural gas reserves at the largest deposit, this provides a prospect for future successful economic development.

Turkmenistan intends to integrate into the global energy market. As a landlocked country which has been completely dependent on the Russian transit network since independence, it has pursued its interests by adhering to the Energy Charter and the Energy Charter Treaty (ECT) that sets important international standards for policy cohesion and rule of law in the energy sector. Turkmenistan signed the ECT in 1994 and ratified it in 1997. Turkmenistan signed the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) in 1995 and ratified it in 1997. Building on the provisions of the Treaty, PEEREA requires participating States to formulate clear policy aims for improving energy efficiency and reducing the energy cycle's negative environmental impact.

During the 2009 Ashgabat Conference on Reliable and Stable Transit of Energy and its Role in Ensuring Sustainable Development and International Cooperation, due to the lack of a mechanism to resolve gas transit conflicts under the ECT, the Government proposed that the United Nations should consider issues of equal, uninterrupted and secure access to energy sources and the means of their transportation, in order to work out common principles and intelligible regulation of relations

between producers, transit countries and consumers under the auspices of the United Nations.

The Government officially recognizes the significance and specific character of environmental issues related to the energy sector, and has taken a number of steps to deal with these problems.

13.2 Institutional, policy and legal framework

Institutional framework

The energy sector in Turkmenistan is a State monopoly. There are several ministries and agencies responsible for the development of this sector, including:

- Ministry of Oil and Gas Industry and Mineral Resources, which is responsible for analysis and prognosis, and has a supporting role in the development of strategy for the sector. It is also responsible for oil refining, domestic petrol distribution and the export of oil and oil products;
- Ministry of Energy and Industry, responsible for the generation, transmission and distribution of electricity;
- State Agency on Management and Use of Hydrocarbon Resources under the President of Turkmenistan, the key intermediary for foreign investment; it negotiates and approves licences, and enters into exploration agreements and PSAs;
- State Concern TurkmenGas, responsible for the production of natural gas, and control of its export, domestic marketing and distribution;
- State Concern TurkmenOil, responsible for the production of oil;
- State Concern Turkmen Oil and Gas Construction, the construction company for the oil and gas sector;
- State Concern TurkmenGeology, responsible for the exploration of hydrocarbon reserves;
- State Fund for the Development of the Oil and Gas Industry and Mineral Resources, which oversees investment and receives a substantial share of revenues generated by the sector.

The State Agency on Management and Use of Hydrocarbon Resources under the President of Turkmenistan was established in 1996. Its exclusive rights as the organization dealing with foreign investors in the oil and gas industry reflect the fact that all crucial decisions related to investment in the gas and oil sectors are made directly by the President. The Agency's income sources consist of royalties,

bonuses, PSAs, other contracts, and other sources including assets and financial means. The Agency deducts 10 per cent of all such income for remittance to the State budget. A procedure of calculation and payment of the said deductions for the State budget is set forth by the Ministry of Finance, the Chief State Tax Service and the Agency.

MoNP is in charge of the conduct of environmental policy. Its responsibility includes the monitoring and inspection of energy sector activities. In addition, the Ministry collects the amount of the normative charges that have to be made for air emissions and discharge of wastewater, and controls industrial waste disposal, notably pollution related to the energy sector. The detailed legal and institutional framework for environmental policy-making is described in Chapter 1.

Legal framework

The most important legal document for the Turkmen energy sector – the Law on Hydrocarbon Resources – spells out fiscal and customs policies, defines benefits enjoyed by investors and companies, and reinforces their environmental accountability in the exploration of hydrocarbon resources. In particular, the Law includes provisions for the issuing of licences for oil and gas operations for a number of years, the extension of licences for production output where appropriate, and a fixed tax on profits for the period of the project implementation. PSAs, which are concluded between a contractor and the State Agency for the Management and Use of Hydrocarbon Resources under the President of Turkmenistan, are the main type of contract and include environmental clauses. The PSAs, including the environmental and social clauses, are confidential.

Environmental clauses of the Law on Hydrocarbon Resources are too general. For example, in accordance with the Law, contractors are obliged to undertake all necessary measures for the prevention of gas burning or emission. Yet this leaves contractors an opening to emit and/or burn natural gases since “undertake all necessary measures” is more of a declaration than an obligation. The principle that would force contractors to utilize rather than emit or burn gas might be an obligation that, without the utilization of associated and/or natural gas, the industrial development of oil and gas fields is forbidden. In the event of gas flaring, contractors must inform a special governmental body about it including the quantity of burnt gas and cause of the event.

There are several other national laws and regulations that contribute to the development of the energy sector. The 1992 Law on Mineral Resources specifies the rational use and protection of mineral resources in favour of future generations: any legal and natural persons, residents of Turkmenistan, irrespective of their form of ownership, as well as legal persons representing other States, in order specified for them, can be the users of mineral resources. The mineral resources users have to guarantee the security of these resources (together with air, land, water, forest and other resources) from harmful impact that can accompany their use along with nature protection measures.

The 1999 Rules on the Development of Hydrocarbon Resources is one of the principal legal documents which is directly and immediately applicable to PSAs (as well as to other oil and gas projects). This document comprises detailed description of environmental protection activities, which should be implemented by the developers. In accordance with the Rules, a developer or operator must prepare and submit the EIA and Environmental Protection Activities Plan. While the EIA should analyse the potential impact of any type of hydrocarbon resources development on the environment, the Plan should determine all necessary measures proposed by an operator to prevent negative impact on the environment. The Rules constitute a solid base for environmental control of developing the hydrocarbon resources.

The 2001 Presidential Resolution on Rational Use of Natural Gas establishes the rules for natural gas consumption by the population and industrial enterprises. Other relevant legal documents as well as available information on sanctions, including fines, for environmental impact are described in Chapters 1, 2 and 3 of this EPR.

Policy framework

The most important national energy policy document is the Oil and Gas Industry Development Programme for the Period until 2030. It was first presented in 2006 as an outcome of Strategy 2020. The Government considers the 2030 Development Programme a valuable policy guidance tool.

The national energy strategy is based on the following main priorities:

- Securing access to new markets by developing a multi-directional gas transportation system;
- Achieving energy independence;

- Providing low-cost energy for domestic consumption;
- Introducing modern technologies for hydrocarbons production and processing.

The Government recognizes the need to implement modern technologies and machinery, not only for exploration and production purposes but also to meet environmental targets. The 2030 Development Programme envisages that the Caspian Sea shelf will be developed jointly with foreign companies through PSAs under the supervision of the State Agency on Management and Use of Hydrocarbon Resources under the President of Turkmenistan.

The Government has ambitious targets to raise production of natural gas to 250 billion m³ (bcm) per year by 2030, of which 200 bcm would be exported. Turkmenistan's total revenue from gas export in 2008 was US\$ 6.2 billion and this is the main source of Turkmenistan's public sector spending. In order to meet the ambitious 2030 production target, the Government wishes to attract foreign investors. Large-scale investments are needed to increase gas production to a point that would justify the construction of new pipelines. At the same time, potential investors want to see a trans-Caspian route in place before they invest so that they have some assurances of being able to monetize their gas production.

Moreover, the Government plans significant increases in oil production. According to the 2030 Development Programme, reserves would be increased by 3.55 billion t and crude output increased 11-fold through hugely expanded development and exploration programmes. However, in order to meet this target, Turkmenistan would need to take into consideration not only technical and financial constraints but also serious environmental risks that accompany the oil industry.

At present, the production and export of natural gas is the main component for the implementation of the national energy strategy. Table 13.1 represents the national energy balance in 2008, showing clearly that natural gas is the dominant factor in the national energy sector. Turkmenistan's energy policy is an essential factor for national economic and social policies. Although Turkmenistan has created a workable legal and institutional framework, the main challenges remain in terms of more transparent legislation and an effective market economy. In order to achieve national sustainable development, the issues of impact of energy production and transportation on the environment should be taken into account very seriously.

The 2001 National Plan on Prevention and Liquidation of Oil Spills strengthened the regulatory framework for responding to oil spills. Currently, the Plan is being revised.

13.3 Review of energy sector

Reserves

Turkmenistan sits on large reserves of hydrocarbons. Despite the scarcity of data, it is generally believed that the country has one of the world's largest reserves of natural gas. By current internationally recognized measures of gas reserves, Turkmenistan is fifth in the world with proven reserves of 8.0 trillion m³ (Tcm). The United States Energy Information Administration (EIA) estimated Turkmenistan gas reserves at between 2.0 and 2.8 Tcm in the period 2000-2009, but increased this figure to 7.4 Tcm in 2010 (Table 13.2).

According to the 2030 Development Programme, total gas reserves are 22.4 Tcm, including 6.2 Tcm in the country's section of the Caspian Sea. Recently, Turkmenistan authorities claimed that discovered cumulative gas reserves in Yuzhniy Yoloten gas field alone were 16 Tcm. The geological study of Turkmenistan territory is not far advanced, and it is strongly expected that gas reserves will reach a higher figure. Some international audits have been conducted at Yuzhniy Yoloten and other south-east fields. According to the results of the audits, the Yuzhniy Yoloten proven reserves amount to 6-14 Tcm. The Yuzhniy Yoloten and Osman field is among the largest in the world and currently the infrastructure for production is being developed. The infrastructure will allow extraction of more than 35 bcm per year.

Without doubt, the country ranks among the top nations in terms of natural gas reserves, and subsequent exploration onshore and offshore in the Caspian Sea should further add to reserves in the future.

The majority of natural gas reserves are located in the east and south-east, but there are also sufficient reserves in the west of Turkmenistan. There are several major large gas fields, located primarily in the Amu Darya River basin in the east, in the south-east, and in the South Caspian Sea basin (onshore and offshore) in the western part of the country. However, many of the gas fields in Turkmenistan were discovered in the 1960s and 1970s and have been producing since then. Currently, the main gas-producing fields include Dauletabad and Shatlyk. Another gas-producing area is in the west of the

country, in particular in the Kemir area, Block 1, in the South Caspian Sea basin.

Over the last 10 years, Turkmenistan has also discovered 17 new natural gas deposits in Dashoguz, Lebap and Mary Provinces. In addition, offshore gas and associated gas reserves from its section of the Caspian Sea are being developed. They are estimated at over 6 Tcm. There are several significant gas reserves in that area, such as the Diyarbakir field (Block 1), with an estimated 150 bcm, and Cheleken field, with more than 100 bcm. It is expected that the potential offshore area is even bigger than the onshore one.

Oil reserves are significantly smaller than gas reserves, with proven oil reserves of about 74-82 million t (Table 13.2) although some reports claim oil reserves of as high as 230 million t. The main oil fields are located in the western part of the country and onshore of the Caspian Sea. However, the absence of agreement on the Caspian Sea legal status among all five Caspian littoral States will preclude the settlement of disputes about countries' maritime borders, and, as a consequence, oil and gas fields will remain undeveloped.

Production and distribution

Oil

Turkmenistan has significantly increased its oil production since independence. Whereas in 1992 the country produced 5.4 million t, by 2004 this figure had virtually doubled, reaching 10.6 million t. After 2004, however, some decline was noted and in 2006 Turkmenistan produced 8.8 million t, with increases in 2009 and 2010 (Table 13.3). During the whole period since independence, the country increased its oil consumption from 3.7 million t in 1992 to 6.5 million t in 2010. At the same time, reflecting increases in oil production and international demand, exports also increased, at least in the first half of the 2000s (Table 13.3). Before 2000, the country's export of oil was insignificant; in 2000, it amounted to 1.4 million t, and in 2001 it almost doubled, reaching 2.7 million t. Exports peaked in 2004, reaching 2.9 million t, and then declined in 2009 to almost 2 million t.

Turkmenistan does not have oil pipelines and, as a landlocked country, has to export its oil through neighbouring countries. Turkmenistan's oil is shipped by tankers to the Caspian Sea ports of Makhachkala, in the Russian Federation; Baku, in Azerbaijan; and Neka, in the Islamic Republic of Iran.

Table 13.1 National energy balance, 2008

Supply and consumption	Coal and peat	Crude oil	Oil products	Gas	Nuclear	Hydro	Geothermal, solar, etc.	Combustible renewables and waste	Electricity	Heat	Total*
Production	..	11,223	..	57,404	..	..	..	..	..	..	68,626
Imports	88	..	..	..	..	..	..	..	88
Exports	..	-2,412	-3,676	-43,685	..	..	..	..	-127	..	-49,900
International marine bunkers**
International aviation bunkers**
Stock changes
TPES	..	8,811	-3,588	13,718	..	..	..	..	-127	..	18,814
Transfers
Statistical differences
Electricity plants
CHP plants	-5,803	..	..	..	..	1,293	173	-4,337
Heat plants
Gas works
Oil refineries	..	-8,018	7,972	..	..	..	..	..	..	..	-46
Coal transformation
Liquefaction plants
Other transformation
Energy industry own use	..	-793	-614	-1,363	..	..	..	..	-233	..	-3,003
Losses	-181	..	-181
TFC	3,770	6,552	..	..	..	..	753	173	11,248
Industry	271	..	271
Transport	964	..	..	..	..	..	19	..	983
Other	2,807	6,552	..	..	..	..	463	173	9,995
Residential	158	..	158
Commercial and public services
Agriculture/forestry	239	..	239
Fishing
Non-specified	2,807	6,552	..	..	..	..	66	173	9,598
Non-energy use of which
Petrochemical feedstocks

Source: http://www.iea.org/stats/balancetable.asp?COUNTRY_CODE=TM, (accessed December 2010).

Notes:

* Totals may not add up due to rounding.

** International marine and aviation bunkers are included in transport for world totals.

Table 13.2: Proved reserves of natural gas and crude oil

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Natural gas (Tcm)	2.8	2.8	2.0	2.0	2.0	2.0	2.8	2.6	2.6	7.4
Crude oil (millions tons)	74.4	74.4	74.4	74.4	74.4	81.8	81.8	81.8	81.8	81.8

Source: United States Energy Information Administration, 2011.

Although the Government pursues increases in oil production and export, the dearth of foreign investors affects the development of oil industry. There are two refineries – Seidi and Turkmenbashi – with a total annual capacity of 11.8 million t of crude oil. In March 2007, Dragon Oil commissioned the new processing facility in Khazar (Cheleken) with primary treatment of oil from sulphur, with the capacity of 2.5 million t of crude oil a year.

Natural gas

Turkmenistan is the second largest gas producer in the CIS region, after the Russian Federation. After independence, output fell sharply from 57 bcm in 1992 to 13 bcm in 1998. In 2000, natural gas production in Turkmenistan skyrocketed to 48 bcm before peaking at 70 bcm in 2008. In 2009, production fell again as a result of the world economic crisis and the resultant reduction in demand for gas (Table 13.3).

The export of natural gas is the most critical factor for national revenue. Gas production declined until 1999 and then began to increase, and exports followed the same trend. In 1992, the country exported 53 bcm but in 1998 only 8.6 bcm. Then, in 2000, exports increased to 38 bcm, and they peaked in 2008 at 49 bcm, followed by a sharp decline in 2009 at 17 bcm (Table 13.3).

National consumption is characterized by a slight increase from 4 bcm in 1992 to 4.4 bcm in 1998. In 2000, when export routes were opened and production boomed, the country was able to increase domestic consumption: from 9.5 bcm in 2001 to 20.7 bcm in 2008 and 19.9 bcm in 2009 (Table 13.3).

One of the most important aspects of the Government's oil and gas strategy is to have diverse pipeline routes to export Turkmen gas to world markets. There are both political and fundamental economic reasons for this strategy.

The Central Asia-Centre pipeline is the key route through which Central Asian countries export their gas to the Russian Federation and further on to European markets through Gazprom's pipelines system. In May 2007, Turkmenistan, Kazakhstan and the Russian Federation signed an intergovernmental

accord to modernize the Central Asia-Centre pipeline as well as to construct a new pipeline along the Caspian Sea's eastern coast via Kazakhstan with additional capacity of up to 30 bcm per year.

Since Turkmenistan is eager to develop pipeline infrastructure to increase gas export, it has signed several agreements with a view to building new gas pipelines in different directions. In 1997 the first pipeline, which supplies gas from Turkmenistan to the Islamic Republic of Iran, was constructed. Two hundred km of the Korpezhe-Kurt Kui pipeline with a capacity of 13.5 bcm connected Turkmenistan and the Islamic Republic of Iran.

Another project is the construction of a more than 7,500 km Central Asia Pipeline from eastern parts of Turkmenistan to Urumqui in western China through Uzbekistan and Kazakhstan. The pipeline was launched in December 2009. The design capacity of the pipeline is 40 bcm per year.

There is a plan to construct the Trans-Caspian pipeline, which would deliver gas from Turkmenistan across the Caspian Sea to Azerbaijan and then to Turkey and Europe via the planned Nabucco pipeline. The plan faces many obstacles, not only financial and technical. The uncertain status of the Caspian Sea creates disputes among all countries. The unresolved status of the Nabucco project, together with all of the above problems, makes the Trans-Caspian pipeline project questionable.

There have been ongoing negotiations on the construction of a pipeline between Turkmenistan, Afghanistan, Pakistan and India to export 30 bcm gas to Pakistan and India. Considering the increase in oil and gas prices on the world market, the country can receive annual income of tens of billions of US dollars from exports of natural gas.

Power sector

Turkmenistan generates 99.9 per cent of its electricity at six natural-gas-fired thermal power plants. Installed capacity in 2010 was 4,100 MW, whereas available capacity was only 2,562 MW. Annual consumption of natural gas at these power plants is approximately 3.5 bcm. The decline in production began in 1992, when the country generated 12.4

GWh, bottoming out in 1999 with generation of 8.3 GWh. The increase in gas production supported the generation of electricity, which has grown since 1999 and reached 15.6 GWh in 2009 – above the level of 1992. The same picture is observed for consumption: 8.3 GWh in 1992, a low of 4.6 GWh in 1998, and then an increase to 9.4 GWh in 2009. Correspondingly, Turkmenistan increased its exports above 2 GWh of electricity in recent years (Table 13.4). Currently, electricity is exported to Afghanistan, the Islamic Republic of Iran, Turkey and Tajikistan. The constant increase in losses might be caused by an increase in commercial losses as well as by technical ones due to obsolete transmission lines and electricity distribution networks.

Current electricity prices and tariff policies do not stimulate efficient use of existing equipment and infrastructure in parallel with installing new power capacities. However, the Government has modernized some power units and plans to replace obsolete capacity with the installation of combined-cycle gas turbine units.

13.4 Impact of energy sector on environment

Main issues of oil and gas industry impact

The production and export of gas and oil can cause severe damage to the environment. Worldwide

practice demonstrates that there are environmental impacts from all oil and gas industry activities: geological and geophysical surveys, drilling and production activities, accidental oil spills, decommissioning of installations, gas and oil transportation, and gas and oil processing. These activities have an environmental impact on the air, surface and groundwater, soil, wildlife, and populations, and should be carefully examined.

Turkmenistan is no exception. According to MoNP, emissions from the oil industry account for 75-80 per cent of total national emissions of pollutants. These pollutants are nitrogen, sulphur and carbon oxides, methane, hydrogen sulphide and sulphurous anhydride. Governmental officials confirm that they have detailed data on sources, types and volumes of pollution and waste discharges during oil and gas activities, which allows them to develop the necessary preventive measures. However, these data are not publicly available.

Nevertheless, it is not clear whether adequate measures are being taken to ensure environmental protection. While the institutional and legislative framework has been created and Turkmenistan has signed several MEAs, the lack of access to relevant information suggests that a number of existing and emerging environmental problems are still unsolved and that appropriate action is needed at both local and national levels.

Table 13.3: Oil and natural gas production and distribution, 2001-2010

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Crude oil production (million tons)	8.3	9.6	10.0	10.6	9.8	8.8	9.0	9.4	9.8	10.9
Export of crude oil including lease condensate (million tons)	2.7	2.8	2.9	2.9	2.3	1.8	2.0	2.4	2.0	n/a
Total petroleum consumption (million tons)	3.7	3.9	4.3	4.7	4.8	4.7	5.0	5.3	5.6	6.5
Dry natural gas production (billion m ³)	47.6	52.9	58.4	57.9	62.3	62.4	68.1	69.7	37.7	n/a
Export of dry natural gas (billion m ³)	38.2	41.5	42.9	41.5	44.7	44.6	48.9	49.0	17.8	n/a
Dry natural gas consumption (billion m ³)	9.5	11.4	15.5	16.4	17.6	17.8	19.2	20.7	19.9	n/a

Source: United States Energy Information Administration, Country Analysis Briefs, 2011.

Note: Data from this source have discrepancies relative to data for 2008 shown in Table 13.1.

Table 13.4: Power generation, export and consumption, 2001-2009

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Power generation	10.5	10.6	10.4	11.4	12.3	13.1	14.0	15.0	15.6
Export	1.1	0.6	0.5	1.1	1.3	1.6	1.9	2.2	2.7
Consumption	7.2	7.6	7.6	7.8	8.4	8.7	9.2	9.3	9.4
Losses	2.2	2.4	2.3	2.5	2.6	2.8	2.9	3.5	3.5

Source: Ministry of Energy and Industry, 2011.

Photo 13.1: Gas flaring in a restaurant

For example, there are no data relating to onshore oil and gas activities, where only national companies operate. What is more, data on offshore energy companies' activities is limited. For example, Dragon Oil, which has the largest hydrocarbon investments in the country, presented a well-documented EIA in accordance with EBRD standards and the Turkmenistan environmental law. According to a report by the NGO Crude Accountability, prior to the start of its project, Dragon Oil undertook extensive public consultations in 1999, meeting with numerous civil society organizations, environmental experts and Government officials. Since then, however, there has not been any more information on the environmental impacts of the company's operations available on its website. There is no available information on environmental impact from any other companies operating in the Caspian Sea or onshore, although the Government affirms that both national and foreign companies in the oil and gas sector comply with international standards and national legislation.

Caspian Sea and energy impact

It is clear that special attention should be paid to the Caspian Sea environmental issues. With oil and gas production and marine transport expected to increase in coming years, the risk of oil spills and other leakages will increase. The Caspian Sea is also a closed sea, meaning that pollution in the Sea itself, and that coming in from rivers, ships, and run-off from industrial sources, can remain in the area for decades. Unfortunately, oil and gas pollution is one

of the major causes of the environmental degradation of the Caspian Sea due to the accumulation of hydrocarbons, heavy metals and other toxins associated with oil and gas.

According to Crude Accountability, oil and gas pollution pose a major threat to Turkmenistan's coastline. Oil pollution in some parts of the Caspian Sea is easily seen on satellite images. The area of greatest offshore development in Turkmenistan waters is near Turkmenbashi and south toward Cheleken and Ogurchinsky Island. Offshore blocks are already producing, and as international corporations jockey for new PSAs, the likelihood of additional drilling is very high.

The report prepared in 2008 on behalf of the partner organizations of the Environment and Security Initiative, *The Environment and Security: Transforming Risks into Cooperation*, noted that Turkmenistan offshore oil production is concentrated on dozens of sea platforms producing 350,000 t of oil a year. So far, six cases of oil fountain ignition accidents and numerous seepages of an oil and water mixture have been registered, especially during exploration in the 1970s and 1980s. However, oil leakages and accidents continue to pose a threat to the environment, especially at Gum Dag and other locations.

Crude Accountability also indicates that there are currently 66 platforms offshore near Cheleken, with 116 wells. Of these, 28 located on 22 platforms are currently operating, while the others are abandoned,

suspended or inactive. As Dragon Oil increases its offshore production capacity, it is simultaneously liquidating leakages from old wells. According to standard calculations, every one million t of produced oil is accompanied by an average of 131.4 t of losses. With planned production increases offshore at Cheleken of up to four million t, one can expect an annual oil spill of over 500 t of crude oil. For all of western Turkmenistan's offshore operations, it is possible to expect about 5000 t of spills. However, neither the Government nor companies provide any data on oil spills.

The refinery in Turkmenbashi City on the Caspian Sea coast is a major source of air, water and land pollution. The environmental impact associated with the refinery operations includes:

- Air: volatile hydrocarbons from crude oil; SO_x from crude oil and process heat; NO_x and particulates from process heat; H₂S from sulphur recovery operations;
- Water: process wastewater from desalting, distillation, cracking, and reforming operations; large quantities of cooling water;
- Solids: desalter sludges; spent catalysts; other process sludges; storage tank bottoms.

There are no data directly related to pollution caused by the refinery. It is impossible even to make an assessment without knowledge of operational and technological parameters.

According to MoNP data, there is high concentration of SO₂ in Turkmenbashi City (3.8 MAC), while in general around the country concentrations of air pollutants do not exceed the limit. This high level is definitely caused by the refinery.

In addition to the risks associated with oil and gas exploration, extraction, production and processing, transportation routes create major environmental risks. Transportation via pipelines or tankers across the Caspian Sea creates significant environmental problems. Increasing oil and natural gas production in the Sea will inevitably result in the construction of pipelines and infrastructure to export these resources to consumers, raising the possibility of loss of habitat for marine life as well as the spectre of accidental spills. The risk of a spill as petroleum is transferred to a tanker or transported by pipeline is well documented in other parts of the Caspian, and is mirrored in Turkmenistan. The greatest possible threats of oil discharge in offshore operations are posed by the following incidents: loss of well control, pipeline leak, tanker leak, tanker accident, and release of bunker oil. Although Turkmenistan has relevant legislative capacity to prevent and/or

mitigate the negative impacts of an oil spill, it is not clear whether the country has the appropriate technical capacity – ships with specialized equipment for offshore oil pollution, and trained crews.

Gas flaring

The most critical environmental problem related to the hydrocarbon sector is associated petroleum gas (APG). This is a blend of different hydrocarbons found in crude oil wells which is released when crude oil is brought to the surface. The composition and amount of such gases vary from one oil field to another. In certain circumstances, such as emergency shutdowns, unplanned maintenance or disruptions to the processing system, flaring serves a vital safety purpose. Flaring is a common practice used by oil and gas companies to burn off excess natural gas that has been extracted from wells during oil production. Companies burn the gas so as to release pressure or because the gas is not saleable. This causes the release of harmful GHGs into the atmosphere.

Regular and reliable statistics on gas flaring in Turkmenistan do not exist. Apparently, in Turkmenistan there is a significant amount of APG that is not only flared and incinerated, but even vented. There is a need for data on concentrations and distribution of methane and other hydrocarbon gases in the air during onshore activities and in the Caspian Sea during offshore activities. Methane's impact on water organisms and communities is a serious threat and should be analysed based on field and laboratory studies. Toxic effects of gas condensate and gas hydrates on humans and marine organisms should also be described.

Gas flaring wastes valuable resources and harms the environment, so reducing gas flaring makes a concrete contribution to reducing global warming. Gas flaring reduction is relevant in the context of energy security and climate change mitigation, desirable for obvious environmental reasons, and feasible as demonstrated by several countries. From satellite observations, the (USA) National Oceanic and Atmospheric Administration (NOAA) has produced annual estimates of global and national gas flaring for 60 countries, from 1995 through 2006, using low-light imaging data acquired by the Defense Meteorological Satellite Programme. This project, funded by the World Bank's Global Gas Flaring Reduction partnership, indicated that Turkmenistan has an upward trend in gas flaring over the time series. According to Global Gas Flaring Reduction, gas flaring in Turkmenistan increased from 0.4 bcm in 1994 to 1.4 bcm in 2008.

The composition, sources and input volumes of gas hydrocarbons in the Caspian Sea play a critical role. It is important to undertake a survey of how APG is flared in Turkmenistan oil fields and then investigate the issues which may impede the country from cutting down on flaring.

According to the Government and Dragon Oil, the company has almost finished the construction of infrastructure which will allow the elimination of gas venting and flaring and the utilization of APG for heat and power generation. However, no data on this infrastructure are available.

Apparently, much remains to be done in Turkmenistan to reduce gas venting and flaring. The country faces major challenges in addressing gas flaring and venting due to the lack of a legislative framework, technologies and resources. Moreover, Turkmenistan must deal with local pollution stemming from the flared gas which has caused many health and environmental hazards for its people. To reduce gas flaring and venting, the nation has to take a set of measures which address this challenge. There are no data on terms and conditions in PSAs regarding environmental issues and in particular regarding APG. Apparently, penalties are insignificant, even for gas venting.

The first step to meet the APG challenge should be the introduction of legislation banning gas flaring except in the event of accident or threat to people's health and the environment. Such legislation should feature both fiscal incentives and penalties. Another measure can be developing sound domestic markets or opening downstream market opportunities to use the flared gas.

Using the gas for energy purposes at the wellhead or nearby production facilities, and reinjecting the gas into the reservoir to maintain pressure and enhance oil recovery or into other underground formations for possible later use, are other options for domestic use. Relevant gas flaring projects could be eligible for financing by the global, regional, bilateral and national environmental funds.

Power sector impact

Turkmenistan's power plants use natural gas, which is considered to be the cleanest of all the fossil fuels as the combustion by-products are primarily CO₂ and water vapour with low levels of NO_x and hardly any particulate matter. In generating a given quantity of energy through combustion, natural gas will produce approximately 30 per cent less CO₂ than oil and just 45 per cent less CO₂ than coal. However, natural gas

is considered to be a non-renewable energy source and will run out eventually if the country's current production level increases.

13.5 Energy efficiency and renewable energy resources

Power production in Turkmenistan is steadily increasing. It allows for increases in both export and consumption (Table 13.4). The Government intends to ramp up production to 35.5 billion kWh per year by 2030.

In order to meet this goal, the Government plans to increase installed generation capacities, but does not pay enough attention to energy efficiency and energy saving. Currently, there is a huge potential for these measures, including reductions in both energy consumption and losses in power production and distribution, along with energy conservation in housing and communal services, industry, agriculture and transport. Energy saving would reduce State expenses, since subsidies for gas and electricity are very large.

Although there are no available data on energy efficiency/saving potential, the fuel and power sectors clearly offer the best prospects for operating with less energy loss. Housing and communal services also offer significant opportunities for energy conservation. The main components of energy consumption in these sectors are heating, hot water supply, lighting and electric appliances. Another source of energy saving might be transport.

Turkmenistan's energy intensity (primary energy consumption per unit of GDP) is very high. It is 10-50 per cent higher than energy intensity in many other former Soviet republics and several times higher than in developed countries. Reductions in current energy intensity can be made in production and energy supply expenditures of society as a whole.

Although energy efficiency is a cross-sectoral subject involving all economic activities, but especially the energy sector itself, the Government has not yet developed any legal and institutional framework for energy efficiency and saving. Tariffs for electricity and gas are so low (see Chapter 3) that they do not allow investment to be attracted to energy efficiency projects. However, the Government could implement initial steps and initiate the development of a legislative and institutional base, along with economic incentives and an awareness-building campaign among the population. The authorities might take into consideration that energy efficiency

measures could save for the nation billions of cm³ of natural gas, which could be exported. These savings might be critical, taking into consideration that, due to free consumption in the domestic market of Turkmenistan, the country has had the fastest consumption growth in the region, averaging 16.1 per cent annually from 2000 to 2006, as compared with 6.3 per cent per year for the rest of Central Asia.

An environmentally friendly energy sector requires not only energy efficiency and savings measures but also the development of renewable energy resources. Turkmenistan possesses a certain potential for wind and solar energy. There is almost no hydropower potential in the country.

Solar energy

With about 270 sunny days per year and solar insolation of around 2,000 kWh m² per year, exposure to the sun is sufficient to consider solar energy as a viable source. Due to the high cost of photovoltaic systems, the most feasible option is to install them in remote areas in small villages inhabited by agricultural workers. It is economically inefficient to connect remote areas with the electricity grid and gas pipelines. Currently, inhabitants of these villages use local trees and shrubs as fuel while drinking water is supplied by motor transport. Renewable energy could become a source of power generation, which would be used for household and agricultural needs, as well as pumping of underground drinking water (see Chapter 8).

Wind energy

Turkmenistan has several sites with strong and stable wind. Of particular note, the German company Goetzpartner, together with the Ministry of Energy and Industry, conducted a wind measurement programme in the Balkanabad area. Calculations based on measurements and existing data of weather stations showed that 1 MW of installed wind power capacities would be able to generate 3.6 million kWh per year. This site could support power capacities of around 200 MW.

13.6 Conclusions and recommendations

Analysis of the structure and scale of the impact of energy sector activities on the environment is critical. Volumes of pollutant inputs into the environment should be examined by the energy operators and authorities. A detailed analysis of the sources, composition and degree of hazard of pollution components is a necessary component of environmental control. Pollution levels in different

regions as well as ranges of typical pollutant levels in the surface waters and air should be provided for public consideration.

Recommendation 13.1:

The Ministry of Nature Protection should:

- (a) *Improve the procedure of environmental impact assessment by companies and State enterprises involved in the energy sector in accordance with international standards;*
- (b) *Introduce gradually, in cooperation with relevant agencies, environmental audits for these companies and State enterprises.*

The production of gas and oil can cause severe damage to the environment. In Turkmenistan, emissions from the oil industry account for 75-80 per cent of total national emissions of pollutants. Data on sources, types and volumes of pollution and waste discharges during oil and gas activities, are well known and allow environmental authorities to develop necessary preventive measures. However, these data are not publicly available. While the institutional and legislative framework has been created and Turkmenistan has signed several international environmental treaties, access to relevant information is lacking. For example, there are no data relating to oil and gas activities onshore, where only national companies operate.

It is clear that special attention should be paid to the Caspian Sea environmental issues. With oil and gas production and marine transport expected to increase in coming years, the risk of oil spills and other leakages will increase. Due to the fact that the Caspian Sea is a closed sea, pollution can remain in the area for decades. Oil and gas pollution is, unfortunately, one of the major causes of the environmental degradation of the Caspian Sea due to the accumulation of hydrocarbons, heavy metals and other toxins associated with oil and gas.

Recommendation 13.2:

The Cabinet of Ministers should:

- (a) *Review the consistency of existing energy sector legislation with the requirements of the Aarhus Convention in terms of public access to environmental information and national environmental legislation;*
- (b) *Encourage companies and State enterprises involved in the energy sector to voluntarily make environmental information publicly available.*

While the fuel and power sectors have the best prospects of operating with less energy loss, there are no available data on energy efficiency/saving

potential. At the same time, the absence of an energy efficiency institutional and legislative framework, along with large subsidies for electricity and natural gas, represents a critical barrier for any energy efficiency measures. Turkmenistan needs to decrease its very high energy intensity. Through energy efficiency/saving activities, the nation could save a significant amount of natural gas which could be exported, especially when new pipelines are commissioned. In addition, the country should meet the requirements of the Energy Charter Protocol on Energy Efficiency and Related Environmental Aspects (PEEREA) signed in 1995 and ratified in 1997, and formulate clear national policy aims for improving energy efficiency and reducing the energy cycle's negative environmental impact.

Furthermore, the Government could invest in alternative sources of energy, in particular small solar projects to ensure sustainable development of remote rural communities, as well as full-scale wind power projects, which could be cost effective when export prices for natural gas are taken into account.

Recommendation 13.3:

The Cabinet of Ministers should:

- (a) *Prepare a draft law on energy efficiency;*
- (b) *Develop a strategy on development of renewable energy for the period until 2030 taking into account international practices;*

- (c) *Establish a State agency for energy efficiency and renewable energy, which will take a leading role in identification of energy efficiency and renewable energy potential, development of relevant policies, legislation, regulations and projects as well as in public awareness campaigns;*
- (d) *Seek international experience and assistance in developing energy efficiency and renewable energy policies, measures and programmes.*

Effective regulations and the provision of the right incentives are crucial to reducing gas flaring. Turkmenistan lacks efficient, effective regulations on flaring and venting. Due to a lack of expertise, the Government needs international assistance with the preparation of relevant regulations and enabling the use of associated gas via the creation of the right incentives, such as proper regulatory structures governing pricing, distribution, shared transport, export facilities, etc. Moreover, procedures for issuing flaring and venting permits, monitoring flaring and venting volumes, and enforcing operational standards should be developed. International assistance with the development of legislation on gas flaring might be helpful.

Recommendation 13.4:

The Cabinet of Ministers should strengthen compliance with existing legislation related to gas flaring.

ANNEXES

Annex I: Participation of Turkmenistan in multilateral environmental agreements

Annex II: Key data and indicators available for the review

Annex III: List of major environment-related legislation

*Annex I****PARTICIPATION OF TURKMENISTAN IN
MULTILATERAL ENVIRONMENTAL AGREEMENTS***

Worldwide agreements		Turkmenistan	
		Year	Status
1971	(RAMSAR) Convention on Wetlands of International Importance especially as Waterfowl Habitat 1982 (PARIS) Amendment 1987 (REGINA) Amendments	2009	Ac
1971	(GENEVA) Convention on Protection against Hazards from Benzene (ILO 136)		
1971	(BRUSSELS) Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage		
1971	(LONDON, MOSCOW, WASHINGTON) Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-bed and the Ocean Floor and in the Subsoil thereof		
1972	(PARIS) Convention Concerning the Protection of the World Cultural and Natural Heritage	1994	Su
1972	(LONDON) Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter 1978 (TORREMOLINOS) Amendments (incineration) 1980 Amendments (list of substances)		
1972	(LONDON, MOSCOW, WASHINGTON) Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxin Weapons, and their Destruction		
1972	(LONDON) Convention on the International Regulations for Preventing Collisions at Sea	2009	Ac
1972	(GENEVA) International Convention for Safe Containers		
1973	(WASHINGTON) Convention on International Trade in Endangered Species of Wild Fauna and Flora 1979 (BONN) Amendment 1983 (GABORONE) Amendment		
1973	(LONDON) Convention for the Prevention of Pollution from Ships (MARPOL) 1978 (LONDON) Protocol (segregated ballast) 1978 (LONDON) Annex III on Hazardous Substances carried in packaged form 1978 (LONDON) Annex IV on Sewage 1978 (LONDON) Annex V on Garbage	2009 2009 2009 2009 2009	Ac Ac Ac Ac Ac
1977	(GENEVA) Convention on Protection of Workers against Occupational Hazards from Air Pollution, Noise and Vibration (ILO 148)		
1979	(BONN) Convention on the Conservation of Migratory Species of Wild Animals 1991 (LONDON) Agreement Conservation of Bats in Europe 1992 (NEW YORK) Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBAMS) 1995 (THE HAGUE) African/Eurasian Migratory Waterbird Agreement (AEWA) 1996 (MONACO) Agreement on the Conservation of Cetaceans of the Black Sea, Mediterranean Sea and Contiguous Atlantic Area (ACCOBAMS)		
1980	(NEW YORK, VIENNA) Convention on the Physical Protection of Nuclear Material		
1981	(GENEVA) Convention Concerning Occupational Safety and Health and the Working Environment		
1982	(MONTEGO BAY) Convention on the Law of the Sea 1994 (NEW YORK) Agreement Related to the Implementation of Part XI of the Convention 1994 (NEW YORK) Agreement for the Implementation of the Provisions of the United Nations Convention on the Law of the Sea of 10 December 1982 relating to the Conservation and Management of Straddling Fish Stocks and Highly Migratory Fish Stocks		
1985	(GENEVA) Convention Concerning Occupational Health Services		

Ac = Accession; Su = Succession; Ra = Ratification.

		Turkmenistan	
		Year	Status
Worldwide agreements			
1985	(VIENNA) Convention for the Protection of the Ozone Layer	1993	Ac
	1987 (MONTREAL) Protocol on Substances that Deplete the Ozone Layer	1993	Ac
	1990 (LONDON) Amendment to Protocol	1994	Ac
	1992 (COPENHAGEN) Amendment to Protocol	2008	Ac
	1997 (MONTREAL) Amendment to Protocol	2008	Ac
	1999 (BEIJING) Amendment to Protocol	2008	Ac
1986	(GENEVA) Convention Concerning Safety in the Use of Asbestos		
1986	(VIENNA) Convention on Early Notification of a Nuclear Accident		
1986	(VIENNA) Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency		
1989	(BASEL) Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal	1996	Ac
	1995 Ban Amendment		
	1999 (BASEL) Protocol on Liability and Compensation		
1990	(LONDON) Convention on Oil Pollution Preparedness, Response and Cooperation		
1992	(RIO) Convention on Biological Diversity	1996	Ac
	2000 (CARTAGENA) Protocol on Biosafety	2008	Ac
1992	(NEW YORK) United Nations Framework Convention on Climate Change	1999	Ra
	1997 (KYOTO) Protocol	1999	Ra
1993	(PARIS) Convention on the Prohibition of the Development, Production, Stockpiling and Use of Chemical Weapons and on Their Destruction		
1994	(VIENNA) Convention on Nuclear Safety		
1994	(PARIS) United Nations Convention to Combat Desertification	1996	Ra
1997	(VIENNA) Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management		
1997	(VIENNA) Convention on Supplementary Compensation for Nuclear Damage		
1998	(ROTTERDAM) Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade		
2001	(STOCKHOLM) Convention on Persistent Organic Pollutants		

Ac = Accession; Su = Succession; Ra = Ratification.

		Turkmenistan	
		Year	Status
Regional and subregional agreements			
1979	(BERN) Convention on the Conservation of European Wildlife and Natural Habitats		
1979	(GENEVA) Convention on Long-range Transboundary Air Pollution		
	1984 (GENEVA) Protocol - Financing of Co-operative Programme (EMEP)		
	1985 (HELSINKI) Protocol - Reduction of Sulphur Emissions by 30%		
	1988 (SOFIA) Protocol - Control of Emissions of Nitrogen Oxides		
	1991 (GENEVA) Protocol - Volatile Organic Compounds		
	1994 (OSLO) Protocol - Further Reduction of Sulphur Emissions		
	1998 (AARHUS) Protocol on Heavy Metals		
	1998 (AARHUS) Protocol on Persistent Organic Pollutants		
	1999 (GOTHENBURG) Protocol to Abate Acidification, Eutrophication and Ground-level Ozone		
1991	(ESPOO) Convention on Environmental Impact Assessment in a Transboundary Context		
2003	(KIEV) Protocol on Strategic Environmental Assessment		
1992	(HELSINKI) Convention on the Protection and Use of Transboundary Waters and International Lakes		
	1999 (LONDON) Protocol on Water and Health		
1992	(HELSINKI) Convention on the Transboundary Effects of Industrial Accidents		
	2003 (KIEV) Protocol on Civil Liability and Compensation for Damage Caused by the Transboundary Effects of Industrial Accidents on Transboundary Waters		
1993	(OSLO and LUGANO) Convention - Civil Liability for Damage from Activities Dangerous for the Environment		
1994	(LISBON) Energy Charter Treaty		
	1994 (LISBON) Protocol on Energy Efficiency and Related Aspects		
	1998 Amendment to the Trade-Related Provisions of the Energy Charter Treaty		
1997	(NEW YORK) Convention on Non-navigatory Uses of International Watercourses		
1998	(AARHUS) Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters	1999	Ra
	2003 (KIEV) Protocol on Pollutant Release and Transfer Register		
1998	(STRASBOURG) Convention on the Protection of Environment through Criminal Law		
2000	(FLORENCE) European Landscape Convention		
2006	(SEMIPALATINSK) Treaty on a Nuclear-Weapon free Zone in Central Asia		

Ra = Ratification.

Biodiversity and living resources	2003	2004	2005	2006	2007	2008	2009	2010	2011
Protected areas									
- Total area (km ²)	14,613	14,613	14,613	14,613	14,613	14,613	14,613	14,613	..
- Protected areas by IUCN categories (% of national territory)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	..
Ia Strict Nature Reserve	..	..	..	..	..	..	7,892.0	..	..
Ib Wilderness Area	..	..	..	..	..	..	..	..	..
II National Park	..	..	..	..	..	..	..	..	..
III Natural Monument	..	..	..	..	..	..	20.2	..	..
IV Habitat / Species Management Area	..	..	..	..	..	..	10,612.0	..	..
V Protected Landscape / Seascape	..	..	..	..	..	..	636.0	..	..
VI Managed Resource Protected Area	..	..	..	..	..	..	..	..	..
Forests and other wooded land									
- Total area (km ²)	..	..	41,270	..	..	..	..	41,270.0	..
- Total area (% of total land area)	..	..	8.8	..	..	..	..	8.8	..
- Undisturbed by humans (1,000 ha)	..	..	..	..	..	..	..	..	..
- Semi-natural (1,000 ha)	..	..	..	..	..	..	..	..	..
- Plantation (1,000 ha)	..	..	..	..	..	..	..	..	..
- Area of regeneration (1,000 ha)	..	..	..	..	..	..	..	..	..
Share of threatened species (IUCN categories) in total number of species:									
- mammals (%)	..	..	..	..	..	..	..	..	..
- birds (%)	..	..	..	..	..	..	..	..	..
- fish (%)	..	..	..	..	..	..	..	..	..
- reptiles (%)	..	..	..	..	..	..	..	..	..
- vascular plants	..	..	..	..	..	..	..	..	..
Land resources and soil	2003	2004	2005	2006	2007	2008	2009	2010	2011
Land area (km ²)	469,930	469,930	469,930	469,930	469,930	469,930	469,930	469,930	..
Agricultural land (1,000 ha)	32,465	32,465	32,615	32,655	32,615	32,613	32,610	..	..
Cultivated land (1,000 ha)	4,491	449	4,511	4,517	4,511	4,372	4,164	..	..
Built-up and other related area (% of total land area)	..	..	..	..	..	..	..	..	..
Soil erosion	..	..	..	..	..	..	..	..	..
- % of total land	..	..	..	..	..	..	..	..	..
- % of agricultural land	..	..	..	..	..	..	..	..	..
Total consumption of mineral fertilizers per unit of agricultural land (kg/ha)	..	..	..	..	..	..	..	..	..
Total consumption of organic fertilizers per unit of agricultural land (t/ha)	..	..	..	..	..	..	..	..	..
Total consumption of pesticides per unit of agricultural land (kg/ha)	..	..	..	..	..	..	..	..	..
Energy	2003	2004	2005	2006	2007	2008	2009	2010	2011
Total final energy consumption (TFC) (Mtoe)	..	..	..	..	..	..	..	..	..
- by fuel	..	..	..	..	..	..	..	..	..
Coal	..	..	..	..	..	..	..	..	..
Petroleum	..	..	..	..	..	..	..	..	..
Gas	..	..	..	..	..	..	..	..	..
Nuclear	..	..	..	..	..	..	..	..	..
Renewables	..	..	..	..	..	..	..	..	..
- by sector	..	..	..	..	..	..	..	..	..
Industry	..	..	..	..	..	..	..	..	..
Transport	..	..	..	..	..	..	..	..	..
Agriculture	..	..	..	..	..	..	..	..	..
Services	..	..	..	..	..	..	..	..	..
Households	..	..	..	..	..	..	..	..	..
Electricity consumption (in million kWh)	..	..	..	..	..	..	..	..	..
Energy intensity TPES/GDP (PPP) (toe/1,000 US\$ (2005 PPP))	1005.89	883.00	818.75	749.99	778.60	696.02	571.50	..	..

Income distribution and poverty	2003	2004	2005	2006	2007	2008	2009	2010	2011
GDP per capita (US\$/capita)									
- in current prices (US\$)	3,487	3,708	4,285	4,854	5,484	6,353	6,718	7,316	..
- in prices and PPPs of 2005 (US\$)	3,705	3,832	4,285	4,701	5,160	5,849	6,129	6,611	..
Consumer price index (CPI) (% change over the preceding year, annual average)	..	..	..	..	..	..	..	..	..
Population below national poverty line	..	..	..	..	..	..	..	..	..
- Total (%)	..	..	..	..	..	..	..	..	..
- Urban (%)	..	..	..	..	..	..	..	..	..
- Rural (%)	..	..	..	..	..	..	..	..	..
Income inequality (Gini coefficient)	..	..	..	..	..	..	..	..	..
Telecommunications	2003	2004	2005	2006	2007	2008	2009	2010	2011
Telephone lines per 100 population	8.1	8.3	8.4	8.8	9.4	9.7	9.9	10.3	..
Cellular subscribers per 100 population	0.2	1.1	2.2	4.5	7.9	23.1	42.8	63.4	..
Personal computer in use per 100 population	1.8	2.4	7.2	..	..	..	..	..	..
Internet users per 100 population	0.4	0.8	1.0	1.3	1.4	1.8	2.0	2.2	..
Education	2003	2004	2005	2006	2007	2008	2009	2010	2011
Literacy rate (%)	98.8	98.8	98.8	..	..	..	..	..	..
Literacy rate of 15-24 years old, men and women (%)	..	..	..	..	..	..	..	99.8	..
Education expenditure (% of the GDP)	..	..	..	..	..	..	..	..	..
Gender Inequality	2003	2004	2005	2006	2007	2008	2009	2010	2011
Country Policy and Institutional Assessment gender equality rating (1=low to 6=high)	..	..	..	..	..	..	..	..	..
Share of women employment in the non-agricultural sector (%)	..	..	..	..	..	..	..	..	..
Gender Parity Index in	..	..	..	..	..	..	..	..	..
- Primary education enrolment (ratio)	..	..	..	..	..	..	..	..	..
- Secondary education enrolment (ratio)
- Tertiary education enrolment (ratio)

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*Annex III****LIST OF MAJOR ENVIRONMENT-RELATED
LEGISLATION***

1984

Code on Administrative Offences

1991

Law on Nature Protection

Regulation on Measures on Drastic Improvement of the Ecological Situation in the Caspian Sea Basin

1992

Law on State Protected Natural Areas

Law on Mineral Resources

Law on Foreign Investments

1993

Forest Code

Law on Protection and Rational Use of Flora

1995

Law on State Ecological Expertise

Law on Environmental Impact Assessment

Model Rules for State Reserves

Model Rules on State Nurseries of Threatened Species of Flora and Fauna

1996

Law on Protection of Atmospheric Air

Law on Hydrocarbon Resources

1997

Criminal Code

Law on Protection and Rational Use of Fauna

Regulations for the Red Data Book of Turkmenistan

1998

Law on Appeals

Law on Hunting and Hunting Management

1999

Law on Addresses of Citizens

Law on Hydrometeorological Activity

2001

National Standard TDS 571-2001 on Environmental Impact Assessment of Planned Economic and Other Activities in Turkmenistan

2003

Law on Public Associations

2004

Land Code

Water Code

2005

Rules on Protection of Coastal Waters from Pollution from Ships

2008

Law on Hydrocarbon Resources

Law on the Licensing of Certain Activities

Law on Foreign Investments

2009

Law on Protection of the Ozone Layer

Law on Radiation Safety

Sanitary Code

Law on Education

2010

Law on Drinking Water

2011

Forest Code

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